

is not rebutted by respondents. Based on the foregoing, the administrative law judge finds that complainant has shown, by a preponderance of the evidence, that the accused products practice this claim element.

c. The claimed phrase “(c) filtering the fingerprint image...”

Complainant argued that the Fed Submit software satisfies this claim limitation through various function calls. (CBr at 195.)

Respondents provided no substantive non-infringement argument with respect to this claim element, aside from alleging weaknesses in complainant’s arguments. (See, inter alia, ROCFF VI.C.1.d.1, ROCFF VI.C.1.d.2 ROCFF VI.C.1.d.3, ROCFF VI.C.1.d.4, ROCFF VI.C.1.d.5; RBr at 149-153.)

The staff argued that complainant has shown by a preponderance of the evidence that the Mentalix systems infringe claim 19 of the of the ‘344 patent. (SBr at 57-58.)

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} Based on the foregoing, the administrative law judge finds that complainant has shown, by a preponderance of the evidence, that the accused products practice this claim element.

d. The claimed phrase “(d) binarizing the filtered fingerprint image...”

Complainant argued that the Fed Submit software satisfies this claim limitation through various function calls. (CBr at 195-96.)

Respondents provided no substantive non-infringement argument with respect to this claim element, aside from alleging weaknesses in complainant’s arguments. (See, inter alia, ROCFF VI.C.1.e.1, ROCFF VI.C.1.e.2; RBr at 149-153.)

The staff argued that complainant has shown by a preponderance of the evidence that the Mentalix systems infringe claim 19 of the of the ‘344 patent. (SBr at 57-58.)

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} Based on the foregoing, the administrative law judge finds that complainant has shown, by a preponderance of the evidence, that the accused products practice this claim element.

e. The claimed phrase “(e) detecting a fingerprint area based on a concentration of black pixels in the binarized fingerprint image...”

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The parties had agreed that this claimed phrase need not be construed by the administrative law judge. (Respondents' Response to Complainant's Motion to Narrow Certain Claim Construction Issues for Trial at 4; CBr at 126; RBr at 93-96 (relating this claimed phrase to element c of asserted claim 1); SRBr at 14-15, fn. 2 (pointing out that respondents' argument that their construction for element c) of asserted claim 1 applies to this claim element is made for the first time in respondents' brief); see also, generally, CRBr at 85-100; SBr at 25-35.) The administrative law judge finds that the plain language is sufficiently clear that a separate construction is unnecessary.

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<sup>14</sup> Respondents represented in RRCFF VI.C.2 that their expert Jones provided a non-infringement opinion on element e) of claim 19, but the administrative law judge has reviewed the testimony on which they rely and has not found any clear reference to element e) of claim 19. Respondents' expert does testify that the accused products do not determine "individual fingerprint areas and shapes," but he then relates that specific testimony to only element f) of claim 19. (Tr. at 1566.)

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} Fingerprints are generally oval shaped. (CFF VI.B.1.h.2  
(undisputed in relevant part).) Based on the foregoing, the administrative law judge finds that  
the accused products practice this claim element.

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- f. The claimed phrase “(f) detecting a fingerprint shape based on an arrangement of the concentrated black pixels in an oval-like shape in the binarized fingerprint image; and...”

Complainant argued that this element is practiced by the Fed Submit software for the same reasons given for element e) of asserted claim 19, supra. (CBr at 197.)

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Based on the foregoing, the administrative law judge finds that complainant has shown, by a preponderance of the evidence, that element f) of asserted claim 19 is practiced by the accused

- g. The claimed phrase “(g) determining whether the detected fingerprint area and shape are of an acceptable quality.”

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The staff argued that it is of the view that complainant has shown by a preponderance of the evidence that the use of the accused Mentalix systems infringes claim 19 of the ‘344 patent.

The administrative law judge has found, supra, that “acceptable quality” as used in the asserted claims is construed as “capable or worthy of being generally approved and further dependent on a customer’s requirement.” {

} Based

on the foregoing, the administrative law judge finds that complainant has shown, by a preponderance of the evidence, that element g) is practiced by the accused products.

h. Conclusion

Based on the foregoing, the administrative law judge finds that complainant has shown, by a preponderance of the evidence, that accused RealScan-10 and RealScan-D, which also includes the RealScan-10F and RealScan-DF, when used with the Fed Submit software, infringe asserted claim 19 of the '344 patent.<sup>15</sup>

5. Independent claim 41

- a. The claimed phrase "a comparator that compares the captured fingerprint image to a previously obtained acceptable fingerprint image..."

The administrative law judge finds that said claimed phrase is substantially similar to element e) of asserted independent claim 1, and the administrative law judge has found, supra, that complainant has not shown that said element e) of asserted claim 1 is practiced by the accused products. Thus, the administrative law judge finds that complainant has not shown that the claimed phrase "a comparator that compares the captured fingerprint image to a previously obtained acceptable fingerprint image..." from asserted claim 41 is practiced by the accused products.

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<sup>15</sup> It is undisputed that each of the RealScan-10, RealScan-D, RealScan-F, RealScan-G2, and RealScan-G10 systems have been imported. (See Order Nos. 11, 18 (stipulations regarding importation).) It is further undisputed that the Fed Submit software supports the RealScan-10 and RealScan-D devices. (CFF VII.B.2.a.44 (undisputed).) Complainant has not shown, however, that the RealScan-G2 and RealScan-G10 have been used with the Fed Submit software. (CBr at 210 (alleging the RealScan-10 and RealScan-D have been incorporated into Mentalix' Fed Submit software but specifically not alleging the same with respect to the RealScan-G2 and RealScan-G10); JX-44 at 6 (testimony that the RealScan-G2 and RealScan-G10 are not ready for testing/integrating); JX-42 at 36-37 (testimony that the systems were not demonstrated in the US).) Based on the foregoing, the administrative law judge finds that the only accused products which complainant has shown infringe asserted claim 19 of the '344 patent, when used with the Fed Submit software, are the RealScan-10 and RealScan-D, which also includes the RealScan-10F and RealScan-DF, as those products have been found to be substantially similar.



Based on the foregoing, the administrative law judge finds that complainant has not shown that asserted claim 41 is practiced by any of the accused products.

6. Dependent claims 42, 43, and 45

The administrative law judge has found, supra, that complainant has not shown that asserted independent claim 41 of the '344 patent is infringed by the accused products. As each of claims 42, 43, and 45 depend from said claim 41, the administrative law judge finds that complainant has not shown, by a preponderance of the evidence, that asserted claims 42, 43, and 45 are practiced by the accused products.

D. Infringement By Third Parties, Contributory Infringement, and Inducement to Infringe

Complainant has accused various third parties of infringement of certain asserted claims of the '562 and/or '344 asserted patents. (CBr at 209-214.) Said accusations depend on software written by said third parties that use the Suprema SDK, that complainant represents is substantially the same as the functions accused of infringement against respondents. (Id.) The administrative law judge has found, supra, that complainant has not shown infringement of the '562 patent, and has further not shown infringement of the asserted claims of the '344 patent, with the exception of asserted claim 19. As complainant has made no allegations of infringement by third parties of claim 19 of the '344 patent, each of complainant's accusations against third parties fail for the same analysis, supra, as for direct infringement by respondents of the various claims in issue.

As complainant has not shown infringement by any third parties, the administrative law judge finds that complainant has also shown neither contributory infringement nor inducement to infringe by respondents.

E. Other Arguments

Respondents argued that the Suprema SDKs cannot directly infringe because each of the asserted claims requires “the use of executable software ... running on a separate computer in order to operate the scanners sold by Suprema...”; that the RealScan SDKs comprise a collection of software routines and utilities used to help third party programmers write an application; that the SDKs are incapable of performing the steps of any asserted claims and therefore cannot form the basis of a direct infringement claim. (RBr at 59.) Respondents further argued that the sample code provided with its scanners is distributed as source code and is not executable, and therefore cannot be used to infringe. (RBr at 59-60.) {

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Complainant argued that its’ expert testified as to how the sample code and the demonstration program infringes the ‘562 patent; that its expert pointed to file names and line numbers in his analysis; and that in fact that testimony was unrebutted by respondents. (Tr. at 74-75.) Specifically, complainant argued that Suprema directly infringed the asserted claims of the ‘562 patent by using the demonstration program; that Mentalix directly infringed the asserted ‘562 patent by using its Fed Submit software in conjunction with the RealScan products, including the RealScan-10, RealScan-D, RealScan-G10 and RealScan-G2. (CRBr at 77-79.) More specifically, it is undisputed that the Fed Submit software supports the RealScan-10 and

RealScan-D-accused devices, and that respondent Mentalix has sold said scanners as a system with its Fed Submit software. (CFF VII.B.2.a.8 (undisputed in relevant part); RRCFF VII.B.2.a.8 (“Mentalix purchased RealScan-10 scanners from suprema, and sold them as a system with its FedSubmit software.”); CFF VII.B.2.a.44 (undisputed).)

The staff argued that complainant has shown that respondents infringe the asserted method and system claims of the ‘344 patent, as Suprema and Mentalix have demonstrated or tested the systems in the US. (SRBr at 36-38.)

The administrative law judge has found, supra, that the only asserted method claim that is infringed is claim 19 of the ‘344 patent. Complainant alleged infringement of claim 19 of the ‘344 patent against only certain RealScan products running the Fed Submit software, i.e. RealScan-10, RealScan-D, RealScan-G2, and RealScan-G10. Thus, the administrative law judge finds respondents’ arguments with respect to the asserted ‘562 patent and with respect to asserted claims 1, 7, 41, 42, 43, and 45 of the asserted ‘344 patent, supra, moot.

## X. Invalidity

### A. Prior Art

Respondents argued that asserted independent claim 10 and asserted dependent claims 15 and 18 of the ‘993 patent would have been obvious considering U.S. Patent No. 3,619,060 (the ‘060 patent) (RX-31) in combination with U.S. Patent No. 2,445,594 (the ‘594 patent) (RX-25). (RBr at 211-218.) Respondents further argued that independent claim 10 and asserted dependent claims 11, 12, 15, 17 and 18 of the ‘993 patent would have been obvious considering the ‘060 patent in combination with U.S. Patent No. 5,615,051 (the ‘051 patent)(RX-7). (RBr at 218-224.) Regarding the ‘344 patent, respondents argued that asserted claims 1, 7, 19, 41, 42,



43, and 45 are rendered obvious by U.S. Patent No. 5,073,949 (the '949 patent) (RX-12) alone or in combination with U.S. Patent No. 5,963,656 (the '656 patent) (RX-4). (RBr at 164-181.) Regarding the '562 patent, respondents argued that asserted independent claim 1 is anticipated by U.S. Patent Application Publication No. US 2007/0014440 (the '440 application) (RX-41); and that dependent claims 5, 6, 7, and 12 and independent claim 30 are rendered obvious by the '440 application. (RBr at 65-74.)

Complainant argued that respondents have not shown by clear and convincing evidence that any of the asserted claims of the '993, '344, and '562 patents are anticipated or obvious in view of any of the prior art asserted. (CBr at 59-76, 121-125, 197-203.) Complainant also argued that secondary indicia of non-obviousness based on copying and willful infringement show that the asserted claims are not obvious. (CBr at 203-206.)

The staff argued that respondents have not established by clear and convincing evidence that any of the asserted claims are invalid as anticipated or obvious. (SBr at 69-86.)

An issued patent is presumed valid, see 35 U.S.C. § 282, and a party challenging a patent's validity must overcome this presumption by clear and convincing evidence. See Pfizer, Inc. v. Apotex, Inc., 480 F.3d 1348, 1360 (Fed. Cir. 2007). Respondents have the burden to overcome the presumption that the asserted claims are valid. Tech. Licensing Corp. v. Videotek, Inc., 545 F.3d 1316 (2008). The burden of persuasion never shifts to complainant. Id. Rather, the risk of "decisional uncertainty" remains on the party or parties asserting invalidity. Id. Thus, it is respondents' burden to prove by clear and convincing evidence that any of the alleged prior art references anticipate or render obvious any asserted claims. See PharmaStem Therapeutics, Inc. v. ViaCell, Inc., 491 F.3d 1342, 1360 (Fed. Cir. 2007) (stating, "the burden falls on the

patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, and would have had a reasonable expectation of success in doing so.”). Failure to do so means that respondents lose on this point. Tech. Licensing, 545 F.3d at 1327.

1. Asserted Prior Art

The ‘060 patent is titled “Identification Device” and was issued on November 9, 1971 (JX-31.)

The ‘594 patent is titled “Telecentric Projection Lens” and was issued on July 20, 1948.

The ‘051 patent is titled “Bright Triplet” and was issued on March 25, 1997 from an application filed on October 7, 1994 and claiming priority to a Japanese patent application filed on October 8, 1993.

The ‘949 patent is titled “Personal Verification Apparatus” and was issued on December 17, 1991.

The ‘656 patent is titled “System and Method For Determining The Quality of Fingerprint Images” and was issued on October 5, 1999.

The ‘440 application (Lo (U.S. Patent Application Publication No. US 2007/0014440)) is titled “Automatic Fingerprint Identification System And Method,” was published on January 18, 2007 and filed on December 18, 2002.

2. Anticipation

A patent claim is invalid as anticipated if it “was known or used by others in this country, or patented or described in a printed publication” before the claimed invention, or it was “patented or described in a printed publication... more than one year prior” to the filing

date. 35 U.S.C. §§ 102(a) and (b). Additionally, a claim is anticipated if “the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent.” 35 U.S.C. § 102(e). For anticipation, “all of the elements and limitations of the claim must be shown in a single prior art reference, arranged as in the claim.” Karsten Mfg. Corp. v. Cleveland Golf Co., 242 F.3d 1376, 1383 (Fed. Cir. 2001). Further, where a prior art reference does not expressly disclose an element or limitation of the claim in issue, extrinsic evidence may be used to prove said element or limitation is inherently present in the prior art. See Continental Can Co. USA, Inc. v. Monsanto Co., 948 F.2d 1264, 1268 (Fed. Cir. 1991). However, “[s]uch evidence must make clear the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” Id. Anticipation is a question of fact, including whether or not an element is inherent in the prior art. In re Schreiber, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

a. The ‘562 Patent

Respondents argued that the ‘440 application discloses each element of claim 1 of the ‘562 patent, and thus, the ‘440 application renders claim 1 of the ‘562 patent invalid as anticipated. (RBr at 65-73.)

Complainant argued that the ‘440 application does not anticipate claim 1 of the ‘562 patent because the ‘440 application does not teach checking print quality before capture occurs as required by element (f) of claim 1, and that the patent examiner reached the same conclusion during prosecution of the ‘562 patent. (CBr at 123.)



The staff argued that the '440 application does not anticipate claim 1 of the '562 patent because the "'440 application discloses that 'capture' occurs and then a quality check is performed," and thus, the '440 application does not meet element (f) of claim 1 of the '562 patent. (SBr at 71-72.)

The '440 application discloses an automatic fingerprint identification system and method and the only dispute among the parties regarding whether the '440 application anticipates claim 1 of the '562 patent centers on element (f) of said claim, which states, "determining whether the scanned image is ready for capture based on an expected number of prints detected in step (e) and the quality of the print images determined in step (d)." (See RBr at 72; CBr at 123; SBr at 71-72.) Thus, element (f) requires that the number of prints is detected and the quality of print images is determined before the image is captured.

The '440 application discloses the use of a scanner or camera to capture prints, which are loaded into a microprocessor for processing. (See RX-41 at [0015].) The '440 application also includes a flow diagram at Figure 3 "illustrating the improved matched system in accordance with the present invention," and including steps 200 and 210. (RX-41 at [0012], Fig. 3.) Regarding said steps 200 and 210, the '440 application states:

In FIG. 3, the present invention is illustrated as followed [sic]. Prints are captured from a person or source, including preferably ten prints and slap prints, in step 200 as described above. The captured print records are reviewed for quality in step 210 using a quality algorithm, such as a preferred ICCS algorithm as described later. Prints that exhibit a predetermined threshold quality (step 205) are enrolled in the database as search records in step 220.

(RX-41 at [0020].) Thus, the '440 application discloses capturing prints as a first step and then

determining the quality of the captured prints. Further, in allowing the '562 patent, the Examiner distinguished the '440 application for the same reason, stating:

The closest prior art found as a result of the aforementioned search is as follows. Lo (U.S. Publication Number 2007/0014440) discloses a system and method which scans and captures and then determines as part of the quality check whether or not the appropriate number of prints are present, or whether some prints have been duplicated, swapped, or whether or not a person is an amputee based on the comparison of their individual prints to their slap print. If an error is discovered then the prints are not enrolled in the system and a new scan and capture is done. Lo specifically discloses analyzing the prints post-capture and there is no obvious reason to modify Lo. The other prior art that is considered to be pertinent is Ohba (U.S. Patent Number 7,174,036) which discloses acquiring fingerprints in a specific sequence but does not determine whether or not to capture the fingerprints based on how many fingerprints were detected. It is for these reasons that the case is considered to be in condition for allowance.

(JX-6 at CMT006044 (emphasis added).) Respondents "agree with the [E]xaminer's reasons for distinguishing the cited reference." (RRBr at 47.) Based on the foregoing, the administrative law judge finds that capturing prints as a first step and then making a quality determination as in the '440 application does not anticipate element (f) of claim 1 of the '562 patent because claim 1 of the '562 patent requires a quality determination before capture. Hence, the administrative law judge finds that respondents have not established, by clear and convincing evidence, that claim 1 of the '562 patent is anticipated by the '440 application.

### 3. Obviousness

Included within the presumption of validity is a presumption of non-obviousness.

Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 714 (Fed. Cir. 1984).

Regarding non-obviousness, the patent statute dictates that a person is not entitled to a patent if

the differences between the claimed invention and the prior art “are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.” 35 U.S.C. §103; see also Net MoneyIN, Inc. v. VeriSign, Inc., 545 F.3d 1359, 1371 (Fed. Cir. 2008) (stating, “differences between the prior art reference and a claimed invention, however slight, invoke the question of obviousness, not anticipation.”).

The ultimate determination of whether an invention would have been obvious is a legal conclusion based on underlying findings of fact. In re Dembiczak, 175 F.3d 994, 998 (Fed. Cir. 1999). The underlying factual inquiries relating to non-obviousness include: 1) the scope and content of the prior art; 2) the level of ordinary skill in the art; 3) the differences between the claimed invention and the prior art; and, 4) secondary considerations of non-obviousness, such as long-felt need, commercial success, and the failure of others. See Graham v. John Deere Co., 383 U.S. 1, 17 (1966).

The first step in an obviousness analysis requires a determination of the scope and content of the prior art, and only analogous art can be considered prior art. In re Clay, 966 F.2d 656, 658 (Fed. Cir. 1992). Whether art is analogous is a question of fact and “[t]wo criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.” Id. at 658-659.

Obviousness may be based on any one of the alleged prior art references or a combination of the same, and what a person of ordinary skill in the art would understand based



on his knowledge and said references. If all of the elements of an invention are found, then:

[A] proper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure.

Velander v. Garner, 348 F.3d 1359, 1363 (Fed. Cir. 2003) (emphasis added) (internal citations omitted). Further, the critical inquiry in determining the differences between the claimed invention and the prior art is whether there is a reason to combine the prior art references. See C.R. Bard v. M3 Sys., 157 F.3d 1340, 1352 (Fed. Cir. 1998). For example:

[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.

KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398, 418-19 (2007) (emphasis added) (KSR).

However, the Supreme Court has rejected a "rigid approach," regarding a patent challenger's obligation to demonstrate a "teaching, suggestion, or motivation to combine" in the prior art. Id. at 419-22. The Court stated that:

When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it,

either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. Sakraida and Anderson's-Black Rock are illustrative-a court must ask whether the improvement is more than the predictable use of prior art elements according to their established function.

Following these principles may be more difficult in other cases than it is here because the claimed subject matter may involve more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement. Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicitly. See In re Kahn, 441 F.3d 977, 988 (CA Fed. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusions of obviousness”). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

Id. at 417-18 (emphasis added). Further, a suggestion to combine may come from the prior art, as filtered through the knowledge of one skilled in the art. See Certain Lens-Fitted Film Pkgs., Inv. No. 337-TA-406, Order No. 141 at 6 (May 24, 2005). “[I]n many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” KSR, 550 U.S. at 420-21.

a. The '993 Patent

Respondents argued that the '060 patent discloses an optical system having an optical axis, as in the preamble of claim 10 of the '993 patent; a prism as in element a) of claim 10; an aperture stop as in element b) of claim 10; and a lens forming a telecentric entrance pupil as in element c) of claim 10. (RBr at 218.) Respondents further argued that the triplet lens from either the '594 patent or the '051 patent could be substituted into the device of the '060 patent to render asserted claim 10 of the '993 patent obvious and invalid. (RBr at 211, 218.)

Complainant argued that the '060 patent in combination with either the '594 patent or the '051 patent fails to disclose elements c) and e) of claim 10 of the '993 patent. (CBr at 62.) Complainant further argued that the '060 patent, the '594 patent, and the '051 patent teach away from the invention of the '993 patent and there is no motivation or suggestion to combine the references. (Id. at 63.)

The staff argued that the '060 patent does not disclose elements c), d), and e) of claim 10 of the '993 patent and that the '060 patent in combination with either the '594 patent or the '051 patent does not teach all of the elements of claim 10. (SBr at 76.) The staff further argued that "[r]espondents have not shown that the proposed combinations would have been obvious to try or that there would have been a reasonable expectation of success." (SBr at 76-77.)

i. The '060 Patent In Combination With The '594 Patent

The '060 patent discloses "a device which employs optical apparatus for comparing an object to be identified with a preselected image." (RX-31 at 1:4-5.) Figure 1 of the '060 patent depicts "the optic portion of the apparatus of [the] invention" of the '060 patent, which is an optical system with an optical axis. (RX-31 at 2:53-54.) Said optic portion includes a light



source 12, a lens 14 for deflecting light beams, a prism 18 with a surface 22 oriented at an angle greater than the angle of total internal reflection, another lens 28, and a diaphragm 30, which is an aperture stop. (RX-31 at Fig. 1; 3:1-20, 39-40, 38-40.)

Elements c) through e) of claim 10 of the '993 patent require:

- c) a first lens unit having a positive power between the aperture stop and the prism for forming a telecentric entrance pupil;
- d) a second lens unit having a positive power for forming a real image of the object, said second lens unit being on the image side of the first lens unit; and
- e) a third lens unit for correcting the field curvature of the image contributed by the first and second lens units.

(JX-1 at 10:26-34.) Regarding the two lens elements 14 and 28 of the '060 patent, lens 14 is located between the light source 12 and the prism 18 and “deflect[s] the light beams 16 into parallel relationship with respect to another.” (RX-31 at 3:1-3, Fig. 1.) Thus, lens 14 of the device of the '060 patent, and not lens 28 of the '060 patent, creates a telecentric condition on the illumination side of prism 18. See Order No. 29 Joint Stipulation Regarding Technology In Issue at 5 (“In a telecentric system, the chief ray (i.e., the center ray) of every light ray bundle is parallel to the axis on the object side, image side, or both”). With respect to lens 28, the '060 patent states that, “[t]he reflected light comes out through face 24 of the prism and is focused with an achromatic lens 28 through a diaphragm 30 onto an included focal plane 32.” (RX-31 at 38-40.) Thus, lens 28 is located between the prism 18 and the aperture stop 30. (See RX-31 at Fig. 1.) The '060 patent does not disclose whether lens 14 or lens 28 have a positive power or a negative power. Based on the foregoing, the administrative law judge finds that the '060 patent does not disclose a first lens unit as required by element c) of independent claim 10 of the '993

patent, a second lens unit as required by element d) of independent claim 10 of the '993 patent, or a third lens unit as required by element e) of independent claim 10 of the '993 patent because the '060 patent only discloses two lens units. Moreover, he further finds that said first lens 14 of the '060 patent, which creates a telecentric condition, is not disclosed as having positive power and is not located between the prism and the aperture stop as required by element c) of said claim 10; and said second lens 28 of the '060 patent is not disclosed as having a positive power as required by element b) of said claim 10.

Regarding respondents' argument that the triplet lens from the '594 patent could be substituted into the device of the '060 patent to render asserted claims 10, 15, and 18 of the '993 patent obvious, the '594 patent does disclose a "telecentric objective" with three lens components, the first and third lenses having a positive power and the middle lens having a negative power. (RX-25 at 4:28-32, Figure.) With respect to distortion correction and field curvature correction, the '594 patent also states:

It is of further advantage in correcting the distortion, and also helpful in correcting the curvature of field, to make the negative meniscus element of at least one of the positive components and preferably of both positive components, of a glass with refractive index greater than 1.63. According to another preferred feature of the invention, the negative component consists of a single negative element whose refractive index is less than 1.55. Since it is the negative component principally which corrects the distortion, it is advantageous to make the curves of this lens stronger, and this may be done without making the power of the lens greater by making this lens of low refractive index.

While the distortion can be corrected to a satisfactory degree by any of these features, a combination of all of them corrects the distortion without making any of the components extremely strong in curvature and thus makes them more economical to construct. Furthermore, the zonal distortion is less

noticeable if all the features are combined.

(RX-25 at 2:30-52 (emphasis added).) Thus, regarding correcting field curvature and distortion correction, the '594 patent discloses that distortion and field curvature can be at least partially corrected by including a particular negative meniscus element on one or both of the positive components; that the negative component is the principal component for correcting distortion; and that the combination of negative elements on the positive components and the curvature of the negative component can correct distortion without introducing "strong" field curvature.

However, as seen from the foregoing (RX-25 at 2:30-52), the administrative law judge finds that the '594 patent does not disclose that the third lens component, i.e. the negative component, is included "for correcting the field curvature of the image contributed by the first and second lens units" as required by element e) of claim 10 of the '993 patent.

Regarding any motivation or reason for substituting the lens system of the '594 patent into the optical system of the '060 patent, respondents' expert Sasian testified:

Q. Dr. Sasian, if a person of ordinary skill in the art was sitting in his or her office back at the time of the invention, what would they need -- what would they need to do or, excuse me, what adjustments to the '060 patent would be necessary to form a fingerprint detection device?

A. Well, if I want to make a fingerprint detection device, as a person of ordinary skill, I would be familiar with the prior art. I would be familiar with the '060 patent and I would see that it is calling for an achromatic lens 28, and it would be a telecentric lens, so I would be also aware of a triplet lens such as in the '594 patent that is telecentric.

And they are two references that I can combine because I need to solve the problem of finding out what is lens element 28 that is called as an achromatic lens in the '060, there are no construction of that, so I have that need to find out a lens that I



can insert there.

In addition, the WO international application 896 teaches that one can combine a prism with a triplet lens. So I have a motivation to make a fingerprint device, I have some prior teachings, so I obviously naturally will combine such references.

(Tr. at 1270-1271 (emphasis added).) Thus, Sasian testified that one of ordinary skill in the art would have known that the telecentric lens of '594 patent would be a suitable substitute for lens 28 of the '060 patent. However, Sasian did not explain why one of ordinary skill would have chosen to substitute a telecentric lens system for lens 28 in the device of the '060 patent where the telecentric condition of said device is created by a different lens, viz. lens 14, located on the illumination side of the prism. Further, complainant's expert McWilliams testified that one of ordinary skill would not have been motivated to combine the asserted prior art:

Q. Okay. Before we get there, Professor, do you have an opinion as to whether one of ordinary skill in the art would be motivated to combine these two references to achieve the invention of the '993 patent?

A. I can't see why somebody would want to combine them.

Q. Would they be motivated to combine them in the sense that they were trying to come up with an invention in the '993 patent? Would they be motivated to combine these two references and to come up with the '993 patent?

A. No. If you were looking at the '060 patent, you are not going to be seeing things in play that are going to make you think of the '993. You have solved the telecentric problem on the illumination side. There is no need to have anything on the detection side at all for dealing with that.

\* \* \*

Q. Okay. Would one of ordinary skill in the art, Professor, be motivated to combine the '594 patent and the '060 patent?

A. I wouldn't see a reason to combine the two.

Q. Why is that?

A. This is teaching some chromatic corrections and correcting a field curvature in this projection lens, dealing with color projection, and the '060 is dealing with fingerprint images where field curvature doesn't matter in the slightest, in creating transparencies from it.

(Tr. at 1849, 1852 (emphasis added).)

Based on the foregoing, the administrative law judge finds that respondents have not established, by clear and convincing evidence, that the combination of the '060 patent and the '594 patent discloses a third lens unit as required by element e) of claim 10 of the '993 patent for correcting the field curvature of the image contributed by the first and second lens unit. He further finds that respondents have not established, by clear and convincing evidence, why a person of ordinary skill in the art would have combined the '060 patent with the '594 patent because the '594 patent is correcting field curvature in a projection lens while the '060 patent is dealing with fingerprint imaging.

Based on the foregoing, the administrative law judge finds that respondents have not proven, by clear and convincing evidence, that claim 10 of the '993 patent is invalid as obvious in view of the '060 patent in combination with the '594 patent.

Regarding lens 28 in the '060 patent, respondents argued that said lens forms a telecentric entrance pupil because the aperture stop is located at the focal point of the lens and "[i]t is textbook science that if an aperture stop is located at the focal point of a lens, the lens forms a telecentric entrance pupil." (See RRCFF IV.D.3.a.10.A-D.) However, contrary to respondents' assertion, the '060 patent discloses that the light "is focused with an achromatic

lens 28 through a diaphragm 30 onto an inclined focal plane 32,” which does not disclose placing the aperture stop at the focal point of lens 28. (RX-31 at 3:38-40 (emphasis added).) Further, as found supra, the ‘060 patent discloses creating a telecentric condition with lens 14, which “deflect[s] the light beams 16 into parallel relationship one with respect to another.” (RX-31 at 3:1-3; See Order 29, Joint Stipulation at 5 (“In a telecentric system, the chief ray... of every light ray bundle is parallel to the axis on the object side, image side, or both”).)

Respondents further argued that the combination of the ‘060 patent and the ‘594 patent discloses a third lens unit according to element e) of claim 10 of the ‘993 patent. In support of said argument, respondents rely on the testimony of their expert Sasian, who testified:

So this lens, it is, indeed, a telecentric lens with the entrance pupil at infinity. Furthermore, the ‘594 discloses on column 1, line 6, 7, that this objective is reasonably well corrected for distortion and curvature of the field.

So there is correction for field curvature, and this is accomplished with the negative field curvature of the third negative element that corrects the field curvature of the positive component, components, the front component and the rear component that I have described before.

\* \* \*

Q. Thank you, Doctor. Let's move on to RDX-5-46, which relates to claim limitation 10E.

Dr. Sasian, do you have an opinion regarding whether the ‘060 patent and ‘594 patent disclose this limitation?

A. Yes, because as I testified before, the triplet of the ‘594 patent has a third component, which is a third unit that corrects for field curvature. So this claim element 10E will also be met. It will be correcting the field curvature contributed by the positive front component and the positive rear component, which are a first and



second lens units having positive power, contributing positive field curvature that would be corrected by the third component, which is the negative middle element that will be -- that is a third lens unit.

(Tr. at 1248-1249, 1268-1269.) However, as found supra, the '594 patent does not disclose that the negative component is introduced "for correcting the field curvature of the image contributed by the first and second lens units" as required by element e) of claim 10 of the '993 patent. Rather, as found supra, the specification of the '594 patent only describes the use of negative elements on the positive components as correcting field curvature and the negative component is only described in the specification of the '594 patent as correcting distortion.

Regarding asserted dependent claims 11, 12, 15, 17, and 18 of the '993 patent, respondents argued that claims 15 and 18 are obvious in view of the '060 patent in combination with the '594 patent. (RBr at 217-218.) As found supra, claim 10 of the '993 patent would not have been obvious in view of the asserted combination, and thus, the administrative law judge further finds that the asserted dependent claims are not obvious in view of the '060 patent in combination with the '594 patent.

ii. The '060 Patent In-Combination With The '051 Patent

As found supra, the '060 patent does not disclose a first lens unit, a second lens unit, or a third lens unit according to elements c), d), and e) of claim 10 of the '993 patent, and the '060 patent discloses creating the telecentric condition in a lens 14 on the illumination side of the prism and not in a lens located between the prism and the aperture stop as required by element c) of claim 10 of the '993 patent.

Regarding respondents' argument that the triplet lens from the '051 patent could be substituted into the device of the '060 patent to render asserted claims 10, 11, 12, 15, 17 and 18

obvious, the '051 patent discloses a "bright triplet and, more particularly, to a behind-the-stop type triplet that has a wide field angle and is bright, so that it is well suited for use on photographic cameras." (RX-7 at 1:5-7.) Significantly, the parties do not dispute that the '051 patent does not disclose a telecentric lens system. (See CRFF 1150.5 ("The '051 patent does not disclose a telecentric entrance pupil as recited in claim 10"; RRCFF IV.D.3.a.67.A ("The patent simply does not expressly teach forming a telecentric entrance pupil"); SBr at 76 ("The Takato '051 patent does not expressly disclose a telecentric system").) As found supra, the device of the '060 patent does not disclose "a first lens unit having a positive power between the aperture stop and the prism for forming a telecentric entrance pupil" as in element c) of claim 10 of the '993 patent because the telecentric condition in the '060 patent is created by lens 14 and not lens 28. Thus, the administrative law judge finds that substitution of the triplet lens system of the '051 patent into the device of the '060 patent would not disclose a first lens unit as in element c) of claim 10 of the '993 patent.

Further, regarding any motivation or reason for substituting the lens system of the '051 patent into the optical system of the '060 patent, respondents' expert Sasian testified:

- Q. Dr. Sasian, if a person of ordinary skill in the art was sitting in their office with the '060 patent and the '051 patent at the time of the invention, what steps would they need to take to make a fingerprint detection device?
- A. Well, what they have to do is combine the -- both references, and replace lens 28 with the triplet of the '051 patent, following the indication of the '060 patent.
- Q. Why would they be motivated to do so?
- A. Because of the need to, to create a fingerprint system. The '060 patent doesn't disclose the constructional data for the achromatic

lens 28. So a person of ordinary skill would have the need to find what that achromatic lens that could be the triplet of the '051 patent.

Q. Can you explain for me why the lens 28 would need to be replaced in the '060 patent?

A. Because, again, the '060 patent does not disclose the construction of that, so a person needs to put a lens and then that person could very well use the triplet of the '051 patent, because they are well-known lenses.

(Tr. at 1280-1281.) Thus, Sasian testified that one of ordinary skill in the art would have known to substitute the lens system of the '051 patent in the device of the '060 patent because the '060 patent does not describe the construction of lens 28 and because the triplet of the '051 patent was well known. However, the administrative law judge finds that the '051 patent includes a lens system that is "well suited for use on photographic cameras" (RX-7 at 1:7-8.) He finds nothing in the record to indicate why one of ordinary skill in the art would have substituted a lens system for a camera into a fingerprint detection device.

Based on the forgoing, the administrative law judge finds that respondents have failed to prove, by clear and convincing evidence, that the device of the '060 patent in combination with the '051 patent discloses every element of claim 10 of the '993 patent or that one of ordinary skill in the art would have been motivated to combine the asserted references.

Based on the foregoing, the administrative law judge finds that respondents have not established, by clear and convincing evidence, that claim 10 of the '993 patent is obvious in view of the '060 patent in combination with the '051 patent.

Regarding asserted dependent claims 11, 12, 15, 17, and 18 of the '993 patent, respondents argued that each of said asserted dependent claims are obvious in view of the '060



patent in combination with the '051 patent. (RBr at 221-224.) As found supra, claim 10 of the '993 patent would not have been obvious in view of the asserted combination, and thus, the administrative law judge further finds that the asserted dependent claims are not obvious in view of the '060 patent in combination with the '594 patent.

b. The '344 Patent

Respondents argued regarding the '344 patent that asserted independent claim 1, claim 7 dependent on claim 1, independent claim 19, independent claim 41, and each of claims 42, 43, and 45, which are dependent on claim 41, are invalid as obvious in view of the '949 patent alone or in combination with the '656 patent. Regarding independent claims 1 and 41 of the '344 patent, respondents argued that the '949 patent teaches every element of said independent claims except for three levels of quality classification, *viz.* acceptable, possibly acceptable, or unacceptable. However, it is further argued that the '949 patent teaches two levels of quality classification and that implementing a third level of quality classification would have been obvious. (RBr at 169-180.) Regarding independent claim 19, respondents argued that said claim 19 is obvious in view of the '949 patent alone because the '949 patent teaches all of the limitations of said claim 19. (RBr at 178-180.) Respondents also argued that the '656 patent discloses three levels of quality classification and thus, that the combination of the '949 patent and the '656 patent would render claims 1, 7, 41, 42, 43, and 45 of the '344 patent obvious. (RBr at 181.)

Complainant argued that none of the asserted claims of the '344 patent are rendered obvious by the '949 patent alone or in combination with the '656 patent. Specifically regarding independent claims 1 and 41 of the '344 patent, complainant argued that the '949 patent does not



teach quality classification and only determines whether two prints are the same; that the '949 patent does not disclose "determining whether the processed combined image is of a good quality;" and that the '646 patent does not "cure the deficiencies" of the '949 patent. (CBr at 198-202.) Regarding independent claim 19 of the '344 patent, complainant argued that the '949 patent does not disclose elements (d) and (g) of claim 19. (CBr at 201-202.)

The staff argued that respondents have not proven by clear and convincing evidence that the asserted claims of the '344 patent are invalid as obvious. Regarding claims 1, 7, 41, 42, 43, and 45 of the '344 patent, the staff argued that the combination of the '949 patent with the '656 patent does not teach quality classification of three levels based on a comparison with a prior image. (SBr at 80-81.) Regarding independent claim 19 of the '344 patent, the staff argued that the '949 patent does not disclose binarization as the term is used in the '344 patent; that the '949 patent does not determine quality based on area and shape; and that "[r]espondents have not proposed any reason why the ['949 patent] would have been modified to match these limitations of the '344 patent." (SBr at 79-80.)

i. Claim 1

Regarding respondents' argument that claim 1 of the '344 patent is obvious in view of the '949 patent alone, the '949 patent discloses a personal verification apparatus at Figure 3, which is described to include:

A finger table 11 consists of, e.g., a transparent prism. A person to be verified places, e.g., two fingers Fa and Fb on the finger table 11 when finger image data is input. When light is emitted from a light source 12 disposed below the finger table 11 through the finger table 11, the image data of the fingers Fa and Fb placed on the finger table 11 is read by a camera 13 as a reflection optical image.

(RX-12 at 4:14-22.) Said apparatus also includes “separating means for separating the image data of the plurality of fingers input by the input means into image data for the respective fingers.” (RX-12 at 46-49.)

Regarding element (c) of claim 1 of the ‘344 patent, which requires “using concentrations of black pixels arranged in oval-like shapes in the combined image to determine individual fingerprint areas and shapes,” the administrative law judge construed said element supra to mean “identifying concentrations of black pixels, which have oval-like shapes, to determine individual fingerprint areas and shapes.” The ‘949 patent discloses taking an “image pattern” as represented in Fig. 4A, finding a “sum signal  $X_{ab}$ ” as represented in Fig. 4B, finding a “y coordinate (separating point)  $y_t$  which separates the two fingers  $F_a$  and  $F_b$ ,” and then generating “feature data” for each of the two fingers as represented in Figs. 4C and 4D. (RX-12 at 5:26-65, Figs. 4A-4D.) Further regarding said “feature data,” the ‘949 patent discloses:

These feature data  $A_a(y)$  and  $A_b(y)$  respectively have minimum peaks (minimum values) at positions of the lateral wrinkles corresponding to the joint portions of the fingers, and these minimum peaks serve as parameters (individuality) to verify the person himself.

(RX-12 at 5:66-6:2.) Thus, the ‘949 patent discloses finding a separating point  $y_t$  between two fingers and hence, the individual fingerprint areas are determined from the separating point  $y_t$ . However, after the individual fingerprint areas are determined, the ‘949 patent only identifies minimum peaks corresponding to individual fingerprint images to verify a person’s identity, and the ‘949 patent does not disclose determining the individual fingerprint shapes. Based on the foregoing, the administrative law judge finds that the ‘949 patent does not teach element (c) of claim 1 of the ‘344 patent insofar as the ‘949 patent does not disclose determining individual

fingerprint shapes.

Respondents argued that the '949 patent discloses a histogram analysis that teaches element (c) of claim 1 of the '344 patent. (See RFF 863-867.) In support of said argument, respondents relied on the testimony of their expert Jones, who testified:

Q. All right. Thank you.

Let's go on to the next slide, RDX-6C-67.

A. Yes.

Q. What does this show?

A. This is addressing element C of claim 1. And under Complainant's construction, actually, as I will mention in a moment, and it refers to a different diagram in the Takeda, figures 4A, 4B, and 4D.

The claim element says using concentrations of black pixels arranged in oval-like shapes in the combined image to determine individual fingerprint areas and shapes. So that 4A is a representation of a filtered and binarized image of two fingers.

And you can see that the fingertips themselves are oval-like shapes. What is happening here is X and Y projections of the image, the X projection is in figure 4B and figures 4C and D show the Y projections.

The key points that are being indicated there in these curves, you can see clearly show the space between the fingers in 4B and the joint locations in 4C, so those concentrations of black pixels are being used to determine where those individual fingerprint areas and shapes are.

And the reason that I say under Complainant's construction, note that there is no need here, there is no processing to determine ovality or shapes or anything, so even under their construction, I believe this claim element is met.

(Tr. at 1608-1610 (emphasis added).) However, while the specification of the '949 patent, cited



supra, discloses finding a separating point for the combined image and then finding minimum peaks for individual fingers, said separating point and minimum values are not used to determine the shapes of the individual fingerprints.

Regarding element (e) of claim 1 of the '344 patent, which requires "comparing each of the separated individual fingerprint images to a corresponding previously captured acceptable fingerprint image," the administrative law judge construed said element, supra, to mean "comparing each of the separated fingerprint images to historical data corresponding to an acceptable fingerprint image." The parties do not dispute that the '949 patent discloses a comparison between separated individual fingerprint images and a corresponding previously captured fingerprint image. (RFF 871 (undisputed in relevant part).) Thus, the parties only dispute whether the previously captured fingerprint image was "acceptable" as required by element (e) of claim 1 of the '344 patent. Further, respondents acknowledged that the '949 patent does not disclose a quality determination with respect to said previously captured fingerprint image, but respondents argued that "[t]he previously registered fingerprint data is inherently an 'acceptable' fingerprint image, since otherwise it could not be used for fingerprint matching." (RBr at 175.) However, respondents did not cite to any evidence in the record to support said inherency argument. Based on the foregoing, the administrative law judge finds that the '949 patent does not teach element (e) of claim 1 of the '344 patent insofar as the '949 patent does not disclose a comparison with a "previously captured acceptable fingerprint image." (JX-1 at 18:1-3 (emphasis added).)

Regarding element (f) of claim 1 of the '344 patent, said element requires "classifying the separated individual fingerprint images as being either acceptable, possibly acceptable, or



unacceptable according to the comparing step” (JX-2 at 18:4-6) and the administrative law judge has construed the term “quality” supra to mean “a measure of acceptability.” As found supra, the ‘949 patent discloses comparing individual fingerprint images with previously captured fingerprint images to “determine whether the person to be verified is the person himself or another person.” (RX-12 at 7:38-40.) As part of the verification process, the ‘949 patent discloses making a determination of “coincidence” or “noncoincidence” for a first finger  $f_a$  and then for a second finger  $f_b$  (See RX-12 at 7:40-64), which the administrative law judge finds are two measures of acceptability corresponding to the “acceptable” and “unacceptable” levels included in element (f) of claim 1 of the ‘344 patent. However, the ‘949 patent does not disclose a third level of quality corresponding to the “possibly-acceptable” level of quality as required in element (f) of claim 1 of the ‘344 patent.

Regarding whether it would have been obvious to include a third level of quality, viz. a “possibly acceptable” level, in the method of the ‘949 patent, respondents expert Jones testified:

Q. All right. Let's have RDX-6C-70 up, please. What does this show, Dr. Jones?

A. So this is showing the -- first shows the claim element 1F of the '344, which reads "quality classifying the separated individual fingerprint images as being either acceptable, possibly acceptable, or unacceptable according to the comparing step."

And there are a couple of sections here simply because there is text in between in the patent to explain these equations. But what these equations are doing is expressing mathematically those comparisons that are going on.

And what I want to emphasize is that there are two particular comparisons of quantities that are referred to as S sub B and, I believe, S sub A. It is difficult for me to read at the moment.

What is happening here is those two quantities are being computed on each of the stored image and the new image. And then comparisons are being made on those two measures between the stored image and the new image. So two comparisons are made.

And what I am trying to demonstrate here, the computation at the bottom is merely a sum of those two things weighted. So you would be able to see three different types of correspondence. That is, neither of the fingers matched. Recall what we're doing here is we're comparing two fingers to two stored fingers. Neither of the fingers matched -- that would be the lowest level. Both fingers matched -- that would be the highest level.

And then only one of the fingers matched -- and that would be a middle level. So to me that's a natural demonstration of unacceptable, where neither matched; acceptable, where both matched; and then if only one finger matched, then that would be possibly acceptable.

So I believe that this satisfies claim element 1F, which calls for those three named levels of acceptability. And, finally, that entire discussion I gave also applies to the classifier element of claim 41 of the '344.

\* \* \*

Q. All right. Very well.

Let's go to the next slide, please, RDX-6C-71. What is shown on this slide?

A. This is merely more of the calculations, and I believe we have probably covered this point, so I really have nothing more to say to this. This was just more of the calculations that lead to that determination of one or both fingers.

(Tr. at 1612-1614, 1618-1619 (emphasis added).) While the '949 patent does disclose verification of individual fingerprints, contrary to the testimony of Jones, the '949 patent does not disclose a third level of classification where one fingerprint is verified and the other is not.

Thus, with respect to Fig. 6, the '949 patent discloses:

In accordance with the collation result obtained for the forefinger Fa and the middle finger Fb, it is finally determined whether the person to be verified is the person himself (steps 61 and 63). In this case, only when the person himself is determined for both the fingers Fa and Fb (step 61), the person to be verified is determined as the person himself. Unless the person himself is determined for both the fingers Fa and Fb (step 63), the person to be verified is not determined as the person himself. However, when the security control is not so important, in order to improve passing efficiency and to achieve a smooth operation, the person to be verified may be determined as the person himself if the person himself is determined for only one finger.

(RX-12 at 8:1-14 (emphasis added).) Thus, in the situation where coincidence is determined for one finger and noncoincidence is determined for the other finger, the '949 patent discloses that one of two outcomes are possible, *viz.* the person is determined to be someone else or the person is verified as himself. There is nothing in the record to indicate how or why the implementation of third level of quality classification would have been obvious to one of ordinary skill in the art based on the '949 patent alone.

Regarding element (h) of claim 1 of the '344 patent, said element requires "determining whether the processed combined image is of a good quality." As found *supra*, the '949 patent discloses making a coincidence determination for each individual fingerprint image and verifying a user's identity based on said coincidence determinations. Thus, the device and method of the '949 patent treat the individual fingerprint images separately in verifying a user's identity, the final verification is based on assessment of the individual fingerprint images, the combined image is not used to determine coincidence or verification, and the '949 patent does not disclose any assessment of the combined image as required by element (h) of claim 1 of the '344 patent.



(See RX-12 at Fig. 6.)

Respondents argued that the '949 patent teaches element (h) of claim 1 of the '344 patent because "a fingerprint that is deemed acceptable by the collation process would be considered to have a measure of acceptability that is adequate and the fingerprint's attributes would be registered in the dictionary section." (RFF 883.) In support, respondents relied on Figure 5 of the '949 patent and the testimony of their expert Jones, who testified:

- Q. Okay. Let's go to the next slide, please, RDX-6C-73. What does this show?
- A. So this is addressing claim element 1H. And here I am specifically discussing Complainant's construction. This is determining whether the processed combined image is of a good quality.

And so this refers to figure 5 of RX-12. And if you look at those blocks, the second block generates the sum signal of pixel density in X direction and the third block computes the Y coordinates for separating the finger image, and then the fourth block generates the pixel density in the Y direction for the four finger and then for the middle finger.

What is happening here is sizes and dimensions -- I shouldn't say sizes. What is being computed here are dimensions of the boxes. So -- and there is some area determination here as well.

So if we adopt Complainant's construction of determining good quality that it could be related to just area and overall things like height and width, then this clearly meets determining whether it is of a good quality.

And I would like to point out the final decision here is registering in the dictionary section. So a determination is being made of what is the -- what are these attributes of the image.

(Tr. at 1620-1621 (emphasis added).) However, Figure 5 of the '949 patent relates only to the registration of data for use in the "dictionary section," which corresponds to a previously



captured fingerprint image and not the combined image referred to in element (h) of claim 1 of the '344 patent. There is no indication in the record regarding how or why any quality determination related to registration of fingerprint data in the "dictionary section" would teach or make obvious a quality determination related to the "combined image" as in element (h) of claim 1 of the '344 patent.

Regarding respondents' argument that claim 1 of the '344 patent is obvious in view of the '949 patent in combination with the '656 patent, respondents have argued that element (f) of claim 1 of the '344 patent would have been obvious in view of the combination of the '949 patent with the disclosure of three levels of quality classification in the '656 patent. The '656 patent "discloses a system and method for determining the quality of fingerprint images based on a ratio of weighted sums of qualities of blocks of pixels" (CFF VI.D.2.5 (undisputed)), and the parties do not dispute that the '656 patent discloses quality classification into three levels corresponding to acceptable, possibly acceptable, or unacceptable. (RFF 908 (undisputed in relevant part).) Further, regarding the motivation to combine the '949 patent with the quality classification scheme in the '656 patent, Jones testified:

Q. And what reason, if any, would a person of ordinary skill in the art back in the time these patents were applied for, would use, would have to combine these two references?

A. Well, both patents are in the same field. Both patents are related to systems that acquire and process fingerprint images.

Both patents were in existence at the time in the same field of art and would be readily accessible. And it would be an obvious conclusion.

(Tr. at 1630-1631 (emphasis added).) Respondents' expert Jones, however, did not provide any reason regarding why a person of ordinary skill in the art would have been motivated to

implement a quality classification scheme as in the '656 patent in the method and device of the '949 patent or how such a combination could have been implemented.

Based on the foregoing, the administrative law judge finds that respondents have not established, by clear and convincing evidence, that claim 1 of the '344 patent would have been obvious to one of ordinary skill in the art in view of the '949 patent alone or in combination with the '656 patent.

ii. Claim 7

Claim 7 of the '344 patent depends from claim 1 and adds the limitation "determining whether the combined image is captured from a left or a right hand." As found supra, claim 1 would not have been obvious in view of the '949 patent alone or in combination with the '656 patent, and hence, he further finds that claim 7 would not have been obvious in view of the asserted combinations.

iii. Claim 19

Regarding claim 19 of the '344 patent, respondents argued that the invalidity analysis for claim 1 elements (a) and (b) apply to elements (a) and (b) of claim 19; that the analysis for claim 1 element (c) applies to elements (e) and (f) of claim 19; and that claim 19 includes three limitations not present in claim 1, viz. elements (c), (d) and (g) of claim 19. (RBr at 178-179.) As found supra, the '949 patent does not disclose or make obvious element (c) of claim 1 of the '344 patent because it does not determine individual fingerprint shapes, and thus he further finds that the '949 patent does not teach element (f) of claim 19 of the '344 patent, which requires "detecting a fingerprint shape based on an arrangement of the concentrated black pixels in an oval-like shape in the binarized fingerprint image." The administrative law judge also finds that

the '949 patent does not teach or make obvious element (g) of claim 19 of the '344 patent, which requires "determining whether the detected fingerprint area and shape are of an acceptable quality," because the '949 patent does not disclose detecting the fingerprint shape.

Regarding element (c) of claim 19 of the '344 patent, which requires "filtering the fingerprint images," respondents' expert Jones testified:

Q. All right. Let's have the next slide, please, RDX-6C-74. What is your opinion here?

A. So this is referring to claim 19 now, but it is element C, which specifically calls out filtering the fingerprint image. And I have gone back to those image drawings, if you will, and if you recall, that image on the left is clearly a processed image.

The way the pixel densities are being generated in the X and Y direction mandate that the image has been filtered in order to create those projections. So I believe that the processing here satisfies limitation C.

\* \* \*

Q. What is your opinion, Dr. Jones, as to whether or not this is inherent?

A. Well, I may have used the wrong word. I said it is mandated. It is clear that filtering took place in order to do this processing, and so I believe that would be inherent. I'm sorry if I used the wrong word.

(Tr. at 1621-1623 (emphasis).) Based on said testimony, respondents asserted that the '949 patent inherently discloses filtering images. (RFF 890.) However, the administrative law judge finds that Jones did not provide any explanation regarding why generating pixel densities in the X and Y direction indicates that the '949 patent inherently discloses filtering images as required by element (c) of claim 19 of the '344 patent.



Regarding element (d) of the '344 patent, which requires "binarizing the filtered fingerprint image," respondents expert Jones testified:

Q. Okay. And let's have the next slide, please, RDX –

A. Yes. So this refers to element 19D.

Q. 6C-75. Wait. I'm sorry. RDX-6C-75. Yes, please.

A. Yes, I'm sorry. This is element 19D of the '949, which refers to binarizing the filtered fingerprint image. And it is clear from the description in the '949 that the input video image goes through an A-to-D converter to generate, and for convenience, I have merely put up figure 4A again. And the issue is that for that image to be generated, that the video signal passed through an A-to-D converter, which converted the analog signal into binary representation, creating binary data.

And so I believe that that satisfies element 19D. And that would be the same as 42.

(Tr. at 1627 (emphasis added).) Thus, Jones testified that the analog to digital conversion of the fingerprint image in the '949 patent meets element (d) of claim 19 of the '344 patent. However, regarding the analog to digital conversion compared to binarizing, complainant's expert McWilliams testified:

But that analog-to-digital conversion is by no means the binarizing process described that we have been addressing all week in these patents. This is a way of representing the time dependent amplitude of a signal when you do an A-to-D conversion and putting it into digital signal format.

As opposed to that, the binarization we're speaking about for fingerprint images here is taking pixels in the image and deciding whether they are white or black. The A-to-D conversion that is spoken about here has a vastly larger number of choices than just 0 or 1 or white or black.

(Tr. at 1810-1811 (emphasis added).) Further, the specification of the '344 patent describes the



binarization process. Thus, it states:

In step 706, a binarization process is performed. The binarization process can remove all of the gray areas and replace them with either black or white pixels based on a black and white threshold point. In one embodiment, the binarization process begins by taking an average gray scale value of the filtered image. In this instance, the average gray-scale value is the black and white threshold point. In this embodiment, all of the pixel values above the average value are replaced with white pixels and all the pixel values equal to and below the average value are replaced with black pixels. The resulting image is comprised of all black and white pixels.

(JX-2 at 15:32-43 (emphasis added).) Based on the foregoing, the administrative law judge finds that the '949 patent does not teach binarizing the filtered fingerprint image as required by element (d) of claim 19 of the '344 patent.

Based on the foregoing, the administrative law judge finds that respondents have failed to establish by clear and convincing evidence that claim 19 of the '344 patent would have been obvious in view of the '949 patent.

iv. Claims 41, 42, 43, and 45

Regarding independent claim 41 and claims 42, 43, and 45, which are dependent on claim 41, respondents argued that the '949 patent discloses the elements of these claims based upon their obviousness arguments related to independent claim 1, dependent claim 7, and independent claim 19. (RBr at 180-181.) As found supra, the asserted prior art does not render independent claim 1, dependent claim 7, or independent claim 19 obvious, and thus, the administrative law judge finds that respondents have failed to establish, by clear and convincing evidence, that independent claim 41 and each of claims 42, 43, and 45, which are dependent on claim 41, would have been obvious in view of the '949 patent alone or in combination with the '656 patent.

c. The '562 Patent

i. The '440 Application

Respondents argued that dependent claims 5, 6, 7, and 12 and independent claim 30 are obvious in view of the '440 application.<sup>16</sup> (RBr at 73-74.) Specifically, with respect to claims 5, 6, and 7 of the '562 patent, respondents argued that the "'440 Application also discloses scanning to obtain a subsequent (second) scanned image as recited in claim 5 of the '562 patent... [and] using timeout periods would be obvious to a person of ordinary skill in the art.'" (RBr at 73.) Regarding claim 12, respondents argued that "using predetermined capture delay time period would be obvious to a person of ordinary skill in the art." (RBr at 73-74.) With respect to claim 30, respondents argued that "functionality that implements claims 1 and 12 would also implement claim 30... [and] [f]or the reasons stated above for claims 1 and 12, the Lo '440 Application renders obvious claim 30." (RBr at 74.)

Complainant argued that the '440 application does not disclose or make obvious all of the elements of dependent claims 5, 6, 7, and 12 and independent claim 30. (CBr at 123-125.) Complainant also argued that respondents' expert Jones did not provide any substantive testimony regarding whether the '440 application renders the asserted claims of the '562 patent obvious. (*Id.* at 124-125.)

The staff argued that while respondents assert that dependent claims 5, 6, 7, and 12, and independent claim 30 would have been obvious in view of the '440 application, the '440 application does not "satisfy the limitation of both independent claims requiring that the system

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<sup>16</sup> As found *supra*, the '440 application does not anticipate claim 1 of the '562 patent application, and respondents have not argued that claim 1 would have been obvious in view of the '440 application.

determine whether the image is ‘ready-for capture’;” that “[r]espondents’ obviousness arguments do not address this limitation;” and that “[r]espondents have presented no evidence that it would have been obvious to modify the Lo ‘440 application to perform the quality checks before capture.” (SRBr at 50.)

As found supra, the ‘440 application does not teach element (f) of claim 1 of the ‘562 patent because the ‘440 application discloses capturing a print image and then performing a quality determination while element (f) of claim 1 of the ‘562 patent requires a quality determination before capture. Further, respondents have not argued that said element (f) of claim 1 of the ‘562 patent would have been obvious in view of the ‘440 application. Thus, the administrative law judge finds that respondents have failed to establish by clear and convincing evidence that claims 5, 6, 7, and 12 of the ‘562 patent, which depend from claim 1, would have been obvious in view of the ‘440 application.

Regarding claim 30 of the ‘562 patent, element (f) of claim 30 requires “determining whether the scanned image is ready for capture based on an expected number of prints detected in step (e) and the quality of the print images determined in step (d).” (JX-3 at 14:52-55.) As found supra, the ‘440 application discloses capturing prints as a first step and then determining the quality of the captured prints, and thus does not disclose determining quality of the print images before capture. Respondents have not presented any evidence to show that it would have been obvious to modify the ‘440 application to perform quality checks before capture. Hence, the administrative law judge finds that respondents have failed to establish, by clear and convincing evidence, that claim 30 of the ‘562 patent would have been obvious in view of the



'440 application.<sup>17</sup>

B. 35 U.S.C. § 112, Second And Sixth Paragraphs

Respondents argued that "[s]everal of the asserted claims of the '344 fail to 'particularly point [] out and distinctly claim [] the subject matter which the applicant regards as his invention,' rendering those claims invalid under the enablement requirement 35 U.S.C. §112 ¶ 2." (RBr at 164-5.) In support, it is argued that complainant's "proposed constructions of 'quality' and 'good quality' would prevent one skilled in the art from understanding the proper scope of claims 1, 7, 19, and 41;" that complainant has proposed that "quality" be construed as a "measure of acceptability," and "good quality" as "measure of acceptability that is adequate;" and that one skilled in the art cannot possibly understand the bounds of the limitations "measure of acceptability" or "measure of acceptability that is adequate." (RBr at 165.)<sup>18</sup> It is further argued that the phrase "either acceptable, possibly acceptable, or unacceptable" in claims 1 and 41 of the '344 patent are indefinite under complainant's proposed non-construction, that complainant has asserted that this term be given its plain and ordinary meaning; that within the context of the biometrics industry, these words are no more objectively meaningful than in the world at large; and that a person of ordinary skill in the art would not understand the phrase "acceptable, possibly acceptable, or unacceptable" to have a particular meaning outside of the

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<sup>17</sup> In view of the findings of the administrative law judge, supra, that respondents have failed to establish, by clear and convincing evidence, that the asserted claims of the '993, '344, and '562 patents are anticipated or obvious, complainant's arguments with respect to secondary considerations have been mooted.

<sup>18</sup> The administrative law judge in the claim construction section has found that a person of ordinary skill in the art would interpret the claim term "quality" as a "measure of acceptability" and the claim term "good quality" as "a measure of acceptability that is adequate".

context of the '344 patent. (RBr at 167.)<sup>19</sup> Respondents further argued that the construction of the term "quality" in claims 1, 5, 7, and 30 of the '562 renders all of the asserted claims of the '562 patent invalid for failure to comply with the definiteness requirement of 35 U.S.C. § 112, second paragraph. (RBr at 65.) Respondents also argued with respect to the asserted claims of the '344 patent that the terms separator (claim 41), comparator (claim 41), image quality determining device (claim 41), and area determining device (43) have no corresponding structure disclosed in the specification; and that as these terms fail to comply with statutory requirements under 35 U.S.C. § 112, sixth paragraph, these claims 41 and 43 (and claims 42 and 45, which depend on 41) are invalid. (RBr at 168.)

The staff argued that while respondents contended that various claims are invalid for indefiniteness; that the limitations of both the '344 and '562 patents concerning "quality" are invalid under complainant's construction; that the limitations of the '344 patent calling for "acceptable, possibly acceptable, and unacceptable" quality classifications are invalid under complainant's construction; and that various alleged "means-plus-function" limitations of the '344 patent are invalid for failure to disclose a corresponding structure, the staff is of the view that none of the claims at issue are invalid for indefiniteness. (SRBr at 51.) The staff further argued that while respondents argued that the phrases "separator," "comparator," "image quality determining device," and "area determining device" from the '344 patent are indefinite because they lack a corresponding structure in the specification, these limitations are not subject to 35 U.S.C. § 112, ¶ 6, and respondents' argument is therefore not applicable; that even assuming that

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<sup>19</sup> The administrative law judge in the claim construction section has found that a person of ordinary skill in the art would construe the claim term "acceptable quality" as "capable or worthy of being generally approved and further dependent on a customer's requirement."

said limitations are written in “means-plus-function” format, the limitations are still not indefinite because the specification discloses a corresponding structure for each. (JX-2 at Fig. 6 7:58-61, 14:17-18 (separator), 14:29-33, 15:50-57 (comparator), Fig. 6, 14:56-62 (image quality determining device), Fig. 7, 15:43-49 (area determining device)). (SRBr at 51-2.)

Complainant argued that respondents have not met their burden of establishing, by clear and convincing evidence, that any asserted claims of the ‘344 patent or of the ‘562 patent are invalid for indefiniteness. (CRBr at 81, 138.)

Section 112 paragraph 2 of the Patent Act requires that a patent specification conclude with one or more claims “particularly pointing out and distinctly claiming subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, ¶ 2. The Federal Circuit has stated that the standard for assessing whether a patent claim is sufficiently definite to satisfy the statutory requirement is as follows: If one skilled in the art would understand the bounds of the claim when read in light of the specification, then the claim satisfies section 112 paragraph 2. Miles Labs., Inc. v. Shandon, Inc., 997 F.2d 870, 875 (Fed.Cir.1993).

Sixty years ago the Supreme Court explained the reason underlying the indefiniteness doctrine in United Carbon Co. v. Binney & Smith Co., 317 U.S. 228, 236, 232 (1942):

A zone of uncertainty which enterprise and experimentation may enter only at the risk of infringement claims would discourage invention only a little less than unequivocal foreclosure of the field. Moreover, the claims must be reasonably clear-cut to enable courts to determine whether novelty and invention are genuine.

In determining whether what the Supreme Court has stated is met, i.e., whether “the claims at issue [are] sufficiently precise to permit a potential competitor to determine whether or not he is infringing,” see Morton Int’l, Inc. v. Cardinal Chem. Co., 5 F.3d 1464, 1470, (Fed.Cir.1993),



significantly the Federal Circuit has not held that a claim is indefinite merely because it poses a difficult issue of claim construction. To the contrary, the Federal Circuit engages in claim construction every day, and cases frequently present close questions of claim construction on which expert witnesses, trial courts, and even judges may disagree. Under a broad concept of indefiniteness, all but the clearest claim construction issues could be regarded as giving rise to invalidating indefiniteness in the claims at issue. Moreover the Federal Circuit has not insisted that claims be plain on their face in order to avoid condemnation for indefiniteness. Rather, what the Federal Circuit has asked is that the claims be amenable to construction, however difficult that task may be. If a claim is insolubly ambiguous, and no narrowing construction can properly be adopted, it has held the claim indefinite. However if the meaning of the claim is discernible, even though the task may be formidable and the conclusion may be one over which reasonable persons will disagree, it has held the claim sufficiently clear to avoid invalidity on indefiniteness grounds. See, e.g., Modine Mfg. Co. v. U.S. Int'l Trade Comm'n, 75 F.3d 1545, 1557, (Fed.Cir.1996). In Modine the intervenors argued that the claims are invalid for indefiniteness if “relatively small” is construed as larger than exactly 0.040 inch. The Federal Circuit indicated that technical terms are not per se indefinite when expressed in qualitative terms without numerical limits. Thus it stated:

When claims are amenable to more than one construction, they should when reasonably possible be interpreted so as to preserve their validity. Whittaker Corp. by its Technibilt Div. v. UNR Indus., Inc., 911 F.2d 709, 711, 15 USPQ2d 1742, 1744 (Fed.Cir.1990); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 932 (Fed.Cir.1984). In this case the specification itself used the terms “relatively small,” and “about 0.015-0.040,” and the construction required to preserve the claims' validity was simply that “relatively small” and “about 0.015-0.040” not include invalidating prior art. It was evident from the

prosecution history that the patentability of claims 9 and 10 did not require an exact numerical limit of the hydraulic diameter. Mathematical precision should not be imposed for its own sake; a patentee has the right to claim the invention in terms that would be understood by persons of skill in the field of the invention. See Shatterproof Glass Corp. v. Libbey-Owens Ford Co., 758 F.2d 613, 624, 225 USPQ 634, 641 (Fed.Cir.), cert. dismissed, 474 U.S. 976, 106 S.Ct. 340, 88 L.Ed.2d 326 (1985) (“if the language is as precise as the subject matter permits, the courts can demand no more”).

By finding claims indefinite only if reasonable efforts at claim construction prove futile, the Federal Circuit accords respect to the statutory presumption of patent validity, see N. Am. Vaccine, Inc. v. Am. Cyanamid Co., 7 F.3d 1571, 1579, 28 USPQ2d 1333, 1339 (Fed.Cir.1993), and protects the inventive contribution of patentees, even when the drafting of their patents has been less than ideal.

Respondents argued that multiple elements of claim 1 of the '562 patent would allegedly be redundant under complainant's construction of “quality.” (RPost at 38.) Specifically, respondents asserted that under complainant's construction, elements (e) and (f) of claim 1 are redundant of element (d). (RPost at 38.) However only element (d) recites “determining print quality”. Element (f) merely refers back to the quality of the print images determined in step (d). Respondents argued that “measure of acceptability” is “wholly subjective” and does not “define the boundaries of the claims' scope.” (RPost at 37-38.) However implementing an invention based on to-be-determined requirements does not render a claim indefinite. In Orthokinetics, Inc. v. Safety Travel Chairs, Inc., the Federal Circuit determined that a claim reciting “so dimensioned” is not indefinite even though the corresponding dimensions would change. 806 F.2d 1565, 1575-76 (Fed. Cir. 1986) (evaluating the limitation “wherein said front leg portion is so dimensioned as to be insertable through the space between the doorframe of an automobile

and one of the seats thereof”). According to the Federal Circuit, the claim was sufficiently definite because one of ordinary skill would have determined the appropriate dimensions for each specific application. With respect to both the ‘562 patent and the ‘344 patent, the administrative law judge finds that one of ordinary skill would understand that she or he can select the appropriate methods for determining quality based on the relevant application. The administrative law judge finds that respondents have not come close to meeting their burden to establish, by clear and convincing evidence, that the claim is “insolubly ambiguous.” Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1347 (Fed. Cir. 2005) (citing Nove Indus., L.P. v. Micro Molds Corp., 350 F.3d 1348, 1353 (Fed. Cir. 2003)).

Respondents argued that complainant’s expert McWilliams offered no testimony as to how one of skill in the art would understand ‘quality’ in the ‘562 patent. (RPost at 36.) However McWilliams testified that one of ordinary skill in the art would understand quality to be a “measure of acceptability.” (Tr. at 615-17.) Respondents contended that “McWilliams declined to answer” when asked how a person of ordinary skill in the art would understand “quality of print images.” (RPost at 36.) However McWilliams testified that the phrase “quality of print images” does not need to be construed, because the terms “quality” and “print images” had already been construed. Further, McWilliams testified that “[t]he quality of the print images can be determined by any of a number of standards ....” (Tr. at 617-18.)

Based on the foregoing, and referring to the second paragraph of 35 U.S.C. § 112 the administrative law judge finds that respondents have not established, by clear and convincing evidence, that any of the asserted claims of the ‘344 and ‘562 patents are invalid for indefiniteness. (35 U.S.C. § 112, Second Paragraph). Moreover for the reasons set forth in



Section VIII. B. 7 supra, the administrative law judge finds that respondents have not established that certain limitations of asserted claims of the '344 patent are in "means-plus-function" format pursuant to the sixth paragraph of 35 U.S.C. § 112.

#### XI. Domestic Industry

As a prerequisite to finding a violation of Section 337, complainant must establish that "an industry in the United States, relating to the articles protected by the patent ... concerned, exists or is in the process of being established." 19 U.S.C. § 1337(a)(2). The domestic industry requirement of section 337 consists of two prongs: the technical prong and the economic prong.<sup>20</sup> Certain Variable Speed Wind Turbines and Components Thereof, Inv. No. 337-TA-376, USITC Pub. 3003, Comm'n Opinion at 14-17 (1996).

For purposes of satisfying the technical prong of the domestic industry requirement, the test for claim coverage is the same as the test for claim coverage used in patent infringement determinations. See Certain Ink Jet Print Cartridges and Components Thereof, Inv. No. 337-TA-446, Comm'n Op. at 6, (May 2, 2002). Thus, the patent claims are construed, then the complainant's products are compared against the construed claims to determine whether it practices each and every claim limitation. See id. at 6-9. To satisfy the technical prong of the domestic industry requirement, complainant need only establish that it practices at least one claim of each of the asserted patents. Id. at 5 n.3.

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<sup>20</sup> Order No. 24, which issued on February 16, 2011 granted complainant's Motion No. 720-26 that it satisfies the economic prong of the domestic industry requirement. The Commission non-reviewed Order No. 24 on March 11, 2011.

A. The '993 Patent

Complainant argued that the ID500 device practices claim 10, 12, 15, and 18 of the '993 patent. (CBr at 217.)

Respondents argued that complainant has failed to meet its burden to show that the ID 500 device practices any claim of the '993 patent because complainant's expert's testimony did not provide "evidence showing that the first lens unit forms a telecentric entrance pupil," and "[c]omplainant has presented no evidence that shows the third lens unit in the ID-500 corrects the field curvature contributed by the first and second lens units." (RBr at 241.)

The staff argued that complainant has shown by a preponderance of the evidence that it practices one or more claims of the '993 patent.

The parties do not dispute that complainant's ID500 device practices the preamble and elements a), b), and d) of claim 10 of the '993 patent. (CFF VIII.C.1.a.2, CFF VIII.C.1.a.15, CFF VIII.C.1.a.17, CFF VIII.C.1.a.24, CFF VIII.C.1.a.27 (all undisputed in relevant part).)

Regarding element c) of claim 10 of the '993 patent, which requires "a first lens unit having a positive power between the aperture stop and the prism for forming a telecentric entrance pupil," respondents' only dispute that complainant's expert McWilliams did not provide testimony that the first lens unit forms a telecentric entrance pupil. (See RBr at 241.) Regarding the first lens unit of the ID500 device, McWilliams testified:

Q. Okay. Let's go to CDX-1C.127, identifying the first lens unit as the next limitation.

A. Again, the first lens unit is on the left photo here on JPX-43, I am holding it in my hand. In the ID-500 they actually have two of these systems acting side by side, so I'm going to take my analysis down through one of the systems.

{ } The excerpts on the right  
are from Cross Match drawings.

Q. For the record the excerpts are CX-235C and 226C and this is slide CDX-1C.128.

And is it your opinion that this first lens unit has a positive power located between the aperture stop and the prism, for forming a telecentric entrance pupil?

A. Yes, it does.

(Tr. at 594-595 (emphasis added).) Thus, McWilliams confirmed the focal length of the first lens unit and concluded that said lens unit was used for forming a telecentric entrance pupil as in element c) of claim 1 of the '993 patent. Respondents have not cited to any evidence in the record to rebut the opinion of McWilliams regarding said first lens unit of the ID500 device. Based on the foregoing, the administrative law judge finds that complainant has shown by a preponderance of the evidence that the ID500 includes a first lens unit according to element c) of claim 10 of the '993 patent.

Regarding element e) of claim 10 of the '993 patent, which requires "a third lens unit for correcting the field curvature of the image contributed by the first and second lens units," complainant's expert McWilliams testified:

Q. And with respect to the drawings, on the left is an excerpt from CX-230C, and on right again another picture from JPX-43.

Let's go to the third lens unit.

A. The third lens unit is shown in blue on that drawing, CDX-1C.131. And on CDX-1C.132 I show a photograph identifying it by the red arrow on the left. And you can see the properties of the geometry as shown in the Cross Match drawing on the right.

Q. For the record, the drawing is 233C.



Professor, is it your opinion that based on the elements you have identified in the ID-500, that each and every limitation of claim 10 is met by that product?

A. Yes, it is.

(Tr. at 595-596 (emphasis added).) Thus, McWilliams identified a third lens element in the ID500 and the properties of said third lens element and concluded that the ID500 meets every element of claim 10 of the '993 patent. Respondents have not cited to any evidence in the record to rebut the opinion of McWilliams regarding said third lens unit. Based on the foregoing, the administrative law judge finds that complainant has shown by a preponderance of the evidence that the ID500 includes a third lens unit according to element e) of claim 10 of the '993 patent.

Based on the foregoing, the administrative law judge finds that complainant has established by a preponderance of the evidence that the ID500 practices every element of claim 10 of the '993 patent, and thus, that complainant has satisfied the technical prong of the domestic industry requirement with respect to the '993 patent.

B. The '344 Patent

Complainant argued that Guardian and SEEK devices utilizing the L SCAN Essentials and Fast SDK software practice claims 1, 7, 41, and 45 of the '344 patent. (CBr at 229-238.)

Respondents argued that complainant did not present evidence to show that the domestic industry products practiced any element of claims 1, 7, 41, or 45 of the '344 patent. (RBr at 232-236.) Respondents also argued that complainant "has not provided any evidence that any customers utilize the sample code provided with" the L SCAN Essentials SDK, and that complainant's expert McWilliams' testimony is incomplete because it was "limited to identifying the function and asserting his conclusion that it performs a certain task." (RBr at 231.)

The staff argued that complainant has shown by a preponderance of the evidence that complainant practices one or more claims of the '344 patent. (SBr-67-68.)

Regarding the '344 patent, complainant's expert McWilliams testified that software operating on complainant's L Scan-Guardian and SEEK devices practices at least one claim of this patent:

Q. Let's turn to CDX-1C.401. Professor, do you have an opinion as to whether the Cross Match L Scan Guardian and SEEK when operated with L Scan Essentials practice any claim of the '344 patent?

A. Yes. These devices practice the claims of the '344 patent.

\* \* \*

Q. What primarily did you rely on in reaching your conclusions?

A. I looked at the source code operating on the devices as shown on the next slide.

\* \* \*

Q. Thank you, Professor.

Did you just focus on one version of this software?

A. I focused on one version, but I understand that there are variations on this that also do the same L Scan Essentials functions.

Q. What about with respect to certain functions, did you rely on specific functions?

A. On the next slide I show that I used this integration sample, for example.

Q. For the record, which is CDX-1C.404.

A. So I used the integration sample and I understand that these function calls with the same names in other versions of L Scan Essentials occurs as well.

Q. What is integration sample, Professor?

A. That's a program you can run to operate the devices and use the software.

(Tr. at 847-849 (emphasis added).) Regarding the preamble of claim 1 of the '344 patent, which states "a method for capturing and quality classifying fingerprint images," McWilliams testified:

{  
  
}

(Tr. at 849.) Regarding element (a) of claim 1, which requires "scanning a plurality of fingers substantially simultaneously," McWilliams testified:

Q. What about with respect to limitation A of the '344 patent, do you have an opinion as to whether that is met by the domestic industry products practicing L Scan Essentials, again, the L Scan Guardian and SEEK?

A. Yes, I found the domestic industry practicing claim 1A, using the software in the way I show in the next slides.

Q. Turn to CDX-1C.408.

{  
..  
}

Q. Please turn to CDX-1C.409.

{  
  
}

(Tr. at 850 (emphasis added).) Regarding element (b) of claim 1, which requires "capturing data representing a combined image of a corresponding plurality of fingerprints," McWilliams testified:



A. Capturing data representing a combined image is practiced by the products as shown in the next couple of slides where the software does this.

Q. Let's please turn to the next slide, CDX-1C.411.

{

}

Q. For the record, that's CDX-1C.412.

{

}

(Tr. at 851 (emphasis added).) Regarding element (c) of claim 1 of the '344 patent, which requires "using concentrations of black pixels arranged in oval-like shapes in the combined image to determine individual fingerprint areas and shapes," McWilliams testified:

A. This is using concentrations of black pixels in the combined image to determine individual fingerprint areas and shapes, and that is practiced in the software as I show in the next slides.

Q. Let's turn to CDX-1C.414.

{

}

Q. For the record now we have moved to CDX-1C.415.

{

}

Q. For the record, we're at CDX-1C.416.

{

}

(Tr. at 852-853 (emphasis added).) Regarding element (d) of claim 1 of the '344 patent, which requires "separating the combined image into individual fingerprint images," McWilliams testified:

Q. Let's please turn to the next limitation of the '344 patent, CDX-1C.417.

Do you have an opinion as to whether the domestic industry products meet this limitation D of the '344 patent, claim 1?

A. Yes. The routines I am describing, separate the combined image into individual fingerprint images, if I can highlight where in the code, and the reasoning in the following slides.

Q. The next slide is CDX-1C.418.

{

}

Q. For the record this is CDX-1C.419.

{

}

(Tr. at 853-854 (emphasis added).) Regarding element (e) of claim 1, which requires "comparing each of the separated individual fingerprint images to a corresponding previously captured acceptable fingerprint image," McWilliams testified:

A. Yes, the domestic industry products compare each of the separated fingerprint images to a corresponding previously captured acceptable image.

Q. And what did you rely on for that, Professor, to reach that

conclusion?

A. The reasoning for that can be found in the source code, which I show on the next pages.

Q. Please turn to CDX-1C.421.

{

}

Q. For the record this is CDX-1C.422.

{

}

(Tr. at 854-855 (emphasis added).) Regarding element (f) of claim 1 of the '344 patent, which requires "quality classifying the separated individual fingerprint images as being either acceptable, possibly acceptable, or unacceptable according to the comparing step (e),"

McWilliams testified:

A. Yes, there is quality classifying of the separated images into levels of acceptable, possibly acceptable or unacceptable, according to the reasoning shown in the next slides about the software.

Q. Please turn to the next slide, CDX-1C.424.

{

}

Q. Next slide is CDX-1C.425.

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Q. For the record, now we're at CDX-1C.426.

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}

(Tr. at 855-857 (emphasis added).) Regarding element (g) of claim 1 of the '344 patent, which requires "indicating the quality classification of each of the individual fingerprint images based on the quality classifying step (f)," McWilliams testified:

A. Yes, there is an indication of the quality classification of each of the prints. It is shown in the -- the support for it is shown looking at the software as I outline on the next pages.

Q. Let's please turn to CDX-1C.429.

{

}

On the visual display, there is a screen shot shown on this slide which has a highlighted yellow area where the quality will be displayed.

On the next slide --

Q. For the record this is CDX-1C.430.

{

}

{

}

Q. For the record, this is CDX-1C.431.

{

}

(Tr. at 857-859 (emphasis added).) Regarding element (h) of claim 1, which requires

“determining whether the processed combined image is of a good quality,” McWilliams testified:

A. Yes. They practice determining whether the processed combined image is of good quality.

Q. How do they do that, Professor?

A. That is done in the following -- in the software.

Q. What software, in particular?

{

}

Q. For the record this is CDX-1C.433.

A. The next slide shows the software call.

Q. This is CDX-1C.434.

{

}

(Tr. at 859-860 (emphasis-added).) Thus, McWilliams testified that every element of claim 1 of the '344 patent is practiced by the Cross Match L Scan Guardian and SEEK when operated with the L Scan Essentials software. Respondents have not cited to any evidence in the record to rebut the opinions of McWilliams regarding claim 1 of the '344 patent with respect to the technical prong of the domestic industry requirement. Based on the foregoing, the administrative law judge finds that complainant has established, by a preponderance of the evidence, that the domestic industry products practice at least one claim of the '344 patent, and thus, he further finds the technical prong of the domestic industry requirement has been satisfied with respect to the '344 patent.

C. The '562 Patent

Complainant argued that Guardian and SEEK devices utilizing the L SCAN Essentials and Fast SDK software practice claims of the '562 patent including claims 1, 7, 12 and 30. (CBr at 220-228.)

Respondents argued that complainant did not present evidence to show that the domestic industry products practice any element of the asserted claims of the '562 patent. (RBr at 236-240.)

The staff argued that complainant has shown by a preponderance of the evidence that complainant practices one or more claims of the '562 patent. (SBr 68-69.)



Regarding the '562 patent, complainant's expert McWilliams testified that the domestic industry products practice claims 1, 7, 12, and 30 of this patent:

Q. CDX-1C.236, please. Professor McWilliams, we're going to turn to the Cross Match Technologies' domestic industry products.

Can you please explain what you have on this slide?

A. Again, but for the Cross Match Technologies, there is the L Scan Guardian and the SEEK units. I examined these units by running them and then examined source code software associated with this operation as well.

Q. And let's go to CDX-1C.237. Are these the claims from the '562 patent, claim 1, claim 7, claim 12, and claim 30 that you concluded practice -- are practiced by these products, the L Scan Guardian and the SEEK?

A. Yes.

(Tr. at 676-677 (emphasis added).) Regarding the preamble of claim 1 of the '562 patent, which states "a method for reliably capturing print images," McWilliams testified:

Q. Let's turn to CDX-1C.240 where you have highlighted the preamble of claim 1 of the '562 patent. And I am going to move to CDX-1C.241. Again, you have got the preamble at the top of your slide and some source code below.

In support, can you please explain what you have on this slide, Professor?

{

}

(Tr. at 680 (emphasis added).) Regarding element (a) of claim 1 of the '562 patent, which requires "initiating camera operation within a scanner," McWilliams testified:

Let's go to CDX-1C.242, highlighted the second element here, initiating camera operation with the scanner. I am going to

move to CDX-1C.243.

Under this limitation can you please explain what you have identified here in support?

{

}

Q. Turning to the source code, CDX-1C.244, same limitation, up at the top, initiating a camera operation with the scanner.

Go ahead, Professor.

{

}

(Tr. at 680-681 (emphasis added).) Regarding element (b) of claim 1 of the '562 patent, which requires "scanning a biometric object to obtain a scanned image," McWilliams testified:

Turning to CDX-1C.245, let's move to limitation B of the '562 patent. And then to CDX-1C.246, with the source code you have identified here. Please explain this source code.

{

}

(Tr. at 681-682.) Regarding element (c) of claim 1 of the '562 patent, which requires "processing the scanned image," McWilliams testified:

Q. Thank you. The next limitation is in CDX-1C.247, limitation C. And at CDX-1C.248, you have got some explanations.

{

}

Q. Thank you, Professor. Turning to the source code at CDX-1C.249 for this limitation C.

{

}

Q. For the record you now moved to CDX-1C.250. Go ahead, Professor.

{

}

(Tr. at 682-683 (emphasis added).) With respect to element (d) of claim 1 of the '562 patent, which requires "determining print quality of individual print images in the scanned image,"

McWilliams testified:

Let's turn to the next limitation, D, highlighted on CDX-1C.251, determining print quality of individual print images in the scanned image, and now move to CDX-1C.252 for this limitation.

{

}

{ determination also does image size, contrast, but as well location of the print images.

Q. Thank you, Professor.

Let's turn to the source code starting at CDX-1C.253 for this limitation.

{

}



{

}

And then back in the process image the function  
CheckResults is called.

Q. Let me tell you, you have moved to CDX-1C.254. Please continue  
your testimony.

{

}

(Tr. at 683-684 (emphasis added).) Regarding element (e) of claim 1, which requires “detecting  
prints in the scanned image,” McWilliams testified:

Q. Thank you. This is CDX-1C.255. The next limitation, E,  
detecting prints in the scanned image. Let's go to CDX-1C.256 for  
this limitation.

Go ahead, Professor.

{

}

Q. Thank you. Let's turn to the source code starting at CDX-1C.257  
for this limitation E.

{

}

(Tr. at 684-685 (emphasis added).) Regarding element (f) of claim 1 of the '562 patent, which

requires "determining whether the scanned image is ready for capture based on an expected number of prints detected in step (e) and the quality of the print images determined in step (d),"

McWilliams testified:

Turning to CDX-1C.258, the last limitation, limitation F of claim 1, let's go to CDX-1C.259 for this limitation. Go ahead, Professor.

{

}

Q. Thank you, Professor.

Let's turn to the source code again at CDX-1C.260 for step F.

{

}

Q. Thank you, Professor.

Let's move to CDX-1C.261 in this series. Go ahead.

{

}

Then the scanned image is ready for capture if and only if both of those conditions are met.

{

}

(Tr. at 685-687 (emphasis added).) Thus, McWilliams testified that every element of claim 1 of the '562 patent is practiced by the Cross Match L-Scan Guardian and SEEK when operated with the L-Scan Essentials software. Respondents have not cited to any evidence in the record to rebut the opinions of McWilliams regarding claim 1 of the '562 patent with respect to the technical prong of the domestic industry requirement. Based on the foregoing, the administrative law judge finds that complainant has established, by a preponderance of the evidence, that the domestic industry products practice at least one claim of the '562 patent, and thus, he further finds the technical prong of the domestic industry requirement has been satisfied with respect to the '562 patent.

## XII. Remedy

Complainant argued that a limited exclusion order directed against all infringing devices and software is appropriate under section 337(d)(1); and that as it relates to the importation of infringing software, such an exclusion order must extend not only to the importation of software on fixed media (such as disks, CD-ROMs, magnetic memory, and semiconductor devices) but also to the electronic transmission of infringing software by means of, for example, the internet, email, or other telephonic or electronic media. (CBr at 241.)

As for any cease and desist order, complainant argued that respondents admit that at least sixteen (16) units of accused Suprema products are held in inventory by Mentalix in the United States; that Mentalix's current inventory may hold a commercially significant value as high as \$196,680.16; that a cease and desist order must include a prohibition against the electronic



transmission of the infringing software so as to prevent respondents Suprema and Mentalix from simply transmitting the software electronically to a U.S. customer, who could then copy it onto a diskette or other tangible medium for use with an infringing system; and that the Commission's cease and desist order should extend to respondent Suprema as well as its U.S.-based distributor Mentalix. (CBr at 243.)

Respondents argued that the only appropriate form of relief against Suprema would be a limited exclusion order without bond and directed solely to further importation of specific products found to be infringing; and that no exclusion order can issue against Mentalix's accused software product FedSubmit because the product is developed entirely domestically. (RBr at 242, 244.) As for any cease and desist order, it was argued that complainant has made no showing of a commercially significant inventory of the accused products in the United States by either Mentalix or Suprema. (RBr at 245.)

The staff argued that, in the event the Commission finds a violation, a limited exclusion order without the additional provisions requested by the private parties but with a certification provision for complainant with respect to the '993 patent would be the proper remedy. (SBr at 88, 91.) As for any cease and desist order, the staff argued that the evidence supports issuance of a cease and desist order to domestic respondent Mentalix, but not to foreign respondent Suprema.

The Commission has broad discretion in selecting the form, scope, and extent of a remedy in Section 337 proceedings. Certain Integrated Circuit Telecommunication Chips, Inv. No. 337-TA-337, Comm'n Op. at 21 (August 3, 1993). Pursuant to its statutory authority found at 19 U.S.C. § 1337 (d), the Commission may exclude from importation goods and products that form the basis for a finding of a violation of Section 337 which includes products that have been

found to infringe the patents-in-issue directly, contributorily or by inducement after importation has occurred. 19 U.S.C. § 1337(d); Certain Flash Memory Circuits, Inv. No. 337-TA-382, Comm'n Op. at 26 (June 26, 1997) ("The Commission has the authority to enter an exclusion order, a cease and desist order, or both.") Indeed, absent special circumstances, the statute requires such exclusion:

If the Commission determines ... that there is a violation of this section, it shall direct that the articles concerned ... be excluded from entry into the United States, unless, after considering the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers, it finds that such articles should not be excluded from entry.

19 U.S.C. § 1337(d). Hence, a remedy excluding respondents infringing products from entry is mandatory if a violation of Section 337 is found, unless the Commission finds that public interest factors militate against such remedy.

Section 337(f) also permits the Commission to issue, in lieu of, or in addition to, an exclusion order, a cease and desist order directing persons found to have violated Section 337 to cease and desist from engaging in the unfair methods or acts involved. 19 U.S.C. § 1337(f). Cease and desist orders are warranted with respect to respondents that maintain commercially significant U.S. inventories of the infringing product. See, e.g., Certain Crystalline Cefadroxil Monohydrate, Inv. No. 337-TA-293, USITC Pub. 2391 at 37-42 (June 1991). The Commission has the authority to issue cease and desist orders where a respondent has a sufficient inventory of infringing goods in the United States. Certain NAND Flash Memory Circuits, Inv. No. 337-TA-526, 2005 ITC Lexis 859, Init. Determin. at \*255 (Oct. 19, 2005) (citing Certain Plastic Encapsulated Integrated Circuits, Inv. No. 337-TA-315, U.S.I.T.C. Pub. No. 2574, Comm'n Op.

at 37 (November 1992)).

Cease and desist orders are directed at a specific respondent in order to prevent the sale, distribution and other use of products that have already been imported into the United States prior to the entry and implementation of any exclusion order. Certain Curable Fluoroelastomer Compositions, Inv. No. 337-TA-364, Notice of Issuance of Limited Exclusion Order and Cease and Desist Order, 1995 WL 1049682 (Mar. 16, 1995). Cease and desist orders can preclude any activity “reasonably related to the importation of infringing products.” Certain Hardware Logic Emulation Systems, Inv. No. 337-TA-383, Comm’n. Op. on Remedy, the Public Interest, and Bonding, 1998 WL 307240 (Feb. 28, 1998). Typical cease and desist orders enjoin a respondent from selling, marketing, distributing and advertising its infringing products, as well as any solicitation of U.S. agents and distributors for the purpose of selling, marketing, distributing, and advertising infringing products. See Certain Electrical Connectors and Products Containing Same, Inv. No. 337-TA-374, Comm’n Cease and Desist Order, 1996 WL 1056313 (May 3, 1996).

In the event a violation is found, the administrative law judge recommends the issuance of a limited exclusion order prohibiting the importation into the United States of infringing articles, regardless of brand name, “that are manufactured abroad or imported by or on behalf of [the respondents], or any of its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns.” Moreover, he recommends that said order should not be limited to specifically-identified products, but rather extend to all infringing products. However as to any infringing software, he recommends any exclusion order extend only to the importation of software on fixed media.



The administrative law judge finds that the additional provisions in the exclusion order requested by the private parties are contrary to Commission precedent. Thus complainants' argument that any exclusion order should direct Customs to block the electronic transmission of software into the United States has been considered by the Commission in previous investigations and has been rejected as impractical. See, e.g., Hardware Logic, Commission Opinion at 19-20 (refusing to bar electronic transmissions out of deference to Customs); Certain Systems for Detecting and Removing Viruses or Worms, Components Thereof, and Products Containing the Same, Inv. No. 337-TA-510 Commission Opinion at 4-5 (Aug. 8, 2005) ("Viruses or Worms") (same). Similarly, respondents' argument that the exclusion order should be limited to specific products has also been repeatedly considered and rejected by the Commission. See, e.g., Certain Integrated Repeaters, Switches, Transceivers and Products Containing Same, Inv. No. 337-TA-435, Commission Opinion at 22-23, USITC Pub. 3547 (Oct. 2002); Certain Laser Bar Code Scanners and Scan Engines, Components Thereof, and Products Containing Same, Inv. No. 337-TA-551, Commission Opinion at 23, USITC Pub. 4006 (May 2008) ("Laser Bar Code Scanners").

However, if a violation of Section 337 is found with respect to the '993 patent, the administrative law judge recommends issuance of an exclusion order that contains a reporting requirement for complainant. {

} Hence the administrative law

judge believes that complainant should be required to periodically certify that it is continuing to

exploit the '993 patent. See, e.g., Certain Variable Speed Wind Turbines and Components Thereof, Inv. No. 337-TA-376, Commission Opinion at 18, USITC Pub. 3003 (Nov. 1996); Certain Wire Electrical Discharge Machining Apparatus and Components Thereof, Inv. No. 337-TA-290, Commission Opinion at 20 (March 16, 1990); Certain Caulking Guns, Inv. No. 337-TA-139, Commission Opinion at 3, USITC Pub. 1507 (March 1984).

With respect to issuance of any cease and desist order, if a violation is found the administrative law judge recommends issuance of a cease and desist order to domestic respondent Mentalix. {

}

### XIII. Bond

Complainant initially argued that the price differential between products is 179% and that the appropriate level of bond is therefore at least 100% during the Presidential review period. (CBr at 244-48.) However it later argued that a bond of 179% should be set. (CRBr at 169.)

Respondents argued that no bond should be required because complainant has failed to present sufficient evidence, despite evidence being available to it. (RRBr at 203.)

The staff argued that if an exclusion order or cease and desist order is issued, then the appropriate Presidential review period bond be in the amount of 100% of entered value. (SRBr at 56.)

Section 337(j)(3) provides for the entry of infringing articles upon the payment of a bond during the sixty-day Presidential review period. 19 U.S.C. § 1337(j)(3). Any bond is to be set at a level sufficient to "offset any competitive advantage resulting from the unfair method of

competition or unfair act enjoyed by persons benefiting from the importation.” Certain Dynamic Random Access Memories, Components Thereof and Products Containing Same, Inv. No. 337-TA-242, Commission Opinion on Violation, Remedy, Bonding and the Public Interest, USITC Pub. No. 2034, 1987 WL 450856 (U.S.I.T.C.) at 38 (1987). When reliable price information is available, the Commission has set a bond by eliminating the price differential between the domestic and the imported infringing product. Certain Digital Satellite System (DSS) Receivers and Components Thereof, Inv. No. 337-TA-392, Final Initial and Recommended Determination on Remedy and Bonding, U.S.I.T.C. Pub. No. 3418, 2001 WL 535427 (U.S.I.T.C.) at 336 (April 2001). Further, the price differential may be based on a weighted average that reliably reflects the range of prices for sales and the volume of sales at each price for each product, and a bond greater than 100% may be set to completely offset any competitive advantage. Certain Two-Handle Centerset Faucets and Escutcheons, and Components Thereof, Inv. No. 337-TA-422, Commission Opinion at 9-11 (July 21, 2000) (setting a bond of 264% based on a weighted average and finding pricing information “reliable because it is supplied by [respondent] and it is accepted by [complainant] and the [staff] as well”). Where reliable price information is not available, Commission precedent establishes that the bond should be set at 100%. Certain Semiconductor Memory Devices and Products Containing Same, Inv. No. 337-TA-414, Recommended Determination on Remedy and Bonding, 1999 WL 1267282 (U.S.I.T.C.) at 6 (December 13, 1999) (Semiconductor Memory Devices); see also Certain Digital Multimeters, and Products With Multimeter Functionality, Inv. No. 337-TA-588, Commission Opinion at 12-13 (June 3, 2008) (setting a bond of 100% where pricing information was unclear and price comparisons would be complicated and difficult) (Digital



Multimeters). On the other hand, if a complainant fails to provide evidence concerning the appropriate bond, then the Commission may decline to impose any bond. See, e.g., Certain Silicon Microphone Packages and Products Containing Same, Inv. No. 337-TA-629, Commission Opinion at 20 (Aug. 21, 2009).

Complainant argued that a bond of 179% should be set so as to be sufficient to protect complainant from injury. (CRBr at 169.) Complainant's request for a bond of 179% uses a weighted average based on actual sales of only one product of complainant, viz. the Cross Match Guardian, and only one accused product, viz. the RealScan-10. (CBr at 246-247.) However, complainant's domestic industry products include at least the Guardian, SEEK, and ID500 products, and the accused products include Suprema's RealScan-10/10F, RealScan-D/DF, RealScan-F, RealScan-G2 and RealScan-G10 scanners, as well as Suprema's RealScan Basic and Extended SDK software, and Mentalix's Fed Submit software. See supra. The most recent "list" price for complainant's Guardian product (with auto capture and finger rolls) is { . } (CX-517C, at 1.) The most recent "list" price for complainant's SEEK product is { } (Id. at 23). The ID500, when sold as a bundled system, has a price of { } (CX-597C.) {

} {

} Based on the foregoing, the administrative law judge finds that the exact pricing information for said products is unclear and determining a meaningful price differential would be complicated and difficult. See Digital Multimeters, Comm'n Op. at 12-13. Thus, the administrative law judge recommends that the appropriate Presidential review period

bond should be 100% of entered value, based on Commission precedent. See Semiconductor Memory Devices.

XIV. Additional Findings

1. Complainant Cross Match Technologies, Inc. (CMT) is a Delaware corporation having a principal place of business in Palm Beach Gardens, Florida. (SFF 1 (undisputed).)
2. CMT is in the business of manufacturing, servicing, and supplying livescan products, document readers, and software solutions, among other things. ((SFF 2 (undisputed).)
3. CMT's livescan products include fingerprint scanners, as well as software or other accessories and services to implement that solution. (SFF 3 (undisputed).)
4. Respondent Suprema, Inc. (Suprema) is a Korean corporation located in Gyeonggi, Korea. (SFF 4 (undisputed).)
5. Suprema is engaged in making various types of biometric devices, including livescan devices, and related software. (SFF 5 (undisputed).)
6. Respondent Mentalix, Inc. (Mentalix) is a Texas corporation, with a principal place of business in Plano, Texas. (SFF 6 (undisputed).)
7. Mentalix sells identity management systems, including livescan devices, for capturing fingerprints, palm prints, mug shots, and demographic data. (SFF 7 (undisputed).)



## CONCLUSIONS OF LAW

1. The Commission has in personam, in rem and subject matter jurisdiction.
2. There has been an importation of accused biometric scanning devices, components thereof, associated software and products containing the same into the United States which are the subject of the unfair trade allegations.
3. It has not been established that the asserted claims of any of the '993, '344, or '562 patents are invalid.
4. Complainant has established that the RealScan-10 and RealScan-10F accused products infringe asserted claims 10, 12, and 15 of the '993 patent.
5. Complainant has not established that any accused products infringe asserted claims 11, 17, or 18 of the '993 patent.
6. Complainant has not established that asserted claims of the '562 patent are infringed by any of the accused products.
7. Complainant has established that asserted claim 19 of the '344 patent is infringed by the RealScan-10, RealScan-10F, RealScan-D, and RealScan-DF accused products, when used with Mentalix' Fed Submit software.
8. Complainant has not established that asserted claims 1, 7, 41, 42, 43, and 45 of the '344 patent are infringed by any of the accused products.
9. Complainant has established a domestic industry.
10. The evidence establishes that there is a violation of section 337.
11. In the event a violation of section 337 is found, a limited exclusion order and an appropriate cease and desist order are recommended. Also a bond of 100% of entered

value during the Presidential Review period is recommended.

#### ORDER

Based on the foregoing, and the record as a whole, it is the administrative law judge's Final Initial Determination that there is a violation of section 337 in the importation into the United States, sale for importation, and sale within the United States after importation of certain biometric scanning devices, components thereof, associated software and products containing the same. It is also the administrative law judge's recommendation, should a violation be found, that a limited exclusion order issue barring entry into the United States of infringing biometric scanning devices, components thereof, associated software and products containing the same and that an appropriate cease and desist order should also issue. The administrative law judge further recommends a bond of 100% of entered value during Presidential review period should a violation be found.

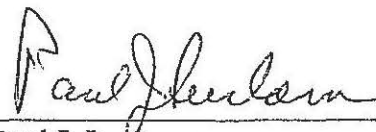
The administrative law judge hereby CERTIFIES to the Commission his Final Initial and Recommended Determinations. The briefs of the parties, filed with the Secretary, are not certified, since they are already in the Commission's possession in accordance with Commission rules.

Further it is ORDERED that:

1. In accordance with Commission rule 210.39, all material heretofore marked in camera because of business, financial and marketing data found by the administrative law judge to be cognizable as confidential business information under Commission rule 201.6(a), is to be given in camera treatment continuing after the date this investigation is terminated.

2. Counsel for the parties shall have in the hands of the administrative law judge those portions of the final initial and recommended determinations which contain bracketed confidential business information to be deleted from any public version of said determinations, no later than June 30, 2011. Any such bracketed version shall not be served via facsimile on the administrative law judge. If no such bracketed version is received from a party, it will mean that the party has no objection to removing the confidential status, in its entirety, from these initial and recommended determinations.

3. The initial determination portion of the Final Initial and Recommended Determinations, issued pursuant to Commission rules 210.42(a) and 210.42-46, shall become the determination of the Commission, unless the Commission, shall have ordered its review of certain issues therein or by order has changed the effective date of the initial determination portion. The recommended determination portion, issued pursuant to Commission rule 210.42(a)(1)(ii), will be considered by the Commission in reaching a determination on remedy pursuant to Commission rule 210.50(a).



Paul J. Luckern  
Chief Administrative Law Judge

Issued: June 17, 2011




**CERTAIN BIOMETRIC SCANNING DEVICES, COMPONENTS  
THEREOF, ASSOCIATED SOFTWARE, AND PRODUCTS  
CONTAINING THE SAME**

337-TA-720

**CERTIFICATE OF SERVICE**

I, James R. Holbein, hereby certify that the attached **Public Version Final Initial and Recommended Determinations** has been served by hand upon the Commission Investigative Attorney, David O. Lloyd, Esq., and the following parties as indicated, on  
July 18, 2011

  
James R. Holbein, Secretary  
U.S. International Trade Commission  
500 E Street, SW  
Washington, DC 20436

**On Behalf of Complainant Cross Match Technologies, Inc.:**

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( ) Via Hand Delivery  
(X) Via Overnight Mail  
( ) Via First Class Mail  
( ) Other: \_\_\_\_\_

**Respondents Suprema, Inc. and Mentalix, Inc.:**

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( ) Via Hand Delivery  
(X) Via Overnight Mail  
( ) Via First Class Mail  
( ) Other: \_\_\_\_\_

**JUL 19 2011**

**UNITED STATES INTERNATIONAL TRADE COMMISSION  
Washington, D.C.**

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**In the Matter of**

**CERTAIN BIOMETRIC SCANNING  
DEVICES, COMPONENTS THEREOF,  
ASSOCIATED SOFTWARE, AND  
PRODUCTS CONTAINING THE SAME**

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**Investigation No. 337-TA-720**

**NOTICE OF COMMISSION DECISION TO REVIEW-IN-PART A FINAL INITIAL  
DETERMINATION FINDING A VIOLATION OF SECTION 337; REQUEST FOR  
WRITTEN SUBMISSIONS REGARDING THE ISSUES UNDER REVIEW AND  
REMEDY, BONDING, AND THE PUBLIC INTEREST**

**AGENCY:** U.S. International Trade Commission.

**ACTION:** Notice.

**SUMMARY:** Notice is hereby given that the U.S. International Trade Commission has determined to review-in-part a final initial determination ("ID") of the presiding administrative law judge ("ALJ") finding a violation of section 337 in the above-captioned investigation, and is requesting written submissions regarding the issues under review and remedy, bonding, and the public interest.

**FOR FURTHER INFORMATION CONTACT:** Clint Gerdine, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 708-2310. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at <http://www.usitc.gov>. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at <http://edis.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

**SUPPLEMENTARY INFORMATION:** The Commission instituted this investigation on June 17, 2010 based on a complaint filed on May 11, 2010, by Cross Match Technologies, Inc. ("Cross Match") of Palm Beach Gardens, Florida. 75 *Fed. Reg.* 34482-83. The complaint, as amended on May 26, 2010, alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain biometric scanning devices, components

thereof, associated software, and products containing the same by reason of infringement of certain claims of U.S. Patent Nos. 5,900,993 ("the '993 patent"); 7,203,344 ("the '344 patent"); 7,277,562 ("the '562 patent"); and 6,483,932 ("the '932 patent"). The complaint further alleges that an industry in the United States exists as required by subsection (a)(2) of section 337, and names two respondents, Suprema, Inc. ("Suprema") of Korea and Mentalix, Inc. of Plano, Texas.

On November 10, 2010, the Commission issued notice of its determination not to review the ALJ's ID granting Cross Match's motion to amend the complaint by adding allegations of infringement as to claims 5-6, 12, and 30 of the '562 patent, and claims 7, 15, 19, and 45 of the '344 patent. On December 27, 2010, the Commission issued notice of its determination not to review the ALJ's ID granting Cross Match's motion to terminate the investigation as to claims 6-8, 13-15, and 19-21 of the '932 patent (eliminating this patent from the investigation); claims 13 and 16 of the '993 patent; claims 4, 15, 30, 32, and 44 of the '344 patent; and claim 2 of the '562 patent based on withdrawal of these claims from the complaint. On March 18, 2011, the Commission issued notice of its determination not to review the ALJ's ID granting Cross Match's motion for summary determination that it satisfies the economic prong of the domestic industry requirement.

On June 17, 2011, the ALJ issued his final ID finding a violation of section 337 by Suprema by reason of infringement of one or more of claims 10, 12, and 15 of the '993 patent. The ALJ also found a violation of section 337 by reason of infringement of claim 19 of the '344 patent. The ALJ found no violation of section 337 with respect to the '932 patent. He also issued his recommendation on remedy and bonding during the period of Presidential review. On July 5, 2011, Cross Match, respondents, and the Commission investigative attorney ("IA") each filed a petition for review of the final ID; and on July 13, 2011, each filed a response to the other party's opposing petition.

Upon considering the parties' filings, the Commission has determined to review-in-part the ID. Specifically, the Commission has determined to review the ALJ's finding of a violation of section 337 based on infringement of claim 19 of the '344 patent. The Commission has determined not to review the remainder of the ID.

On review, with respect to violation, the parties are requested to submit briefing limited to the following issues:

- (1) Who infringes claim 19 of the '344 patent and what type of infringement has occurred? Please consider direct, contributory, and induced infringement.
- (2) Is there is a sufficient nexus between the infringer's unfair acts and importation to find a violation of section 337? *See, e.g., Dynamic Random Access Memories, Components Thereof and Products Containing Same*, Inv. No. 337-TA-242, Comm'n Op. (Sept. 21, 1987); *Certain Cardiac Pacemakers and Components Thereof*, Inv. No. 337-TA-162, 1984 WL 273827, Order No. 37 (March 21, 1984).



In addressing these issues, the parties are requested to make specific reference to the evidentiary record and to cite relevant authority.

In connection with the final disposition of this investigation, the Commission may issue an order that results in the exclusion of the subject articles from entry into the United States. Accordingly, the Commission is interested in receiving written submissions that address the form of remedy, if any, that should be ordered. If a party seeks exclusion of an article from entry into the United States for purposes other than entry for consumption, the party should so indicate and provide information establishing that activities involving other types of entry either are adversely affecting it or likely to do so. For background, see *In the Matter of Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360, USITC Pub. No. 2843 (December 1994) (Commission Opinion).

When the Commission contemplates some form of remedy, it must consider the effects of that remedy upon the public interest. The factors the Commission will consider include the effect that an exclusion order and/or cease and desist orders would have on (1) the public health and welfare, (2) competitive conditions in the U.S. economy, (3) U.S. production of articles that are like or directly competitive with those that are subject to investigation, and (4) U.S. consumers. The Commission is therefore interested in receiving written submissions that address the aforementioned public interest factors in the context of this investigation.

When the Commission orders some form of remedy, the U.S. Trade Representative, as delegated by the President, has 60 days to approve or disapprove the Commission's action. See section 337(j), 19 U.S.C. § 1337(j) and the Presidential Memorandum of July 21, 2005. 70 *Fed. Reg.* 43251 (July 26, 2005). During this period, the subject articles would be entitled to enter the United States under bond, in an amount determined by the Commission. The Commission is therefore interested in receiving submissions concerning the amount of the bond that should be imposed if a remedy is ordered.

**WRITTEN SUBMISSIONS:** The parties to the investigation are requested to file written submissions on the issues under review that specifically address the Commission's questions set forth in this notice. The submissions should be concise and thoroughly referenced to the record in this investigation. Parties to the investigation, interested government agencies, and any other interested parties are encouraged to file written submissions on the issues of remedy, the public interest, and bonding, and such submissions should address the recommended determination by the ALJ on remedy and bonding. The complainant and the IA are also requested to submit proposed remedial orders for the Commission's consideration. Complainant is also requested to state the dates that the patents at issue expire and the HTSUS numbers under which the accused articles are imported. The written submissions and proposed remedial orders must be filed no later than close of business on August 30, 2011. Reply submissions must be filed no later than the close of business on September 8. No further submissions on these issues will be permitted unless otherwise ordered by the Commission.

Persons filing written submissions must file the original document and 12 true copies thereof on or before the deadlines stated above with the Office of the Secretary. Any person

desiring to submit a document to the Commission in confidence must request confidential treatment unless the information has already been granted such treatment during the proceedings. All such requests should be directed to the Secretary of the Commission and must include a full statement of the reasons why the Commission should grant such treatment. *See* 19 C.F.R. §210.6. Documents for which confidential treatment by the Commission is sought will be treated accordingly. All nonconfidential written submissions will be available for public inspection at the Office of the Secretary.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, and in sections 210.42-46 of the Commission's Rules of Practice and Procedure, 19 C.F.R. §§ 210.42-46.

By order of the Commission.

/s/  
James R. Holbein  
Secretary to the Commission

Issued: August 18, 2011

**UNITED STATES INTERNATIONAL TRADE COMMISSION  
Washington, D.C.**

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**In the Matter of**

**CERTAIN BIOMETRIC SCANNING  
DEVICES, COMPONENTS THEREOF,  
ASSOCIATED SOFTWARE, AND  
PRODUCTS CONTAINING THE SAME**

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**Investigation No. 337-TA-720**

**NOTICE OF COMMISSION DECISION TO MODIFY A FINAL INITIAL  
DETERMINATION FINDING A VIOLATION OF SECTION 337; ISSUANCE OF A  
LIMITED EXCLUSION AND A CEASE AND DESIST ORDER; AND TERMINATION  
OF THE INVESTIGATION**

**AGENCY:** U.S. International Trade Commission.

**ACTION:** Notice.

**SUMMARY:** Notice is hereby given that the U.S. International Trade Commission has determined to modify a final initial determination ("ID") of the presiding administrative law judge ("ALJ") finding a violation of section 337 by respondents in the above-captioned investigation, and has issued a limited exclusion order directed against products of respondents Suprema, Inc. ("Suprema") of Gyeonggi, Korea and Mentalix, Inc. ("Mentalix") of Plano, Texas, and a cease and desist order directed against Mentalix.

**FOR FURTHER INFORMATION CONTACT:** Clint Gerdine, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 708-2310. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at <http://www.usitc.gov>. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at <http://edis.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

**SUPPLEMENTARY INFORMATION:** The Commission instituted this investigation on June 17, 2010 based on a complaint filed on May 11, 2010, by Cross Match Technologies, Inc. ("Cross Match") of Palm Beach Gardens, Florida. 75 *Fed. Reg.* 34482-83. The complaint, as amended on May 26, 2010, alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain biometric scanning devices, components thereof, associated software, and products containing the same by reason of infringement of certain claims of U.S. Patent Nos. 5,900,993 ("the '993 patent"); 7,203,344 ("the '344 patent");

7,277,562 ("the '562 patent"); and 6,483,932 ("the '932 patent"). The complaint further alleges that an industry in the United States exists as required by subsection (a)(2) of section 337, and names two respondents, Suprema and Mentalix.

On November 10, 2010, the Commission issued notice of its determination not to review the ALJ's ID granting Cross Match's motion to amend the complaint by adding allegations of infringement as to claims 5-6, 12, and 30 of the '562 patent, and claims 7, 15, 19, and 45 of the '344 patent. On December 27, 2010, the Commission issued notice of its determination not to review the ALJ's ID granting Cross Match's motion to terminate the investigation as to claims 6-8, 13-15, and 19-21 of the '932 patent (eliminating this patent from the investigation); claims 13 and 16 of the '993 patent; claims 4, 15, 30, 32, and 44 of the '344 patent; and claim 2 of the '562 patent based on withdrawal of these claims from the complaint. On March 18, 2011, the Commission issued notice of its determination not to review the ALJ's ID granting Cross Match's motion for summary determination that it satisfies the economic prong of the domestic industry requirement.

On June 17, 2011, the ALJ issued his final ID finding a violation of section 337 by reason of infringement of one or more of claims 10, 12, and 15 of the '993 patent by the imported devices. The ALJ also found a violation of section 337 by reason of infringement of claim 19 of the '344 patent. The ALJ found no violation of section 337 with respect to the '562 patent. He also issued his recommendation on remedy and bonding during the period of Presidential review. On July 5, 2011, Cross Match, respondents, and the Commission investigative attorney ("IA") each filed a petition for review of the final ID; and on July 13, 2011, each filed a response to the opposing petitions.

On August 18, 2011, the Commission determined to review the ALJ's finding of a violation of section 337 based on infringement of claim 19 of the '344 patent. The determinations made in the final ID that were not reviewed became final determinations of the Commission by operation of rule. *See* 19 U.S.C. § 210.42(h).

The Commission requested briefing on certain questions concerning the issues under review and requested written submissions on the issues of remedy, the public interest, and bonding from the parties and interested non-parties. 76 *Fed. Reg.* 52970-71 (August 24, 2011).

On August 30 and September 8, 2011, respectively, complainant Cross Match, respondents, and the IA each filed a brief and a reply brief on the issues for which the Commission requested written submissions.

Having reviewed the record in this investigation, including the final ID and the parties' written submissions, the Commission has determined to: (1) modify-in-part the final ID and issue an Opinion supplementing the ID's analysis concerning its finding that the accused scanners infringe claim 19 of the '344 patent; and (2) affirm all other findings of the ID underlying the issue under review. Specifically, the Commission has determined that respondent Mentalix directly infringes claim 19 of the '344 patent, and that respondent Suprema indirectly infringes claim 19,



via induced infringement, but does not infringe claim 19 via contributory infringement. These actions result in a finding of a violation of section 337 with respect to claim 19 of the '344 patent.

Further, the Commission has made its determination on the issues of remedy, the public interest, and bonding. The Commission has determined that the appropriate form of relief is both: (1) a limited exclusion order prohibiting the unlicensed entry of biometric scanning devices, components thereof, associated software, and products containing the same that infringe one or more of claims 10, 12, and 15 of the '993 patent and claim 19 of the '344 patent where the infringing scanning devices are manufactured abroad by or on behalf of, or are imported by or on behalf of, Suprema or Mentalix, or any of their affiliated companies, parents, subsidiaries, licensees, contractors, or other related business entities, or successors or assigns; and (2) a cease and desist order prohibiting Mentalix, Inc. from conducting any of the following activities in the United States: importing, selling, marketing, advertising, distributing, offering for sale, transferring (except for exportation), and soliciting U.S. agents or distributors for, biometric scanning devices, components thereof, associated software, and products containing the same that infringe one or more of claims 10, 12, and 15 of the '993 patent and claim 19 of the '344 patent.

The Commission further determined that the public interest factors enumerated in sections 337(d)(1), (f)(1) (19 U.S.C. §§ 1337(d)(1), (f)(1)) do not preclude issuance of the limited exclusion or cease and desist order. Finally, the Commission determined that a bond of 100 percent of the entered value of the covered products is required to permit temporary importation during the period of Presidential review (19 U.S.C. § 1337(j)). The Commission's orders and opinion were delivered to the President and to the United States Trade Representative on the day of their issuance.

The Commission has terminated this investigation. The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in sections 210.42, 210.45, and 210.50 of the Commission's Rules of Practice and Procedure (19 C.F.R. §§ 210.42, 210.45, 210.50).

By order of the Commission.

/s/  
James R. Holbein  
Secretary to the Commission

Issued: October 24, 2011

***PUBLIC VERSION***

**UNITED STATES INTERNATIONAL TRADE COMMISSION  
Washington, D.C.**

**In the Matter of**

**CERTAIN BIOMETRIC SCANNING  
DEVICES, COMPONENTS THEREOF,  
ASSOCIATED SOFTWARE, AND  
PRODUCTS CONTAINING THE SAME**

**Investigation No. 337-TA-720**

**COMMISSION OPINION**

**I. SUMMARY**

On June 17, 2011, the presiding administrative law judge ("ALJ") issued his final initial determination ("ID") in the above-captioned investigation, finding a violation of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337, as amended ("section 337"), with respect to U.S. Patent Nos. 5,900,993 ("the '993 patent") and 7,203,344 ("the '344 patent"). The Commission determined to review the ALJ's finding of a violation of section 337 based on infringement of claim 19 of the '344 patent. On review, the Commission modifies in part the ALJ's finding on infringement of claim 19 and terminates the investigation with a finding of a violation of section 337 with respect to both patents.

**II. BACKGROUND**

The Commission instituted this investigation on June 17, 2010 based on a complaint filed on May 11, 2010, by Cross Match Technologies, Inc. ("Cross Match") of Palm Beach Gardens, Florida. 75 *Fed. Reg.* 34482-83. The complaint, as amended on May 26, 2010, alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and the sale within the United States

after importation of certain biometric scanning devices, components thereof, associated software, and products containing the same by reason of infringement of certain claims of the '993 and '344 patents, and U.S. Patent Nos. 7,277,562 ("the '562 patent") and 6,483,932 ("the '932 patent"). The complaint further alleges that an industry in the United States exists as required by subsection (a)(2) of section 337, and names two respondents, Suprema, Inc. ("Suprema") of Gyeonggi, Korea, and Mentalix, Inc. ("Mentalix") of Plano, Texas.

On June 17, 2011, the ALJ issued his final ID finding a violation of section 337 by reason of infringement of one or more of claims 10, 12, and 15 of the '993 patent by the imported devices. He also found a violation of section 337 by reason of infringement of claim 19 of the '344 patent, but found no violation with respect to the '562 patent. He also issued his recommendation on remedy and bonding during the period of Presidential review. On July 5, 2011, Cross Match, respondents, and the Commission investigative attorney ("IA") each filed a petition for review of the final ID; and on July 13, 2011, each filed a response to the opposing petitions.

On August 18, 2011, the Commission determined to review the ALJ's finding of infringement of claim 19 of the '344 patent.<sup>1</sup> The Commission requested briefing on certain questions concerning the issues under review and requested written submissions on the issues of remedy, the public interest, and bonding from the parties and interested non-parties. 76 *Fed. Reg.* 52970-71 (August 24, 2011). On August 30 and September 8, 2011, respectively,

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<sup>1</sup> The determinations made in the final ID that were not reviewed became final determinations of the Commission by operation of rule. See 19 U.S.C. § 210.42(h).



complainant Cross Match, respondents, and the IA each filed a brief and a reply brief on the issues for which the Commission requested written submissions.<sup>2</sup>

After considering the written submissions, the Commission has determined to modify the ALJ's final ID by supplementing his analysis regarding infringement of claim 19 of the '344 patent. The Commission has determined that Mentalix directly infringes claim 19 of the '344 patent and that Suprema indirectly infringes claim 19, via induced infringement, but does not contributorily infringe claim 19.

### **Patent and Products at Issue**

The asserted claims of the '344 patent pertain to a method used by a conventional optical scanning system for forming and detecting up to four simultaneous fingerprint images by comparing the scanned images with previously scanned images in accordance with an acceptable quality threshold. Suprema manufactures and imports hardware and software for scanning fingerprints. Mentalix directly imports Suprema's scanners for integration with Mentalix's software in the United States. ID at 2 (citing Order No. 11). Mentalix's accused software can be used with fingerprint scanners sold by other companies as well as Suprema. Cross Match contends that the asserted system and method claims of the '344 patent for fingerprint imaging

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<sup>2</sup> See Brief and Reply Brief of the Office of Unfair Import Investigations on the Issues Under Review, and on Remedy, the Public Interest, and Bonding (August 30 and September 8, 2011) ("IA's Submission," "IA's Reply"); Complainant Cross Match Technologies, Inc.'s Response to Commission Questions and Submission Regarding Appropriate Remedies and Bond (August 30, 2011) ("Cross Match's Submission"); Complainant Cross Match Technologies, Inc.'s Reply to Respondents' and Staff's Response to the Commission's August 18, 2011 Notice (September 8, 2011) ("Cross Match's Reply"); Respondents Suprema, Inc. and Mentalix, Inc.'s Written Submission Regarding the Issues Under Review and Remedy, Bonding, and the Public Interest (August 30, 2011) ("Respondents' Submission"); Respondents Suprema, Inc. and Mentalix, Inc.'s Reply to Complainant's and Staff's Response to Commission Questions and Submission Regarding Appropriate Remedies and Bond (September 8, 2011) ("Respondents' Reply").



are infringed by Suprema's hardware when used with either respondent's software. Suprema's accused scanners use optical systems, including a light source and a sensor, to obtain images of fingerprints, and a platen for capturing fingerprints. The accused scanners use a series of optical light-focusing elements to obtain an image of the fingerprint and a camera to scan the fingerprint image. Suprema provides software development kits ("SDKs") that allow customers to create their own software to operate the scanner. The SDKs include manuals as well as dynamic link libraries ("dlls") that include functions that operate various features of the accused fingerprint scanners. Suprema is accused of infringing all the asserted patents by reason of the sale and importation of its scanners with the SDKs. Mentalix is accused of infringing the asserted '344 patent when it integrates its FedSubmit software with Suprema's scanners.

### **III. DISCUSSION**

For the reasons set forth below, the Commission has determined to modify the final ID's infringement findings which are under review, and find a violation of section 337 by the accused Suprema scanners integrated with Mentalix's software with respect to claim 19 of the '344 patent. We find that claim 19 is directly infringed by Mentalix, and that Suprema induces infringement of, but does not contributorily infringe, claim 19. We adopt the ALJ's findings in his final ID that are not inconsistent with our determinations and opinion.

#### **The '344 Patent - Identity of the Infringer and Theory of Infringement**

We determined to review the ALJ's finding of infringement by the accused scanners in combination with the FedSubmit software. *See* ID at 97, 168. Specifically, our review concerned who infringes claim 19 of the '344 patent, under what theory of infringement, and whether there is a sufficient nexus between the infringer's unfair acts and importation to find a violation of section 337.

1. *Relevant law*

After properly construing the claims, a factual inquiry is conducted to compare the asserted claims with the accused device or process to determine infringement. *See MBO Labs., Inc. v. Becton Dickinson & Co.*, 474 F.3d 1323, 1329 (Fed. Cir. 2007). The patentee bears the burden of demonstrating infringement by a preponderance of the evidence. *Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1310 (Fed. Cir. 2005). To prove literal infringement, the patentee must show that an accused product contains every limitation in the asserted claims. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1350 (Fed. Cir. 1999) (“To infringe a method claim, a person must have practiced all steps of the claimed method.”); *Lucent Technologies, Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1317 (Fed. Cir. 2009).

Infringement may be indirect as “[w]hoever actively induces infringement of a patent shall be liable as an infringer.” *See* 35 U.S.C. § 271(b). Also, “[w]hoever . . . imports into the United States a component of a patented machine, manufacture, combination . . . or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made . . . for use in [patent infringement], and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer.” *See* 35 U.S.C. § 271(c). However, there can be no indirect infringement unless there is direct infringement. *Glenayre Elecs., Inc. v. Jackson*, 443 F.3d 851, 858 (Fed. Cir. 2006).

“To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they “actively and knowingly aid[ed] and abett[ed] another’s direct infringement.” *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (*en banc*) (citations omitted). However, “knowledge of the acts alleged to constitute infringement”

is not enough. *Id.* A high level of specific intent and action to induce infringement must be proven, as mere knowledge of possible infringement by others does not amount to inducement. *Id.*; see also *Cross Med. Prods.*, 424 F.3d at 1312 (“In order to succeed on a claim of inducement, the patentee must show, first that there has been direct infringement, and second, that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another’s infringement.”). The intent element can be satisfied by the patentee showing that the “infringer’s actions induced infringing acts and that he knew or should have known his actions would induce actual infringements.” *DSU*, 471 F.3d at 1306. Induced infringement may be established by circumstantial evidence. See *Golden Blount, Inc. v. Robert M. Peterson, Inc.*, 438 F.3d 1354, 1362-63 (Fed. Cir. 2006).

A seller of a component of an infringing product can be held liable for contributory infringement if: (1) there is an act of direct infringement by another person; (2) the accused contributory infringer knows its component is included in a combination that is both patented and infringing; and (3) there are no substantial noninfringing uses for the accused component, *i.e.*, the component is not a staple article of commerce. *Carborundum Co. v. Molten Equip. Innovations, Inc.*, 72 F.3d 872, 876 (Fed. Cir. 1995).

The knowledge requirement for indirect infringement may be satisfied by actual knowledge or the doctrine of “willful blindness.” See *Global-Tech Appliances, Inc. v. SEB S.A.*, 131 S. Ct. 2060, 2071-72 (2011) (“a willfully blind defendant is one who takes deliberate actions to avoid confirming a high probability of wrongdoing and who can almost be said to have actually known the critical facts;” “merely a ‘known risk’ that the induced acts are infringing” is insufficient to establish knowledge of infringement).

The Commission’s remedial authority to issue exclusion orders extends to violations of



section 337 based on indirect infringement. *See Certain Optoelectronic Devices, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-669, Comm'n Notice (July 12, 2010) (finding a violation of section 337 based on contributory and induced infringement by respondent, and issuing limited exclusion and cease and desist orders directed against the products of the indirectly infringing respondent).

2. *ALJ's ID*

Claim 19 (a method claim) of the '344 patent reads:

A method for capturing and processing a fingerprint image, the method comprising:

- (a) scanning one or more fingers;
- (b) capturing data representing a corresponding fingerprint image;
- (c) filtering the fingerprint image;
- (d) binarizing the filtered fingerprint image;
- (e) detecting a fingerprint area based on a concentration of black pixels in the binarized fingerprint image;
- (f) detecting a fingerprint shape based on an arrangement of the concentrated black pixels in an oval-like shape in the binarized fingerprint image; and
- (g) determining whether the detected fingerprint area and shape are of an acceptable quality.

'344 patent (JX-2), col 19:24-37.

The ALJ found that Suprema's accused RealScan-10, RealScan-10F, RealScan-D, and RealScan-DF products infringe claim 19 when integrated with Mentalix's FedSubmit software, but did not name the infringer or state whether infringement was direct and/or indirect. *See ID* at 88-97, 100.



3. *Identity of Infringer and Theory of Infringement*

a. **Parties' arguments**

Cross Match and the IA both submit that the record evidence establishes that Mentalix directly infringes claim 19 of the '344 patent. Cross Match's Submission at 2-4; IA's Submission at 6. [[

]]. Cross Match's Submission at 2-4 (citing JX-44C (Remmers - Chief Technology Officer and Corporate Vice President (VP) of Mentalix) at 19, 40-41). Cross Match submits that Mentalix then integrated its own proprietary FedSubmit software with the Suprema scanner units and software, and repeatedly tested the integrated scanner products in the United States, thereby infringing claim 19 by practicing all steps of the claimed method during testing. *Id.* (citing JX-44C at 19, 48-51, 57-68, 122-23); *see Lucent Technologies*, 580 F.3d at 1317.

Regarding direct infringement, respondents do not dispute that Mentalix has used the FedSubmit software in conjunction with the imported scanners to directly infringe claim 19 of the '344 patent, but, as discussed *infra*, they contend that there is no nexus between importation of Suprema's scanners and respondents' unfair acts to support finding a violation of section 337. Respondents' Submission at 18-31.

Regarding indirect infringement, both Cross Match and the IA submit that Suprema indirectly infringes claim 19 of the '344 patent via induced infringement, where Mentalix is the direct infringer. Cross Match's Submission at 4-7; IA's Submission at 6-7; *see Glenayre*, 443 F.3d at 858. Regarding induced infringement, Cross Match contends that the record evidence establishes that Suprema "knowingly induced infringement and possessed specific intent to encourage another's infringement." *Id.* at 6 (citing *MEMC Elec. Materials, Inc. v. Mitsubishi Materials Silicon Corp.*, 420 F.3d 1369, 1378 (Fed. Cir. 2005)). Cross Match submits that [[

]]. Cross Match's Reply at 3-7 (citing JX-40C (Song Dep.) at 129-30, 182-87, 1360; CX-395C at SPA0235176 at CMT-T-000582; JX-42C (Moon Dep. (Suprema's Vice-President)) at 148, 154, 361; CX-393C at SPA0089763 at 5, 45; CX-158C at SPA0061499 at 2; Song, Tr. at 1143-46; CX-387C at SPA0242635 at 2, 8; CX-544C (Lee Dep.) (Suprema's Chief Research Engineer) at 9-13, 42-43; CX-152C at SPA0168465 at 2, 5). Cross Match further argues that Suprema intended its scanners to be used for the autocapture, image

quality checking, and automatic segmentation processes that are covered by the '344 patent.

Cross Match's Submission at 5 (citing JX-29C at 120544-45; CX-383).

The IA asserts that [[

]]. IA's Submission at 6-7 (citing Song (Suprema's Executive Vice-President (VP) of Research and Development), Tr. at 1138-39). The IA argues that Suprema's failure to obtain an opinion of counsel, or otherwise try to avoid infringement, is further evidence of intent to induce. IA's Reply at 6 (citing *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 698-701 (Fed. Cir. 2008)).

Cross Match also asserts that Suprema indirectly infringes via contributory infringement. Cross Match's Submission at 4-7. Cross Match contends that the infringing functionalities of Mentalix's FedSubmit software originate in functions from the Suprema SDKs provided to Mentalix by Suprema and created specifically to be used with Suprema RealScan fingerprint scanners. *Id.* at 6-7 (citing JX-29 at § 1.3); Cross Match's Reply at 9-13. Cross Match submits that the functions in the Suprema SDKs are designed to permit use of the capabilities of the Suprema biometric scanners and serve no other purpose. Cross Match's Submission at 6 (citing *Ricoh Co., Ltd. v. Quanta Computer Inc.*, 550 F.3d 1325, 1337 (Fed. Cir. 2008) ("A component, specially adapted for use in the patented process and with no substantial non-infringing use, would plainly be good for nothing else but infringement of the patented process.")). Cross Match cites [[  
]], and submits that Suprema's scanner is especially adapted to work only with the FedSubmit software and lacks any substantial noninfringing uses. Cross Match's Reply at 9-13 (citing Remmers, Tr. at 1070-74; CX-502C; JX-44C at 2, 17-19, 30, 124).



Regarding indirect infringement, respondents argue that there is no record evidence showing that Suprema indirectly infringed claim 19, either via contributory or induced infringement. *Id.* at 6-18. Regarding induced infringement, respondents contend that Suprema lacks both: (1) knowledge that its products could be used to infringe, and (2) intent to cause infringement, showings which are necessary to support a finding of induced infringement. *Id.* [[

]]. *Id.* at 6-18. Respondents also submit that these circumstances do not constitute “willful blindness” of the ’344 patent, which is an exception to the knowledge requirement for inducement. *Id.* (citing *Global-Tech Appliances*, 131 S. Ct. at 2071-72). Respondents also submit that there is nothing in the record to show Suprema’s intent to induce infringement, but only its intent to cause the *acts* which are alleged to constitute infringement. *Id.* (citing *DSU*, 471 F.3d at 1305) (emphasis added).

Regarding contributory infringement, respondents contend that Suprema does not satisfy the statutory requirements of 35 U.S.C. § 271(c), *i.e.*, that Suprema does not provide a “material or apparatus for use in practicing a patented process,” with knowledge that it is “especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial infringing use.” *Id.* at 7-14; Respondents’ Reply at 15-25. Respondents argue that Suprema’s RealScan scanners are capable of substantial non-infringing uses. Respondents’ Submission at 7-14. They submit that Suprema’s scanners can be used with Suprema’s own software and with a wide array of third-party software, including software developed by its customers DNA Lifeprint, M2Sys, Fingerprint Solutions, and others. *Id.* (citing



JX-51C at 51, 104-05, 110-12; JX-56C at 62, 66, 72-74; JX-55C at 21-23; JX-54C at 46-48, 54).

They also note that the ALJ found that none of these third party customers infringed any claim of the asserted patents (and the Commission did not review his findings). *Id.* (citing ID at 98).

**b. Analysis**

The Commission finds that the record evidence is sufficient to support a finding of direct infringement of claim 19 of the '344 patent by Mentalix, and a finding of induced infringement by Suprema. However, we do not find that the record evidence supports a finding of contributory infringement by Suprema.

**Direct/Induced infringement**

The record evidence shows, and Mentalix itself does not dispute, that it integrates its FedSubmit software with the imported Suprema scanners and SDK software to produce a resulting scanner system that practices claim 19, and that Mentalix directly infringed claim 19 by [[

]]. See JX-44C at 19, 48-51, 57-68, 122-23; Mentalix's Submission at 18.

Accordingly, Mentalix is a direct infringer and has violated section 337 if a nexus is found between the importation of the Suprema scanners and SDK and the unfair act of infringement.

19 U.S.C. § 1337(a)(1)(B). As described *infra*, we find that the same record evidence that shows induced infringement by Suprema also shows the requisite nexus between importation and the unfair acts to find a violation of section 337 by both respondents.

The record evidence shows that Suprema is liable for induced infringement under section 271(b). [[ ], then "willfully blinded" itself to the infringing nature of Mentalix's activities which it had actively encouraged. See *DSU*, 471 F.3d at 1305; *Global-Tech Appliances*, 131 S. Ct. at 2070-71 (the knowledge

requirement for inducement may be satisfied by the doctrine of “willful blindness” where the inducer “takes deliberate actions to avoid confirming a high probability of wrongdoing” and therefore “can almost be said to have actually known the critical facts.”). The doctrine of “willful blindness” requires that: (1) the alleged infringer must subjectively believe that there is a high probability that a fact exists; and (2) the defendant must take deliberate actions to avoid learning that fact. *Global-Tech*, 131 S.Ct. at 2070.

[[<sup>3</sup>

]]. Ultimately, Suprema succeeded in developing into its scanners the autocapture, image quality checking, and automatic segmentation processes that are covered by the ‘344 patent. *See* JX-29 (RealScan Basic SDK Reference Manual) at 120544-45; CX 383 (RealScan-10 product brochure); CX-544C at 9-13, 42-43 [[

]]. In the “Cross-Reference to Related Applications” section at the beginning of the written disclosure, the ‘562 patent states that “[t]he present application is related to U.S. patent application Ser. No. 10/345,420 and U.S. patent application Ser. No. 10/345,366, both filed on

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<sup>3</sup>[[

]]. *See* Song, Tr. at 1138 (emphasis added).

Jan. 16, 2003, which are incorporated by reference in their entireties."<sup>4</sup> See '562 patent (JX-3), col. 1:11-14. This incorporation-by-reference language is similarly repeated three separate times in column 5 of the written description. See '562 patent (JX-3), col. 5:30-34, 39-42, 64-67 ("U.S. patent application Ser. No. 10/345,420 and U.S. patent application Ser. No. 10/345,366, which are incorporated by reference in their entireties."). The '562 and '344 patents also have overlapping inventors and share the same assignee, Cross Match, so a word search likely would have identified both patents.

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<sup>4</sup>The '344 patent issued in April 2007, six months prior to the October 2007 issue date of the '562 patent. See '344 patent (JX-2), '562 patent (JX-3).

[[

]]. Suprema's deliberate avoidance of acquiring knowledge of the '344 patent is further shown by its failure to obtain the opinion of counsel. Such an opinion undoubtedly would have uncovered the '344 patent, the fact that both the '344 and '562 patents are assigned to Cross Match, and would have analyzed whether Suprema infringed any of the Cross Match patents. *See* Tr. at 1138-39, 1143-46; JX-40C at 129-30, 182-87; CX-395C at SPA0235176 at CMT-T-000582; JX-42C at 148, 154, 361; *see, e.g., Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 698-701 (Fed. Cir. 2008).

Based on the foregoing, the Commission finds that the record evidences Suprema's subjective belief of the high probability that Cross Match's scanner technology was patented, and therefore Suprema was aware of the likelihood that the scanner products it was developing would be covered by Cross Match's patents, but took steps to avoid learning for certain that they were. *See Global-Tech Appliances*, 131 S. Ct. at 2071-72. Accordingly, even if Suprema did somehow fail to learn of the '344 patent at issue here [[



]], Suprema willfully blinded itself to the evidence of the existence of '344 patent and therefore deliberately shielded itself from the nature of the infringing activities it actively encouraged and facilitated Mentalix to make. *Id.*

Because we find that the doctrine of "willful blindness" has been satisfied here, it is not necessary for the Commission to reach the issue of whether actual knowledge of the '344 patent has been shown by the record evidence.

Regarding aiding and abetting direct infringement, we find that the record is replete with evidence of Suprema's efforts to collaborate with Mentalix to import the scanners and to help adapt Mentalix's FedSubmit software to work with Suprema's imported scanners and SDK to practice claim 19 of the '344 patent. These collaborative efforts between Suprema and Mentalix included, but are not limited to, [[

]].

The record evidence of these collaborative efforts is sufficient to show Suprema's aiding and abetting of Mentalix to adapt and integrate its FedSubmit software with Suprema's scanners and SDK to infringe claim 19 of the '344 patent. Accordingly, the Commission finds that Suprema satisfies the requisite elements for inducing infringement of claim 19 by Mentalix.

### **Contributory infringement**

The Commission finds that the record evidence is insufficient to prove that Suprema is a contributory infringer because complainant has failed to satisfy its burden to prove that the accused products have no substantial non-infringing uses. To the contrary, the evidence shows that Suprema provides the same scanners and SDK to all customers. The scanners and SDK may be modified by customers to suit their individual applications. [[

]]. However, Cross-Match has not provided evidence to show that the Suprema scanners and SDK sold to third parties have no non-infringing uses. *See Ricoh Co., Ltd. v. Quanta Computer Inc.*, 550 F.3d 1325, 1337 (Fed. Cir. 2008). Nor has Cross-Match shown that the Suprema scanners and SDK are incapable of being used in any way other than by infringing claim 19 of the '344 patent. In the instant investigation, Cross Match alleged that several third parties directly infringed certain claims of the '562 and/or the '344 patent based on software written by third parties that use the Suprema SDK but chose not to allege direct infringement of claim 19 by any of these third-party customers, and therefore there is no finding that this claim is directly infringed by any entity other than Mentalix. *See* ID at 98. Cross-Match's third party infringement allegations in this investigation are inconsistent with its argument that Suprema scanners and SDK have no non-infringing uses. Accordingly, we find

that Cross Match has not met its burden to demonstrate that there are no substantial non-infringing uses for Suprema's imported scanners and SDK.

Contrary to Cross Match's contentions, there is no record evidence that Suprema is selling a unique RealScan scanner and SDK to Mentalix that is specially adapted to infringe claim 19 in combination with the FedSubmit software. We find that the evidence Cross Match presents regarding Mentalix's efforts to customize its FedSubmit software is irrelevant since the focus of a contributory infringement analysis is on the contributory component and whether that component has substantial non-infringing uses or is specially adapted to combine only with the components of an end-product that infringes. *See CR Bard, Inc. v. Advanced Cardiovascular Sys., Inc.*, 911 F.2d 670, 674-75 (Fed. Cir. 1990) (the Court finding that the "critical issue" was "[w]hether the ACS catheter has no use except through practice of the patented method[.]"). The focus is not on whether the end-product components it combines with are specially adapted to infringe. Also, it is undisputed that Suprema is not a system integrator (*i.e.*, it does not provide an integrated fingerprint system with a complete software application), so therefore end-users of Suprema's software have to develop and use their own software to operate the RealScan scanners for actual scanning applications. *See* Jones (respondents' expert), Tr. at 1411-16. It is further undisputed that [[

]]. *See* Jones, Tr. at 1417-18; RDX-6C-06. Thus, we find that the evidence shows that all of Suprema's sales are of RealScan scanners and SDK that require development of unique end-user software to operate. Therefore in the hands of third-party customers other than Mentalix, these same scanners and SDK are capable of substantial non-infringing use. *See* JX-51C at 51, 104-05, 110-12; JX-56C at 62, 66, 72-74; JX-55C at 21-23; JX-54C at 46-48, 54, 74-75; McWilliams, Tr. at 671-73.



Based on this evidence, the Commission finds that Cross-Match has failed to satisfy its burden to demonstrate contributory infringement with respect to the imported Suprema scanners and SDK. *See CR Bard*, 911 F.2d at 674-75.

4. *Nexus Between Unfair Acts And Importation*

a. **Parties' arguments**

Cross Match and the IA submit that the requisite nexus between the unfair acts and importation is established by the record evidence here. Cross Match's Submission at 7-14; Cross Match's Reply at 13-16; IA's Submission at 7-11; IA's Reply at 6-9. Cross Match contends that nexus is established here by either: (1) respondents' knowledge that the imported RealScan scanners would be incorporated into an infringing device; or (2) Suprema's contributory infringement of claim 19. Cross Match's Submission at 7-14 (citing *Certain Inkjet Ink Cartridges with Printheads and Components Thereof*, Inv. No. 337-TA-723, 2011 ITC LEXIS 394, Order No. 37, at \*6-7 (January 28, 2011); *Certain Hardware Logic Emulation Systems and Components Thereof*, Inv. No. 337-TA-383, 1998 ITC LEXIS 64, Comm'n Op. (April 1, 1998) ("*Hardware Logic*"). Specifically, Cross Match submits that the record here provides substantial evidence that respondents undertook significant software programming efforts to facilitate the combination of imported Suprema RealScan scanners and software with Mentalix's FedSubmit biometric identification software. Cross Match's Submission at 8-9 (citing CX-366C at 1-3; CX-534C at MTX0006136; CX-382C at 1-4). Cross Match argues that respondents' knowledge that the RealScan scanners would be combined with the FedSubmit software to produce an infringing device establishes the requisite nexus between the unfair act and the importation. *Id.*



Cross Match contends that *Cardiac Pacemakers*, where the Commission found no nexus due to lack of indirect infringement, is distinguishable from this investigation. *Certain Cardiac Pacemakers and Components Thereof*, Inv. No. 337-TA-162, 1984 WL 273827, Order No. 37, at \*2 (March 21, 1984). Cross Match explains that the “two minor components” at issue in *Cardiac Pacemakers* were general, off-the-shelf ruby tubes and quartz crystals that did not infringe, and that the Commission found that these components were “minor” and “staple articles used in several non-infringing applications.” Cross Match’s Submission at 12-14 (citing *Cardiac Pacemakers*, Order No. 37). On the other hand, Cross Match argues, the record here establishes that the imported RealScan scanners are not mere “minor components,” but rather are sophisticated biometric devices with advanced optics that have also been separately adjudicated to infringe the '993 patent. *Id.*; see ID at 77.

The IA agrees that a nexus exists based on induced infringement, and therefore contends that there is no need to reach the issue of contributory infringement. IA’s Submission at 7-11. The IA asserts that *DRAMs* is similarly distinguishable from this case because the Commission did not find induced or contributory infringement in that investigation. *Id.* at 8-10 (citing *Certain Dynamic Random Access Memories, Components Thereof and Products Containing Same*, Inv. No. 337-TA-242, Comm’n Op. at 90-92 (Sept. 21, 1987). The IA further submits that other Commission precedent found a nexus based on similar facts, *i.e.*, integration of U.S. components with the imported article to assemble the infringing system, and provides authority to also find a nexus here based on Suprema’s inducement of Mentalix’s direct infringement. *Id.* (citing *Certain Fluidized Supporting Apparatus and Components Thereof*, Inv. No. 337-TA-182/188, Initial Determination at \*143-44, 1984 ITC LEXIS 70 (June 16, 1984) (“there is a sufficient link between the alleged unfair acts and the assembled article if the importation of

components of the article is an important step in the production and sale of the article.”); *Certain Personal Computers and Components Thereof*, Inv. No. 337-TA-140, Comm’n Op. at 36 (March 9, 1984) (the Commission found a nexus existed when a computer chip containing infringing software was added to an imported computer after importation because the computer chip was an “integral part” of the infringing computer system when it was sold)).

Respondents argue that there is no nexus between importation and respondents’ unfair acts. Respondents’ Submission at 18-29; Respondents’ Reply at 25-38. They contend that under these circumstances, where the complete infringing article is not imported, but rather assembled in the United States, the Commission’s authority to find a section 337 violation (and issue a remedy) is limited to articles that indirectly infringe, either contributorily or by inducement. *Id.* (citing *Cardiac Pacemakers*, Order No. 37; *DRAMs*, Comm’n Op. at 90-92). They submit that the facts of this investigation are precisely like those in *Cardiac Pacemakers* and *DRAMs* where a lack of indirect infringement prohibits a finding of a violation of section 337. *Id.*

#### **b. Analysis**

The Commission finds respondents’ nexus argument moot in view of our modification to the final ID, as discussed *supra*, that there has been direct infringement of claim 19 of the ’344 patent by Mentalix and indirect infringement of claim 19, via inducement, by Suprema. *See DRAMs*, Comm’n Op. at 90-92; *Cardiac Pacemakers*, Order No. 37, at \*2.

### **IV. CONCLUSION ON VIOLATION WITH RESPECT TO THE ’344 PATENT**

For the reasons discussed herein, the Commission has determined to modify-in-part the subject ID such that: (1) Mentalix is found to directly infringe claim 19 of the ’344 patent; (2) Suprema is found to indirectly infringe claim 19 via induced infringement; and (3) Suprema is not

found to indirectly infringe claim 19 via contributory infringement. These actions result in a finding of a violation of section 337 by both respondents. Also, the Commission affirms all the ALJ's factual findings underlying the issues that are on review.

## **V. REMEDY, PUBLIC INTEREST, AND BONDING**

For the reasons set forth below, the Commission has determined to adopt the ALJ's recommended determination ("RD") on remedy and bonding. *See* ID at 158-66. We have also determined that the public interest does not preclude the ALJ's recommended remedy.

The Commission is authorized to issue a limited exclusion order when the Commission determines that there is a violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337). The ALJ recommended that if the Commission were to determine that there has been a violation of section 337, a limited exclusion order should issue that prohibits the importation into the United States of infringing articles, regardless of brand name, "that are manufactured abroad or imported by or on behalf of either respondent, or any of its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns." *Id.* Also, the ALJ recommended that the order should not be limited to specifically-identified products, but rather should extend to all infringing products. *Id.* The ALJ further recommended, as to software associated with any infringing article, that any exclusion order extend only to the importation of software on fixed media. *Id.* He rejected Cross Match's argument that any exclusion order should block the electronic transmission of such software into the United States because previous investigations have found that this proposed remedy is impractical. *Id.* (citing *Hardware Logic*, Comm'n Op. at 19-20 (refusing to bar electronic transmissions out of deference to Customs' limitations in its ability to enforce the order); *Certain Systems for Detecting and*



*Removing Viruses or Worms, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-510, Comm'n Op. at 4-5 (August 8, 2005)).

Further, with respect to the '993 patent, the ALJ recommended that any exclusion order contain a reporting requirement for Cross Match. [[

]]. Accordingly, the ALJ found that Cross Match should be required to periodically certify that it is continuing to exploit the '993 patent. *Id.* (citing *Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, Comm'n Op. at 18, USITC Pub. 303 (Nov. 1996); *Certain Wire Electrical Discharge Machining Apparatus and Components Thereof*, Inv. No. 337-TA-290, Comm'n Op. at 20 (March 16, 1990); *Certain Caulking Guns*, Inv. No. 337-TA-139, USITC Pub. 1507, Comm'n Op. at 3 (March 1984)).

The ALJ also found that a cease and desist order directed to Mentalix is warranted because respondents admitted that [[

]]. *Id.* (citing JX-44C at 124-25); see *Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, USITC Pub. 2391, Comm'n Op. at 37-42 (June 1991).

Regarding bonding, the ALJ found that, [[

]]. Therefore, the ALJ recommended a bond of 100 percent of the entered value of the covered products during the period of Presidential review. *Id.*



**A. Remedy**

The Commission agrees with the ALJ that the appropriate relief includes a limited exclusion order covering infringing biometric scanning devices, components thereof, associated software, and products containing the same that are manufactured abroad or imported by or on behalf of Suprema or Mentalix, or any of its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns. We also agree with the ALJ that Cross Match has provided specific evidence that Mentalix maintains a "commercially significant" inventory of accused, infringing scanner systems using the FedSubmit software products such that issuance of a cease and desist order directed against Mentalix is warranted. *See* JX-44C at 124-25.

The Commission also agrees with the ALJ that any exclusion order should include a reporting requirement with respect to the '993 patent. The record evidence establishes that [[

]], we view a reporting requirement as warranted in this case to ensure that Cross Match continues to exploit the '993 patent while the remedy is in place.

We further find that a cease and desist order directed to Suprema, a foreign entity, is *not* warranted. Under long-standing precedent, the Commission does not issue cease and desist orders directed to foreign respondents who do not have inventories in the United States because of

the difficulty in enforcing such an order. *See, e.g., Certain Flash Memory Circuits and Products Containing Same*, Inv. No. 337-TA-382, USITC Pub. 3046, Comm'n Op. at 25, (July 1997) ("It is our practice to issue cease and desist orders only to domestic respondents, particularly in *light* of the difficulty of enforcing such orders against foreign entities."). Cross Match has not established that Suprema itself, or through an agent, maintains inventories in the United States. *See, e.g., Certain Cast Steel Railway Wheels, Processes for Manufacturing or Relating to Same and Certain Products Containing Same*, Inv. No. 337-TA-655, Comm'n Op. at 9 (March 19, 2010) ("the record evidence shows that respondents [including foreign respondents] maintain commercially significant inventories of wheels in the United States"); *Certain Abrasive Products Made Using a Process for Powder Preforms, and Products Containing Same*, Inv. No. 337-TA-449, USITC Pub. 3530, Comm'n Op. at 7-8 & n.16, (Aug. 2002) (foreign respondent's agent maintained a domestic inventory on respondent's behalf).

In addition, the Commission finds that complainant has not established evidence demonstrating the need for a provision in any remedial order excluding electronic importation. Unlike the facts of *Hardware Logic* where electronic importation was barred by the cease and desist order, Suprema's SDK software, by itself, was not found to directly or contributorily infringe here. *See Hardware Logic*, Comm'n Op. at 39-42. Moreover, we agree with the ALJ that enforcement of such a provision would be impractical. *Id.* at 19-20. Accordingly, the Commission has determined not to issue a cease and desist order directed to Suprema or include a provision in any remedial order excluding electronic importation.

#### **B. Public interest**

When issuing an exclusion order under section 337(d) or a cease and desist order under section 337(f), the Commission must weigh the remedy sought against the effect such a remedy

would have on the following public interest factors: (1) the public health and welfare; (2) the competitive conditions in the United States economy; (3) the production of articles in the United States that are like or directly competitive with those subject to the investigation; and (4) United States consumers. *See* 19 U.S.C. §§ 1337(d)(1), (f)(1).

The Commission finds that its remedial orders are not contrary to the public interest since U.S. demand for biometric scanning devices, components thereof, associated software, and products containing the same can be met by other entities, including Cross Match. We also find that respondent has not presented evidence that an exemption for repair parts is necessary in this case for any remedial order. *See Certain Liquid Crystals Display Modules, Products Containing Same, and Methods Using the Same*, Inv. No. 337-TA-634, Comm'n Op. at 8 (Nov. 24, 2009) ("*LCD Devices*"). Tellingly, unlike *LCD Devices*, there have been no third-party submissions regarding remedy, the public interest, and bonding. Also, respondents have not made clear exactly what "replacement parts" are necessary to import here, what burdens and expenses would be imposed on third parties in the absence of such a "repair parts" exemption, and how long such an exemption is necessary to be in effect.

Also, we specifically find that our remedial orders with respect to claim 19 of the '344 patent are not contrary to the public interest because the record evidence firmly establishes that [[

]].

**C. Bonding**

Section 337(j) provides for entry of infringing articles during the sixty (60) day period of Presidential review upon posting of a bond and states that the bond is to be set at a level "sufficient to protect the complainant from any injury." 19 U.S.C. § 1337(j)(3); *see also* 19 C.F.R. § 210.50(a)(3).

The Commission has determined that the posting of a bond is warranted in this case because Cross Match has proven that it exploits all of the patents at issue in the United States, and therefore any infringing importation undercuts the domestic industry and results in injury to Cross Match. *See* 19 U.S.C. § 1337(j)(3); ID at 142-44 (finding that Complainant satisfies technical prong) (unreviewed by Commission). The Commission also agrees with the ALJ that [[



]]. Accordingly, the Commission has determined that a bond of 100 percent of the entered value for the covered products is appropriate during the period of Presidential review. *See Digital Multimeters*, Comm'n Op. at 12-13.

**D. Request for a Hearing**

The Commission has determined that no hearing pursuant to Commission Rule 210.45(a) is warranted here because this case does not present any special circumstances that can be resolved only by holding a hearing on the issues of remedy, the public interest, and bonding. Again, tellingly, no third-parties filed submissions in this investigation.


**VI. CONCLUSION**

The Commission has determined that there has been a violation of section 337, and has further determined that the appropriate form of relief is a limited exclusion order prohibiting the unlicensed entry of biometric scanning devices, components thereof, associated software, and products containing the same that infringe one or more of claims 10, 12, and 15 of the '993 patent or claim 19 of the '344 patent, and that are manufactured abroad or imported by or on behalf of Suprema or Mentalix, or any of its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns. The Commission has also determined to issue a cease and desist order directed to Mentalix prohibiting it from importing, selling, advertising, distributing, marketing, consigning, transferring (except for exportation), offering for sale in the United States and soliciting U.S. agents or distributors for the subject products.

The Commission further has determined that the public interest factors enumerated in section 337(d)(1) (19 U.S.C. § 1337(d)(1)) and (f)(1) (19 U.S.C. § 1337(f)(1)) do not preclude issuance of the limited exclusion order and cease and desist order. Finally, the Commission

determined that there should be a 100 percent bond of the entered value of the covered products during the period of Presidential review.

By order of the Commission.



James R. Holbein  
Secretary to the Commission


Issued: November 10, 2011

**CERTAIN BIOMETRIC SCANNING DEVICES,  
COMPONENTS THEREOF, ASSOCIATED SOFTWARE, AND  
PRODUCTS CONTAINING THE SAME**

**337-TA-720**

**CERTIFICATE OF SERVICE**

I, James R. Holbein, hereby certify that the attached **Notice** has been served by hand upon the Commission Investigative Attorney, David O. Lloyd, Esq., and the following parties as indicated, on **November 10, 2011**.



James R. Holbein, Secretary  
U.S. International Trade Commission  
500 E Street, SW  
Washington, DC 20436

**On Behalf of Complainant Cross Match Technologies,  
Inc.:**

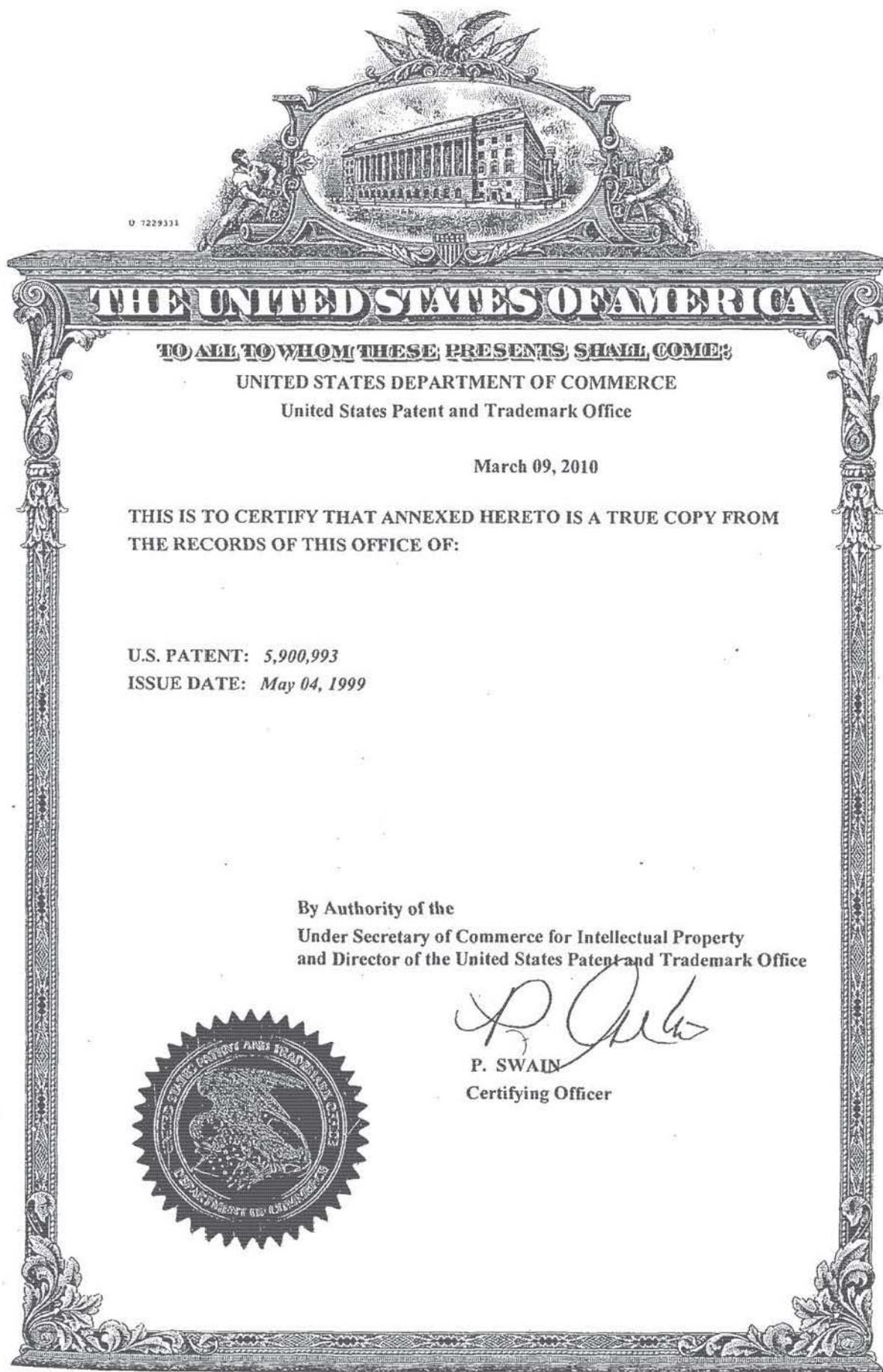
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☐ Via Hand Delivery  
☒ Via Overnight Mail  
☐ Via First Class Mail  
☐ Other: \_\_\_\_\_

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☐ Via Hand Delivery  
☒ Via Overnight Mail  
☐ Via First Class Mail  
☐ Other: \_\_\_\_\_







US005900993A

**United States Patent** [19]

Betensky

[11] Patent Number: **5,900,993**[45] Date of Patent: **May 4, 1999**[54] **LENS SYSTEMS FOR USE IN FINGERPRINT DETECTION**

[75] Inventor: Ellis Betensky, Toronto, Canada

[73] Assignee: Cross Check Corporation, North Palm Beach, Fla.

[21] Appl. No.: 08/854,157

[22] Filed: May 9, 1997

[51] Int. Cl.<sup>6</sup> ..... G02B 13/18

[52] U.S. Cl. .... 359/710; 356/71

[58] Field of Search ..... 359/663, 710; 356/71

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Hebert, Robert T., "Off-axis optical elements in integrated, injection-molded assemblies," *SPIE*, vol. 2600, pp. 129-134, Dec. 1995.

Stoltzmann et al., "Versatile anamorphic electronic fingerprinting: design and manufacturing considerations," *SPIE*, vol. 2537, pp. 105-116, Aug. 1995.

Primary Examiner—Georgia Y. Epps

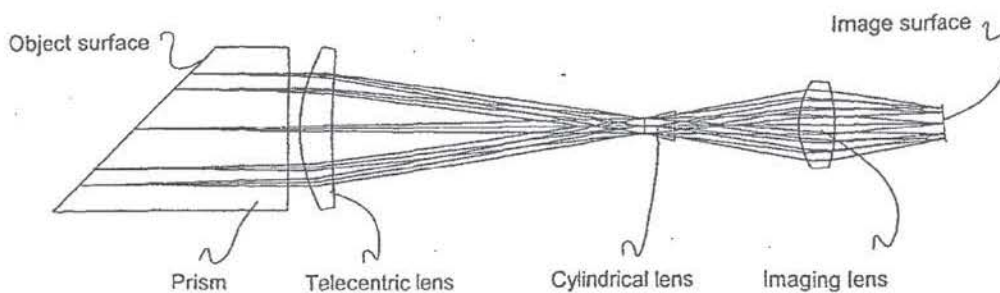
Assistant Examiner—Michael A. Lucas

Attorney, Agent, or Firm—Maurice M. Klee

## [57]

**ABSTRACT**

Lens systems for use in fingerprint detection systems employing frustrated total internal reflection are provided. The systems include an aperture stop and three lens units. The first lens unit has a positive power, is located on the object side of the aperture stop, and forms a telecentric pupil for the lens system. The second lens unit has a positive power, is located on the image side of the first lens unit, and forms a real image of the object. In certain embodiments, the third lens unit is located between the first and second lens units and has substantially afocal cylindrical power. In other embodiments, the third lens unit serves to correct the field curvature of the image contributed by the first and second lens units.

**18 Claims, 9 Drawing Sheets**

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5,900,993

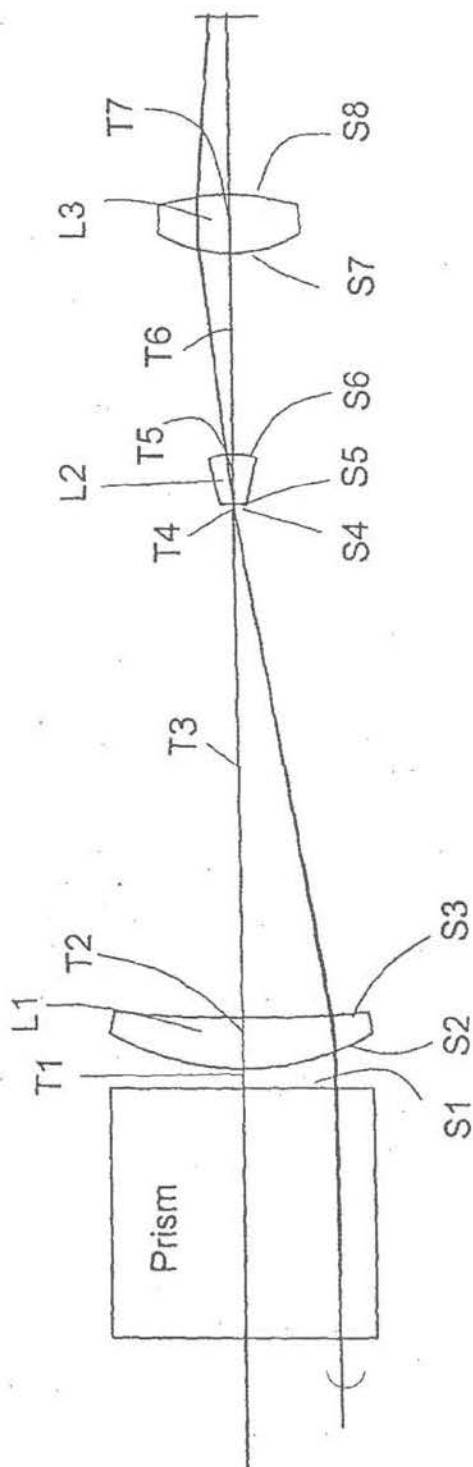


FIG. 1A

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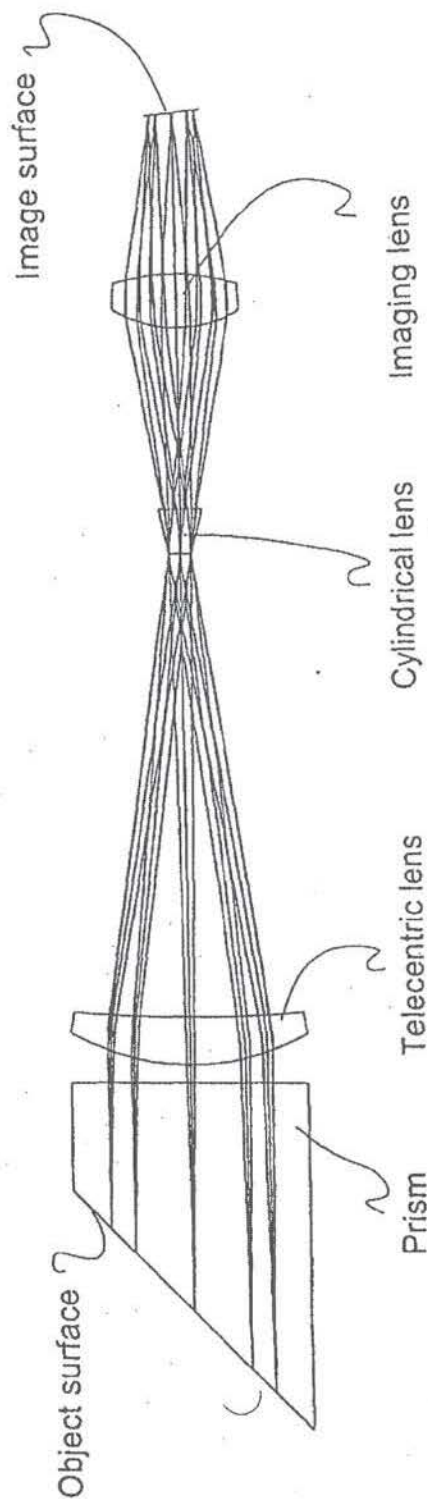


FIG. 1B-1

ADD-221

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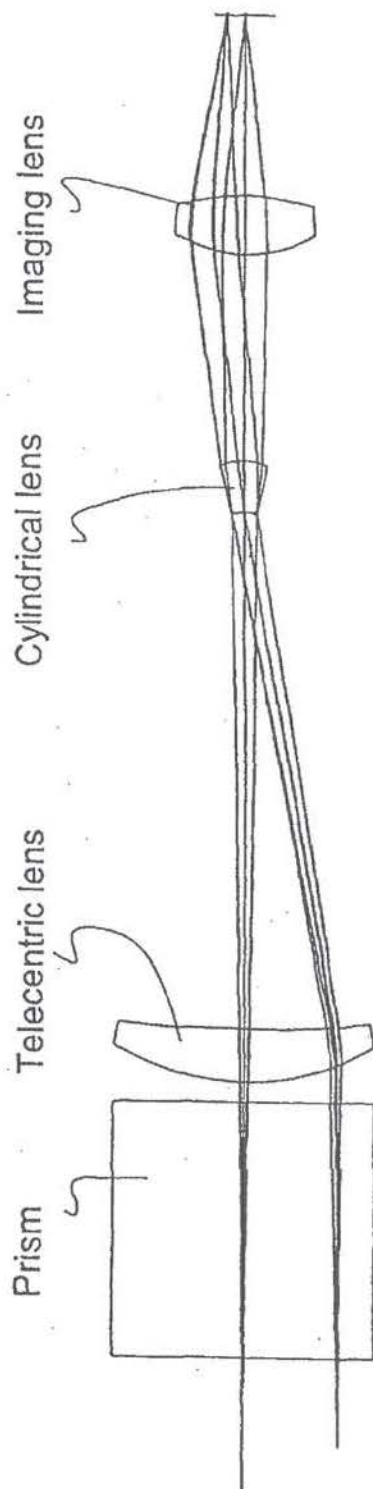


FIG. 1B-2

ADD-222



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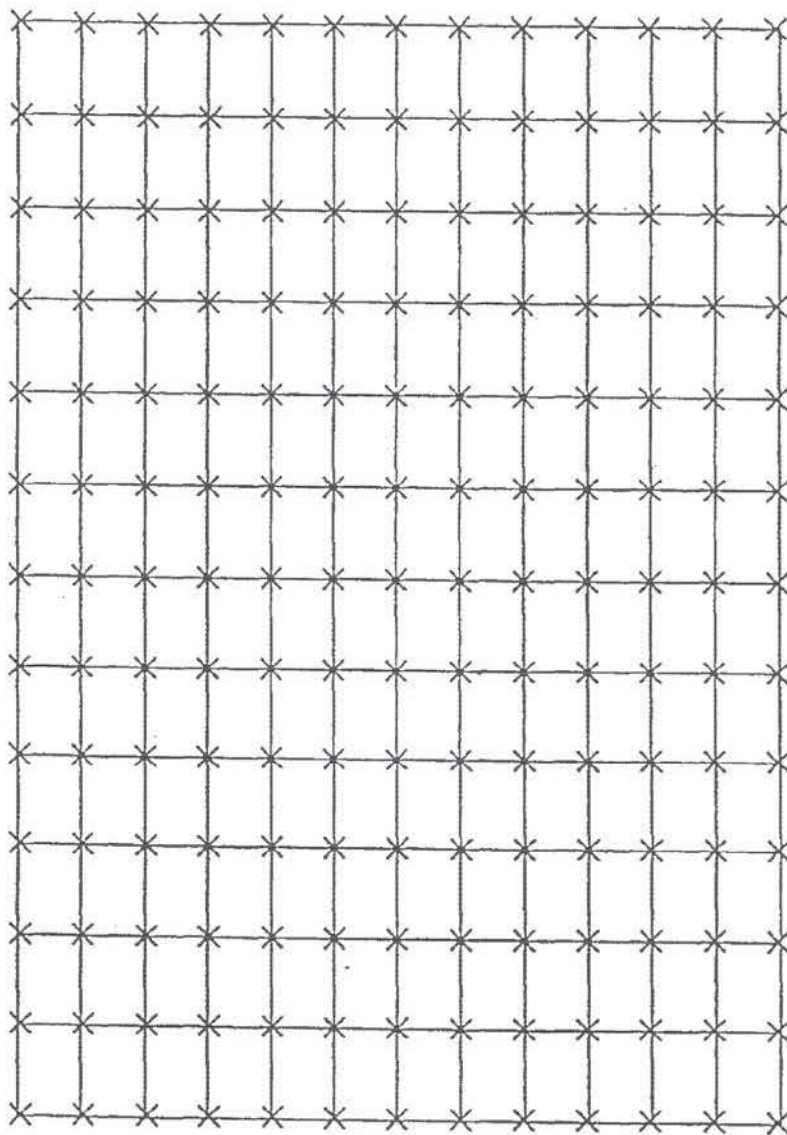


FIG. 1C

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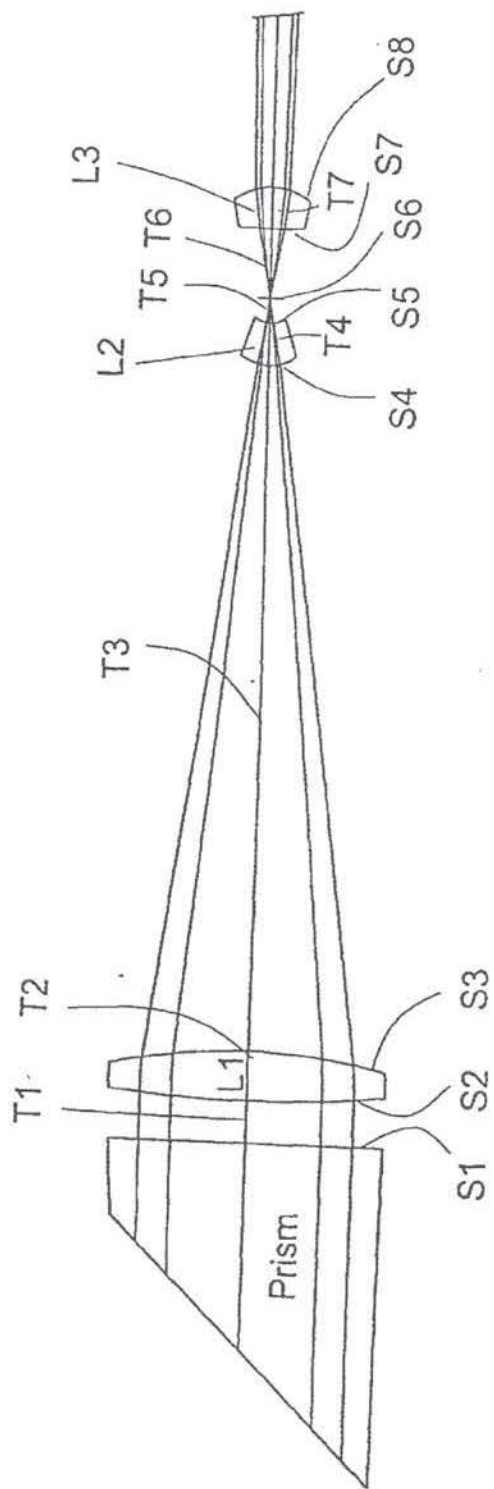


FIG. 2A

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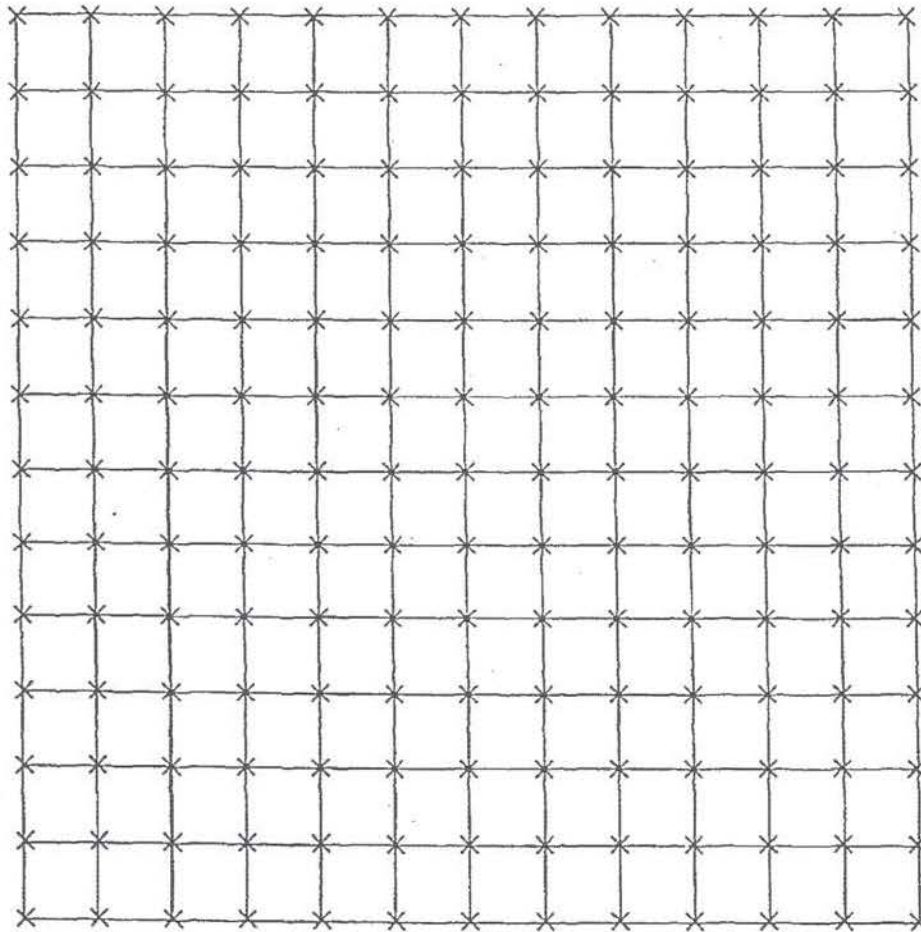


FIG. 2B

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5,900,993

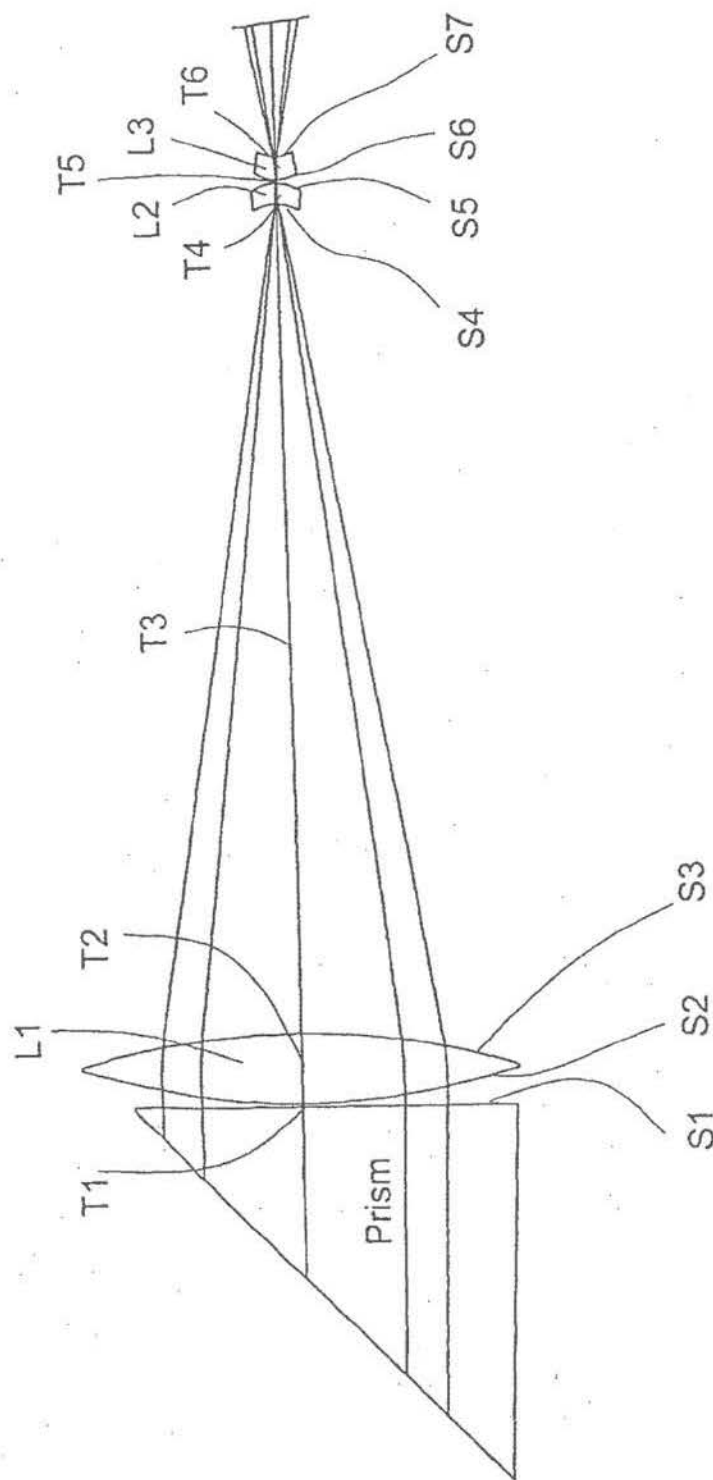


FIG. 3



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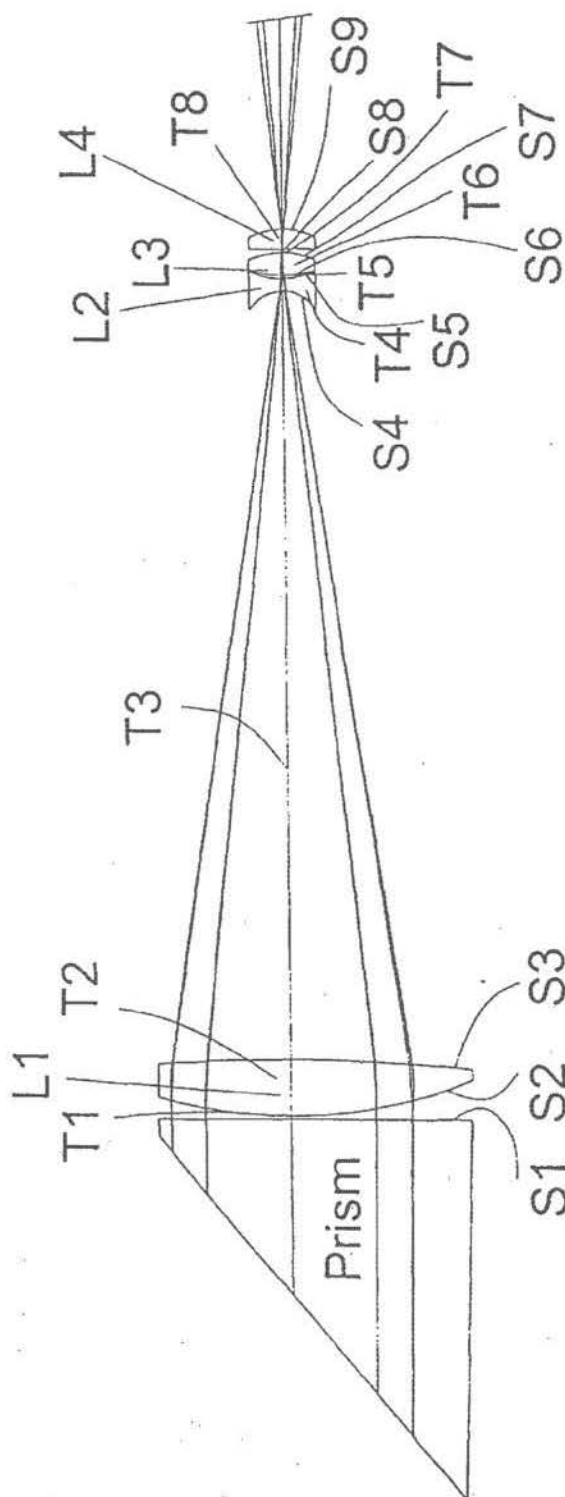


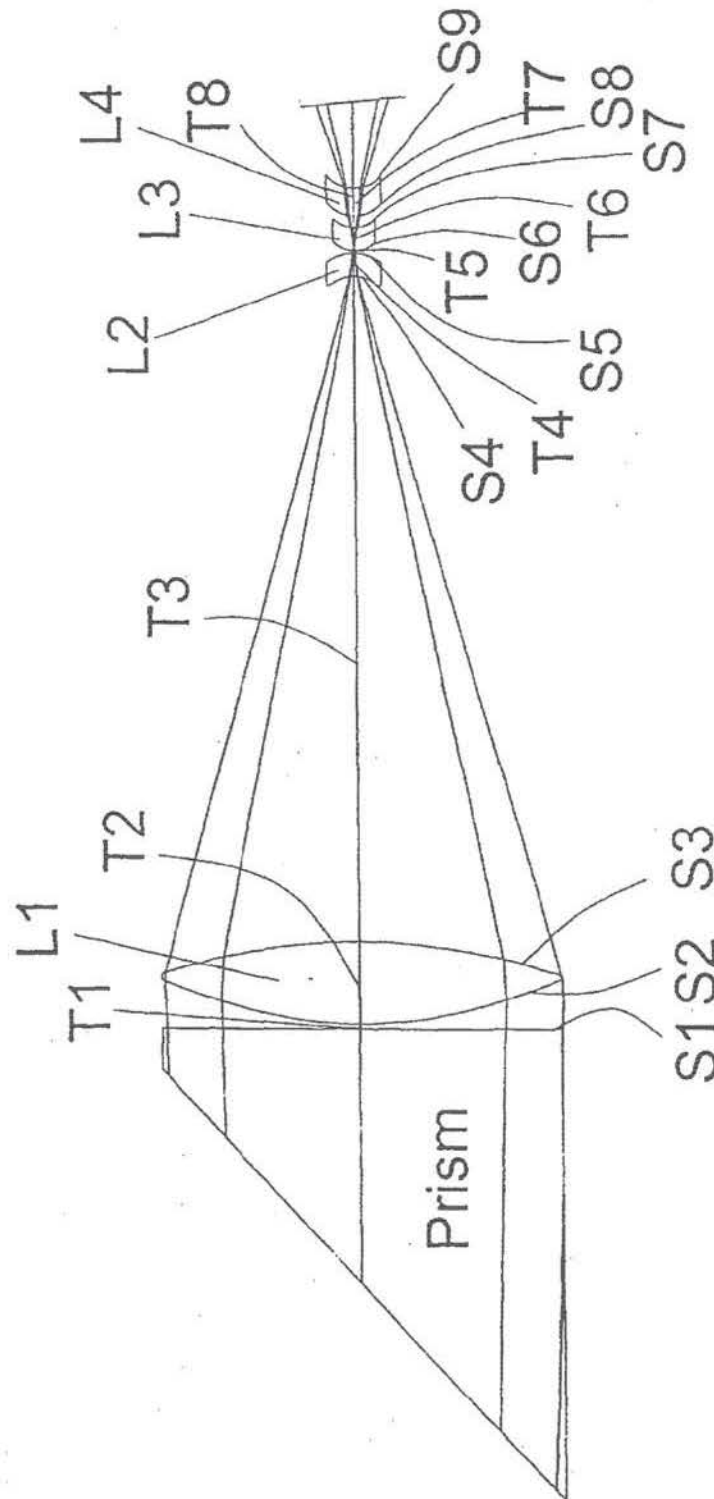
FIG. 4

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1

## LENS SYSTEMS FOR USE IN FINGERPRINT DETECTION

### FIELD OF THE INVENTION

This invention relates to lens systems and, in particular, to lens systems for use in fingerprint detection where an image of fingerprint ridges is produced by means of frustrated total internal reflection at the tilted face of a prism.

### BACKGROUND OF THE INVENTION

A description of some of the problems involved in fingerprint detection using frustrated total internal reflection can be found in Stoltzmann et al., "Versatile anamorphic electronic fingerprinting: design and manufacturing considerations," *SPIE*, Vol. 2537, pages 105-116, August 1995. These authors conclude that the optical system used to form the image of the fingerprint ridges should include prisms for correcting optical distortion. In practice, an optical system employing prisms is expensive to manufacture compared to an optical system employing only lens elements, both because prisms themselves are expensive and because collimating optics are required to avoid introducing aberrations.

Significantly with regard to the present invention, Stoltzmann et al. specifically teach away from the use of an optical system employing only lens elements to produce an image of fingerprint ridges. In particular, they state that a system employing cylindrical lenses cannot successfully correct for high levels of horizontal/vertical compression.

As an alternative to distortion correcting prisms, Bahu-guna et al., "Prism fingerprint sensor that uses a holographic optical element," *Applied Optics*, Vol. 35, pages 5242-5245, September 1996, describe using a holographic optical element to achieve total internal reflection without tilting the object (fingerprint ridges), thus allowing a rectilinear image of the object to be produced using only lens elements. The use of a holographic optical element, of course, increases the cost and complexity of the optical system.

Hebert, Robert T., "Off-axis optical elements in integrated, injection-molded assemblies," *SPIE*, Vol. 2600, pages 129-134, December 1995, describes another approach to the fingerprint detection problem, namely, the use of off-axis optics to avoid tilting the object. This approach requires the use of complex optical surfaces which are difficult to manufacture economically.

### DESCRIPTION OF THE INVENTION

In view of the foregoing, it is an object of the invention to provide improved lens systems for use in fingerprint detection. In particular, it is an object of the invention to provide lens systems which employ only lens elements and do not employ distortion correcting prisms, holographic optical elements, or off-axis optics.

A further object of the invention is to provide inexpensive lens systems for use in fingerprint detection systems. In particular, it is an object of the invention to provide lens systems for use in fingerprint detection which comprise molded lens elements which can be produced in large quantities at low cost.

To achieve these and other objects, the invention in accordance with a first of its aspects provides an optical system having an optical axis, said system forming an image of an object, e.g., fingerprint ridges, and comprising:

- (a) a prism having a first surface for contacting the object and a second surface, said first surface being oriented with respect to the optical axis at an angle greater than the angle of total internal reflection of the surface, e.g., at an angle greater than about 42° for a prism composed of BK7 glass;

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- (b) an aperture stop which is separate from or a part of a lens element;

- (c) a first lens unit comprising one or more lens elements, said first lens unit having a positive power and being located between the aperture stop and the prism for forming a telecentric entrance pupil;

- (d) a second lens unit comprising one or more lens elements, said second lens unit having a positive power and being located on the image side of the aperture stop, said second lens unit forming a real image of the object, e.g., an image which can be viewed with an electronic detector such as a video camera; and

- (e) a third lens unit comprising one or more lens elements, said third lens unit being located between the first and second lens units and having a cylindrical optical power which is substantially afocal, i.e., the third lens unit has a very long focal length but not an infinite focal length so that the unit can provide some correction for field curvature.

The first lens unit is preferably a single lens element which is composed of either a high index glass or a plastic material, in which case, at least one surface of the lens element is aspherical. The second lens unit is preferably a single lens element which is composed of either a high index glass or a plastic material, in which case, at least one surface of the lens element is aspherical.

The third lens unit having cylindrical power is preferably a single molded plastic lens element having a substantial thickness, e.g., the lens element preferably has a thickness which is about equal to the lens element's maximum clear aperture. Preferably, one of the optical surfaces of the third lens unit is adjacent to the system's aperture stop, e.g., one of the optical surfaces of the third lens unit is substantially in contact with a mechanical aperture stop. Alternatively, the aperture stop can be formed directly on a surface of the third lens unit.

The cylindrical power of the third lens unit is used to reduce the size of the image in one direction only. In particular, the combination of the tilted first surface of the prism and the telecentric entrance pupil formed by the first lens unit causes the image of the object to be foreshortened in the direction of the tilt of the first surface. The cylindrical power of the third lens unit serves to eliminate this effect by reducing the size of the image in the direction orthogonal to the direction in which the image has been foreshortened. In this way, the final image magnification (image reduction) at the detector is the same in both the direction of the tilt and the direction orthogonal to the tilt.

In addition to reducing the size of the image in the direction orthogonal to the tilt, i.e., in addition to reducing the anamorphosis of the image, the cylindrical power also helps in correcting the field curvature of the image. To achieve this result, the first and second lens units are preferably designed to compensate for astigmatism in a direction perpendicular to the cylindrical power plane.

In accordance with a second of its aspects, the invention provides an optical system having an optical axis, said system forming an image of an object and comprising:

- (a) a prism having a first surface for contacting the object and a second surface, said first surface being oriented with respect to the optical axis at an angle greater than the angle of total internal reflection of the surface;

- (b) an aperture stop which is separate from or a part of a lens element;

- (c) a first lens unit comprising one or more lens elements, said first lens unit having a positive power and being located between the aperture stop and the prism for forming a telecentric entrance pupil;

- (d) a second lens unit for forming a real image of the object, said second lens unit comprising one or more lens



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elements, having a positive power, and being on the image side of the first lens unit; and

- (e) a third lens unit comprising one or more lens elements, said third lens unit correcting the field curvature of the image contributed by the first and second lens units.

For this second aspect of the invention, the first and second lens units are again each preferably a single lens element which is composed of either a high index glass or a plastic material. As with the first aspect of the invention, when a single lens element composed of plastic is used for the first and/or the second lens unit, that element will have at least one surface which is aspherical.

The third lens unit for correcting field curvature is preferably a single negative meniscus lens element composed of plastic, e.g., a molded plastic element, which is located either in the vicinity of the aperture stop or in the vicinity of the image. The third lens unit preferably includes at least one aspherical surface.

For this second aspect of the invention, correction for the foreshortening introduced by the tilted object as seen from the telecentric entrance pupil can be achieved by processing the image after detection either with electronic hardware or with computer software.

The above lens systems are preferably used with monochromatic light sources, e.g., with LEDs, and thus do not provide color correction. However, color correction can be added to the lenses if desired. For monochromatic illumination, it may be desirable to dye one or more of the lens elements to reject ambient light while transmitting the monochromatic illumination.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a schematic drawing of a lens system constructed in accordance with the first aspect of the invention.

[FIG. 1B is] FIGS. 1B-1 and 1B-2 are schematic drawing drawings of the lens system of FIG. 1A illustrating the orientation of the cylindrical lens element of this system, as viewed from the side and the top, respectively.

FIG. 1C is a plot of grid distortion for the lens system of FIG. 1A.

FIG. 2A is a schematic drawing of a lens system constructed in accordance with the second aspect of the invention.

FIG. 2B is a plot of grid distortion for the lens system of FIG. 2A.

FIGS. 3-5 are schematic drawings of further lens systems constructed in accordance with the second aspect of the invention.

The foregoing drawings, which are incorporated in and constitute part of the specification, illustrate the preferred embodiments of the invention, and together with the description, serve to explain the principles of the invention. It is to be understood, of course, that both the drawings and the description are explanatory only and are not restrictive of the invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1A, 1B, 2A, and 3-5 illustrate various lens systems constructed in accordance with the invention. Corresponding prescriptions and performance characteristics appear in Tables 1 to 5, respectively.

SCHOTT designations are used for the glasses employed in the lens systems. Equivalent glasses made by other manufacturers can be used in the practice of the invention. Industry acceptable materials are used for the acrylic elements.

All dimensions given in the tables are in millimeters except where indicated. "Total Track" refers to the distance

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from the exit surface of the prism to the image. "Maximum Field" is the maximum linear half length of the tilted object projected onto a vertical surface. "Primary Wave" is the monochromatic wavelength used in designing the lens system. The tables are constructed on the assumptions that light travels from left to right in the figures and that the object and the image satisfy the Schleimpflug condition.

The aspheric coefficients set forth in Tables 1, 3, and 5 are for use in the following equation:

$$z = \frac{cy^2}{1 + [1 - (1 + k)c^2y^2]^{\frac{1}{2}}} + Dy^4 + Ey^6 + Fy^8 + Gy^{10} + Hy^{12} + Iy^{14}$$

where  $z$  is the surface sag at a distance  $y$  from the optical axis of the system,  $c$  is the curvature of the lens at the optical axis, and  $k$  is a conic constant, which is zero except where indicated in the tables. Instead of using the above equation, the aspheric surface for the lens system of Table 2 is defined by an even power polynomial having the coefficients shown in the table, where  $r$  is the distance from the optical axis.

FIG. 1 and Table 1 illustrate a lens system constructed in accordance with the invention which employs a cylindrical lens (12) for distortion correction. As shown in FIG. 1C, the lens system produces a rectangular image of a rectangular object. In particular, the crosses in this figure are calculated image points while the grid represents the ideal rectilinear image. The field used in producing this figure was 18.5 millimeters wide and 26.2 millimeters high, while the image was 3.6 millimeters wide and 5.1 millimeters high.

FIGS. 2-5 and Tables 2-5 illustrate various lens systems constructed in accordance with the invention which employ only rotationally symmetric lens elements, as opposed to a cylindrical element as in FIG. 1 and Table 1. As illustrated in FIG. 2B, these lens systems produce a square image of a rectangular object. In particular, the field used in producing this figure was 18.5 millimeters wide and 26.2 millimeters high, as in FIG. 1C, but the image, rather than being rectangular, is a square 3.5 millimeters on a side. As discussed above, rectangular data can be obtained from this square image by processing the image after detection either with electronic hardware or with computer software. As in FIG. 1C, the crosses in FIG. 2B are calculated image points while the grid represents the ideal rectilinear image.

The lens systems of FIGS. 2-5 illustrate the following features of the invention: FIG. 2 illustrates the use of a conic first lens element, a spherical glass second lens element, and a molded plastic third lens element having one aspherical surface; FIG. 3 illustrates an all plastic system where each lens element has one aspherical surface; FIG. 4 illustrates an all glass spherical system; and FIG. 5 illustrates a system having a short object to image distance.

Table 6 shows the correspondence between the lens elements of FIGS. 1-5 and the first, second, and third lens units referred to above and in the claims.

Preferably the first lens unit of both the first and second embodiments of the invention has a focal length  $f_1$  which is less than about 0.75 times the total track for lens systems which include an aspherical surface and less than about 1.25 times the total track for systems employing spherical lens elements. Table 7 sets forth the  $f_1$  and total track values for the lens systems of Examples 1-5.

Although preferred and other embodiments of the invention have been described herein, further embodiments may be perceived by those skilled in the art without departing from the scope of the invention as defined by the following claims.



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TABLE 1

SYSTEM DATA						
Total Track		107.593				
Working F/#		5.10882				
Obj. Space N.A.		0.022				
Maximum Field		13.1				
Primary Wave		0.650000 microns				
SURFACE DATA SUMMARY						
Surf	Type	Radius	Thickness	Glass	Diameter	Conic
OBJ	TILTSURF	—	25	BK7	26.20408	—
1	STANDARD	Infinity	2	ACRYLIC	26.09679	0
2	STANDARD	25.70843	5.2		26.04222	0
3	EVENASPH	231.1318	51.70056		25.2033	0
STO	STANDARD	Infinity	0	BK7	2.487769	0
5	TOROIDAL	Infinity	5		2.556231	0
6	TOROIDAL	Infinity	20.27059		4.734597	0
7	STANDARD	13.64298	5.8	ACRYLIC	13.95049	0
8	EVENASPH	-18.10472	17.62166		13.58516	-5.661331
IMA	TILTSURF	—	0		6.167979	—
SURFACE DATA DETAIL						
Object Surface			Tilted 45 degrees			
Image Surface			Tilted 6.5 degrees			
ASPHERICAL SURFACE DATA						
Surf.	D	E	F	G	H	I
3	1.123047E-5	-1.738811E-8				
8	3.954257E-5	1.31374E-7	4.264235E-8	-2.068281E-9	4.132821E-11	-3.018667E-13
	Surface 5	TOROIDAL	Radius of revolution.		-3.967406	
	Surface 6	TOROIDAL	Radius of revolution.		-6.046119	

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TABLE 2

SYSTEM DATA						
Total Track		135.915				
Working F/#		4.36037				
Maximum Field		15.89				
Primary Wave		0.650000 microns				
SURFACE DATA SUMMARY						
Surf Type	Radius	Thickness	Glass	Diameter	Conic	
OBJ TILT-SURF	—	25	BK7	31.78003	—	
1 STAN-DARD	Infinity	5.190437	ACRYLIC	32.86197	0	
2 STAN-DARD	136.3678	6		33.13347	0	
3 STAN-DARD	-66.82787	83.18716		32.97939	-3.393647	

TABLE 2-continued

40	4	STAN-DARD	5.478497	5	K10	6.598144	0
	5	STAN-DARD	3.073549	2.831673		3.660189	0
	STO	STAN-DARD	Infinity	8.328321		3.099801	0
45	7	STAN-DARD	250.2192	5	ACRY-LIC	7.829303	0
	8	EVEN-ASPH	-9.070955	20.37725		9.067809	0
50	IMA	TILT-SURF	—	0		6.134792	—

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SURFACE DATA DETAIL							
<hr/>							
55	Object Surface			Tilted 45 degrees			
	Image Surface			Tilted 7.21 degrees			
<hr/>							
Surface 8 Aspherical Coefficients for powers of r							
r <sup>2</sup> : -0.02235599; r <sup>4</sup> : 5.636344E-5; r <sup>6</sup> : 9.350753E-6; r <sup>8</sup> : -1.163031E-6;							
r <sup>10</sup> : 8.182924E-8; r <sup>12</sup> : -2.915787E-9; r <sup>14</sup> : 4.1623E-11							

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TABLE 3

SYSTEM DATA						
Total Track		70				
Working F/#		4.30765				
Obj. Space N.A.		0.022				
Maximum Field		13.102				
Primary Wave		0.650000 microns				
SURFACE DATA SUMMARY						
Surf	Type	Radius	Thickness	Glass	Diameter	Conic
OBJ	TILTSURF	—	11	BK7	26.20408	—
1	STANDARD	Infinity	0.2		27.90575	0
2	EVENASPH	39.89135	4.473029	ACRYLIC	28.21343	-5.826537
3	STANDARD	-48.78966	53.56381		28.19267	0
4	STANDARD	-2.906349	1.339289	ACRYLIC	2.914914	0
5	EVENASPH	-2.656021	0.2		3.107117	0
STO	STANDARD	2.184049	1.523577	ACRYLIC	2.657442	0
7	EVENASPH	2.191862	8.700297		2.213909	0
IMA	TILTSURF	—	0		4.932881	—
SURFACE DATA DETAIL						
Object Surface			Tilted 45 degrees			
Image Surface			Tilted 6.8 degrees			
ASPHERICAL SURFACE DATA						
Surf.	D	E	F	G	H	I
2	-1.676925E-6	5.368215E-9				
5	0.004577377	0.0007814665	-0.004157694	0.0001039365		
7	0.004622665	0.008402386	-0.005275569	-0.002330626	0.006666924	-0.003251713

TABLE 4

SYSTEM DATA					
Total Track		70			
Working F/#		4.31084			
Obj. Space N.A.		0.022			
Maximum Field		13.102			
Primary Wave		0.650000 microns			
SURFACE DATA SUMMARY					
Surf Type	Radius	Thickness	Glass	Diameter	Conic
OBJ TILTSURF	—	11	BK7	26.20408	—
1 STANDARD	Infinity	0.2		27.48681	0
2 STANDARD	43.31	3.5	SF1	27.72874	0
3 STANDARD	-171.85	49.17685		27.58105	0
4 STANDARD	-3.234051	0.8	BK7	5	0
5 STANDARD	6.522	0.25		5	0
6 STANDARD	12.474	1.4	SF1	5	0
7 STANDARD	-7.133	0.2		5	0
STO STANDARD	Infinity	1.3	SF6	5	0
9 STANDARD	-6.522	13.17316		5	0
IMA TILTSURF	—	0		4.9432	—
SURFACE DATA DETAIL					
Object Surface: Tilted 45 degrees					
Image Surface: Tilted 6.2 degrees					

TABLE 5

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SYSTEM DATA						
	Total Track	40.1763				
	Working F/#	4.33983				
40	Obj. Space N.A.	0.022				
	Maximum Field	13.102				
	Primary Wave	0.650000 microns				

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SURFACE DATA SUMMARY						
	Surf Type	Radius	Thickness	Glass	Diameter	Conic
45	OBJ TILT-SURF	—	11	BK7	26.20408	—
	1 STANDARD	Infinity	0.2		22	0
50	2 EVEN-ASPH	20.65035	3.5	ACRYLIC	22	0
	3 STANDARD	-31.72422	29.02133		22	0
	4 EVEN-ASPH	-1.70406	1	ACRYLIC	2.6	0
55	5 STANDARD	-2.198759	0.1		2.6	0
	STO STANDARD	1.547474	1	ACRYLIC	2	0
	7 EVEN-ASPH	1.829054	0.4824209		2	0
60	8 STANDARD	1.755336	1.177711	ACRYLIC	2.6	0
	9 EVEN-ASPH	2.020989	3.694845		2.6	0
	IMA TILT-SURF	—	0		4.976063	—

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TABLE 5-continued

SURFACE DATA DETAIL				
Object Surface: Tilted 45 degrees				
Image Surface: Tilted 5.02 degrees				
ASPHERICAL SURFACE DATA				
Surf.	D	E	F	G
2	-4.629466E-5	-4.629466E-5		
4	0.01786009	0.0319493	-0.05570782	0.03130791
7	0.06001557	0.03785613	-0.03016861	0.03552276
9	0.01319803	0.001277422	0.001882929	0.001614795

TABLE 6

Example	Unit 1	Unit 2	Unit 3
1	L1	L3	L2
2	L1	L3	L2
3	L1	L2	L3
4	L1	L4	L2, L3
5	L1	L3, L4	L2

TABLE 7

	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5
$f_1$	58.6	92.6	45.6	71.1	26.1
Total track	107.6	135.9	70.0	70.0	40.2
$f_1$ /Total track	0.54	0.68	0.65	1.0	0.65

What is claimed is:

1. An optical system having an optical axis, said system forming an image of an object and comprising:

- a prism having a first surface for contacting the object and a second surface, said first surface being oriented with respect to the optical axis at an angle greater than the angle of total internal reflection of the surface;
- an aperture stop;
- a first lens unit having a positive power between the aperture stop and the prism for forming a telecentric entrance pupil;
- a second lens unit having a positive power on the image side of the aperture stop for forming a real image of the object; and
- a third lens unit between the first and second lens units, said third lens unit having cylindrical power, said cylindrical power being substantially afocal.

2. The optical system of claim 1 wherein the first lens unit comprises at least one aspherical surface.

3. The optical system of claim 1 wherein the first lens unit consists of a single lens element.

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4. The optical system of claim 1 wherein the second lens unit comprises at least one aspherical surface.

5. The optical system of claim 1 wherein the second lens unit consists of a single lens element.

6. The optical system of claim 1 wherein the third lens unit comprises an optical surface which is adjacent to the aperture stop.

7. The optical system of claim 1 wherein the third lens unit consists of a single lens element.

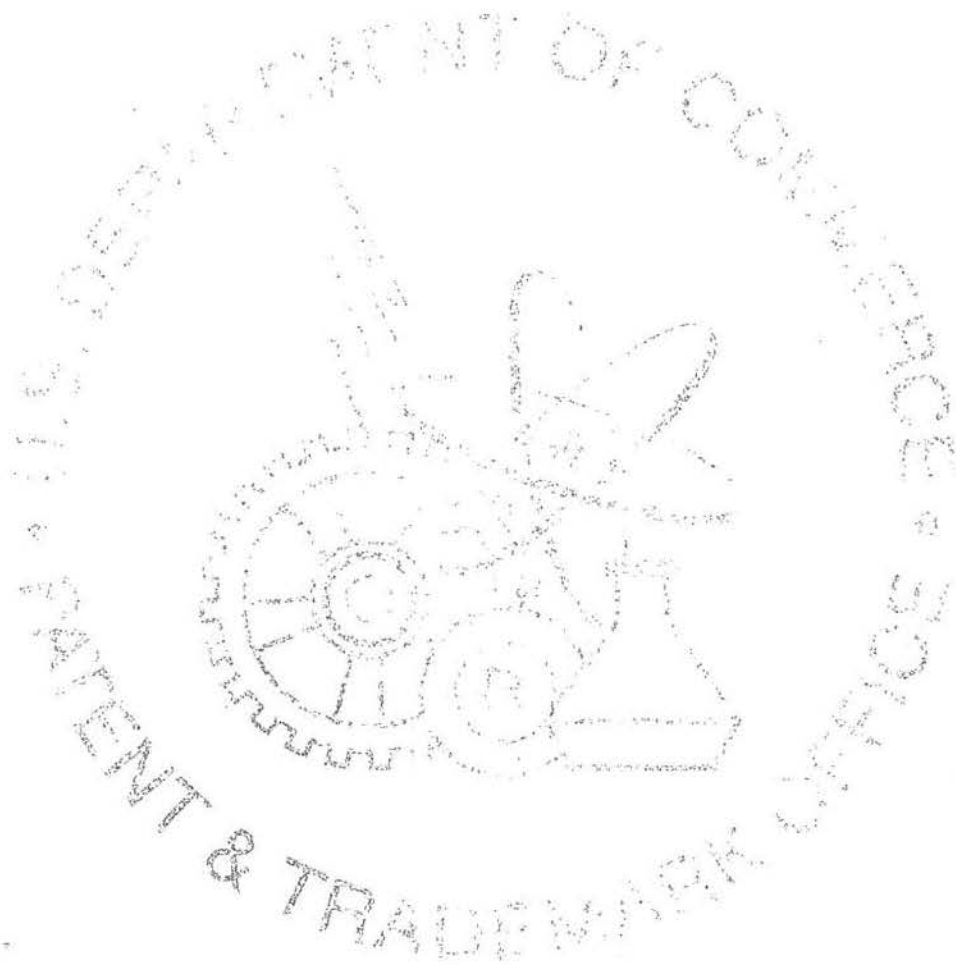
8. The optical system of claim 1 wherein the cylindrical power of the third lens unit is used to reduce the size of the image in one direction only.

9. The optical system of claim 1 wherein the cylindrical power of the third lens unit serves to reduce the field curvature of the image contributed by the first and second lens units.

10. An optical system having an optical axis, said system forming an image of an object and comprising:

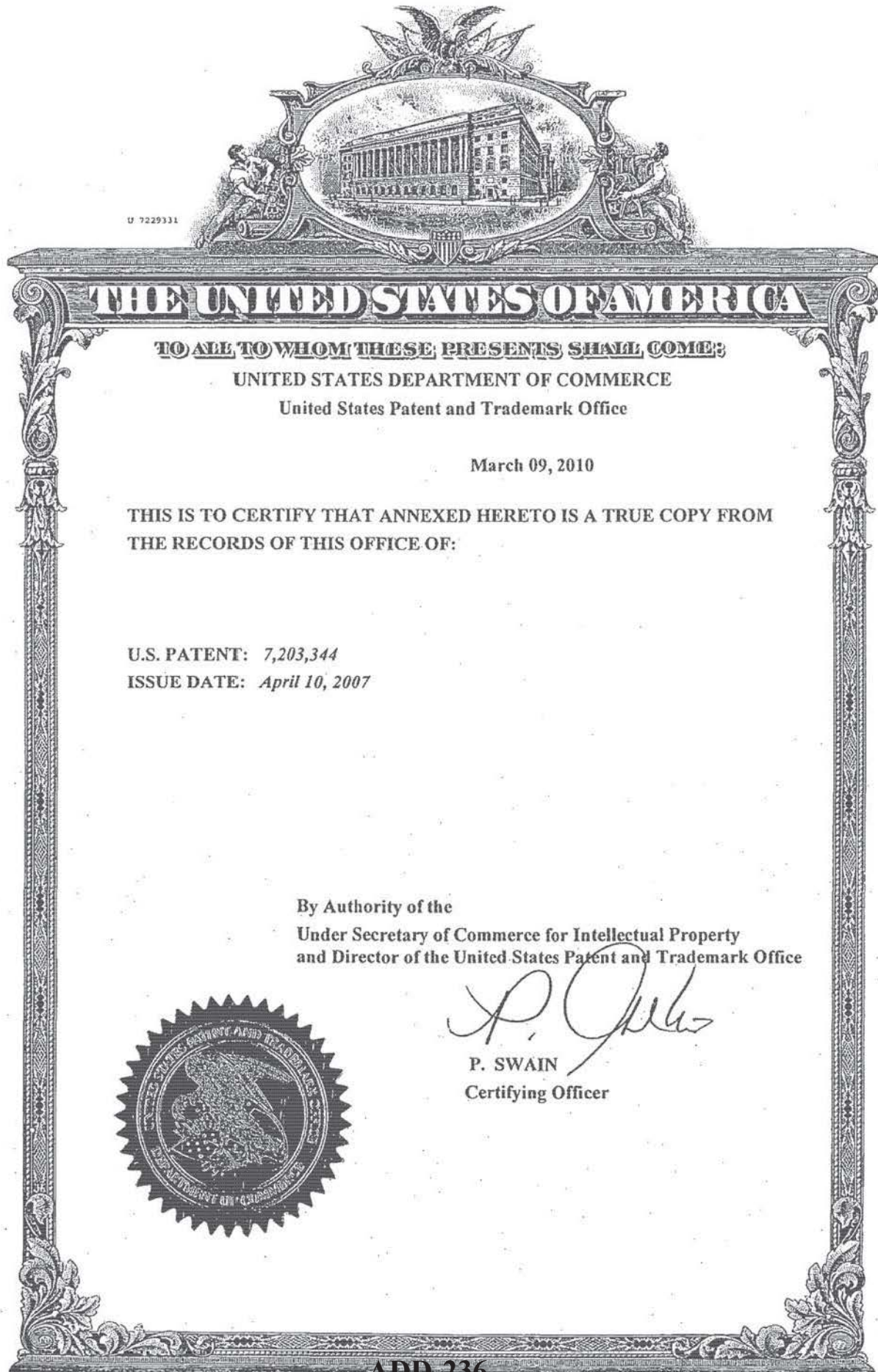
- a prism having a first surface for contacting the object and a second surface, said first surface being oriented with respect to the optical axis at an angle greater than the angle of total internal reflection of the surface;
  - an aperture stop;
  - a first lens unit having a positive power between the aperture stop and the prism for forming a telecentric entrance pupil;
  - a second lens unit having a positive power for forming a real image of the object, said second lens unit being on the image side of the first lens unit; and
  - a third lens unit for correcting the field curvature of the image contributed by the first and second lens units.
11. The optical system of claim 10 wherein the first lens unit comprises at least one aspherical surface.
12. The optical system of claim 10 wherein the first lens unit consists of a single lens element.
13. The optical system of claim 10 wherein the second lens unit comprises at least one aspherical surface.
14. The optical system of claim 10 wherein the second lens unit consists of a single lens element.
15. The optical system of claim 10 wherein the third lens unit has a negative power.
16. The optical system of claim 10 wherein the third lens unit has an overall meniscus shape.
17. The optical system of claim 10 wherein the third lens unit comprises an aspherical surface.
18. The optical system of claim 10 wherein the third lens unit consists of a single lens element.

\* \* \* \* \*









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By Authority of the  
Under Secretary of Commerce for Intellectual Property  
and Director of the United States Patent and Trademark Office

*P. Swain*

P. SWAIN  
Certifying Officer





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(12) **United States Patent**  
**McClurg et al.**

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 (45) **Date of Patent:** **Apr. 10, 2007**

(54) **BIOMETRIC IMAGING SYSTEM AND METHOD**

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(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 199 days.

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(74) Attorney, Agent, or Firm—Sterne, Kessler, Goldstein & Fox P.L.L.C.

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G06K 9/00 (2006.01)

(57) **ABSTRACT**

(52) **U.S. Cl.** 382/115; 382/124; 382/125  
 (58) **Field of Classification Search** 382/124, 382/125, 112, 116, 115; 29/346; 198/396; 358/1.14; 340/5.83

See application file for complete search history.

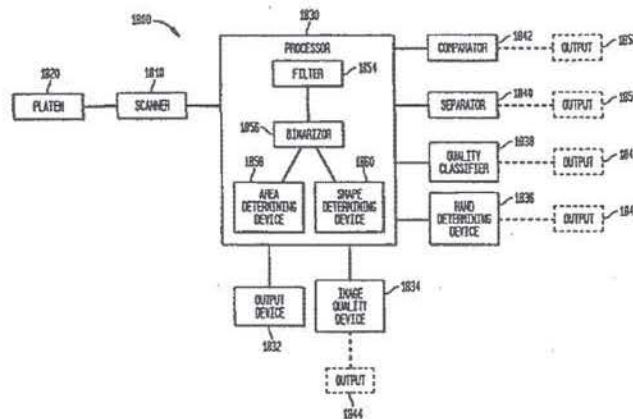
A method and system of obtaining a ten-print plain impression fingerprint includes scanning a print image, processing the scanned image, separating the processed image into individual fingerprint images, and determining how many print images have been scanned. The method also includes comparing the print image to a previously scanned print image, quality classifying the separated images, indicating a quality classification of the print image based on the classifying step, and determining whether the print image is of a good quality. The system can include a ten-print scanner having a finger guide and a platen used to position four finger slaps onto the platen.

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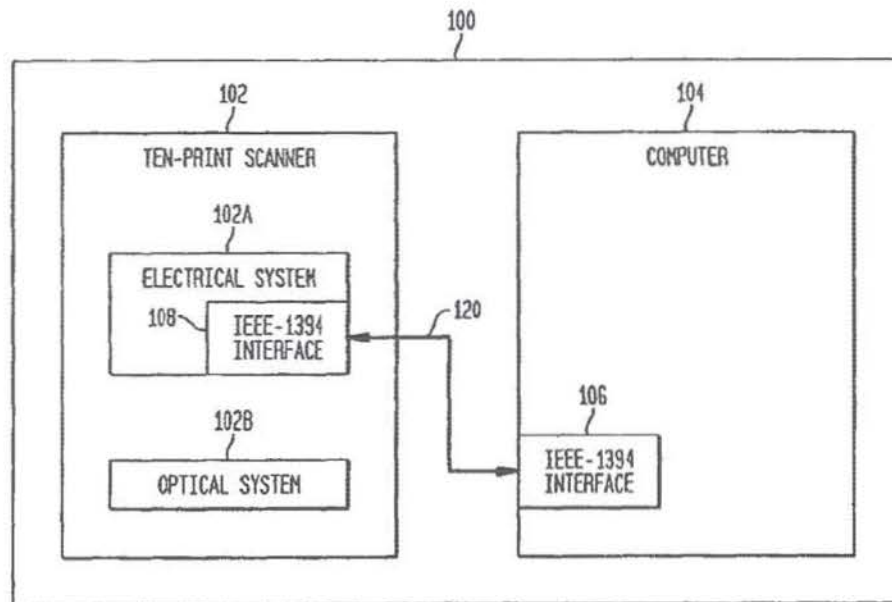
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FIG. 1A





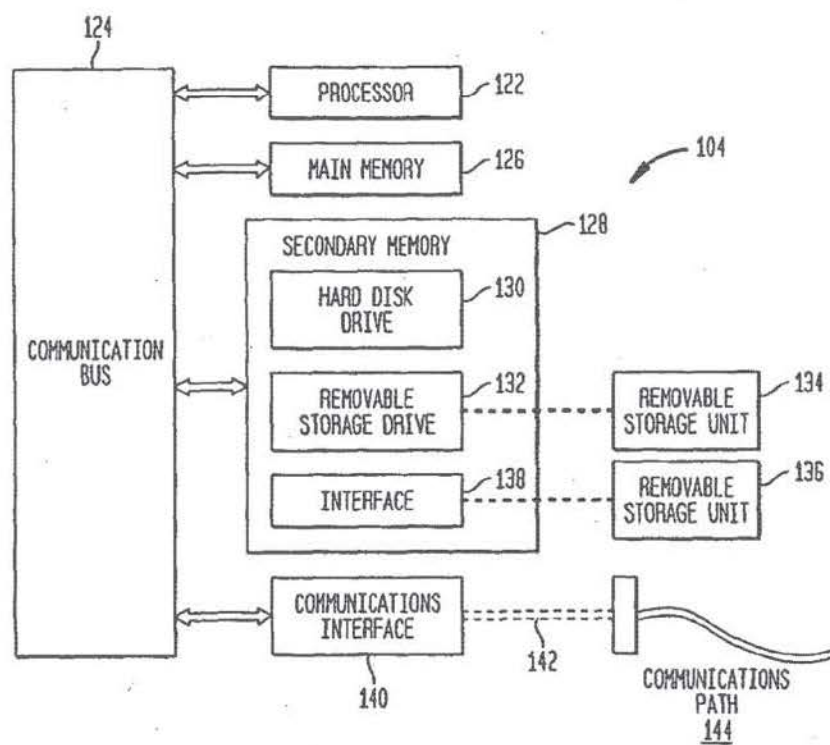
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FIG. 1B



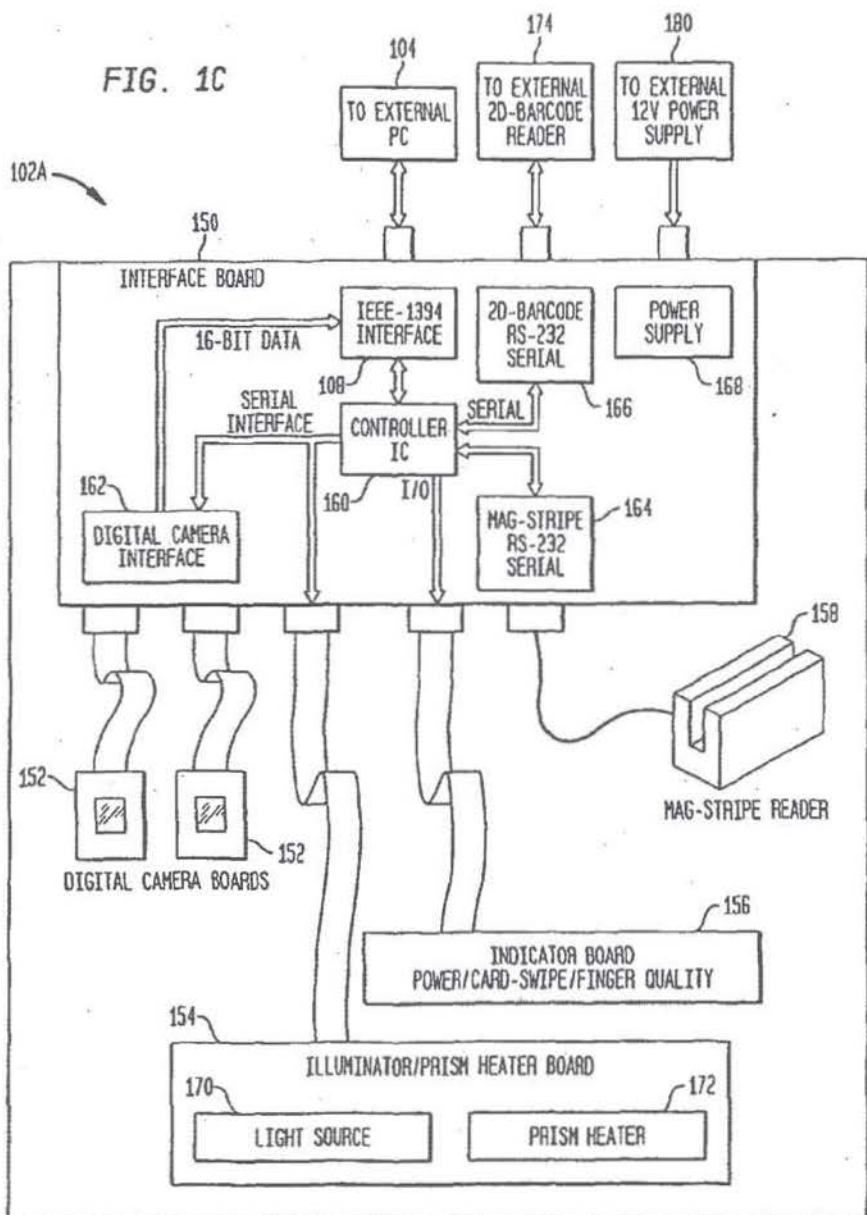
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FIG. 1C



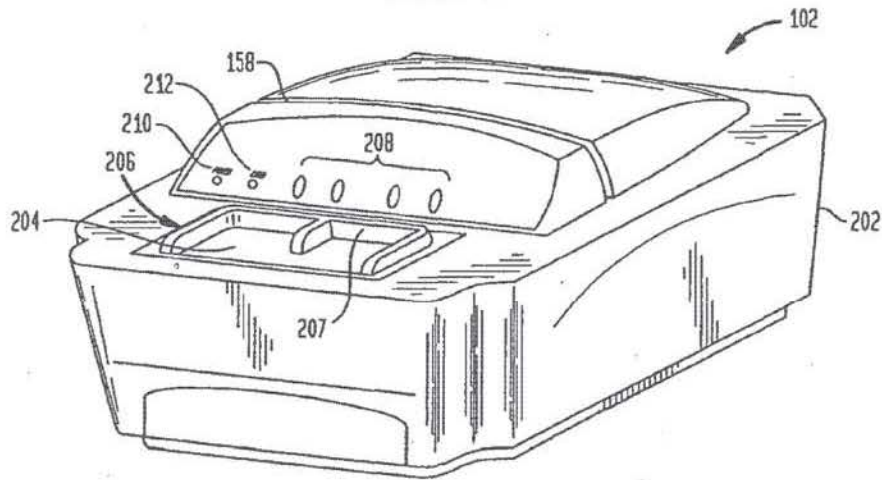
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FIG. 2

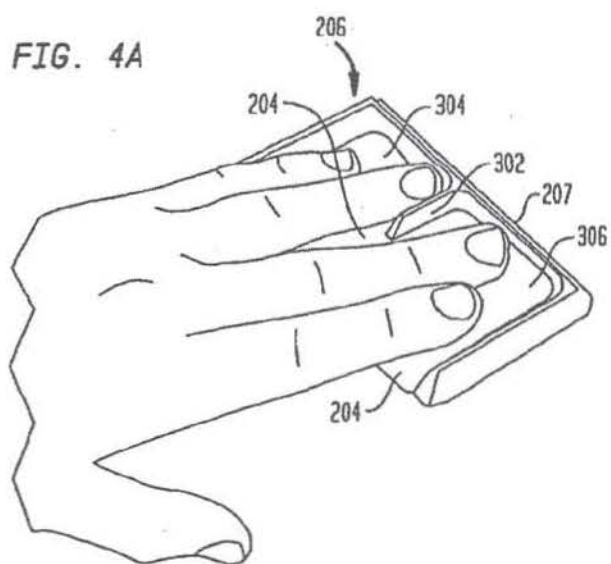
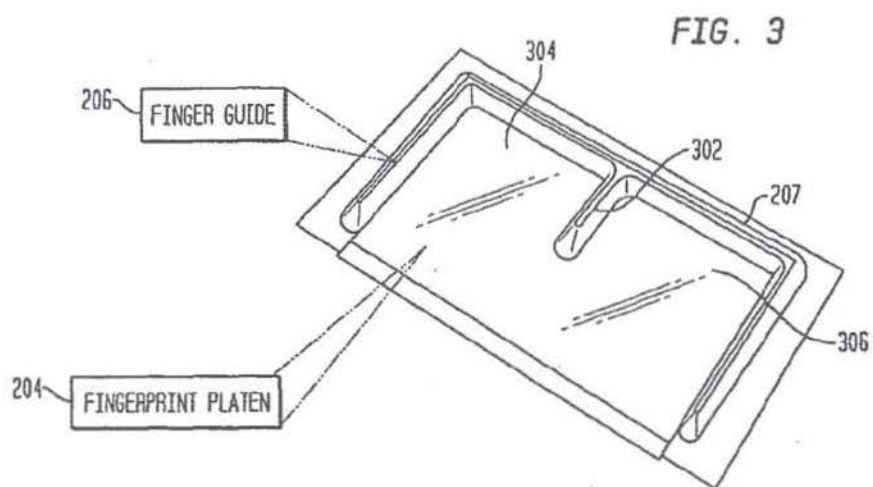


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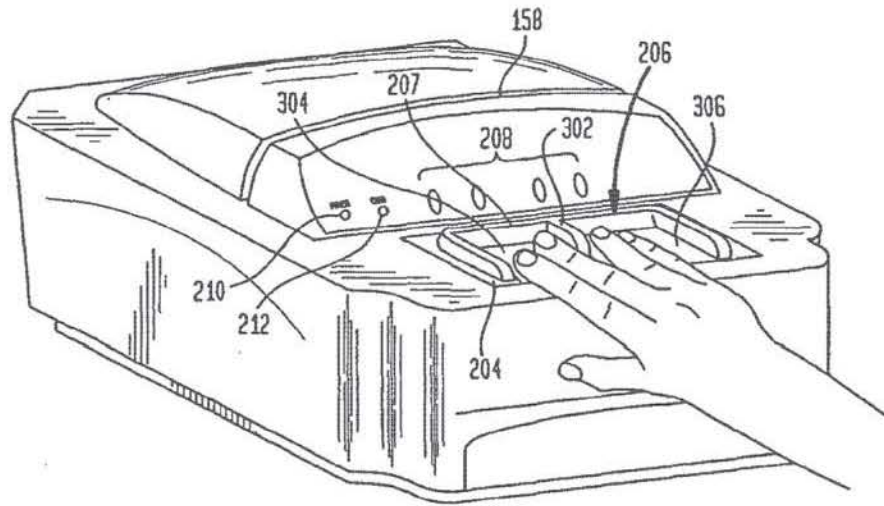
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FIG. 4B



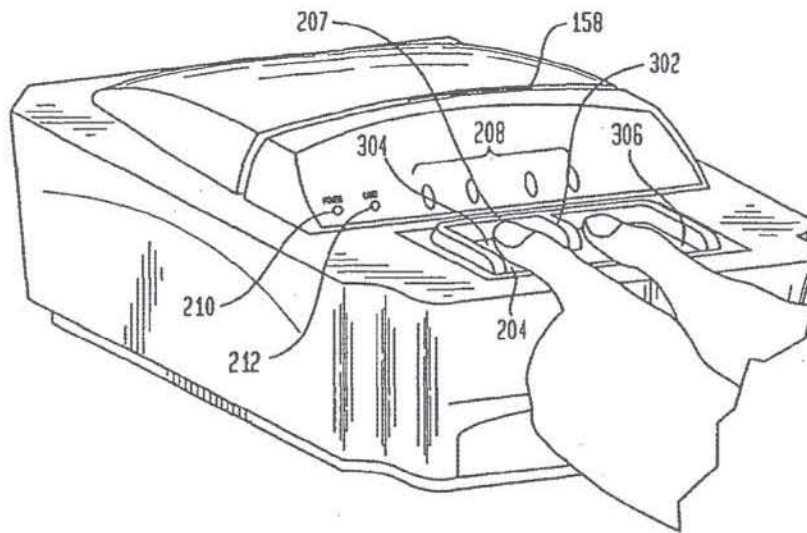
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FIG. 4C



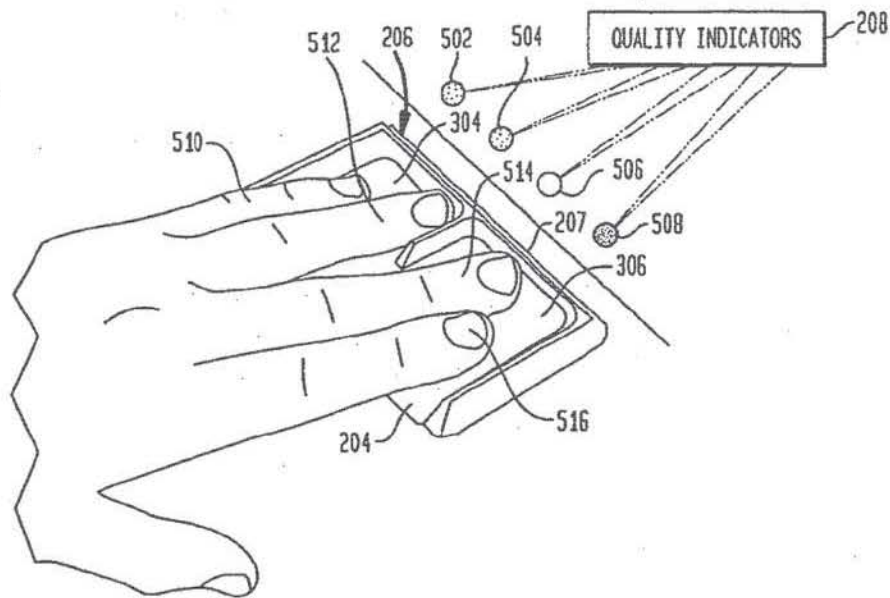
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FIG. 5





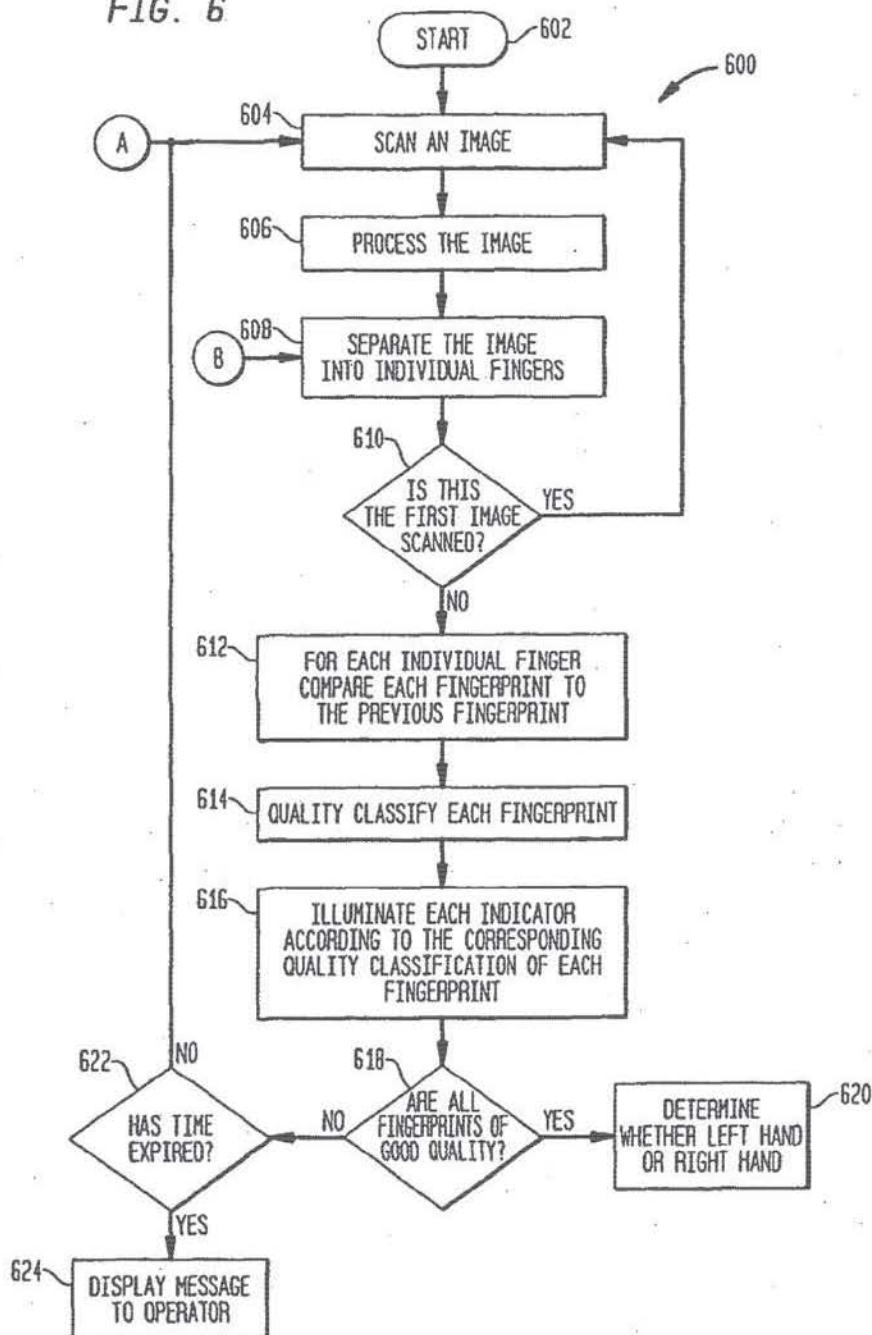
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FIG. 6



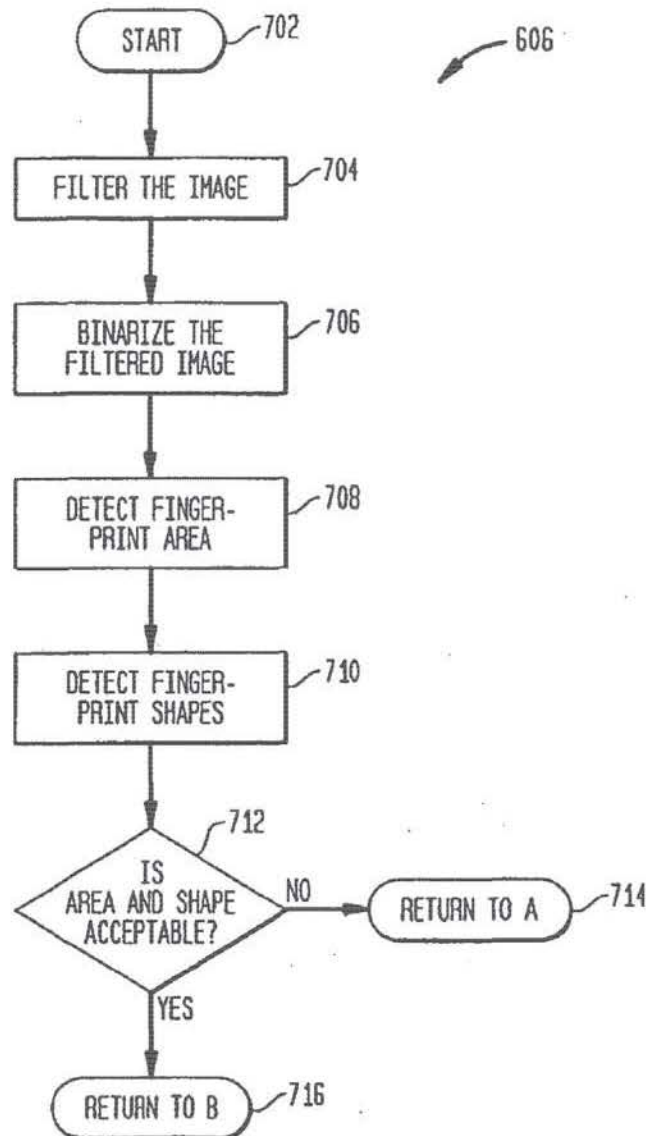
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FIG. 7



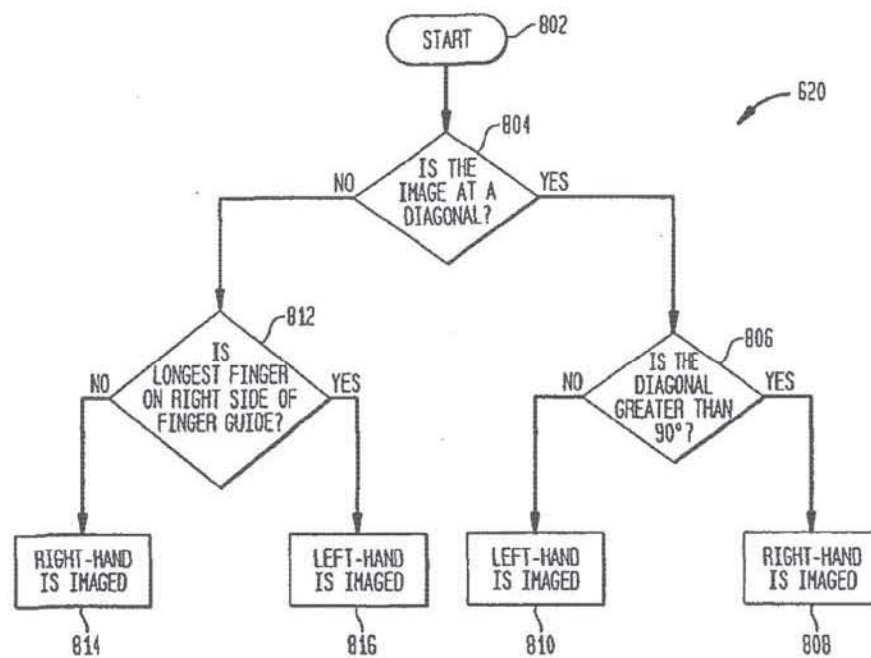
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FIG. 8



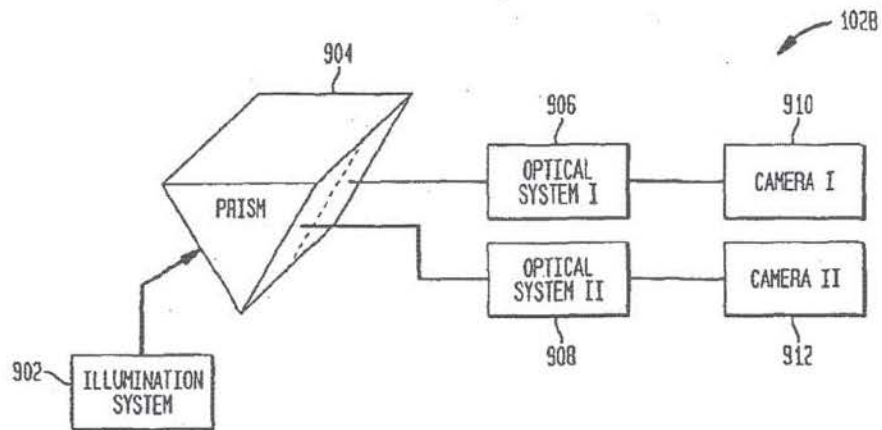
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FIG. 9





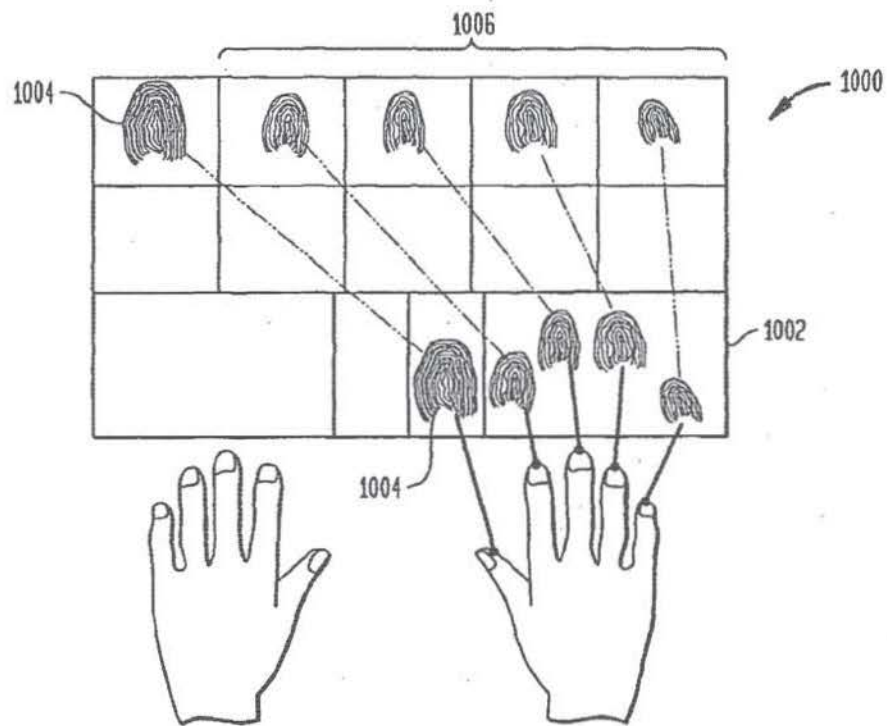
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FIG. 10



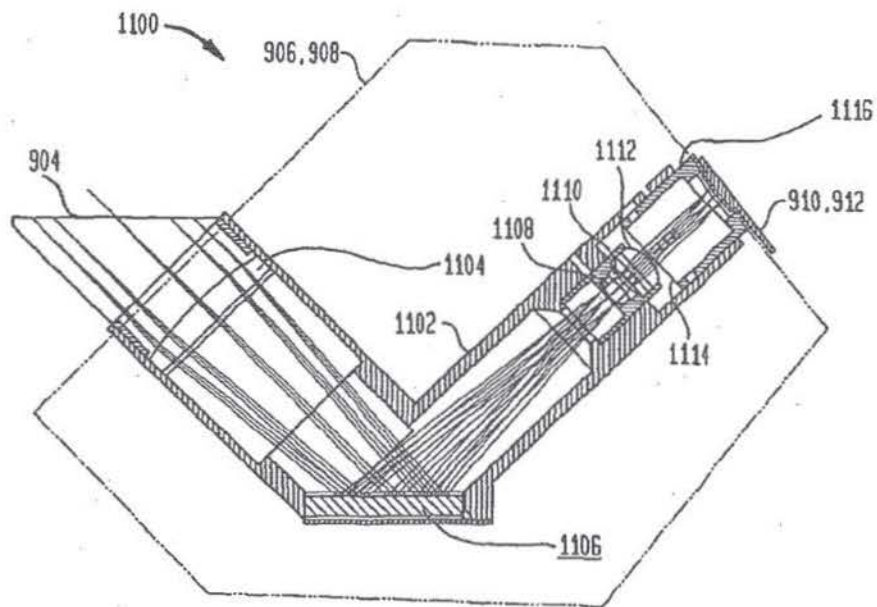
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FIG. 11



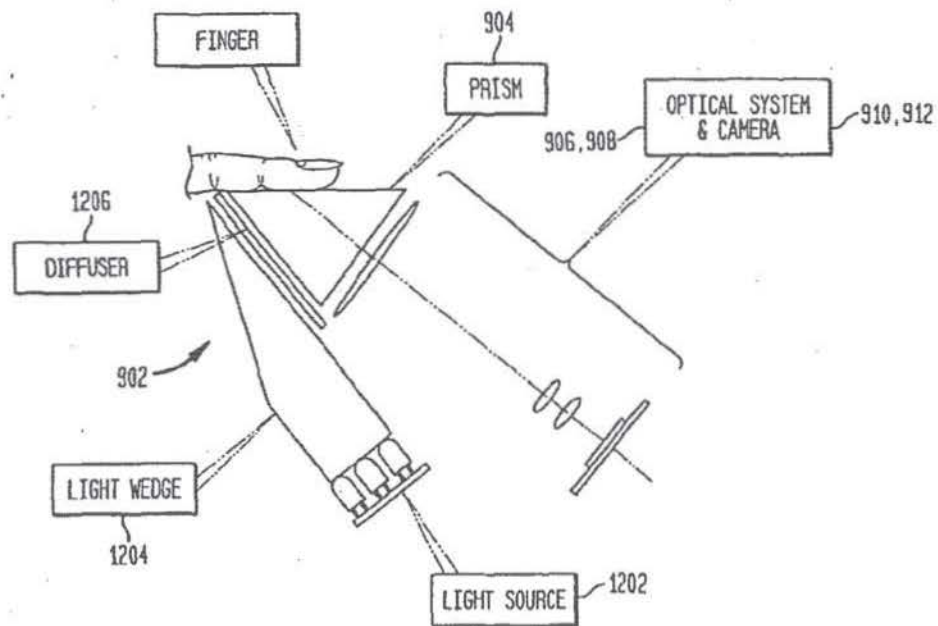
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FIG. 12



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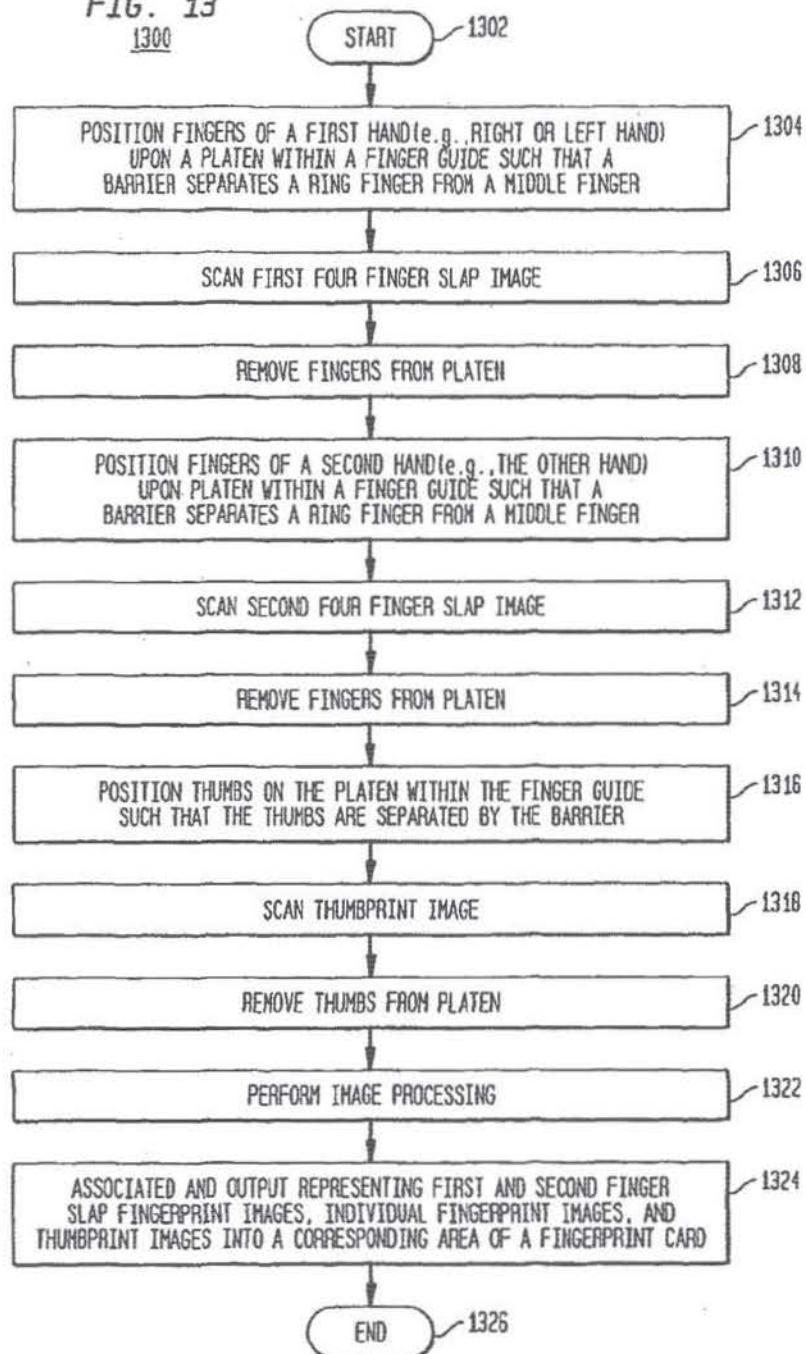
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FIG. 13

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FIG. 14

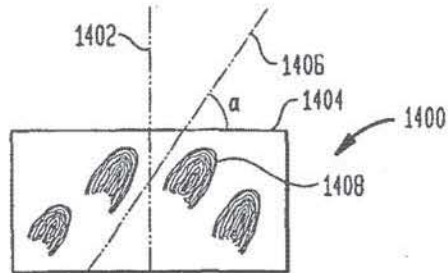


FIG. 15

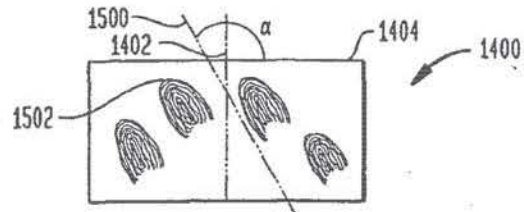


FIG. 16

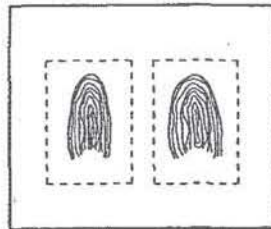


FIG. 17

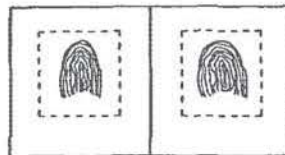
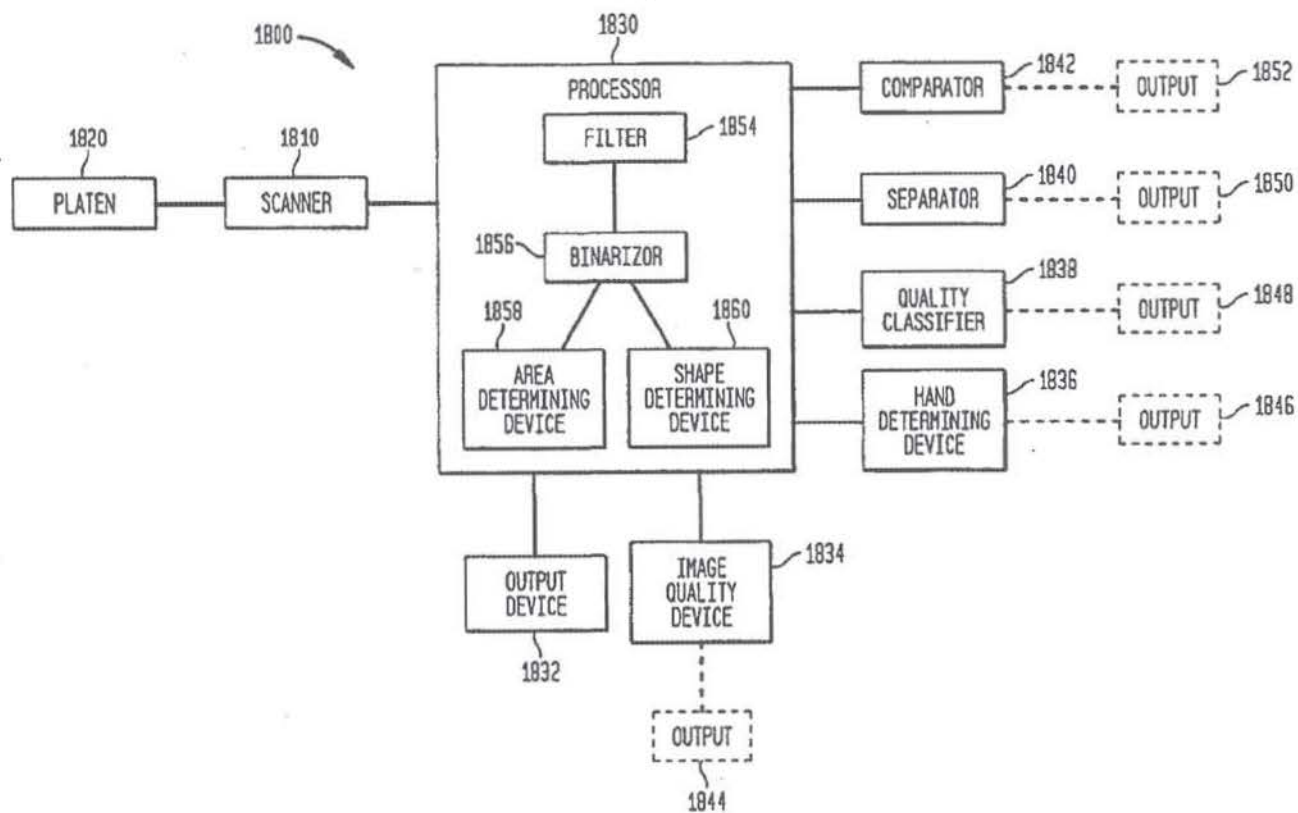


FIG. 18



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# BIOMETRIC IMAGING SYSTEM AND METHOD

## CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of U.S. Provisional Patent Application No. 60/348,678, filed on Jan. 17, 2002, which is incorporated by reference herein in its entirety.

The present application is related to U.S. patent application Ser. No. 10/345,366, filed concurrently herewith, which is incorporated by reference herein in its entirety.

The present application is related to U.S. patent application Ser. No. 10/050,046, filed Jan. 17, 2002 (now U.S. Pat. No. 6,954,260 that issued Oct. 11, 2005), and entitled "Systems and Methods For Illuminating A Platen In A Print Scanner," and U.S. patent application Ser. No. 10/047,983, filed on Jan. 17, 2002 (now U.S. Pat. No. 6,809,303 that issued Oct. 26, 2004), and entitled "Platen Heaters For Biometric Image Capturing Devices," which are both incorporated by reference herein in their entireties.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention is generally related to biometric imaging systems. More particularly, the present invention is related to a fingerprint imaging system.

### 2. Background Art

Biometrics is a science involving the analysis of biological characteristics. Biometric imaging captures a measurable characteristic of a human being for identity purposes. Print capture and recognition is an important biometric technology. Law enforcement, banking, voting, and other industries increasingly rely upon prints as a biometric to store, recognize or verify identity. See, e.g., Gary Rothenbaugh, *Biometrics Explained*, International Computer Security Association, Inc., pp. 1-34, (1998), which is incorporated herein by reference in its entirety. Generally, a biometric is a measurable, physical characteristic or personal behavior trait used to recognize the identity, or verify the claimed identity, of a person who has a biometric reference template (e.g., data that represents a biometric measurement) on file.

One type of biometric imaging system is an Automatic Fingerprint Identification System (AFIS). Automatic Fingerprint Identification Systems can be used for law enforcement purposes to collect print images from criminal suspects when they are arrested.

One type of AFIS input device is a ten-print scanner. Typically, ten-print scanners require each finger to be imaged using a roll print technique. Each finger is identified prior to imaging (e.g., right hand thumb, right hand ring finger, left hand middle finger, etc). This enables the device to know whether the left or right hand is being imaged and to know where to place the imaged print on a fingerprint card. Unfortunately, the process of rolling each finger to obtain prints during an arrest or background check is a relatively complex and time consuming process. Also, ten-print scanners are usually custom-made consoles. Such consoles contain built-in equipment, such as a monitor, a keyboard, a pointing device, and at least one processor for processing and viewing fingerprint images. Custom-made consoles are very expensive and are manufactured at low volume rates. Custom-made consoles are also burdened with high maintenance costs. When the console malfunctions, the entire system is inoperable.

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What is needed is a fingerprint workstation that can capture plain impression fingerprints. What is also needed is an affordable fingerprint workstation with reduced complexity relative to a conventional rolled print workstation, which can provide data and fingerprint image integrity based on Federal Bureau of Investigation (FBI) certification standards. What is further needed is a fingerprint workstation that can capture up to four simultaneous fingerprint impressions as a single image, segment the single image to create four separate images, and automatically determine whether the single image is a left or right hand image.

## BRIEF SUMMARY OF THE INVENTION

Embodiments of the present invention provide a ten-print plain impression fingerprint workstation system and method that can ensure data and fingerprint image integrity and adhere to FBI certification standards. The system and method can be used to capture up to four simultaneous fingerprint impressions as a single image and segment the single image to create four separate images. The system and method also can distinguish whether fingerprint impressions from a left or right hand were captured.

Embodiments of the present invention are directed to a ten-print plain impression fingerprint scanner system and method. The ten-print scanner has a finger guide and a platen that assists in positioning four finger slaps onto the platen. The ten-print scanner also includes at least four indicators that provide real-time feedback for each finger of a fingerprint image of the four finger slaps. In another embodiment of the present invention, the ten-print scanner can be a part of a fingerprint workstation. The fingerprint workstation also includes a computer that is interfaced to the ten-print scanner via a communication link.

Embodiments of the present invention provide a method including scanning a print image, processing the scanned image, and separating the processed image into individual fingerprint images. The method also includes comparing the print image to a previously scanned print image, quality classifying the separated images, indicating a quality classification of the print image based on the quality classifying step, and determining whether the print image is of a good quality.

Embodiments of the present invention provide a method including scanning a print image, filtering the print image, binarizing the filtered image. The method also includes detecting a fingerprint area based on the binarized image, detecting a fingerprint shape based on the binarized image, and determining whether the fingerprint area and shape are acceptable.

Embodiments of the present invention provide a method for processing fingerprints including scanning a print image of at least one finger placed on a platen and determining whether the scanned print image includes data representative of at least one finger positioned at a diagonal relative to a section of the platen.

Embodiments of the present invention provide a system including a platen that receives a finger or thumb, a scanner that scans the finger or thumb on the platen, and a processor that processes the scanned image. The system also includes a separator that separates the processed image into individual fingerprint images and a comparator that compares the print image to a previously scanned print image. The system further includes a quality classifier that quality classifies the separated images and an output device that indicates a quality classification of the print image based on



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the classifier. The system further includes an image quality determining device that determines whether the print image is of a good quality.

Further embodiments, features, and advantages of the present invention, as well as the structure and operation of the various embodiments of the present invention, are described in detail below with reference to the accompanying drawings.

#### BRIEF DESCRIPTION OF THE FIGURES

The accompanying drawings, which are incorporated herein and form part of the specification, illustrate the present invention and, together with the description, further serve to explain the principles of the invention and to enable a person skilled in the pertinent art(s) to make and use the invention.

FIG. 1A shows a fingerprint workstation according to an embodiment of the present invention.

FIG. 1B shows an exemplary computer system.

FIG. 1C shows an exemplary electrical system for a fingerprint workstation according to an embodiment of the present invention.

FIG. 2 shows a ten-print scanner according to an embodiment of the present invention.

FIG. 3 shows a finger guide and a platen of a fingerprint workstation according to an embodiment of the present invention.

FIG. 4A shows left-hand positioning on a finger guide of a fingerprint workstation according to an embodiment of the present invention.

FIG. 4B shows right-hand positioning on a finger guide of a fingerprint workstation according to an embodiment of the present invention.

FIG. 4C shows thumb positioning of a finger guide of a fingerprint workstation according to an embodiment of the present invention.

FIG. 5 shows feedback indicators for a fingerprint workstation according to an embodiment of the present invention.

FIG. 6 is a flow diagram depicting a method that determines a quality of individual fingerprints according to an embodiment of the present invention.

FIG. 7 is a flow diagram depicting a method for processing four finger slap images according to an embodiment of the present invention.

FIG. 8 is a flow diagram depicting a method for determining whether a scanned four finger slap is a right hand or a left hand according to an embodiment of the present invention.

FIG. 9 shows an electrical/optical system of a ten-print scanner according to an embodiment of the present invention.

FIG. 10 shows a placement of fingerprints onto a fingerprint card.

FIG. 11 shows a 90 degree cross section of an exemplary optical system according to an embodiment of the present invention.

FIG. 12 shows an exemplary illumination system according to an embodiment of the present invention.

FIG. 13 is a flow diagram depicting a method of capturing and processing print images according to embodiments of the present invention.

FIG. 14 shows a four finger slap image according to embodiments of the present invention.

FIG. 15 shows a four finger slap image according to embodiments of the present invention.

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FIG. 16 shows a section of the four finger slap image in FIG. 14.

FIG. 17 show images of thumbs according to embodiments of the present invention.

FIG. 18 shows a system that captures and processes biometric images according to embodiments of the present invention.

The features and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters identify corresponding elements throughout. In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The drawings in which an element first appears is indicated by the leftmost digit(s) in the corresponding reference number.

#### DETAILED DESCRIPTION OF THE INVENTION

While the present invention is described herein with reference to illustrative embodiments for particular applications, it should be understood that the invention is not limited thereto. Those skilled in the art(s) with access to the teachings provided herein will recognize additional modifications, applications, and embodiments within the scope thereof and additional fields in which the present invention would be of significant utility.

#### Sections

Terminology  
Overview  
The Electrical System  
The Optical System  
Finger Guide and Platen  
Real-Time Feedback Quality Indicators  
Overall Method of Capturing and Processing Prints  
Method for Determining Quality of Captured Fingerprints  
Slap Image Processing  
Left Hand/Right Hand Determination  
Print Images  
Overall System

#### Terminology

To more clearly delineate the present invention, an effort is made throughout the specification to adhere to the following term definitions consistently.

The term "finger" refers to any digit on a hand including, but not limited to, a thumb, an index finger, middle finger, ring finger, or a pinky finger.

The term "print" can be any type of print including, but not limited to, a print of all or part of one or more fingers, palms, toes, foot, hand, etc. A print can also be a rolled print, a flat print, or a slap print.

The term "data" or "information" throughout the specification can be representative of a biometric, a digital or other image of a biometric (e.g., a bitmap or other file), extracted digital or other information relating to the biometric, etc.

The term "live scan" refers to a capture of any type of print image made by a print scanner. A live scan can include, but is not limited to, a scan of a finger, a finger roll, a flat finger, slap print of four fingers, thumb print, palm print, or a combination of fingers, such as, sets of fingers and/or thumbs from one or more hands or one or more palms disposed on a platen.



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In a live scan, one or more fingers or palms from either a left hand or a right hand or both hands are placed on a platen of a scanner. Different types of print images are detected depending upon a particular application. For example, a flat print consists of a fingerprint image of a digit (finger or thumb) pressed flat against the platen. A roll print consists of an image of a digit (finger or thumb) made while the digit (finger or thumb) is rolled from one side of the digit to another side of the digit over the surface of the platen. A slap print consists of an image of four flat fingers pressed flat against the platen. A platen can be movable or stationary depending upon the particular type of scanner and the type of print being captured by the scanner.

The terms "biometric imaging system," "scanner," "live scanner," "live print scanner," "fingerprint scanner," and "print scanner" are used interchangeably, and refer to any type of scanner which can obtain an image of all or part of one or more fingers, palms, toes, foot, hand, etc. in a live scan. The obtained images can be combined in any format including, but not limited to, an FBI, state, or international ten-print format.

#### Overview

Embodiments of the present invention provide a fingerprint workstation system and method. Although ten-print capture and four finger slap capture are preferred systems and method described throughout the specification and/or claims, it is to be appreciated that any available number of fingers and/or thumbs are also contemplated within the scope of the present invention. Thus, even when the above terminology is used, it includes less fingers and/or thumbs.

The fingerprint workstation can provide a simple way to capture fingerprints to perform background checks by allowing four finger slap impressions to be captured in a single image. A simultaneous impression of the four fingers from one hand captured as a single image can automatically be segmented to create up to four separate images. After the fingerprints from the fingers from both hands are captured, thumb prints from both hands can be captured simultaneously. Each individual extracted image can then be placed within the corresponding finger and/or thumb print box on a fingerprint card. These processes, as further described with reference to FIGS. 6-8, can be performed using the systems shown in FIGS. 1-5 and 18.

Proper sequencing of the placement of the finger and/or thumb prints can be performed using software analysis and/or physical properties of a platen having a finger guide. As seen in FIGS. 14-17, discussed in detail below, each scanned image can have predetermined image sizes. For example, in an embodiment: (1) the image size for four finger slap images can be 1600 by 1000 pixels; (2) the image size for two fingers positioned on each side of physical barrier 302 (FIG. 3) can be 800 by 1000 pixels; (3) the image size for each finger can be 400 by 1000 pixels; and (4) the image size for each thumb can be 500 by 1000 pixels. Fingerprint images can be presented on a workstation screen, such as a monitor coupled to a personal computer, to provide real time quality checks and ease of correction. The fingerprint workstation uses slap impressions rather than conventional rolled impressions to speed up the process of applicant processing and simplify the task of capturing quality prints.

The fingerprint workstation can provide long sustained use at an affordable cost. The affordable cost can be achieved through many different factors. For example, one factor can be the mechanical simplicity and reduced complexity of the workstation. Hence, designing the fingerprint workstation to

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capture plain impression fingerprints provides a reduction in complexity relative to a rolled print design. Another factor can be the employment of an improved illumination system within the fingerprint workstation (e.g., an illumination system that provides excellent uniformity). The illumination system can also be thermally stabilized and generate little or no heat, thus creating a more efficient light source. Also, the illumination light wavelength can be selected to maximize fingerprint information and definition, thereby improving the quality of a fingerprint when dealing with any color pigmentation, overly wet, dry, or oily fingers, etc. to be fingerprinted.

Other factors that contribute to an affordable cost can include the ability to produce the workstation in high volume, a custom set of electronics and optics, the incorporation of a magnetic card scanner into the workstation for reduced enrollment times and less data errors, a replaceable silicone pad platen for reducing image rejections, a real-time quality control feedback system for reducing the time spent in fingerprint acquisition, and/or an ergonomic case and platen design for facilitating fingerprint capture and ease of use.

FIG. 1A is a high level block diagram illustrating a fingerprint workstation 100 according to one embodiment of the present invention. Fingerprint workstation 100 includes a ten-print scanner 102, a computer 104, and an interface cable 120. Interface cable 120 can be a 1394 serial interface bus that couples ten-print scanner 102 to computer 104. 1394 is an IEEE standard for a high performance serial bus designed to provide high speed data transfers. 1394 is a cost-effective way to share real-time information from data intensive applications, such as cameras, camcorders, VCRs, video disks, scanners, etc. The present invention is not limited to a 1394 interface. Any type of interface can be used to couple scanner 102 and computer 104.

Computer 104 may be any commercial off-the-shelf computer. For example, computer 104 may be a personal computer (PC). An example implementation of computer 104 is shown in FIG. 1B. Various embodiments are described in terms of this exemplary computer 104. After reading this description, it will be apparent to a person skilled in the relevant art how to implement the invention using other computer systems and/or computer architectures. Computer 104 may include one or more processors, such as processor 122. Processor 122 is connected to a communication bus 124.

Computer 104 also includes a main memory 126, preferably random access memory (RAM), and may also include a secondary memory 128. Secondary memory 128 may include, for example, a hard disk drive 130 and/or a removable storage drive 132, representing a floppy disk drive, a magnetic tape drive, an optical disk drive, etc. Removable storage drive 132 reads from and/or writes to a removable storage unit 134 in a well-known manner. Removable storage unit 134, represents a floppy disk, magnetic tape, optical disk, etc., which is read by and written to by removable storage drive 132. As will be appreciated, removable storage unit 134 includes a computer usable storage medium having stored therein computer software and/or data.

In alternative embodiments, secondary memory 128 may include other similar means for allowing computer programs or other instructions to be loaded into computer 104. Such means may include, for example, a removable storage unit 136 and an interface 138. Examples of such may include a program cartridge and cartridge interface (such as that found in video game devices), a removable memory chip (such as an EPROM, or PROM) and associated socket, and other



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removable storage units 136 and interfaces 138 which allow software and data to be transferred from the removable storage unit 136 to computer 104.

Computer 104 may also include a communications interface 140. Communications interface 140 allows software and data to be transferred between computer 104 and external devices. Examples of communications interface 140 may include a modem, a network interface (such as an Ethernet card), a communications port, a PCMCIA slot and card, a wireless LAN (local area network) interface, etc. Software and data transferred via communications interface 140 are in the form of signals 142 which may be electronic, electromagnetic, optical, or other signals capable of being received by communications interface 140. These signals 142 are provided to communications interface 140 via a communications path (i.e., channel) 144. This channel 144 carries signals 142 and may be implemented using wire or cable, fiber optics, a phone line, a cellular phone link, a wireless link, and other communications channels.

In this document, the term "computer program product" refers to removable storage units 134, 136, and signals 142. These computer program products are means for providing software to computer 104. The invention is directed to such computer program products.

Computer programs (also called computer control logic) are stored in main memory 126, and/or secondary memory 128 and/or in computer program products. Computer programs may also be received via communications interface 140. Such computer programs, when executed, enable computer 104 to perform the features of the present invention as discussed herein. In particular, the computer programs, when executed, enable processor 122 to perform the features of the present invention. Accordingly, such computer programs represent controllers of computer 104.

In an embodiment where the invention is implemented using software, the software may be stored in a computer program product and loaded into computer 104 using removable storage drive 132, hard disk drive 130 or communications interface 140. The control logic (software), when executed by processor 122, causes processor 122 to perform the functions of the invention as described herein.

In another embodiment, the invention is implemented primarily in hardware using, for example, hardware components such as application specific integrated circuits (ASICs). Implementation of hardware state machine(s) so as to perform the functions described herein will be apparent to persons skilled in the relevant art(s).

In yet another embodiment, the invention is implemented using a combination of both hardware and software.

In the embodiments using ten-print scanner 102, computer 104, and 1394 serial bus 120, the overall system costs less than a console configuration for an AFIS system, while providing high-speed data transfers. Current 1394 interfaces support serial transmission speeds up to 400 Mbps.

Returning to FIG. 1A, ten-print scanner 102 provides four finger slap impressions in a single image. Simultaneous impressions of up to four fingers from one hand are captured as a single image and automatically segmented to create up to four separate images. After the fingers from both hands are captured, thumb prints from one or both hands are captured simultaneously. Each individual extracted image can then be inserted within a corresponding print box on a fingerprint card. Proper sequencing of the placement of the prints can be performed using software analysis and/or physical properties of a platen having a finger guide. Fin-

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gerprint images are presented on a monitor associated with computer 104 for real time quality checks and ease of correction.

Ten-print scanner 102 comprises an electrical system 102A and an optical system 102B. The combination of electrical system 102A and optical system 102B provides electro-optical technology for capturing plain impression fingerprints. Electrical system 102A can provide power to ten-print scanner 102, control status signals for various components internal to ten-print scanner 102, control input/output signals between components internal to ten-print scanner 102, and control input/output signals between ten-print scanner 102 and computer 104 via IEEE 1394 interface cards 108 and 106, respectively. Optical system 102B can allow scanner 102 to illuminate an area of a platen for receiving a finger or fingers and capture information from the area of the platen, and convert the captured information into a fingerprint image. The captured information can be based on light reflected off the platen.

#### The Electrical System

FIG. 1C shows electrical system 102A according to an embodiment of the present invention. Electrical system 102A can include an interface board 150, two sensors (e.g., digital camera boards) 152, an illuminator/prism heater board 154, an indicator board 156, and a magnetic-stripe reader 158. Interface board 150 can be coupled to digital camera boards 152, illuminator/prism heater board 154, indicator board 156, and magnetic-stripe reader 158. Interface board 150 also can interface each of boards 152, 154, and 156 and magnetic-stripe reader 158 to computer 104.

Interface board 150 can include a controller 160, a sensor (e.g., a digital camera) interface 162, a magnetic-stripe reader RS-232 serial interface 164, a 2D barcode RS-232 serial interface 166, IEEE-1394 interface 108, and a power supply interface 168. Controller 160 can be coupled to digital camera interface 162, illuminator/prism heater board 154, indicator board 156, magnetic-stripe reader RS-232 serial interface 164, 2D barcode RS-232 serial interface 166, and IEEE-1394 interface 108.

Controller 160 and IEEE-1394 interface 108 can provide a communication link between ten-print scanner 102 and computer 104. In some embodiments, controller 160 may be any one of a microprocessor, a microcomputer, a microcontroller, etc. In an embodiment, controller 160 may be used to control sensors (e.g., digital cameras) mounted on digital camera boards 152, a light source 170 used in optical system 102B, a prism heater 172 used to remove unwanted moisture from a platen, indicators used to indicate power status, card swipe status, and quality of fingerprint status, magnetic-stripe reader 158, and an external 2D barcode reader 174 that may be attached to scanner 102 via 2D barcode RS-232 serial interface 166. In another embodiment, both controller 160 and computer 104 are used to control the digital cameras, light source 170, prism heater 172, power/card swipe/fingerprint quality indicators, magnetic-stripe reader 158, and external 2D barcode reader 174. In yet another embodiment, computer 104 is used to control the digital cameras, light source 170, prism heater 172, power/card swipe/fingerprint quality indicators, magnetic-stripe reader 158, and external 2D barcode reader 174, and controller 160 is used as a conduit.

The 2D barcode reader 174 and magnetic-stripe reader 158 may be any off-the-shelf serial devices used to scan bar codes and data from documents, respectively. Bar codes and documents may include, but are not limited to, identification information, account information, fingerprint code informa-



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tion, etc. 2D barcode reader 174 is coupled to controller 160 via 2D barcode RS-232 serial interface 166. Magnetic-stripe reader 158 is coupled to controller 160 via magnetic-stripe RS-232 serial interface 164.

Using 2D barcode reader 174 and magnetic-stripe reader 158 can reduce enrollment time and can substantially reduce data errors. For example, 2D barcode 174 and/or magnetic-stripe reader 158 may be used in conjunction with a user interface to simplify demographic data entry. Demographic information swiped from magnetic-stripe reader 158 or 2D barcode reader 174 may be sent to controller 160 via interfaces 164 and 174, respectively, and controller 160 will transmit the information to computer 104 via IEEE-1394 interface 108.

Although not specifically shown in FIG. 1C, power supply interface 168 supplies power to all of the components within ten-print scanner 102 and can be coupled to an external 12-volt power supply 180.

Digital camera interface 162 can be coupled to controller 160 via a serial connection. Digital camera interface 162 can also be connected to digital camera boards 152 to provide electronics for clocking data to and from digital cameras mounted onto digital camera boards 152. Although two digital camera boards are shown, any number of digital camera boards and digital cameras may be used. Controller 160 may send control signals to each camera serially via digital camera interface 162. Digital camera interface 162 is also connected to IEEE-1394 interface 108 for sending 16-bit image data from the cameras mounted on digital camera boards 152 to computer 104.

Illuminator/prism heater board 154 can be coupled to controller 160 via a serial interface. Controller 160 can control different zones of light source 170 in the illumination system of optical system 102B. The light source can be an illumination source array. The illumination source array can be divided into zones. In one embodiment, a plurality of sources are divided into at least three groups in at least three respective zones. The intensity of each group of sources can be independently controlled by controller 160 relative to other groups such that a flat, uniform illumination is provided to the platen. Use of such zones simplifies control, while still retaining sufficient flexibility to adjust the relative intensity of the light source groups to ensure flat, uniform illumination is provided to the platen. An example of a more detailed description of an illumination source array and its division into zones can be found in U.S. patent application Ser. No. 10/050,046, filed on Jan. 17, 2002 (now U.S. Pat. No. 6,954,260 that issued Oct. 11, 2005), entitled "Systems and Methods For Illuminating A Platen In A Print Scanner," to Arnold et al., which is incorporated herein by reference in its entirety.

Water vapor condensing onto a fingerprint platen surface of a prism may cause an undesirable fingerprint image called a halo. One way to prevent this from occurring, the fingerprint platen of scanner 102 can be heated to remove water vapor that condenses onto the platen surface of the prism or to prevent such water vapor from forming. An example system and method that can be used to heat the platen using heating elements attached to the sides of a prism is described in "Platen Heaters For Biometric Image Capturing Devices," U.S. patent application Ser. No. 10/047,983 (now U.S. Pat. No. 6,809,303 that issued Oct. 26, 2004), by Carver et al., filed on Jan. 17, 2002 and incorporated by reference herein in its entirety. In one embodiment, controller 160 can control trip point limits for turning heating elements ON and OFF when heating the fingerprint platen. Controller 160 can also monitor the temperature of the fingerprint platen via a

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thermostat controller. In one embodiment, this information may be transmitted to computer 104 via IEEE 1394 interface 108.

In some embodiments, ten-print scanner 102 can provide real-time feedback of fingerprint quality. This can be accomplished using fingerprint quality indicators (shown in FIG. 2), which provide feedback to the user to indicate whether an appropriate level of fingerprint quality has been achieved. Fingerprint quality indicators include four indicators, one for each finger of the four finger slap being scanned. Fingerprint quality indicators and the process used for determining the quality of each fingerprint is discussed in more detail below.

Indicator board 156 can be coupled to controller 160 via a serial input/output connection. Controller 160 can provide control signals to indicator board 156 for illuminating indicators, such as LEDs (light emitting diodes), to indicate whether the quality of a particular fingerprint for a particular finger is acceptable or unacceptable. Controller 160 can also provide a control signal for indicating that the system is powered-ON and control signals indicating whether a card swipe from magnetic-stripe reader 158 or 2D barcode reader 174 is successful. For example, if a card swipe is not successful, a CARD LED located on scanner 102 will be illuminated RED indicating that the card must be swiped again. Alternatively, if the card swipe is successful, the CARD LED will be illuminated GREEN.

#### The Optical System

FIG. 9 is a block diagram illustrating scanner optical system 102B of ten-print scanner 102 according to an embodiment of the present invention. Scanner optical system 102B can include an illumination system 902, a prism 904, optical systems 906 and 908, and two cameras 910 and 912. Although two optical systems and digital cameras are shown, any number of optical systems and digital cameras may be used. As previously stated, one side of prism 904 is used as platen 204 and includes finger guide 206, as can be seen in FIG. 2. Illumination system 902 illuminates the underside of platen 204. As shown in FIG. 3, finger guide 206 is separated into left side 304 and right side 306. In one embodiment, camera 910, in combination with optical system 906, is used to detect an image of the fingers placed on the left side 304 of finger guide 206 and camera 912, in combination with optical system 908, is used to detect an image of the fingers placed on the right side 306 of finger guide 206. Digital cameras 910 and 912 can be any solid state digital camera, such as a CCD or CMOS camera. In one example, digital cameras 910 and 912 may be provided on digital camera boards 152 described in FIG. 1C.

FIG. 11 shows a 90 degree cross section of an exemplary optical system (e.g., optical system 906 or 908) according to an embodiment of the present invention. Optical system 1100 can include prism 904, an optical housing 1102, and camera 910 or 912. Optical housing 1102 can be coupled to prism 904 at one end and to camera 910 or 912 using a focus mount 1116 at the opposite end. Optical housing 1102 can include, inter alia, a first lens element 1104, a fold mirror 1106, a second lens element 1108, a third lens element 1110, a fourth lens element 1112, and an aperture stop 1114.

A biometric object, such as a finger or fingers, placed on prism 904 for imaging, is focused through first lens element 1104 and reflected off of fold mirror 1106. Aperture stop 1114 is used to limit light passing through optical system 906 or 908 such that only light rays traveling within a range of angles at or near a direction along an optical axis are detected. Aperture stop 1114 helps maintain telecentricity in



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optical system 1100. The reflected image is then focused through second, third, and fourth lens elements 1108, 1110, and 1112 for detection by camera 910 or 912.

In an embodiment, first lens element 1104 has two convex surfaces and is made of SF3 glass. Second lens element 1108 has two convex surfaces and is made of LaK10 glass. Third lens element 1110 has two concave surfaces and is made of SF8 glass. Fourth lens element 1112 has a concave surface and a convex surface and is made of SK16 glass. Although lens elements 1104, 1108, 1110, and 1112 are discussed as being made of glass, they are not limited to glass. In fact, lens 1104, 1108, 1110, and 1112 can be made of any transparent material that can focus light rays and form images by refraction, such as plastic, or the like.

FIG. 12 shows an exemplary illumination system (e.g., illumination system 902) according to an embodiment of the present invention. In one embodiment, illumination system 902 includes an illumination source array 1202, a light wedge 1204, and a diffuser 1206. Illumination source array 1202 illuminates an end region of light wedge 1204. Light wedge 1204 then internally reflects light and sends it to diffuser 1206 prior to entering prism 904. The light from illumination source array 1202 can be any single wavelength or narrowband of wavelengths such as infra-red, visible or ultraviolet light. In one example, blue/green light having a wavelength of approximately 510 nm is used. An example illumination system is described in "Systems and Methods For Illuminating A Platen In A Print Scanner," U.S. patent application Ser. No. 10/050,046, by Arnold et al., filed on Jan. 17, 2002 (now U.S. Pat. No. 6,954,260 that issued Oct. 11, 2005), which is incorporated herein by reference in its entirety. In some embodiments, the light wedge 1204 can be used to aid in capturing print information for individuals with smaller hands and/or smaller fingers. It is to be appreciated that although a diffuser 1206 is shown and described, in various embodiments wedge 1204 can cause diffusing of the light without requiring diffuser 1206.

#### Finger Guide and Platen

FIG. 2 shows a ten-print scanner 102 according to an embodiment of the present invention. A housing 202 for ten-print scanner 102 can be constructed of impact resistant injection molded polycarbonate. One skilled in the relevant art(s) would know that other types of housings could be used without departing from the scope of the invention. Ten-print scanner 102 can include a fingerprint platen 204, a finger guide 206, fingerprint quality indicators 208, a power indicator 210, and a card indicator 212. Ten-print scanner 102 can also include magnetic-stripe reader 158 located at the top of ten-print scanner 102. Fingerprint quality indicators 208 are located directly above finger guide 206. Power indicator 210 is illuminated when power is applied to scanner 102, for example via external 12-volt power supply 180. Card indicator 212 can be illuminated green when a card swipe is successful and red when a card swipe is unsuccessful.

Fingerprint platen 204 receives the four finger slaps and the thumbs during fingerprinting. In an embodiment, platen 204 is a surface on one side of a prism (not shown). In another embodiment, platen 204 is a surface of an optical quality silicone rubber sheet placed on top of one side of a prism. The optical quality silicone rubber sheet can be replaceable. Optical quality silicone rubber platens provide adequate surface quality to optimize image enhancements as well as protect the optical surface. Example optical quality silicone rubber platens are described in U.S. patent application Ser. No. 10/132,719, entitled "Silicone Rubber Sur-

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faces for Biometric Print TIR Prisms," filed Apr. 26, 2002, and incorporated by reference herein in its entirety.

Finger guide 206 can be located along the sides and the top of fingerprint platen 204. Finger guide 206 is a mechanism for locating and separating the four finger slap to provide accurate and efficient placement of fingers. Finger guide 206 also provides a physical barrier that facilitates the identification of either a right or left hand using software analysis of the four finger slap fingerprint images.

FIG. 3 shows finger guide 206 and fingerprint platen 204 of fingerprint workstation 100 according to an embodiment of the present invention. As previously stated, one side of a prism is used as fingerprint platen 204. Fingerprint platen 204 can include an optical quality silicone rubber sheet attached to the side of the prism used as the platen. The optical silicone pad may be easily removed and replaced by operating personnel when needed. The size of the active fingerprint platen area 204 can be about 2.05 by about 3.6 inches at 500 dots per inch ("dpi").

Finger guide 206 includes a physical barrier 302 positioned along the middle of the top of finger guide 206. Physical barrier 302 is used to separate the four finger slap. Two fingers of the four finger slap are placed on a left side 304 of physical barrier 302 while the other two fingers of the four finger slap are placed on a right side 306 of physical barrier 302.

FIG. 4A shows placement of up to four fingers on a left hand on fingerprint platen 204 and finger guide 206 according to an embodiment of the present invention. As is shown in FIG. 4A, when the left hand is placed on platen 204, finger guide 206 physically separates a ring finger and a middle finger of the left hand. Finger guide 206 is designed so that when the tips of the middle and ring fingers make contact with finger guide 206, the four fingers are positioned correctly in the viewing area. This forces the four fingers to have a diagonal orientation with respect to section 207 of finger guide 206. This is also true when a right hand is positioned on fingerprint platen 204, as shown in FIG. 4B. Based on the orientation of the four fingers on the viewing area and the separation of the ring and middle fingers on finger guide 206, a determination can be made as to whether the left or right hand is placed on fingerprint platen 204. The process for determining whether a left or right hand is being imaged is described below with reference to FIGS. 6, 7, and 8.

FIG. 4C shows placement of thumbs onto fingerprint platen 204 according to an embodiment of the present invention. When thumb prints are captured, the left thumb is placed on left side 304 of finger guide 206 and the right thumb is placed on right side 306 of finger guide 206.

#### Real-time Feedback Quality Indicators

The present invention can provide feedback of real-time individual fingerprint quality to an operator and/or a user. Providing real-time fingerprint quality feedback simplifies the use of fingerprint workstation 100 and facilitates capturing of the best possible fingerprints. In general, feedback can indicate to an operator and/or a user an acceptable scan condition of each individual finger scanned. An acceptable scan condition can include, among others, an indication of acceptable finger placement relative to the platen, and/or an indication that an acceptable image of a print of the finger was captured.

FIG. 5 shows feedback indicators 208 for fingerprint workstation 100 according to an embodiment of the present invention. An indicator (502, 504, 506, and 508) is assigned to each finger of the four finger slap being scanned. For



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example, if a left hand is placed on fingerprint platen 204, indicator 502 corresponds to pinky finger 510, indicator 504 corresponds to ring finger 512, indicator 506 corresponds to middle finger 514, and indicator 508 corresponds to pointer finger 516. If a right hand is placed on fingerprint platen 204, indicator 502 corresponds to pointer finger 516, indicator 504 corresponds to middle finger 514, indicator 506 corresponds to ring finger 512, and indicator 508 corresponds to pinky finger 510.

Each image frame can be processed to determine a quality of the individual fingerprint. After determining the quality of each individual fingerprint, the corresponding indicators 502, 504, 506, and 508 provide feedback to the user to indicate possible corrections or the need to re-position fingers 510, 512, 516, and/or 518 on fingerprint platen 204. This assures that an appropriate level of fingerprint quality can be achieved. In an embodiment, multi-color LEDs can be used for indicators 502, 504, 506, and 508. In that embodiment, a red LED may indicate poor quality, a green LED may indicate acceptable quality, and an amber LED may indicate possibly acceptable quality. In another embodiment, indicators 502, 504, 506, and 508 may be bar graph LED indicators, wherein the level of the bar indicates quality acceptance. In still further embodiments, indicators 502, 504, 506, and 508 can be any electrical, mechanical, or audio device or signal known to alert a user of a condition, as would be known to one skilled in the art.

Quality indications can also be displayed at a separate display on the fingerprint workstation. For example, an external PC 104 can output a variety of displays indicating quality of fingerprint scan for each finger

#### Overall Method of Capturing and Processing Prints

FIG. 13 is a flowchart depicting a method 1300 for capturing and processing prints according to embodiments of the present invention (steps 1302–1328). After starting in step 1302, in step 1304 fingers of a first hand (e.g., one of the right or left hand) are positioned upon a platen within a finger guide. This can be so that a barrier separates a ring finger from a middle finger. In step 1306, a four finger slap image of the first hand is scanned. In step 1308, fingers from the first hand are removed from the platen.

In step 1310, finger from a second hand (e.g., the other hand) are positioned upon the platen within the finger guide. This can be so that the barrier separates a ring finger from a middle finger. In step 1312, a four finger slap image of the second hand is scanned. In step 1314, fingers from the second hand are removed from the platen.

In step 1316, each thumb is positioned on the platen within the finger guide. This can be so that the barrier separates the thumbs. In step 1318, thumb images are scanned. In step 1320, the thumbs are removed from the platen.

In an embodiment, in step 1322 various types of image processing method can take place. Several types of image processing that can take place are described in relation to FIGS. 6–8 described in detail below.

In an embodiment, in step 1324 an output representing first and second four finger slap images, individual fingerprint images, and/or thumb images can be associated (e.g., printed) onto corresponding areas of a fingerprint card.

In step 1326, process 1300 ends.

#### Method for Determining Quality of Captured Fingerprints

FIG. 6 is a flow diagram 600 depicting a method for determining the quality of individual fingerprints according to an embodiment of the present invention (steps 602–624). The invention is not limited to the description provided

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herein with respect to flow diagram 600. Rather, it will be apparent to persons skilled in the relevant art(s) after reading the teachings provided herein that other functional flow diagrams are within the scope of the present invention. The process begins with step 602 and immediately proceeds to step 604.

In step 604, a four finger slap image is scanned. In an embodiment of the present invention, a signal may be sent to indicators 502, 504, 506, and/or 508 (see FIG. 5) to indicate whether or not fingerprints are being scanned. For example, if indicators 502, 504, 506, and 508 are green, then fingerprints are being scanned. If indicators 502, 504, 506, and 508 are red, then fingerprints are not being scanned. In step 606, the scanned image is processed. The procedure for processing the scanned image according to an embodiment of the present invention is further described with respect to FIG. 7. In step 608, each finger of the four finger slap image is separated into its own image. In decision step 610, it is determined whether the processed image is the first image scanned. If yes, the process proceeds back to step 604 to scan another image. If no, the process proceeds to step 612.

In step 612, each individual fingerprint is compared to a corresponding previously scanned fingerprint. In step 614, in one embodiment each fingerprint is quality classified as being either acceptable, possibly acceptable, or unacceptable according to the results of the comparison. In an alternative embodiment, in step 614 each fingerprint is quality classified as being either acceptable or unacceptable. In various embodiments, quality classification can be based on if an area and shape of currently imaged fingerprints are: of equal size and shape, within a previously determined threshold associated with an acceptable quality fingerprint, etc. In these cases, an indicator light can be illuminated green to indicate the currently scanned fingerprint image is an acceptable quality image. If the size and the shape of the currently imaged scanned fingerprint image are below the predetermined acceptable quality threshold, but above a previously determined threshold associated with an unacceptable quality fingerprint, then the indicator light can be illuminated amber to indicate the currently scanned fingerprint image is a possibly acceptable quality image. Finally, if the size and shape of the currently imaged fingerprint is at or below the previously determined threshold associated with an unacceptable quality, then the indicator light can be illuminated red to indicate that the currently scanned fingerprint image is an unacceptable quality image.

It is to be appreciated that all threshold levels are changeable and may be based on customer requirements. For example, one customer's requirements may be to set the acceptable quality threshold at 90% and the unacceptable quality threshold at 10%. Another customer's requirements may not be as stringent, only requiring the acceptable quality threshold to be at 80% and the unacceptable quality threshold to be at 20%.

In step 616, each indicator is illuminated according to the quality classification of the fingerprint. In decision step 618, it is determined whether all fingerprints for the four finger slap are of acceptable quality. If yes, the process proceeds to step 620, where a determination is made as to whether a left or right hand is being imaged. This process is described with reference to FIG. 8. If no, the process then returns to step 604 to scan another image.

This above process is repeated until either fingerprints of acceptable quality for all fingers are achieved or a time-out has occurred. In step 622, a determination is made whether a time-out has occurred. If a time-out occurs, in step 624 a message is displayed to the operator indicating that the



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operator may switch from an automatic detection mode to a manual mode for the image capture operation and repeat the process manually, if necessary. Alternatively, the operator may use a modified version of the program for special circumstances (e.g., a person having less than four fingers or having less than two thumbs). If no time out has occurred, process 600 returns to step 604.

FIG. 10 shows a fingerprint receiving device (e.g., a fingerprint card) 1000 for a right hand according to embodiments of the present invention. In this embodiment, once Acceptable quality scanned fingerprint images are achieved for two four finger slaps and two thumbs, four finger slap prints 1002, thumb prints 1004, and segmented fingerprints 1006 are output to fingerprint card 1000.

#### Slap Image Processing

FIG. 7 is a flow diagram illustrating method 606 for processing the four finger slap image according to an embodiment of the present invention (steps 702-716). The invention is not limited to the description provided herein with respect to flow diagram 606. Rather, it will be apparent to persons skilled in the relevant art(s) after reading the teachings provided herein that other functional flow diagrams are within the scope of the present invention. The process begins with step 702, and immediately proceeds to step 704.

In step 704, the scanned fingerprint image is filtered to remove all high frequency content, which corresponds to ridge and valley transitions of a finger. Thus, the scanned fingerprint image is filtered to remove all of the ridge and valley transitions to indicate the outlying of the fingerprint area.

In step 706, a binarization process is performed. The binarization process can remove all of the gray areas and replace them with either black or white pixels based on a black and white threshold point. In one embodiment, the binarization process begins by taking an average gray scale value of the filtered image. In this instance, the average gray scale value is the black and white threshold point. In this embodiment, all of the pixel values above the average value are replaced with white pixels and all the pixel values equal to and below the average value are replaced with black pixels. The resulting image is comprised of all black and white pixels.

In step 708, a fingerprint area is detected. Usually, the black areas of the image are concentrated around the fingerprints. Thus, the detection step detects the areas concentrated by black pixels. In step 710, fingerprint shapes are detected. The fingerprint shapes can be oval-like shapes. The fingerprint shape detection step detects the areas concentrated by black pixels that are comprised of oval-like shapes. In step 712, it is determined whether the detected areas and shapes are representative of a four finger slap and acceptable. This can be based on historical data of a four finger slap image. For example, a previously determined Acceptable quality four finger slap image can be stored and used in comparison to the presently detected image to determine if the presently detected areas and shapes are representative and/or acceptable. If no, then the process returns to step 604 in FIG. 6 to scan another image. If yes, then the process proceeds to step 608 in FIG. 6 to separate the image into individual fingers.

#### Left Hand/Right Hand Determination

FIG. 8 is a flow diagram 620 depicting a method for determining whether a scanned four finger slap image is of a right hand or a left hand according to an embodiment of the present invention (steps 802-816). The invention is not limited to the description provided herein with respect to flow diagram 620. Rather, it will be apparent to persons

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skilled in the relevant art(s) after reading the teachings provided herein that other functional flow diagrams are within the scope of the present invention. The process begins with step 802, and immediately proceeds to step 804.

As previously stated, the orientation of the up to four fingers on the viewing area or fingerprint platen 204 and the separation of the ring and middle fingers by physical barrier 302 of finger guide 206 are used to determine whether the left or right hand is placed onto fingerprint platen 204 for imaging. For optimal performance, a person must place their fingers onto fingerprint platen 204 in a manner such that the largest area possible of the fingerprint image is obtained, while also capturing all four fingers. In order for this to occur, the person must place the four finger slap at a diagonal with the tips of the middle finger and the ring finger making contact with finger guide 206. Other positions may also be possible.

In decision step 804, it is determined whether the detected fingerprints are at a diagonal. If yes, in step 806 it is then determined whether the diagonal is less than 90 degrees or greater than 90 degrees with respect to the base of fingerprint platen 204. If the diagonal is more than 90 degrees, in step 808 it is determined that the right hand is being imaged. If the diagonal is less than 90 degrees, in step 810 it is determined that the left hand is being imaged.

It is to be appreciated that although the person positioning fingers at a diagonal may be an optimal position, the invention is not limited to diagonal positioning of the four finger slap. Other positions may be possible.

Returning to decision step 804, if it is determined that the fingerprints are not at a diagonal, then the process proceeds to decision step 812. In decision step 812, it is determined whether the longest finger (i.e., the middle finger) is on right side 306 of physical barrier 302. If the longest finger is not on right side 306 of physical barrier 302, then in step 814 it is determined that the right-hand is being imaged. If the longest finger is on right side 306 of physical barrier 302, then in step 816 it is determined that the left-hand is being imaged.

In an alternative embodiment, decision step 812 may be altered to determine whether the pinky finger (i.e., the smallest finger) is on right side 306 of physical barrier 302. If the pinky finger is on right side 306 of physical barrier 302, then the right-hand is being imaged. If the pinky finger is not on right side 306 of physical barrier 302, then the left-hand is being imaged. In another alternative embodiment, decision step 812 may search left side 304 of physical barrier 302 to determine whether the longest finger or the shortest finger can be found.

#### Print Images

FIGS. 14-15 are images (e.g., a four finger slap image) 1400 according to embodiments of the present invention. FIG. 14 shows a left hand image 1400, while FIG. 15 shows a right hand image 1400. Image 1400 can be 1600 pixels by 1000 pixels. In this embodiment, as seen in FIG. 16, an image of two fingers on either side of barrier 302 can be 800 pixels by 1000 pixels and an image of each individual finger (not shown) can be 400 pixels by 1000 pixels. Also, in this embodiment, images of thumbs, as seen in FIG. 17, can be 500 pixels by 1000 pixels.

In the FIG. 8 described above, a method 620 for determining which hand is being scanned is discussed. FIGS. 14-15 show how the image analysis works. In one embodiment, an angle of a diagonal line is used to determine which hand is being scanned. In this embodiment, an angle of a diagonal line is with respect to a Y axis 1402 and an X axis 1404. If the diagonal line is an axis of symmetry of a left hand 1406, the diagonal line is at an angle  $\alpha$  less than 90°.



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In contrast, if the diagonal line is an axis of symmetry of a right hand 1500, the diagonal line is at an angle  $\alpha$  greater than 90° degrees.

In another embodiment, a highest fingerprint image is used to determine which hand is being scanned. For example, in FIG. 14 a highest fingerprint image 1408 is on a right side of an image of barrier 302. This means that a left hand was scanned. In contrast, in FIG. 15 a highest fingerprint image 1502 is on a left side of the image of barrier 302. This means that a right hand was scanned.

## Overall System

FIG. 18 shows a system 1800 that captures and processes biometric images according to embodiments of the present invention. System 1800 includes a scanner 1810 coupled between a platen 1820 and a processor 1830. Platen 1820 can be used to receive one or more fingers and/or one or more thumbs to be scanned by scanner 1810. Processor 1830 can be coupled to various devices, which can include: an output device 1832, an image quality device 1834, a hand determining device 1836, a quality classifier 1838, a separator 1840 that separates an overall four-finger slap image into individual finger images, and a comparator 1842. Each of the devices 1834-1842 can be used to perform the corresponding functions described in process 600 as described above in FIGS. 6-8. Also, each of the devices 1834-1842 can have its own output or output device 1844-1852. Processor 1830 can include a filter 1854 and a binarizer 1856. A binarized signal from binarizer 1856 can be used by an area determining device 1858 and/or a shape determining device 1860. Again, each of the devices 1858-1860 can be used to perform the corresponding functions described in process 600 as described above in FIGS. 6-8.

## CONCLUSION

Control functionality described above can be carried out in a ten print scanner, a computer coupled to the ten print scanner, or distributed between both the ten print scanner and the computer. Embodiments of the system have been described above with regard to a camera, including but not limited to a digital camera. This is not intended to limit the present invention because any type of sensor, detector, or camera can be used to capture a print image as is known in the art.

While specific embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. It will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined in the appended claims. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A method for capturing and quality classifying fingerprint images, the method comprising:

- (a) scanning a plurality of fingers substantially simultaneously;
- (b) capturing data representing a combined image of a corresponding plurality of fingerprints;
- (c) using concentrations of black pixels arranged in oval-like shapes in the combined image to determine individual fingerprint areas and shapes;
- (d) separating the combined image into individual fingerprint images;

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(e) comparing each of the separated individual fingerprint images to a corresponding previously captured acceptable fingerprint image;

(f) quality classifying the separated individual fingerprint images as being either acceptable, possibly acceptable, or unacceptable according to the comparing step (e);

(g) indicating the quality classification of each of the individual fingerprint images based on the quality classifying step (f); and

(h) determining whether the processed combined image is of a good quality.

2. The method of claim 1, further comprising:

(d1) determining whether the combined image is a first image captured, wherein when the combined image is the first image captured, the method repeats steps (a)-(d) and the determining step (d1) before performing steps (e)-(g).

3. The method of claim 1, further comprising:

determining whether the combined image is a first image captured, wherein when the combined image is not the first image captured, the method continues onto steps (e)-(g).

4. The method of claim 1, wherein step (c) comprises:

(c1) filtering the combined image;

(c2) binarizing the filtered combined image;

(c3) detecting the individual fingerprint areas based on the concentrations of the black pixels in the binarized combined image;

(c4) detecting the individual fingerprint shapes based on arrangements of the concentrated black pixels in oval-like shapes in the binarized combined image; and

(c5) determining whether the individual fingerprint areas and shapes are acceptable.

5. The method of claim 4, wherein when the determining step (c5) determines whether each of the individual fingerprint areas and shapes are acceptable, then the method continues onto step (d).

6. The method of claim 4, wherein when the determining step (c5) determines each of the individual fingerprint areas and shapes are unacceptable, then the method returns to the scanning step (a).

7. The method of claim 1, wherein when the determining step (h) determines the combined image is of the good quality, the method further comprises:

(i) determining whether the combined image is captured from a left or a right hand.

8. The method of claim 7, wherein the determining step (i) comprises:

(i1) determining whether the combined image represents at least one finger that is positioned at a diagonal with respect to a section of a platen included in a scanner.

9. The method of claim 8, wherein when the determining step (i1) determines the finger is at a diagonal, the method further comprises:

(i2a) determining whether the diagonal is at an angle greater than 90°.

10. The method of claim 9, wherein when the determining step (i2a) determines the diagonal is at an angle greater than 90°, an output indicates the combined image is from a right hand.

11. The method of claim 9, wherein when the determining step (i2a) determines the diagonal is at an angle less than 90°, an output indicates the combined image is from a left hand.

12. The method of claim 8, wherein when the determining step (i1) determines the finger is not at a diagonal, the method further comprises:



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(i2b) determining whether a longest finger is on a right side of a finger guide coupled to the platen.

13. The method of claim 12, wherein when the determining step (i2b) determines the longest finger is on the right side of the finger guide, an output indicates the combined image is from a left hand.

14. The method of claim 12, wherein when the determining step (i2b) determines the longest finger is on a left side of the finger guide, an output indicates the combined image is from a right hand.

15. The method of claim 1, wherein when the determining step (h) determines the image is of a bad quality, the method further comprises determining whether a predetermined time period has expired.

16. The method of claim 15, wherein when the predetermined time period has expired, an output is generated indicating that a user can switch to a manual mode.

17. The method of claim 15, wherein when the predetermined time period is unexpired, the method returns to the scanning step (a).

18. The method of claim 4, wherein the determining step (c5) compares previous acceptable images to the binarized image to determine acceptability.

19. A method for capturing and processing a fingerprint image, the method comprising:

- (a) scanning one or more fingers;
- (b) capturing data representing a corresponding fingerprint image;
- (c) filtering the fingerprint image;
- (d) binarizing the filtered fingerprint image;
- (e) detecting a fingerprint area based on a concentration of black pixels in the binarized fingerprint image;
- (f) detecting a fingerprint shape based on an arrangement of the concentrated black pixels in an oval-like shape in the binarized fingerprint image; and
- (g) determining whether the detected fingerprint area and shape are of an acceptable quality.

20. The method of claim 19, wherein when the determining steps (e) and (f) detect a plurality of acceptable fingerprint areas and shapes in the binarized image, then the method further comprises: (h) separating the binarized image into individual fingerprint images.

21. The method of claim 19, wherein when the determining step (g) determines the fingerprint area and shape are unacceptable, then the method returns to step (a).

22. The method of claim 19, wherein the determining step (g) compares previous acceptable images to the binarized fingerprint image to determine acceptability.

23. A method of processing fingerprints, the method comprising:

- (a) scanning at least one finger placed on a platen of a scanner;
- (b) capturing data representing a corresponding fingerprint image; and
- (c) determining whether the fingerprint image includes data of an acceptable quality representative of at least one finger positioned at a diagonal relative to a section of the platen to thereby determine if the fingerprint image is from a left hand or a right hand based on detecting areas with concentrations of black pixels arranged in oval-like shapes in a binarized image.

24. The method of claim 23, wherein when the determining step (c) determines the finger is at a diagonal, the method further comprises:

- (c1) determining whether the diagonal is at an angle greater than 90°.

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25. The method of claim 24, wherein when the determining step (c1) determines the diagonal is at an angle greater than 90°, an output indicates the fingerprint image is from a right hand.

26. The method of claim 24, wherein when the determining step (c1) determines the diagonal is at an angle less than 90°, an output indicates the fingerprint image is from a left hand.

27. The method of claim 23, wherein when the determining step (c) determines the image is not at a diagonal, the method further comprises:

- (c2) determining whether a longest finger is on a right side of a finger guide coupled to the platen.

28. The method of claim 27, wherein when the determining step (c2) determines the longest finger is on the right side of the finger guide, an output indicates the fingerprint image is from a left hand.

29. The method of claim 27, wherein when the determining step (c2) determines the longest finger is on a left side of the finger guide, an output indicates the fingerprint image is from a right hand.

30. A system for capturing and quality classifying fingerprint images, the system comprising:

- means for scanning a plurality of fingers substantially simultaneously;
- means for capturing data representing a combined image of a corresponding plurality of fingerprints;
- means for determining individual fingerprint areas and shapes based on concentrations of black pixels arranged in oval-like shapes in the combined image;
- means for separating the combined image into individual fingerprint images;
- means for comparing each of the separated individual fingerprint images to a corresponding previously obtained acceptable fingerprint image;
- means for quality classifying the separated individual fingerprint images as being either acceptable, possibly acceptable, or unacceptable according to the comparison;
- means for indicating a quality classification of each of the individual fingerprint images based on the means for quality classifying; and
- means for determining whether the processed combined image is of a good quality.

31. The system of claim 30, further comprising: means for determining how many of the combined images have been captured.

32. The system of claim 30, wherein the means for determining individual fingerprint areas and shapes comprises:

- means for filtering the combined image of the plurality of fingerprints;
- means for binarizing the filtered combined image;
- means for detecting a fingerprint area based on the concentrations of black pixels in the binarized image;
- means for detecting a fingerprint shape based on arrangements of the concentrated black pixels in oval-like shapes in the binarized image; and
- means for determining whether the individual fingerprint areas and shapes are acceptable.

33. The system of claim 30, further comprising: means for determining whether the combined image is captured from a left or a right hand.

34. The system of claim 33, wherein the means for determining left or right hand comprises means for determining whether the combined image includes an image



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representative of at least one finger positioned at a diagonal relative to a section of a platen included in a scanner.

35. The system of claim 33, wherein the means for determining left or right hand comprises means for determining whether a longest finger is on a right side or a left side of a finger guide coupled to the platen.

36. A system for capturing and processing data representative of a fingerprint image, the system comprising:  
 means for scanning one or more fingers;  
 means for capturing the data representing the fingerprint image;  
 means for filtering the fingerprint image;  
 means for binarizing the filtered fingerprint image;  
 means for detecting a fingerprint area based on a concentration of black pixels in the binarized fingerprint image;  
 means for detecting a fingerprint shape based on an arrangement of concentrated black pixels in oval-like shape in the binarized fingerprint image; and  
 means for determining whether the detected fingerprint area and shape are of acceptable quality.

37. The system of claim 36, further comprising means for separating the binarized fingerprint image into individual fingerprint images, if a plurality of acceptable fingerprint areas and shapes are detected.

38. A system for processing fingerprints, the system comprising:  
 means for scanning at least one finger placed on a platen;  
 means for generating data representative of a fingerprint image associated with the at least one finger; and  
 means for determining whether the at least one finger is from a left or a right hand, based on concentrations and arrangements of black pixels in a binarized fingerprint image.

39. The system of claim 38, wherein the means for determining comprises means for determining whether a longest finger is on a right side or a left side of a finger guide coupled to the platen.

40. The system of claim 38, wherein the means for determining comprises means for determining whether the captured fingerprint image includes an image representative of at least one finger positioned at a diagonal relative to a section of the platen.

41. A system, comprising:  
 a platen that receives a plurality of fingers or thumbs;

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a scanner that substantially simultaneously scans the plurality of fingers or thumbs on the platen;

an image capturer that captures data representing a corresponding combined fingerprint image of the plurality of fingers or thumbs;

a processor that processes the combined fingerprint image;

a separator that separates the processed combined fingerprint image into individual fingerprint images;

a comparator that compares the captured fingerprint image to a previously obtained acceptable fingerprint image;

a classifier that classifies each of the separated individual fingerprint images as being either acceptable, possibly acceptable, or unacceptable according to results of the comparison;

an output device that indicates a classification of each of the individual fingerprint images based on the classifier; and

an image quality determining device that determines whether the captured combined fingerprint image is of a good quality.

42. The system of claim 41, wherein the processor comprises:

a filter that filters the combined fingerprint image; and  
 a binarizer that binarizes the filtered combined fingerprint image.

43. The system of claim 42, wherein the processor further comprises:

an area determining device that determines an area of each of the individual fingerprint image based on a concentration of black pixels in the binarized combined image.

44. The system of claim 42, wherein the processor further comprises:

a shape determining device that determines a shape of each of the individual fingerprint images based on an arrangement of concentrated black pixels in oval-like shape in the binarized combined image.

45. The system of claim 41, further comprising a hand determination device that determines which hand(s) the plurality of fingers or thumbs belongs to.

\* \* \* \* \*

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,203,344 B2  
APPLICATION NO. : 10/345420  
DATED : April 10, 2007  
INVENTOR(S) : George W. McClurg

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Page 3 of Title Page, Item [56], FOREIGN PATENT DOCUMENTS section, please replace "JP 0 623 890 A2 11/1994" with --EP 0 623 890 A2 11/1994--.

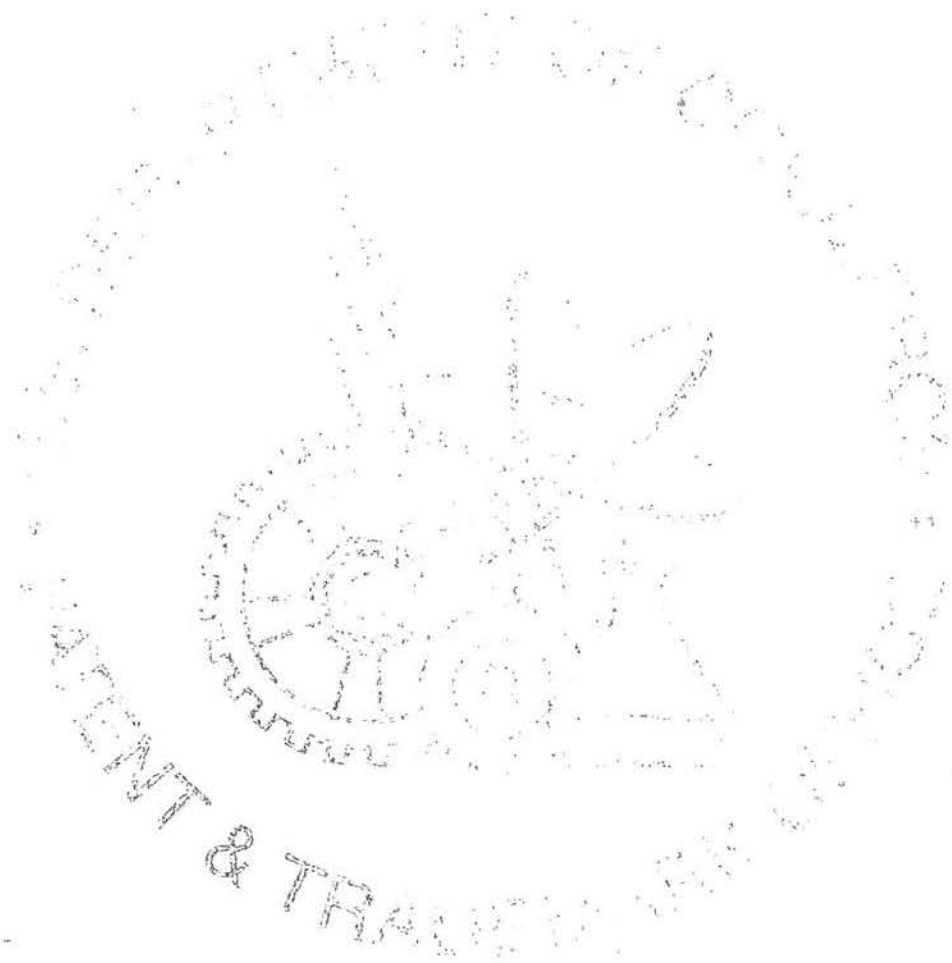
Signed and Sealed this

Twelfth Day of June, 2007

A handwritten signature in black ink, reading "Jon W. Dudas", is centered within a rectangular box with a light gray stippled background.

JON W. DUDAS

*Director of the United States Patent and Trademark Office*







**CERTIFICATE OF SERVICE**

I, Darryl M. Woo, hereby certify that on August 12, 2014, I caused the foregoing **[CORRECTED] APPELLANTS' NON-CONFIDENTIAL OPENING EN BANC BRIEF** to be served on the following parties as indicated below:

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Dated: August 12, 2014

By: /s/ Darryl M. Woo  
Darryl M. Woo

**CERTIFICATE OF COMPLIANCE WITH  
TYPE-VOLUME LIMITATION, TYPEFACE REQUIREMENTS,  
AND TYPE-STYLE REQUIREMENTS WITH FRAP 32(A)(7)(B) AND  
FEDERAL CIRCUIT RULE 32**

1. This brief complies with the type-volume limitation of Federal Rule of Appellate Procedure 32(a)(7)(B) and Federal Circuit Rule 32.

√ This brief contains 13,990 words, excluding the parts of the brief exempted by Federal Rule of Appellate Procedure 32(a)(7)(B)(iii),

2. This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) or Federal Rule of Appellate Procedure 28.1(e) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6).

√ The brief has been prepared in a proportionally spaced typeface using Microsoft Office Word Version 2010, in 14pt., Times New Roman.

/s/ Darryl M. Woo  
(Signature of Attorney)

Darryl M. Woo  
(Name of Attorney)

Respondents-Appellants  
(State whether representing appellant, appellee, etc.)

August 12, 2014  
(Date)