

# **Appellee's Brief**

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U.S. COURT OF APPEALS FOR  
THE FEDERAL CIRCUIT

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BRIEF FOR THE COMMISSIONER OF  
PATENTS AND TRADEMARKS

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UNITED STATES COURT OF APPEALS FOR THE  
FEDERAL CIRCUIT

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Appeal No. 88-1245

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IN RE DIANE M. DILLON

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APPEAL FROM THE BOARD OF PATENT  
APPEALS AND INTERFERENCES

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RULE 47.5 STATEMENT

- (1) No other appeal from the Patent and Trademark Office has been taken with respect to the application involved in this appeal.
- (2) None.

STATEMENT OF JURISDICTION

The Board of Patent Appeals and Interferences had jurisdiction based on 35 U.S.C. § 134.

This Court has jurisdiction over this appeal from the final decision of the Board of Patent Appeals and Interferences under 35 U.S.C. § 141 and 28 U.S.C. § 1295(a)(4)(A).

The appeal is timely under 35 U.S.C. § 142 and 37 CFR § 1.304.



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STATEMENT OF THE ISSUES

In the opinion of the Commissioner there are two issues involved in this appeal:

1. Whether the Board of Patent Appeals and Interferences (Board) erred in affirming the rejection of claims 2 through 14, 22 and 34 through 37 under 35 U.S.C. § 103 as unpatentable over a patent to Sweeney (U.S. Patent No. 4,390,417; Sweeney '417) in combination with patents to Elliott et al. (Elliott), Howk et al. (Howk), Kessler et al. (Kessler), Speh et al. (Speh), White and Neves?
2. Whether the Board erred in affirming the rejections of claims 16 through 22, 24 through 33, 35, 36 and 37 under 35 U.S.C. § 103 as unpatentable over either of Sweeney '417 or another patent to Sweeney (U.S. Patent No. 4,395,267; Sweeney '267) in

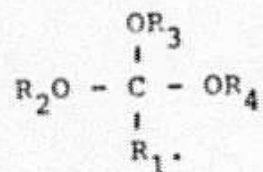


combination with the Elliott, Howk, Kesslin and Speh patents?

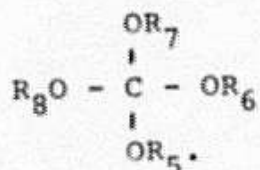
STATEMENT OF THE CASE

A. Proceedings before the Patent and Trademark Office

Applicant filed the application involved in this appeal, Serial No. 06/671,570, on November 15, 1984. The application was a "continuation-in-part" (CIP) of an earlier application. The earlier application disclosed and claimed compositions including a hydrocarbon fuel and orthoesters having three "OR" groups. These orthoesters may be represented by the general formula



Hereinafter we shall refer to these compounds as the "tri-orthoester". The CIP application involved in this appeal, as originally filed, disclosed and claimed compositions which included tri-orthoester as well as orthoesters having four "OR" groups and having the general formula (App. 16)



We shall refer to these compounds as the "tetra-orthoester." In addition, applicant included claims directed to the method comprising combusting the compositions.

By amendment (App. 137 to 148), following the first Office action (App. 133 to 136), applicant limited the claims to compositions and methods including only the tetra-orthoester. The examiner finally rejected the claims (App. 127 to 132) and applicant appealed to the Board. The Board's decision (App. 1 to 11) affirmed the examiner's prior art rejections.

B. Statement of Facts

1. The claimed subject matter

The subject matter recited in claims 2 through 14, 16 to 22 (App. 37 to 40), 36 and 37 (App. 43) is directed to a composition "comprising" two essential components: (1) "a hydrocarbon fuel" and (2) the tetra-orthoester. All of these claims also specify the relative amount of tetra-orthoester in the composition. For example, claim 2 recites the limitation in functional terms (App. 37) as a sufficient amount "to reduce the particulate emissions from combustion of the hydrocarbon fuel." Other claims limit the amount to specific volume percentages of the fuel/orthoester mixture. Thus, claim 4 recites that the orthoester is present "in an amount from about 0.05 to about 49 volume percent of the total volume of the hydrocarbon fuel and orthoester." App. 37. Other claims describe (1) the specific orthoester (e.g., claim 6 limits the orthoester to those where the radicals  $R_5$  to  $R_8$  are derived from aliphatic, alicyclic, or aromatic compounds comprising 1 to

10 carbon atoms); (2) the fuel (e.g. claim 16 recites middle distillate fuel) or (3) the unrecited but permissible components (e.g. claim 36 states that "the composition is essentially free of alcohol").

The remaining claims are directed to a "method of reducing the particulate emissions from combustion of a hydrocarbon fuel . . . ." App. 41. The process comprises the single step of "combusting" the fuel containing the tetra-orthoester.

Applicant's specification provides examples purporting to demonstrate the effectiveness of a tri-orthoester compound and a tetra-orthoester compound as to reduction of particulate emissions. Data is presented for two compounds: (1) trimethyl orthoacetate, a tri-orthoester, and (2) tetramethyl orthocarbonate, a tetra-orthoester. The examples appear to demonstrate that the addition of these specific compounds reduces particulate emissions as compared to #2 diesel fuel without any additive. App. 21 to 31. Applicant did not provide a side-by-side comparison of the effectiveness of the tri- and tetra-orthoesters as fuel additives. The examples also purport to indicate that the tetramethyl orthocarbonate reduces particulate emissions in propane as compared to propane without any additive. App. 32 to 36.



2. The Prior Art

a. The Prior Art Described in Applicant's Specification

Applicant's specification notes that the petroleum industry has encountered numerous problems in supplying hydrocarbon fuels. She notes that atmospheric pollution, particularly particulate emissions, is one of the problems. App. 14, lines 16 to 19. The specification goes on to describe some prior attempts at alleviating the particulate emissions problem using various fuel additives. App. 15.

b. The Sweeney '417 Patent: The use of tri-orthocester as a water scavenger in non-aqueous liquids such as hydrocarbon fuels

Sweeney '417 (App. 72 to 79) is titled "Method for Dewatering Non-Aqueous Liquids." It relates to fuel additives which are added to address a problem encountered with non-aqueous liquids such as hydrocarbon fuels, the removal of entrained water. The patent notes that in diesel fuels

if water is present in amount greater than about 0.05 w %, it is found that that there is undesirably high corrosion of various parts of the diesel engine including fuel pump injectors. This may be a serious problem if after use of such a fuel, the engine is shut down for an extended period of time.

App. 76, col. 1, lines 14 to 20. The patent further teaches that entrained water may interfere with combustion of the fuel (App. 76, col. 1, line 64 to col. 2 line 5):

In the case of diesel fuel, it is possible to feed the hydrocarbon to an engine and to obtain proper combustion even when the fuel contains low water

content. As the water content increases up into the range of 0.05 w % - 0.2 w %, combustion may be obtained with high probability of at least intermittent problems. As water content increases above about 0.2 w %, the ability of an engine to run using diesel fuel is minimized.

The patentee further indicates that the water in diesel fuel is picked up during normal handling, transportation and storage:

Diesel fuel . . . is commonly produced containing substantially no water i.e. less than about 0.01 w %. As it is handled, transported, and stored, it may pick up water in amount up to 5 w %.

App. 76, col. 1, lines 53 to 57.

While the patent focuses on hydrocarbon fuels as a preferred embodiment, the patentee notes (App. 76, col. 1, lines 46 to 48):

The non-aqueous liquids which may be dewatered by the apparatus of this invention may include a wide variety of liquids which are used in commerce.

Sweeney addresses the water problem by adding a dewatering agent to the hydrocarbon fuel. The agent "may be a ketal or acetal or orthoester." App. 76, col. 1, lines 61 to 63. The orthoester is characterized by the formula  $RC(OR')_3$ , the same general formula as that of the tri-orthoester. App. 76, col. 1, lines 67 to 68. "R" and "R'" may be alkyl (that is derived from an aliphatic compound) or cycloalkyl, preferably having 1 to 10 carbon atoms. App. 77, col. 3, lines 1 to 19.

The dewatering agent is added in amounts at least equivalent to the amount of water present, "i.e. in an

amount of at least one mole of ketal or acetal or orthoester per mole of water present." App. 77, col. 3, lines 48 to 51. The amount of dewatering chemical may be as high as 20 moles of chemical for each mole of water. App. 77, col. 3, lines 50 to 56. But Sweeney states that the ratio is "preferably 1.05 - 1.5:1, say 1.1:1." App. 77, col. 3, lines 54 to 55. Sweeney also notes that excess dewatering agent may be added (App. 77, col. 4, lines 17 to 21):

It is a feature of this invention that it is possible to add an excess of dewatering chemical so that the liquid is "buffered" i.e. so that if the liquid is later contacted with additional water a pH below 7, the dewatering chemical will react therewith.

Effective dewatering requires that the mixture of dewatering chemical and non-aqueous liquid be acid, that is the pH of the mixture should be below 7. This level of acidity is obtained by contacting the mixture with an acid resin catalyst. App. 77 col.3, lines 58 to 62. The patentee notes with a pH below 7, the dewatering agent reacts with the water to form an alcohol. App. 77, col. 4, lines 4 to 9. The purpose of the catalyst is to reduce the pH of the mixture, thus creating the proper conditions for reaction of the orthoester with water.

- c. The Sweeney '267 Patent: The use of tri-orthoester as an alcohol/water co-solvent in hydrocarbon fuels

This patent (App. 80 to 83) relates to another problem associated with hydrocarbon fuels, "extending" the fuels to avoid shortages. Sweeney addresses this problem by adding a

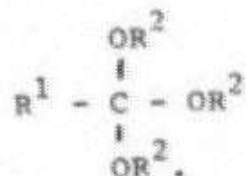


water-miscible alcohol which is substantially immiscible with the fuel and, as a co-solvent, a ketal, acetal or orthoester. App. 81, col. 1, lines 31 to 39. The orthoester is characterized by the formula  $RC(OR')_3$ , the same formula as the tri-orthoester. App. 81, col. 2, lines 65 to 68. Again, R and R' may be  $C_1$  to  $C_{10}$  alkyl groups. App. 82, col. 3, lines 19 to 21. The co-solvent may be added in amounts of 10 to 1000 volumes per 100 volumes of hydrocarbon fuel and preferably in an amount in excess of the amount of alcohol. (App. 82, col. 3, lines 47 to 52).

The extended fuels are said to be single phase compositions with improved stability over extended periods of time. In particular, the fuels remain a single phase in the presence of water which ordinarily causes the separation of the alcohol and fuel. App. 82, col. 3, line 66 to col. 4, line 9. Sweeney indicates that with adequate proportions of acetal, ketal or orthoester the fuels are stable over extended periods of time with unexpectedly high amounts of water and that this is "especially so at a pH below 7." App. 82, col. 4, lines 47 to 51. He believes that the acid acts as a catalyst for the formation of alcohol by the reaction of the co-solvent and water. App. 82, col. 4, lines 12 to 14.

- d. The Elliott Patent: The use of tri- and tetra-orthoester as water scavengers in non-aqueous liquids

The Elliott patent (App. 56 to 64) relates to synthetic esters which have utility in hydraulic fluids. The disclosed orthoesters include those which have the same general structural formula as the tri-orthoester (App. 57, col. 1, lines 8 to 20):



But Elliott also indicates that "R<sup>1</sup>" in the formula may be "the same as OR<sup>2</sup>." App. 57, col. 1, lines 23 to 24. The suggested substitution of OR<sup>2</sup> for R<sup>1</sup> results in a compound with the same general formula as the tetra-orthoester. "R<sup>2</sup>" may be an alkyl radical having one to four carbon atoms. App. 57, col. 1, lines 25 to 26. As to the disclosed orthoesters, Elliott teaches (App. 57, col. 1, lines 53 to 58):

The orthoesters employed in the hydraulic fluids are particularly useful when employed in minor amounts, e.g. 1 to 50 percent by weight, as water scavengers. In a preferred form of the invention the orthoesters are used in amounts of 1 to 30 percent, more preferably 5 to 20 percent by weight. (Emphasis added.)

- e. The Howk, Kesslin and Speh Patents: The chemical properties of tri- and tetra-orthoesters

These references demonstrate that the tetra-orthoester was known in the prior art and that the tri- and

tetra-orthoesters are chemically similar.

Howk (App. 46 to 49) teaches the preparation of acetylenic acetals and orthoesters by reaction of an alkyne with an orthoester. App. 46, col. 1, lines 11 to 16. As shown in Table II (App. 48) both the trialkyl orthoesters (tri-orthoester) and the the tetraalkyl orthoesters (tetra-orthoester) react similarly with a variety of alkynes resulting in the desired acetylenic acetals and orthoesters.

Kesslin (App. 50 to 52) discloses a method of producing purified orthoformic esters. The method may be employed to form trialkyl orthoformate, a tri-orthoester or tetraalkyl orthoformate, a tetra-orthoester. App. 50, col. 2, lines 4 to 9; App. 50, col. 2, line 70 to App. 51, col. 3, line 7.

The Speh patent (App. 53 to 55) relates to the production of tetra-orthoesters of orthocarbonic acid having the general formula  $C(OR)_4$  (App. 54, col. 1, lines 2 to 12).

f. The White and Neves Patents: Propane and acetylene containing hydrocarbon fuels

These patents relate to hydrocarbon fuels containing additives.

White (App. 44 to 45) states (App. 44, col. 2, lines 15 to 25:

In accordance with this invention, ordinary liquified propane is mixed with a normally liquid, hydrocarbon fuel, such as commercial cracked gasoline, benzene, naphtha, or kerosene, or any readily miscible, normally liquid, petroleum or coal tar distillate which will reduce the vapor pressure of the mixture to within the safe pressure working limits of existing butane gas systems . . . .



White also notes a problem with moisture in such hydrocarbon fuels (App. 45, col. 1, lines 9 to 22):

There is some moisture present in most all commercial hydrocarbon fuels and it is highly objectionable in liquified gas systems, because, in cold temperatures, it may freeze and form ice on the regulator valve parts, causing them to stick and cease to function. Even though the present fuel mixture has anti-freeze properties, it is desirable to add some other anti-freeze solution to it to reduce the freezing point of the moistures in the mixture. For that purpose, a small quantity of methyl alcohol, say, about one quart to each hundred gallons of the mixture, may be added, because it has an affinity for the moisture.

Neves (App. 65 to 71) relates to a blended fuel containing ethanol, a gaseous hydrocarbon fuel, lubricating oil, water and a water binding component. The hydrocarbon fuel may be

any gaseous lower alkane, alkene, alkyne, or diene, cycloform thereof, or lower aryl compounds, the preferred additives include gaseous hydrocarbons having from one to six carbon atoms. However, it has been found that acetylene and propane are particularly effective additives because of the affinity of ethanol for these compounds.

App. 67, col. 4, lines 52 to 58. Water is added in an amount up to the amount of ethanol. App. 68, col. 6, lines 7 to 8. In order to prevent phase separation due to the presence of water, a water binding component is added. App. 68, col. 6, lines 39 to 55. While preferring benzene, the patent states that "any well-known binding component which prevents phase separation may be used . . . ." App. 68, col. 6, lines 56 to 58. Neves states that the preferred

concentration of binding agent is from four to ten percent.  
App. 68, col. 6, lines 63 to 65.

g. The Moy et al Patent: Particulate reducing additives in hydrocarbon fuels

This patent (App. 153 to 156) was referred to by the examiner in his Answer (App. 88). Moy et al. (Moy) relates to hydrocarbon fuels containing smoke (particulate) suppressing additives. Moy notes (App. 153, col. 1, lines 23 to 42):

The petroleum industry has encountered problems in supplying middle distillate and heavy residual oils suitable for use in compression ignition and jet engines and which will not contribute materially to the pollution of the atmosphere through soot and smoke formed during the combustion of liquid hydrocarbon fuels. For example, smoke suppressant additives derived from certain metal salts have been employed in distillate hydrocarbon fuels such as diesel fuels, but they are often characterized by a number of deficiencies. Typical shortcomings of prior art metal-containing smoke suppressant additives are thermal instability, poor water tolerance, poor oxidative stability, a tendency toward gel formation, the formation of crankcase deposits as a result of blowby from engine cylinders, and clogging of fuel injectors.

Moy's approach was to use as the smoke suppressant the combination of an ether of hydroquinone and a mixture of isopropyl alcohol and diacetone alcohol. App. 153, col. 1, lines 62 to 71.

Moy also indicates that the effectiveness of a smoke suppressant activity may be expressed as the ratio of the percent of smoke reduction of a particular additive in

question to the percent smoke reduction of a reference additive. App. 154, col. 3, lines 23 to 51.

### 3. The Board's Decision

The Board made specific findings as to the scope and content of the prior art. It found that Sweeney '417 teaches (1) dewatering non-aqueous hydrocarbon liquids such as diesel fuel by addition of components including the tri-orthoester having the general formula  $RCH(OR^1)_3$ ; (2) that the orthoester reacts with water at a pH below 7 to form alcohols; and (3) that excess dewatering agent may be added as a "buffer" to remove any additional water which may be entrained in the fuel. App. 4.

The Board found that the Sweeney '267 patent teaches (1) that middle distillate hydrocarbon fuels may be extended by the addition of immiscible alcohols in the presence of tri-orthoester as a co-solvent; (2) that the co-solvent prevents the formation of two phases due to the presence of water by acting not only as a co-solvent but also by reaction with water to form alcohol; and (3) that Sweeney teaches adding as little as 9 volume percent co-solvent.

The Board also noted that the Sweeney patents did not disclose the tetra-orthoesters recited in applicants' claims. However, it found that

Elliott teaches the equivalence of orthoesters having the formula  $R^1-C(OR^2)_3$ , where  $R^{[1]}$  is hydrogen, an alkyl radical having 1 to 5 carbon atoms, or the same as  $-OR^2$ , which are particularly



useful when employed in minor amounts, e.g., 1 to 50 percent by weight, preferably 1 to 30%, and more preferably 5 to 20%, as water scavengers in non-aqueous liquids (lines 53 to 58 of column 1).

App. 5.

The Board concluded that based upon the close structural and chemical similarity between the tri- and tetra-orthoesters and Elliott's teaching that both orthoesters act as water scavengers, it would have been prima facie obvious to use the tetra-orthoester as a dewatering or water scavenging agent for hydrocarbon fuels.

App. 5

The Board also concluded that the use of the tetra-orthoester would have been prima facie obvious from the teachings of the Sweeney patents alone. It premised this conclusion upon the close structural and chemical similarity between the tri- and tetra-orthoesters and the known use of the tri-orthoester as an additive for hydrocarbon fuels. The Board felt the one having ordinary skill in the art would have had a reasonable expectation that the tetra-orthoester would behave similarly to the tri-orthoester. App. 6.

With respect to the difference in applicant's and Sweeney's purposes in adding orthoesters to fuels, the Board noted App. 7 to 8:

[I]t is well established that differences between appellant's and the prior art's motivation for adding a component to a composition will not alone render the claimed composition, or process, unobvious. To establish unobviousness those

differences must be reflective of unexpectedly superior properties or advantages as compared with the prior art compositions. In re Lintner, 458 F.2d 1013, [1016], 173 USPQ 560, 562 (CCPA 1972).

Furthermore, the explicit appreciation of appellant's particular problem is not dispositive of the issue of obviousness. The mere recitation of a newly discovered function inherently possessed by things and processes in the prior art does not cause claims drawn thereto to distinguish over that prior art.

As to applicant's purported unexpected results, the board felt that the examples failed to demonstrate any unexpected results over the compositions disclosed in the Sweeney patents. App. 9.

The Board specifically addressed the patentability of claims 13 and 14 (App. 6):

With respect to appealed claim 13, White teaches the well-known and obvious use of liquified propane in liquid hydrocarbon fuels ([App.44,] lines 15 to 25 of column 2); and that a small quantity of water scavenger such as methanol may be added (lines 9 to 22 of column 2).

With respect to appealed claim 14, Neves teaches the well-known and obvious use of acetylene as a component in diesel fuels; and that where ethanol and hydrocarbon fuels are blended, the presence of a small amount of water may cause undesired phase separation, and a binding component, such as 4 to 10% benzene should be added (lines 13 to 18 and 48 to 51 of column 3 [App. 67] and lines 55 to 65 of column 6 [App. 68]).

As to the claims which recited that the fuel "is essentially free of alcohol," the Board noted that the specification defined that phrase to mean less than 1% by volume of the hydrocarbon fuel, that Sweeney '417 teaches adding orthoester to fuels which do not contain alcohol and

that Sweeney '267 teaches that the amount of alcohol added may be as low as 5 volumes per 100 volumes of fuel. App. 7.

#### SUMMARY OF THE ARGUMENT

The claimed subject matter would have been prima facie obvious since the combined teachings of the references suggest the claimed composition and method. Where the prior art suggests a significant reason which leads to the claimed subject matter, prima facie obviousness exists notwithstanding the failure of the prior art to teach the inventor's particular purpose.

The examples in applicant's specification fail to provide evidence of any unexpected differences in properties between the claimed and prior art compositions.

Applicant's arguments fail to demonstrate that the Board made any clearly erroneous findings of fact or committed error as a matter of law in its conclusion that the subject matter would have been obvious.

#### ARGUMENT

I. The claimed subject matter would have been prima facie obvious from the combined teachings of the references

A. The references of record suggest utilizing tetra-orthoesters as fuel additives

Both Sweeney patents specifically relate to improvements in hydrocarbon fuels. Both teach tri-orthoesters corresponding to applicant's disclosed tri-orthoesters as an additive for hydrocarbon fuels. Sweeney '417 discloses that tri-orthoesters act as



dewatering agents or water scavengers in fuels where the pH is below 7. Sweeney '267 teaches that the same compounds act as co-solvents for alcohols and hydrocarbon fuels and, under acid conditions, react with water to form alcohol. Sweeney '417 further recommends inclusion of excess (i.e., sufficient) dewatering agent to protect against subsequent water entrainment. The principal difference between the claimed composition and the compositions disclosed in the Sweeney patents is that the orthoester additive used in the Sweeney patents are "tri-" rather than "tetra-" orthoesters. The tetra-orthoesters, however, are not themselves new. The Elliott, Howk, Speh and Kesslin patents teach such compounds. The Elliott patent teaches that tri-orthoesters and tetra-orthoesters have utility as water scavengers in non-aqueous liquids such as hydraulic fluids. We note in this regard that Sweeney '417 expressly teaches that the dewatering agents are not limited to fuels but may be used with "a wide variety of liquids which are used in commerce." App. 76, col. 1, lines 46 to 48. In view of the (1) structural similarity between the tri- and tetra-orthoesters (2) Elliott's teaching that both tri- and tetra- type compounds act as water scavengers, and (3) the chemical similarity demonstrated by the Howk and Kesslin patents, we submit that it would have been prima facie obvious to substitute the tetra-compounds for the tri-orthoesters suggested by the Sweeney patents. The

motivation for making this substitution comes from the expected similarity in properties between the orthoesters. "Structural similarity, alone, may be sufficient to give rise to an expectation that compounds similar in structure will have similar properties." In re Merck & Co., Inc., 800 F.2d 1091, 1096, 231 USPQ 375, 379 (Fed. Cir. 1986) (quoting In re Payne, 606 F.2d 303, 313, 203 USPQ 245, 254 (CCPA 1979)). The expectation of similar properties also comes from Elliott's teaching that both tri- and tetra-orthoesters act as water scavengers and from the disclosure of the similarity in the preparation of the tri- and tetra-orthoesters (Kesslin) and that both react similarly with alkynes (Howk). One having ordinary skill in the art would have had a reasonable expectation that the prior art tetra-orthoesters would work well as water scavengers in hydrocarbon fuels. In re Merck & Co., Inc., supra.

Claims 13 and 14 are similarly unpatentable. These claims include acetylene and propane as the hydrocarbon fuels. App. 39. The White and Neves patents relate to propane and acetylene fuels, respectively. Both patents recognize that steps must be taken to deal with water that is present in the fuel. White, App. 45, col. 1, lines 9 to 22; Neves, App. 68, col. 6, lines 58 to 58. In view of Sweeney's and Elliott's teachings of the use of tri- and tetra-orthoesters as water scavengers and Sweeney's specific teaching that a wide variety of non-aqueous liquids may be

dewatered, it would have been prima facie obvious to utilize tetra-orthoesters as the dewatering or water binding agents in Whites and Neves fuels.

As to applicant's method claims, it must be kept in mind that the method comprises the single step of combusting the fuel orthoester mixture. The principal use for any fuel is combustion. It would, in view of the teachings of the Sweeney, Elliott and the other patents of record, have been prima facie obvious to combust the suggested mixture of tetra-orthoester and fuel. We further note that even if it is assumed, arguendo, that the composition would have been unobvious, this does not require that the otherwise old process similarly be considered unobvious. The substitution of an unobvious starting material into an old process does not necessarily result in an unobvious process. In re Durden, 763 F.2d 1406, 1411, 226 USPQ 359, 362 (Fed. Cir. 1985).

- B. Prima facie obviousness does not require the the prior art suggest applicant's specific purpose for utilizing tetra-orthoester as a fuel additive

We note, as did the Board, that the references relied upon do not expressly teach adding orthoesters to hydrocarbon fuels for the express purpose of particulate reduction. We submit that a conclusion that claimed subject matter would have been prima facie obvious does not require that the prior art disclose or suggest applicant's reasons



or purposes for adding the tetra-orthoester. Long-standing precedent in this Court supports our view.

The factual situation here is on all fours with In re Mod, 408 F.2d 1055, 161 USPQ 281 (CCPA 1969). In Mod, the applicants asserted that the claimed composition was unobvious because applicants discovered that the composition exhibited a property not disclosed in the prior art. Mod claimed certain compounds which, according to Mod's specification, exhibited antimicrobial activity against a variety of microorganisms. The claims were rejected based upon a patent to Bousquet which disclosed a homolog and an isomer of Mod's claimed compounds. The reference taught the latter compounds to be useful as insecticides. Mod's specification also indicated that the prior art compounds had the same or similar antimicrobial activity. Mod argued that the "discovery of the 'unobvious or unexpected' antimicrobial activity of the claimed compounds, not disclosed by the prior art, is sufficient to render 'the subject matter as a whole' unobvious under § 103." 408 F.2d at 1056-57, 161 USPQ at 283. The CCPA rejected this argument holding (408 F.2d at 1057, 161 USPQ at 283):

Inasmuch as the claimed compounds and those of Bousquet do possess a close structural relationship and it is not denied that they have a specific, significant property in common, viz. insecticidal activity, we do not regard the additional antimicrobial activity discovered by appellants for the claimed compounds sufficient ground to hold that the subject matter as a whole is unobvious. It may well be that the present compounds are unobvious antimicrobial agents to

those working in that art. In that event, appellants are not without further recourse. There is no evidence here, however, to contradict the conclusion that the present compounds are obvious insecticides to those working in the insecticide art, and thus have been effectively placed in the public domain by Bousquet who provides adequate motivation to those of ordinary skill to make them. (Emphasis in original, citations omitted.)

The situation here is the same. The prior art teaches that both the tri-orthoesters and tetra-orthoesters have a significant, specific property in common, they act as water scavengers. The prior art further teaches that the tri- and tetra-orthoesters may be made by similar processes and that when used as starting materials, form similar products. The use of the tetra-orthoesters as water scavengers, therefore, would have been prima facie obvious. Additionally, applicant's specification indicates that both compounds, when added to fuels, reduce particulate emissions. This serves to confirm the reasonable expectation that one having ordinary skill in the art that the tri- and tetra-orthoesters would have similar properties.

In re de Montmollin, 344 F.2d 976, 145 USPQ 416 (CCPA 1965) is to the same effect. Applicants there claimed a dye which had the property of dyeing both wool and cotton. The prior art composition was disclosed as useful in dyeing wool. The CCPA stated (344 F.2d at 979, 145 USPQ at 417-18):

Under the circumstances, and weighing the available evidence, we do not regard the additional ability to dye cotton sufficient to

render the subject matter as a whole unobvious. We think the reference teachings provide more than adequate reason to those of ordinary skill for making the present compounds.

Since the prior art establishes that the orthoesters are chemically and structurally similar and the compounds share a significant property in common, applicant's discovery of particulate emission reduction does not compel a conclusion that the subject matter as a whole would have been unobvious.

The facts and arguments for patentability here are also similar to those in In re Kronig, 539 F.2d 1300, 190 USPQ 425 (CCPA 1976). Kronig claimed a process for producing allyl acetate by a reaction which employed a catalyst in the presence of a water. Kronig disclosed that the water acted to extend the life of the catalyst. A primary reference taught the same reaction with a slightly different catalyst, but did not teach using water. A reference to Yasui et al indicated the addition of water to a similar reaction system resulting in increased product yield. The CCPA noted:

Appellants further allege that the effect of water addition which they disclose (to lengthen the service life of the catalyst) is different from the effect of water addition disclosed by Yasui et al. Nevertheless, Yasui et al. provide ample motivation to add water in order to increase product yields, and we do not view the rejection as deficient merely because appellants allege a different advantage resulting from the addition of water. Obviousness under 35 U.S.C. 103 does not require absolute predictability, and it is sufficient here that Yasui et al. clearly suggest doing what appellants have done, viz. adding water. (Citations omitted.)



Here, as in Kronig, the prior art suggests doing what applicant has done, add tetra-orthoesters to a hydrocarbon fuel.

It might be argued that In re Wright, No. 87-1464, slip op. (Fed. Cir. May 24, 1988) holds that a prima facie case requires the prior art to teach or suggest (1) the inventor's purposes for doing what was done, (2) the specific results achieved or (3) the solution to the problem which the inventor set out to solve. To the extent such an argument is correct, then the Wright decision is inconsistent, and cannot be reconciled, with the Mod, de Montmollin, Kronig and other cases<sup>1</sup> which have never been

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<sup>1</sup>E.g., In re Payne, 606 F.2d 303, 316, 203 USPQ 245, 256 (CCPA 1979) ("A finding of obviousness is not precluded . . . when some but not all of the claimed properties are predictable from the prior art"); In re Nolan, 553 F.2d 1261, 1267, 193 USPQ 641, 645 (CCPA 1977) ("Appellant has not shown that the unexpected [properties] have a significance equal to or greater than that of the expected [properties]"); In re Lintner, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972) ("The fact that appellant uses sugar for a different purpose does not alter the conclusion that its use in a prior art composition would be prima facie obvious from the purpose disclosed in the references"); In re Gershon, 372 F.2d 535, 538-39, 152 USPQ 602, 605 (CCPA 1967) ("We think it is sufficient that the prior art clearly suggests doing what appellants have done, although an underlying explanation of exactly why this should be done, other than to obtain the expected superior beneficial results, is not taught or suggested in the cited references").

expressly overruled. We submit that where the prior art suggests a significant reason which would lead one having ordinary skill in the art to the claimed subject matter, a conclusion that the invention would have been prima facie obvious is manifestly justified. If the prior art does not provide a reason or motivation which leads to the invention, the obviousness inquiry must be decided in favor of the patent applicant. Where the art provides a reason, the inquiry must then continue to consider any objective rebuttal evidence.

For example, if the prior art suggests an inventor's compound or composition per se, that compound or composition would be prima facie obvious, regardless of the properties disclosed in the inventor's application. This, however, may or may not be sufficient to support a conclusion that the invention would have been obvious under section 103. Consideration must also be given to the properties of the inventor's compound or composition and those expected from the prior art.

This approach, we submit, is consistent with the approach taken by this Court and its predecessor Courts prior to Wright. Our concern with Wright relates not to the result that the claimed invention was unobvious, but rather to the apparent requirement that a prima facie case requires that the prior art suggest the applicant's properties, results and the particular problem and its solution. The

Court stated the dispositive issue as follows (slip op. at 6):

Thus the question is whether what the inventor did would have been obvious to one of ordinary skill in the art attempting to solve the problem upon which the inventor was working.<sup>2]</sup>

The Court went on to state (slip op. at 8):

The PTO position that the claimed structure is prima facie obvious is not supported by the cited references. No reference shows or suggests the properties and results of Wright's claimed structure, or suggests the claimed combination as a solution to the problem of increasing pitch measurement capacity. It is not pertinent whether Wright's new structure also has the the prior art attribute of increased visibility of the bubble, for that is not his invention.

We feel that these statements may be significant departures from, and are inconsistent with, previous precedent of this Court. For that reason, the Court may wish to reconsider whether the language of Wright is too broad.

We note that had Sweeney '417 taught the addition of tetra-orthoester, for the purpose of scavenging water applicant's particular purpose for adding it would be irrelevant. In re Thuau, 135 F.2d 344, 346, 57 USPQ 324, 325 (CCPA 1943); See Titanium Metals Corp. v. Banner, 778 F.2d 775, 777-79, 227 USPQ 773, 778 (Fed. Cir. 1987). We

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<sup>2</sup>To the extent the answer to this question depends upon whether "'appellant's problem' and the prior art 'present different problems requiring different solutions'" (slip op. at 6-7), we note that both Sweeney and the prior art employed the same solution to different problems, adding an orthoester to the hydrocarbon fuel.



submit that the result should be no different with respect to prima facie obviousness where the prior art teaches or suggests a significant reason for adding the tetra-orthoester.

The proposition that the prima facie case requires consideration of the applicant's particular problem could lead to anomalous results for essentially identically claimed subject matter. For example, two chemists are working on different significant problems associated with hydrocarbon fuels. One is attempting to solve problems relating to water entrainment. The other is independently attempting to find solutions to problems relating to particulate emissions during combustion. The first discovers that the addition of tetra-orthoester results in dewatering. The second chemist discovers, independently, that the addition of tetra-orthoester reduces particulate emissions. Neither knows about the others work. Both apply for patents with claims directed to identical compositions. The examiner cites the same references as were applied below. Applying Wright, it appears that a prima facie case has been established only as to the composition developed to solve the water entrainment problem. Having no prima facie case against the composition which addressed the particulate emission problem, the claims would be allowable over the art. If the first chemist can not present convincing rebuttal evidence, his claims are not and can not

be allowable. We submit it does not make sense to hold a composition unobvious under § 103 if made for one reason but obvious if made for another.

We submit that determination of prima facie obviousness should look to whether the composition (or other statutory class of invention) is suggested by the prior art. If it is, then, in reaching the ultimate legal conclusion as to obviousness, consideration must be given to any available objective evidence of non-obviousness. This approach, we submit, is consistent with precedent of this Court prior to the Wright decision. The former CCPA stated:

This court has indicated that a prima facie case of obviousness is established when it would appear that the reference teachings upon which the Patent Office relies are sufficient for one of ordinary skill in the relevant art to make the combination proposed by the examiner. The inquiry initially centers about the prior art upon which the Patent Office depends for its rejection. (Citations omitted.)

In re Fielder, 471 F.2d 640, 642, 176 USPQ 300, 302 (CCPA 1973); In re Rinehart, 531 F.2d 1048, 1054-55, 189 USPQ 143, 148-49 (CCPA 1976). The CCPA also held in In re Lintner, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972):

In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the references before him to make the proposed substitution, combination or other modification.

See, also, In re Lalu, 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed. Cir. 1984) and In re Clinton, 527 F.2d 1226,

1228, 188 USPQ 365, 367 (CCPA 1976) ("We first consider the references by themselves to see whether they suggest doing what appellants have done.").

II. The data presented by applicant in her specification fails to demonstrate unexpected results probative of nonobviousness

Applicant's specification provides data which is said to show that the claimed subject matter would have been unobvious. The data indicates decreased particulate emissions results from the combustion of a mixture of fuel and orthoester as compared to combustion of the fuel alone. Examples III to XII (App. 21 to 28) show the effect of a tri-orthoester on the combustion of #2 diesel fuel. The data indicates a 10 to 27 percent decrease in particulates as compared to the combustion of #2 diesel fuel alone. Examples XIII to XVIII show the effects of a tetra-orthoester on the combustion of #2 diesel fuel. This data indicates a 7 to 17 percent reduction in particulates as compared to #2 diesel fuel alone. Examples XIX to XXV (App. 32 to 36 relate to the combustion of propane containing a tetra-orthoester. The data indicates a 1 to 5 percent reduction in particulates compared with propane alone.

In order to rebut a prima facie case of obviousness by means of a comparison showing allegedly unexpected results, the claimed subject matter must be compared with the closest prior art. In re Payne, 606 F.2d 303, 316, 203 USPQ 245,



256 (CCPA 1979). The comparison must relate to unexpected differences in properties not just to the existence of an unexpected property. As was stated by the CCPA in In re Hoch, 428 F.2d 1341, 1344, 166 USPQ 406, 409 (CCPA 1970):

Such actual differences in properties are required to overcome a prima facie case of obviousness because the prima facie case, at least to a major extent, is based on the expectation that compounds which are very similar in structure will have similar properties. Therefore, to overcome the prima facie case, it must be shown that the expectation on which it is based was in fact unsound -- as by showing that there are substantial, actual differences in properties. (Emphasis in original.)

The Sweeney patents are the closest prior art and relate to a mixture of tri-orthoester and hydrocarbon fuel. Applicant's examples do not attempt to compare the properties of a tri-orthoester containing mixture with a tetra-orthoester containing mixture. Rather they compare the mixture with fuels not containing any additive. Applicant's data, rather than demonstrating unexpected differences in properties, confirms that both the tri-orthoesters and the tetra-orthoesters have similar properties. Both act to reduce particulate emissions with respect to the combustion of #2 diesel fuel. In fact, the data may indicate that the prior art tri-orthoester is more effective than the tetra-orthoester in reducing particulate emissions. It should be noted, however, that the data for Examples III to IX (App. 21 to 25), relating to the tri-orthoester mixture, and that of Examples XIII through

XVIII (App. 28 to 31) relating to the tetra-orthoester were obtained under different operating conditions and may not be directly comparable.

The failure to demonstrate unexpected differences in properties between distinguishes this case from cases like In re Murch, 464 F.2d 1051, 175 USPQ 89 (CCPA 1972). In Murch not only was the property not disclosed in the prior art, but the applicant showed that the claimed subject matter was superior to the prior art in the undisclosed property. 464 F.2d at 1056, 175 USPQ at 92.

III. Applicant's arguments fail to demonstrate any error in the Board's decision

A. The cited references are from "analogous arts"

The statutorily mandated reference point for establishing obviousness is a "person having ordinary skill in the art." 35 U.S.C. § 103. The hypothetical person is presumed to be aware of all analogous or pertinent prior art. As was stated by this Court in Standard Oil Co. v. American Cyanamid Co., 774 F.2d 448, 454, 227 USPQ 293, 297, (Fed Cir. 1985):

The issue of obviousness is determined entirely with reference to a hypothetical "person having ordinary skill in the art." It is only that hypothetical person who is presumed to be aware of all the pertinent prior art. (Emphasis in original.)

This Court has provided guidance in determining whether a reference is from a nonanalogous art:

The determination that a reference is from a nonanalogous art is therefore two fold. First, we decide if the reference is within the field of the inventor's endeavor. If it is not we proceed to determine whether the reference is reasonably pertinent to the particular problem with which the inventor was involved.

In re Deminski, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986) (quoting from In re Wood, 599 F.2d 1032, 1036, 202 USPQ 171, 174 (CCPA 1978)). The person having ordinary skill in the art is also presumed to have knowledge of references which are directed to the same technological field as the claimed subject matter. In re Skoll, 523 F.2d 1392, 1396, 187 USPQ 481, 484 (CCPA 1975).

We submit that all the claimed references are reasonably pertinent to the field of the inventor's endeavor. The field of applicant's endeavor is the improvement of hydrocarbon fuels. The record indicates that those working in this field have a number of concerns. As demonstrated by the Moy patent (App. 153 to 156) and the prior art discussed in applicant's specification (App. 15), a concern in the art is reduction of particulate emissions. The Sweeney, White and Neves patents demonstrate that those working in the art are also concerned with water entrainment. We further submit that the hypothetical person looking for additional solutions to the problems involved with hydrocarbon fuels would look to areas which are faced with similar problems. The Elliott patent is pertinent to the water entrainment problem. The hypothetical person of



ordinary skill working with fuel additives would also be concerned with the chemical properties and the method of manufacture of additives. The Elliott, Speh, Howk and Kesslin patents are relevant for this purpose. Thus, we submit that the art relied upon is reasonably within the field of applicant's endeavor, the improvement of hydrocarbon fuels and to the problems involved therewith. One having ordinary skill in the arts related to improvement of hydrocarbon fuels would be presumed to have knowledge of the cited references.

B. The Sweeney patents are relevant to the claimed subject matter

Applicant asserts that the Sweeney patents are not relevant to the claimed subject matter. Br. 13 to 21. The principal reason is that Sweeney does not teach use of the tetra-orthoesters. While the Board did indicate its view that the claimed subject matter would have been obvious over the Sweeney patents alone, the rejection affirmed by the Board was premised upon a combination of references. Nonobviousness can not be shown by attacking references individually where the rejection is based upon a combination of references. In re Keller, 642 F.2d 413, 426, 208 USPQ 871, 882 (CCPA 1980). In re Young, 403 F.2d 754, 757, 159 USPQ 725, 728 (CCPA 1968). The Elliott patent provides the teaching that both the tri- and tetra-orthoesters act as water scavengers. In view of the similarity in chemical structures of the two compounds and that both compounds act

as water scavengers in non-aqueous liquids, we submit it would have been prima facie obvious to use tetra-orthoester as a water scavenger in hydrocarbon fuels.

Applicant asserts that the Sweeney patents scavenge water by a catalytic mechanism, which is inherently unpredictable and that the "board decision merely concludes without evidence that orthoester (II) would have similar properties to orthoester (I) in the catalytic environment disclosed in Sweeney's patents." Br. 18 to 19. Sweeney '267 does indicate that the water scavenging may be catalyzed by acid. App. 82, col. 4, lines 12 to 14. However, the patent does not teach that stabilization results only when the pH is above 7. Rather, stabilization is characterized as being especially good at a pH below 7. App. 82, col. 4, lines 47 to 51. We also note that the mixture of tetra-orthoester and hydrocarbon fuel would be useful even at a pH above 7. Sweeney '417 teaches adding excess orthoester against the possibility of additional water entrainment. App. 77, col. 4, lines 17 to 21. If water is later found in the mixture and the pH is above 7, one need only pass the mixture through the acid catalyst to effect removal of the water.

Contrary to applicant's assertions the record provides ample support for a conclusion that the tri-orthoesters and tetra-orthoesters would have similar properties. The structures are similar, Elliott teaches that both act as

water scavengers, Kessler teaches that the trialkyl orthoformates and tetraalkyl orthoformates may be made by similar processes and Howk teaches that both tetraalkyl orthoesters and trialkyl orthoesters react similarly with alkynes. We submit, therefore, that the board's finding that the tri- and tetra-orthoesters would act as water scavengers in non-aqueous liquids, such as hydrocarbon fuels, has not been shown to be clearly erroneous. Applicant's examples, demonstrating that both compounds reduce particulate emissions, merely confirms the expected similarity in properties. We further note that applicant has not provided any evidence which demonstrates that there are any unexpected differences in properties between the tri- and tetra-orthoesters. In re Hoch, 428 F.2d 1341, 1344, 166 USPQ 406, 409 (CCPA 1970).

- C. The board did not use impermissible hindsight in reaching its decision.

Applicant asserts that the board used hindsight to "reconstruct" the invention. We submit that impermissible hindsight was not employed.

Any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such as reconstruction is proper.

In re McLaughlin, 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971). The references of record provide ample factual



support for the Board's conclusion that the claimed subject matter would have been obvious. No information present only in applicant's specification is necessary to support the Board's decision.

D. Applicant's remaining arguments are not convincing

Applicant argues (Br. 36 to 40) that inherency is not a valid issue. The Board's statement with respect to inherency was made in response to applicant's argument that her purpose for adding the orthoesters is different than those of the prior art. In partial response the Board stated (App. 7 to 8):

[T]he explicit appreciation of appellant's particular problem is not dispositive of the issue of obviousness. The mere recitation of a newly discovered function inherently possessed by things and processes in the prior art does not cause claims drawn thereto to distinguish over that prior art. Appellant cannot remove from the public domain via a patent that which is inherently taught by the prior art, i.e., the use of orthoesters as additives to hydrocarbon fuels. (Emphasis added.)

This statement is totally consistent with the Mod, de Montmollin and Kronig cases previously discussed. Each of those cases involved expected unexpected properties. The unexpected properties were manifestly "inherent" in the obvious inventions.

Applicant argues (Br. 43 to 47) for patentability based upon the limitations exemplified by those in claim 34. She argues that claim 34 is additionally patentable since it requires the fuel to be essentially free of alcohol and is

dependent upon a claim which limits the concentration of tetra-orthoester to 0.1 to 5.0 volume percent. Applicant also notes that according to Sweeney's teaching alcohol will form in situ due to the reaction of orthoester and water.

As to the amount of orthoester, Sweeney indicates the addition of relatively low amounts of dewatering agent, preferably 1.05 to 1.5 moles for every mole of water. App. 77, col.3, lines 51 to 56. Water may be present up to five weight percent. App. 76, col. 1, lines 53 to 57. While an actual estimate of the volume percent of dewatering additive can not be made without information as to the specific gravities of the diesel fuel and the additive, it appears that the volume percent will be similar to the 0.1 to 5.0 volume per cent claimed. Additionally, we note that applicant has not demonstrated any criticality or associated any unexpected results with the particular amounts of orthoester.

With respect to the "essentially free of alcohol" limitation, we note as did the Board, that Sweeney '417 adds the dewatering agent to fuels which are "essentially free of alcohol" and that no evidence has been presented which establishes any different or unexpected results due to limiting the amount of alcohol. We also note that applicant has not indicated that the tetra-orthoesters of her claims do not similarly react with any water present to form alcohol.

CONCLUSION

For the reasons stated above, applicant has failed to demonstrate that the Board clearly erred as to its factual finding or committed error as a matter of law as to its conclusion that the claimed subject matter would have been obvious.

Respectfully submitted,

  
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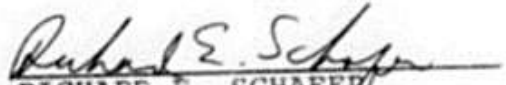
Date: June 14, 1988



CERTIFICATE OF SERVICE

I hereby certify that on June 14, 1988 I caused two copies of the foregoing BRIEF FOR THE COMMISSIONER OF PATENTS AND TRADEMARKS to be mailed by United States mail (first-class, postage prepaid), addressed as follows:

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