

IN THE UNITED STATES PATENT OFFICE

APPLICATION OF)
 RALPH H. MUNCH) FEBRUARY 6, 1975
 SERIAL NUMBER 412,939) GROUP ART UNIT 213
 FILED: NOVEMBER 5, 1973) EXAMINER: E. A. GOLDBERG
 TITLE: CAPACITOR AND DIELECTRIC)
 IMPREGNANT COMPOSITION)
 THEREFOR)

B
 BRIEF ON BEHALF OF RALPH H. MUNCH

 WILLIAM H. DUFFEY
 FOR APPELLANT

Commissioner of Patents

Washington, D.C. 20231

Sir:

Appellant filed this appeal on November 12, 1974 from the final rejection dated July 16, 1974 of Claims 1-7 in the above-identified application. Appellant filed an Amendment Under Rule 116 on October 15, 1974 which was entered by the Examiner. On January 6, 1975 appellant was granted a one month extension of time in which to file this brief.

Authorization is enclosed herewith to charge Deposit Account No. 13-4125 for the statutory fee of \$50.00 required for filing a brief in support of this appeal.

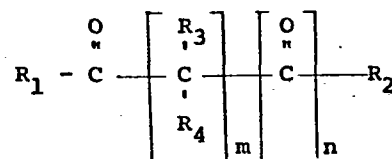
Appellant does not wish to be granted an oral hearing in this appeal. Three copies of this brief are submitted herewith for the convenience of this Honorable Board.

The appealed claims are reproduced below in their present form.

DSW 435859

THE CLAIMS

1. An electrical capacitor comprising at least two electrodes and a dielectric sheet positioned therebetween, said dielectric sheet and interstices between said dielectric sheet and said electrodes being impregnated with a dielectric liquid composition comprising at least one ketone having an atmospheric boiling point greater than about 150°C. and represented by the structure



wherein R_1 and R_2 have a combined carbon atom content of less than 20 and are individually alkyl, alkenyl, phenyl, tolyl, naphthyl, substituted phenyl, substituted tolyl or substituted naphthyl wherein the substituted aromatic radicals individually contain no more than 18 carbon atoms; R_1 and R_2 can further be part of the same moiety which comprises a cyclic ketone wherein R_1 and R_2 together provide 4 or more contiguous carbon atoms to form a chain; R_3 and R_4 are individually hydrogen or C_1 to C_8 alkyl; n is zero or 1; and m is a whole number from zero to 6, provided that if n and m are both 1 then neither R_3 or R_4 can be hydrogen.

2. A capacitor of Claim 1 wherein the composition contains from about 0.001 to 8 percent by weight of an epoxide stabilizer.

3. A capacitor of Claim 2 wherein the composition contains from about 0.1 to 3 percent by weight of 3,4-epoxycyclohexyl-methyl-3,4-epoxycyclohexane carboxylate.

4. A capacitor of Claim 2 wherein the ketone is selected from the group consisting of dimethyl benzophenone, cyclohexanone and acetophenone.

5. A capacitor of Claim 2 wherein the composition further contains a non-ketonic organic compound selected from the group consisting of an ester of a carboxylic acid, an alkyl benzene, alkyl naphthalene, alkyl biphenyl, alkyl polyphenyl, alkaryl ethers and alkyl-substituted derivatives thereof, diaryl alkanes and alkyl-substituted derivatives thereof, and diaryl ethers and alkyl-substituted derivatives thereof wherein said alkyl groups and alkanes have from 1 to about 20 carbon atoms, said aryl radicals are benzene, naphthalene, biphenyl or polyphenyl and said polyphenyls include from 3 to about 5 phenyl groups.

6. A capacitor of Claim 5 wherein the ester is selected from the group consisting of aliphatic dicarboxylic acids having from 4 to 10 carbon atoms and aromatic dicarboxylic acids having from 8 to 16 carbon atoms.

7. A capacitor of Claim 1 wherein the dielectric sheet is selected from the group consisting of paper, polyolefin film, and combinations thereof.

THE INVENTION

Appellant's invention is directed to electrical capacitors of the type having wound or stacked conducting layers (Drawing reference numerals 11, 12) separated by dielectric spacer sheets (Drawing reference numerals 13, 14). The dielectric sheets and surrounding interstices are impregnated with a liquid dielectric composition in order to realize the greatest

dielectric strength of the capacitor dielectric material.

Appellant's improved capacitors are characterized by impregnation with a dielectric liquid composition comprising at least one ketone having an atmospheric boiling point greater than about 150°C. and represented by the chemical structure of Claim 1. Exemplary ketones within the present invention are dimethyl benzophenone, cyclohexanone and acetophenone. Under some conditions it is advisable to mix the ketone with one or more non-ketonic organic compounds of Claim 5. Epoxide stabilizers are preferably employed in the dielectric composition.

DESCRIPTION OF THE REFERENCES

The references relied upon by the Examiner are as follows:

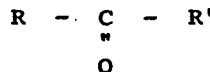
Coggins et al (U.S.P. 2,418,820)

The Coggins et al reference relates to electrical condensers in which castor oil or a mixture containing castor oil is employed as the dielectric impregnating medium. The term "ketones" appears once in this reference in column 7 at line 62, being recited in the broad context of ". . . fatty acid esters or mixtures thereof such as vegetable oils or waxes, and also to other fatty acid derivatives such as ketones". The Coggins et al reference, employed by the Examiner as the primary reference, claims only two types of dielectric compositions, viz., castor oil and alkyl ricinoleates, particularly glycerol triricinoleate.

Ralston et al (U.S.P. 2,039,837)

This reference discloses dielectric materials for electrical apparatus comprising a ketone having the structural

formula

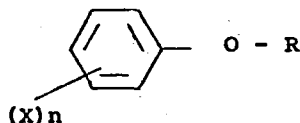


wherein R is either an aryl or a heterocyclic radical and R' is an alkyl radical containing at least 11 carbon atoms.

The "mixed ketones" described by Ralston et al are mostly of wax-like consistency and are solid at room temperature. See the melting points of 29 representative mixed ketones illustrated on pages 1 and 2 of the patent, all of which points are substantially higher than room temperature. The ketones disclosed and claimed by Ralston et al are intended for insulating use in electrical wires and cables as well as in electrical condensers.

Munch et al (U.S.P. 3,745,432)

This reference discloses electrical capacitors impregnated with mixed halogenated aliphatic-aromatic ethers represented by the structure



wherein R is an alkyl of from one to about 10 carbon atoms, each X is individually chlorine, fluorine or bromine, and n is 1 or 2. There is no mention of ketones in the specification or claims.

Handbook of Chemistry and Physics, 47th Edition 1966-1967
Published by Chemical Rubber Co., Cleveland, Ohio
(Page E-55)

This Handbook reference recites dielectric constants

of pure organic liquids. The Handbook was cited for its disclosure of the dielectric constant of cyclohexanone. The same citation enumerates the dielectric constants of many other classes of organic liquids as well as certain other ketones.

Fields (U.S.P. 2,930,811)

The Fields reference discloses liquid mixtures of polycarboxylates obtained by the free-radical catalyzed addition of certain alkyl benzenes and certain alkyl or alkoxyalkyl esters of acrylic acid. Fields does not disclose ketones of any type or class.

Eustance (U.S.P. 3,754,173)

Eustance discloses electrical capacitors impregnated with an aromatic ester such as dioctyl phthalate which has been stabilized with an epoxide such as diglycidyl ether of bisphenol A.

THE EXAMINER'S REJECTIONS

Claims 1 and 7 stand rejected under 35 USC 103 as unpatentable over Coggins et al in view of Ralston et al, Munch and the Handbook. The Examiner urges that both Coggins et al and Ralston et al broadly disclose the use of ketones mixed with other dielectrics for capacitor impregnants. He further urges that the use of an old material (a ketone) would be obvious because of pollution problems of chlorinated materials as evidenced by Munch. In the Examiner's view, the particular ketone employed would be no more than the choice of a known material (i.e., a particular ketone) based upon its intended use. The Examiner

draws attention to the Handbook wherein a particular ketone within the present claims, viz., cyclohexanone, is disclosed as a dielectric liquid.

Claims 2-6 stand rejected under 35 USC 103 for the same reasons as set forth above in further view of Fields and Eustance. The Examiner deems it obvious to use an epoxide compound as a scavenger or stabilizer, noting Munch and Eustance. The use of additional dielectric components were deemed obvious by the Examiner, with attention drawn to Ralston et al and Fields.

The Examiner urges that there appears to be nothing critical relative to the particular ketone or ketone-containing mixture claimed by appellant.

THE ISSUE

The sole issue involved in this appeal is whether Claims 1-7 are unpatentable over the cited references under the provisions of 35 USC 103.

APPELLANT'S ARGUMENTS

For the reasons set forth hereinafter, appellant respectfully traverses the Examiner's conclusion regarding obviousness of the present invention. Turning first to the primary reference of Coggins et al, appellant respectfully urges this Honorable Board to observe that the word "ketone" is mentioned only once in the entire specification and claims of the primary reference. Appellant wonders how such a casual mention of such a broad chemical class can be construed as suggestive of appellant's invention herein? Coggins et al used the term "ketones" as their way of exemplifying "other fatty acid derivatives" to

which the principles of their invention were said to be applicable. When one reads the teachings of Coggins et al in column 7 between lines 55 and 75, one must surely gain the impression that such disclosure cannot be suggestive of the specific class of ketone dielectric liquid compositions disclosed and claimed by appellant.

Appellant has carefully set forth the chemical boundaries which he considers to represent his invention. Appellant has imposed clear carbon atom limitations within his claims. Appellant has accurately defined the scope of his aryl substituents. How can it be urged that Coggins et al is suggestive of appellant's discovery within the spirit and meaning of 35 USC 103?

The Ralston et al reference, cited by the Examiner as a secondary reference, clearly fails to supply the palpable deficiencies of the primary reference. The ketones of Ralston et al, described as "mixed ketones", must be melted prior to their use with electrical apparatus. What Ralston et al were seeking was an insulating and dielectric material having a high dielectric constant, possessing good heat resistance, being unaffected by atmospheric conditions, being difficult to oxidize, and having a low vapor pressure. See page 1, column 1, at lines 31-35. It was not their intent to seek a superior dielectric liquid composition having outstanding properties as a capacitor impregnant. No capacitor performance or life data is found in that reference. No mention is made of key parameters such as dissipation factor. Indeed, Ralston et al were exclusively in pursuit of solid insulating materials. See column 1 on page 1, lines 46-57.

To further distinguish Ralston et al from appellant's invention, attention is drawn to the chemical scope of the claimed ketones in that reference. The substituent "R" in Claim 1

of Ralston et al must be either aryl or heterocyclic and is preferably an aryl group. The substituent "R'" is a relatively long chain alkyl radical wherein there must be at least 11 carbon atoms. It is not surprising to a chemist, therefore, that these high molecular weight ketones are usually solid at room temperature. Heptadecyl phenyl ketone is a typical compound claimed in Ralston et al. The R' group therein is heptadecyl having 17 carbon atoms. The R group is phenyl which has 6 carbon atoms making a total of 23 carbon atoms in the two substituent groups. Now compare this with Claim 1 of this appeal wherein R₁ and R₂ must have a combined carbon atom content of less than 20. Appellant's capacitor impregnants are liquid compositions by definition. See Claim 1 where the word "liquid" is carefully and advisedly employed. Support for the term "liquid" runs through appellant's entire specification. Also see page 14 of appellant's specification at line 21 et seq. wherein a preferred method of introducing the impregnating dielectric liquid is described. The liquid is admitted to the capacitor assembly through fill hole 21 which is seen in FIG. 2 of the instant drawing. Thermal melting of the impregnant prior to introduction into the capacitor, as advocated and necessitated by the teachings of Ralston et al, is neither appropriate nor desirable in appellant's invention. Thus, the long chain alkyl groups in the ketones of Ralston et al are not appropriate for the present invention. In this regard see pages 5-8 of the instant specification wherein the alkyl substituents in R₁ and/or R₂ are usually lower alkyl groups such as C₁ to C₃. Compare this to the alkyl substituent R' of Ralston et al which must be at least C₁₁.

To further distinguish the present invention from the

teachings of Ralston et al, the melting points of several representative ketones within the present scope are listed below. Please note that each of these ketones is clearly a liquid at room temperature (at 26°C.) whereas the ketones of Ralston et al are solids.

<u>Ketone</u>	<u>Melting Point °C.</u>
2-Nonanone	- 8
2-Octanone	- 20.9
Acetophenone	19.7
Cyclohexanone	- 45
3-Decanone	14
4-Decanone	- 9

In this prosecution record the Examiner urged that solid ketones are contemplated by appellant in view of page 8, line 10, of the specification. Appellant maintains that, in any event, the "dielectric liquid composition" described in his claims is necessarily liquid at room temperature. Page 8 of the specification merely alludes to that particular situation wherein an admixture of one or more ketones may be utilized wherein one of the ketones is itself semisolid or solid at room temperature. The dielectric liquid composition is nonetheless a liquid when it is prepared for introduction into the capacitor assembly as an impregnant.

The key point which appellant seeks to stress herein with respect to the Ralston et al reference is that the Ralston et al reference teaches away from the use of dielectric liquid compositions comprising ketone substituents. Therein lies a profound distinction between the Ralston et al reference and appellant's claims. The Courts have consistently held that non-

obviousness can be supported if the relevant prior art teaches away from the new invention being claimed. Such is the precise set of facts herein. In support of this proposition, appellant draws attention to the following language of the District Court of Delaware in the case of W. L. Gore and Associates, Inc. v Carlisle Corporation, 183 USPQ 459 (1974).

"If principle teaches away from discovery of patent in suit, fact that it [the principle] was generally accepted prior to invention supports determination that invention was not obvious."

Turning now to the Munch reference, appellant finds no basis for the Examiner's contention that "the use of the old material ketone would be obvious because of pollution problems of chlorinated materials as evidenced by Munch". If the Munch reference is suggestive of ketones without mentioning ketones, why is it not equally suggestive of aldehydes? Why not amines? Why not alcohols? Aldehydes, amines and alcohols are as old as ketones and their dielectric constants are comparable to ketones according to the Handbook reference cited by the Examiner. Appellant finds no persuasion in the Examiner's statement that the use of ketones as capacitor impregnants would be obvious because of recent data showing that certain of the polychlorinated biphenyls are resistant to natural degradation. Such a statement is not supported by evidence.

Turning now to the Handbook, the Examiner has cited that reference for the disclosure of cyclohexanone as "a dielectric liquid". Appellant claims cyclohexanone (among many other ketones) as an improved impregnant for electrical capacitors. How can the Handbook function as a secondary reference in rejecting appellant's Claims 1 and 7 under 35 USC 103? The Handbook recites dielectric constants

of pure liquids which include a host of organic compounds. It is noted that only the dielectric constant is provided in the Table. There is no mention of boiling point, vapor pressure, biodegradability, volatility, compatibility with an epoxide scavenger, etc. Appellant urges that a mere tabular summary of dielectric constants of organic liquids does not, ipso facto, suggest that any of those liquids would perform as superior capacitor impregnants. Dielectric constant data alone is not an indicator of a superior impregnant. How could the Handbook have been suggestive to appellant in view of the encyclopedic recitation of different types of chemical compounds? How could the Handbook be considered suggestive of cyclohexanone when cyclohexanone is but one of perhaps 100 varied compounds appearing on the same page in the same Table? Why is the Handbook more suggestive of cyclohexanone than it is of benzaldehyde, or pyridine, or hexanol, or cresol, or benzoyl chloride, or perhaps 50 other possibilities? Appellant asks this Honorable Board, therefore, to give no more weight to the Handbook as a 35 USC 103 reference than it fairly deserves. That is, the Handbook does no more than confirm quantitatively the dielectric constant of certain ketones within the scope of appellant's claims.

The Fields reference does not disclose ketones of any kind, least of all the select class of liquid ketones disclosed and claimed by appellant herein. While Fields could be said to disclose some of the non-ketonic organic compounds of appellant's Claim 5, there is no teaching or suggestion in Fields to combine its teachings with any of the other references of record herein. It must necessarily fail, therefore, as a secondary reference.

The Eustance reference is directed to a capacitor im-

pregnant comprising an aromatic ester together with an epoxide stabilizer or scavenger. Since the essential ketonic element is neither taught nor suggested by Eustance, the latter must necessarily fail as a secondary reference.

Appellant draws attention to the surprising nature of his discovery which resides in the unexpected performance of the claimed ketones vis-a-vis conventional type impregnants. See the Table on page 16 of the specification and the first paragraph on page 17 wherein no failures of the test capacitors occurred during the accelerated life test while the control capacitors suffered 100% failure at the same conditions. The control capacitor impregnant was electrical grade polychlorinated biphenyl containing about 42% chlorine, a widely known and widely used conventional impregnant. Through these unexpected results, appellant has indeed made a contribution to the art of impregnating capacitors, a contribution which is neither taught nor suggested by the art of record. Appellant urges, however, that his unexpected results are not essential to his claim to patentability. Attention is drawn to the following language of the District Court of Illinois, Northern District, Eastern Division, in the case of Nuclear-Chicago Corporation et al v Nuclear Data, Inc., 173 USPQ 326 (1972):

"Unexpected results although a strong indication of non-obviousness, are not a prerequisite for patentability."

Appellant does urge, however, that the unexpected results set forth in the specification do indeed traverse the Examiner's statement that appellant's invention represents "an obvious selection process of picking known ketones". Appellant likewise traverses the Examiner's contention that no evidence has been presented as to the criticality of appellant's particu-

lar ketones and/or ketone admixtures. Appellant maintains that such a showing of criticality is not incumbent upon him because he has already presented in this prosecution record a prima facie rebuttal to each of the references employed in an attempt to show obviousness under 35 USC 103. Indeed, appellant has shown that the sole reference which discusses in detail the use of ketones in electrical apparatus (the Ralston reference) actually teaches away from ketones having the chemical structure embraced by appellant's claims. Appellant reiterates his position that one having ordinary skill in the capacitor art would be led away from the present invention if he were to follow the teachings and suggestions of the art of record herein. Appellant has discovered the unexpected qualities of ketones heretofore not deemed worthy of application in electrical capacitors. To this extent appellant has contributed a significant advancement in the art which is clearly deserving of patentable merit. A showing of criticality by the appellant is uncalled for herein as illustrated by the case of In re Kroekal and Pfaff, 183 USPQ 610 (1974), wherein the Court of Customs and Patent Appeals stated that:

"When applicant seeking patent for a chemical composition claims a range of proportions for various elements thereof, he need not demonstrate the criticality of his selection of a particular range unless such criticality is essential to non-obviousness."

In view of the foregoing remarks, the Honorable Board of Appeals is respectfully urged to reverse the Examiner's final rejection of Claims 1 through 7 and to hold said claims allowable in their present form.

Respectfully submitted,

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