

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte DON LEE KLEYER and
MICHAEL ANDREW LUTZ

Appeal No. 2006-2649
Application No. 10/336,259

ON BRIEF

Before ADAMS, GRIMES, and LEBOVITZ, Administrative Patent Judges.

GRIMES, Administrative Patent Judge.

DECISION ON APPEAL

This appeal involves claims to an electrically conductive silicone composition, which the examiner has rejected as obvious. We have jurisdiction under 35 U.S.C. § 134. We affirm.

Background

“Silicone adhesives are useful in a variety of applications by virtue of their unique combination of properties.” Specification, page 1. The specification discloses “a curable silicone composition for preparing a silicone adhesive and more particularly . . . a condensation-curable silicone composition containing an electrically conductive filler and a hydroxy-functional organic compound.” Id. The silicone composition is said to

have “numerous advantages, including good flow, low VOC (volatile organic compound) content, and adjustable cure. Moreover, the present silicone composition cures to form a silicone adhesive having good adhesion and unexpectedly superior electrical conductivity as evidenced by low contact resistance and/or volume resistivity.” Page 3. “The silicone composition . . . is useful for preparing an electrically conductive silicone adhesive. . . . In particular, the silicone adhesive is useful for bonding electronic components to flexible or rigid substrates.” Id.

Discussion

1. Claims

Claims 1-17 are pending and on appeal. The claims stand or fall together. See the Appeal Brief, page 3. We will consider claim 1 to be representative. Claim 1 reads as follows:

1. A curable silicone composition for preparing a silicone adhesive, the composition prepared by mixing:
 - (A) an organopolysiloxane containing an average of at least two silicon-bonded hydroxy groups per molecule;
 - (B) a crosslinking agent in an amount sufficient to cure the composition; wherein the agent is selected from (i) at least one silane having the formula $R^2_nSiX_{4-n}$ wherein each R^2 is independently selected from monovalent hydrocarbon and monovalent halogenated hydrocarbon groups having from 1 to about 8 carbon atoms, n is 0 or 1, and X is $-OR^2$ or $-OCH_2CH_2OR^2$; (ii) a partial hydrolyzate of (i), and (iii) mixtures comprising (i) and (ii);
 - (C) an electrically conductive filler in an amount sufficient to impart electrical conductivity to the silicone adhesive, wherein the filler comprises particles having at least an outer surface of a metal selected from the group consisting of silver, gold, platinum, palladium, and alloys thereof;
 - (D) an effective amount of a hydroxy-functional organic compound having a molecular weight up to about 1000 and containing at least one hydroxy group per molecule, provided the compound does not substantially inhibit cure of the composition; and
 - (E) a catalytic amount of a condensation catalyst comprising a metal salt of a carboxylic acid.

Claim 1 is directed to a composition comprising an organopolysiloxane, a crosslinking agent, a condensation catalyst, metal-coated electrically conductive particles, and “an effective amount of a hydroxy-functional organic compound having a molecular weight up to about 1000.” The specification states that “[e]xamples of hydroxy-functional compounds . . . include, but are not limited to, monohydric alcohols such as methanol, ethanol, propanol, [etc.], . . . ; [and] dihydric alcohols such as ethylene glycol, propylene glycol . . . , [and] 1,4-butanediol.” Page 11, lines 7-15.

The specification defines an “effective amount” as a “concentration . . . such that the silicone composition cures to form a silicone adhesive having improved electrical conductivity, initial contact resistance and/or volume resistivity, compared with a similar silicone composition lacking only the hydroxy-functional organic compound.” Page 12, lines 4-8.

2. Obviousness

The examiner rejected claims 1-17 under 35 U.S.C. § 103 as obvious in view of La Scola¹ and Asai.² The examiner stated that La Scola teaches an electrically conductive silicone composition comprising all of the components recited in instant claim 1, except for the hydroxy-functional organic compound. See the Examiner’s Answer, page 3. The examiner cited Asai for its teaching of polysiloxane compositions containing hydroxy-functional organic compounds, and reasoned that a person of ordinary skill in the art would have been motivated to add a hydroxy-functional compound to La Scola’s composition based on Asai’s teaching that such compounds

¹La Scola et al., U.S. Patent 4,777,205, issued October 11, 1988

²Asai, Japanese Patent Application 03-128968, published May 31, 1991

prevent formation of “a silicon carbide/oxide film at the surface of [an electrical] contact when exposed to electrical energy.” Examiner’s Answer, pages 4-5.

We agree with the examiner that the cited references would have made the composition of claim 1 prima facie obvious. As the examiner noted, La Scola teaches all of the components of the claimed composition except for the hydroxy-functional organic compound: an organopolysiloxane with at least two hydroxy groups per molecule (see column 2, lines 14-25 and 51-53); a crosslinking agent of the recited formula (see column 3, lines 28-52); an electrically conductive filler comprising silver-coated mica particles (see column 1, lines 67-68); and a metal salt of a carboxylic acid as a condensation catalyst (see column 5, lines 29-32).

Asai teaches that “silicone products are used in electrical equipment. . . . For example, . . . silicone rubber compositions are used as adhesives, sealants, casting agents, coating agents, etc.” Page 2. “[W]hen such silicone products are used in the vicinity of electrical contacts . . . a decline in the conductivity of the electrical contacts may occur, and, in extreme cases, conduction may disappear altogether and electrical contact functionality may be lost.” Page 3. Asai explains why:

[S]ilicone products typically contain . . . volatile organosiloxane oligomers as by-products and residues of the starting materials. . . . [I]t is believed that faulty conduction at electrical contacts is due to the fact that organosilane or organosiloxane oligomers . . . volatilize at normal temperature or under heating and, upon reaching an electrical contact, undergo a chemical change under the influence of the discharge energy . . . and form insulating substances, such as silicon dioxide, silicon carbide, etc.

Id.

Asai teaches that this problem can be avoided by including an alcohol or glycol in the silicone composition. See page 4, third and fourth paragraphs ("It is an object of the present invention to provide . . . a silicone composition which . . . will not cause conduction faults at electrical contacts. . . . This object is obtained by using a silicone composition containing alcoho[ls] . . . or glycols."). Asai teaches that suitable alcohols and glycols include "methanol, ethanol, propanol, butanol, . . . ethylene glycol, propylene glycol, [and] 1,4-butanediol." Page 7, fourth paragraph. Finally, Asai teaches that the disclosed composition "is suitable for use in the vicinity of electrical contacts . . . as well as for use in electrical insulating materials, electrically conductive materials, protective coating materials," etc. Page 9, third paragraph (emphasis added).

We agree with the examiner that a person of ordinary skill in the art would have found it obvious to combine a hydroxy-functional organic compound with the silicone composition taught by La Scola. The suggestion to do so is provided by Asai, which teaches that a silicone composition that includes an alcohol or glycol (hydroxy-functional organic compounds) does not cause conduction faults at electrical contacts.

Appellants argue that "one skilled in the art would not be motivated to combine the disclosures of La[]Scola and Asai." Appeal Brief, page 6. Appellants reason that La[]Scola relates to an electrically conductive composition comprising silver coated mica particles. Asai does not teach or suggest any compositions containing silver coated mica particles or any electrically conductive filler. Therefore, La[]Scola and Asai are not within the same field of endeavor because La[]Scola relates to a conductive composition and Asai does not.

Id.

This argument is not persuasive. La Scola relates to an electrically conductive silicone composition, and teaches that the composition “may be employed . . . as electrically conductive gaskets, as electrically conductive adhesives, as encapsulating agents for electronic components and as cores for ignition cables.” Col. 11, lines 6-9. Asai relates to silicone compositions for use in electrical equipment, and teaches that the compositions are suitable “for use in electrical insulating materials, electrically conductive materials, [etc.] in sealed or semi-sealed electrical equipment.” Page 9, third paragraph (emphasis added). Since both La Scola and Asai relate to silicone compositions for use in electrically conductive components, we do not agree that the references are not within the same field of endeavor.

Appellants also argue that La Scola and Asai teach away from each other because “La[]Scola discloses purposely adding organo silanes and unreactive, organopolysiloxane diluents that evaporate at room temperature to the compositions . . . [and] Asai discloses [that] organosiloxane oligomers and organo silanes can cause a problem.” Appeal Brief, page 7.

This argument is also unpersuasive. Asai teaches that “silicone products typically contain . . . volatile organosiloxane oligomers as by-products and residues of the starting materials. In addition, . . . volatile organosiloxane oligomers or organosilanes may be used together with the organopolysiloxane.” Page 3, first full paragraph. Asai also discloses that the “organosilane or organosiloxane oligomers” are responsible for the loss of conductivity of electrical contacts. See id.

However, Asai teaches that this problem can be avoided by including an alcohol or glycol in the silicone composition. See page 4, fourth full paragraph, and page 7,

fourth full paragraph. Asai's teachings are not restricted to a particular silicone composition; Asai teaches more generally that adding alcohols or glycols solves the problems experienced with silicone compositions. Thus, assuming that those skilled in the art would have expected La Scola's composition to cause the loss of electrical conductivity discussed by Asai, they also would have expected that adding an alcohol or glycol to the composition would overcome that problem, as taught by Asai. Therefore, we do not agree that the references would have taught away from their combination.

Finally, Appellants argue that the prior art references do not suggest that adding a hydroxy-functional organic compound to La Scola's composition "would provide improved initial contact resistance and/or volume resistivity to the composition or a cured product thereof." Appeal Brief, page 8. Appellants argue that therefore, the cited references do not provide a motivation to combine or a reasonable expectation of success. See id., pages 8 and 9.

We do not find this argument persuasive. Granted, the references do not discuss what effect a hydroxy-functional organic compound would be expected to have on the contact resistance or volume resistivity of a silicone composition. However, prima facie obviousness does not require the prior art to suggest combining elements for the same reason that Appellants combined them. See In re Dillon, 919 F.2d 688, 692-93, 16 USPQ2d 1897, 1901 (Fed. Cir. 1990) ("[I]t is not necessary in order to establish a prima facie case of obviousness . . . that there be a suggestion in or expectation from the prior art that the claimed compound or composition will have the same or a similar utility as one newly discovered by applicant.").

Here, the cited references disclose all of the components of the instantly claimed composition, and would have suggested combining those components in order to produce an electrically conductive silicone composition that does not cause conduction faults at electrical contacts. The references therefore support a prima facie case of obviousness, which Appellants have not rebutted. The rejection under 35 U.S.C. § 103 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

Donald E. Adams)
Administrative Patent Judge)
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) BOARD OF PATENT
Eric Grimes)
Administrative Patent Judge) APPEALS AND
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