United States Patent

Schneider

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[54] CLEANSING AGENT COMPOSITION

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[52] **U.S. Cl.**.....**252/171,** 106/311, 252/364

[51] **Int. Cl.**.....**C09d 9/00,** C11d 7/50, C23g 5/02

[58] **Field of Search** 252/171, 170, 66–69, 252/364; 106/311; 260/652.5

[56] **References Cited**

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[57] **ABSTRACT**

A cleansing agent for removing polar and nonpolar soils from electrical packages which is suitably active on both polar and nonpolar soils, is nonflammable, has a narrow boiling range of 113°–121$\pi\zeta$ c., and includes the azeotrope of 2-ethoxyethanol and tetrachloroethylene, with an excess of the latter of approximately 15 to 70 percent by weight.

3 Claims, No Drawings

CLEANSING AGENT COMPOSITION

BACKGROUND OF INVENTION

1. Field of Invention

This invention relates to azeotropes generally, and particularly to azeotropic mixtures which in combination with a component of the azeotrope are nonflammable.

2. Prior Art

In the Industry in which electronic packages are prepared, many soldering operations are performed and the flux residues which accumulate must be removed, otherwise the integrity of the electronic package is impaired. Some of these residues are ionizable materials, and others are in the nature of organic materials such as resins. The problem of removing both of these residues, in order to achieve a completely clean, residue-free electronic package is considerable. The ideal solvent should first of all be a material which does not have a flash point. Secondly, it is desirable that it be a true azeotrope so that its composition under all normal conditions of use will remain constant; and also so that it may be recovered after extensive use in order to be reused. The factor of economy, constant unvarying composition, and ability to recover or reconstitute the material are economic factors which are important in industry. The solvent must be capable of removing nonpolar residues, and it also must be capable of removing polar residues.

Various polar solvents combined with nonpolar solvents form azeotropic mixtures, but these azeotropes fall short of having the desired characteristics, either because they are flammable, or because their polar activity is too low to remove ionizable materials. The search for an azeotrope has not developed a material which has not only sufficient polar activity, but which is also sufficiently nonflammable to perform satisfactorily upon electronic packages. Those composed of sufficient polar solvents to perform satisfactorily on ionizable materials invariably are flammable. Those azeotropes which are nonflammable, have invariably been found to have too little polar solvent activity to make them satisfactory for use in the Industry.

SUMMARY OF THE INVENTION

It has found that an azeotropic mixture with an excess of components thereof could be prepared, which would be nonflammable and nevertheless had sufficient nonpolar and polar activity as to have an excellent solvent action upon electronic packages, completely removing both ionizable material and resinous residues. In addition, although the mixture was not entirely an azeotrope, the boiling range of the azeotrope and nonpolar solvent was in such a narrow range (113°–121° C.) that for all practical purposes the mixture functioned substantially like an azeotrope for vapor degreasing, and also had a substantially constant composition during its use. In addition, it was found that the composition had no flash point although one of the components separately would flash. An excess of nonpolar solvent beyond that sufficient to form an azeotrope with the polar solvent, apparently suppressed the normal characteristics of the azeotrope as to its flash point, and the cleansing agent did not flash.

PREFERRED EMBODIMENT

The polar solvent discovered as suitable for mixture was 2-ethoxyethanol. This material has a flash point of 120° F. It is an excellent polar solvent but by virtue of its flash point, it is unsatisfactory for ordinary use except under the most guarded conditions. The nonpolar solvent discovered for the mixture was tetrachloroethylene. This material has no flash point. The polar solvent and the nonpolar solvent are mixed in a ratio of one to nine by weight. An azeotropic mixture with an excess of nonpolar solvent results. The azeotropic mixture is approximately 10 percent by weight of polar solvent and 50.6 percent by weight on nonpolar solvent making a total azeotrope weight of 60.6 percent by weight of the entire mixture. This leaves an excess 39.4 percent by weight of nonpolar solvent.

In the use of this solvent for cleaning polar and nonpolar soils from electronic packages, the flash point of the azeotrope which is 208° F. may be exceeded without danger of the combination of azeotrope and nonpolar solvent flashing. Due to the presence of the polar solvent in the azeotrope in the amount of 10 percent, excellent removal of polar soils and residues is achieved, since this particular solvent is not only present in sufficient amounts, but it is also a very efficient polar solvent. In addition, the nonpolar solvent being present in the mixture in the amount of 90 percent, (in part as part of the azeotrope and in part as excess) the nonpolar soils and residues are removed with a high degree of efficiency. The dangers incidental to the materials flashing are obviated for the mixture of azeotrope and excess nonpolar solvent has no flash point and mixture functions continuously as a cleansing agent wherein the polar and nonpolar solvents are at all times present in substantially the same amounts to efficiently cleanse the electronic package. The narrow boiling range: 113°–121° C. permits the azeotrope and the excess nonpolar solvent to function substantially as an azeotrope.

While the amount set forth for the polar and nonpolar solvents constitute a preferred embodiment, it has been found that they may be varied within a limited scope. The polar solvent may be reduced from 10 percent to 5 percent or increased as high as 14 percent, and the mixture will still function with a high degree of efficiency on ionizable soils and will not have a flash point. If the polar solvent is reduced to less than 5 percent the mixture will not be sufficiently polar to efficiently remove ionizable soils. If the polar solvent is increased to above 14 percent the mixture will have a flash point. The reduction of 2-ethoxyethanol to 5 percent by weight brings a corresponding increase of tetrachloroethylene to 95 percent by weight, and conversely 14 percent of the former brings a corresponding decrease of the latter to 86 percent. Within this range, the azeotrope is present by weight in the amounts of 30.3 percent to 84.8 percent by weight, while the excess over the azeotrope, of tetrachloroethylene varies in the range of 69.7 percent to 15.2 percent by weight. The excess over the azeotrope within this range apparently prevents the azeotrope from having a flash point. In this percentage range the polar solvent enters completely into the azeotropic mixture with a part of the nonpolar solvent, and it is present in sufficient amounts to efficiently remove polar soils. When the nonpolar solvent is varied within the range from 95 percent to 86 percent by weight, it is able to function as a nonflammable excess material in addition to the azeotrope mixture; the excess apparently accomplishes the suppression of the flash point of the azeotrope. The desirable attributes of this solvent mixture are due at least in part to the fact that the boiling point of the excess material (the nonpolar solvent) and the boiling point of the azeotrope (and azeotropic mixture of polar and nonpolar solvents) are in a very narrow range i.e., 113°–121° C. (235°–250° F.). This narrow boiling range endows the mixture of azeotrope and excess material with suitable characteristics for vapor degreasing, being absent a flash point, and also for removal of soils by physical contact with the solvent by immersion or spraying.

It is conventional to add to cleansing agents, certain well known stabilizers, antioxidants, acid acceptors, wetting agents and water. Such additions are merely a matter of choice and do not constitute a part of the invention.

The foregoing description is merely intended to illustrate an embodiment of the invention. The component parts have been shown and described. They each may have substitutes which may perform a substantially similar function; such substitutes may be known as proper substitutes for the said components and may have actually been known or invented before the present invention.

It is claimed:

1. A cleansing agent composition for removing polar and nonpolar soils from electronic packages consisting essentially of by weight

a. 39.4 percent tetrachloroethylene; and

b. 60.6 percent of an azeotropic mixture of 50.6 percent tetrachloroethylene and 10.0 percent 2-ethoxy ethanol.

2. A cleansing agent composition for removing polar and nonpolar soils from electronic packages according to claim 1 in which the composition has a boiling range of 113° to 121° C.

3. A cleansing agent composition for removing polar and nonpolar soils from electronic packages consisting essentially of by weight

a. 5–14 percent 2-ethanol;

b. 86–95 percent tetrachloroethylene;

c. wherein 30.3–84.8 percent is the azeotrope; and

d. wherein 15.02–69.7 percent is the excess tetrachloroethylene.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,637,513 Dated January 25, 1972

Inventor(s) Alvin F. Schneider

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 2, "5-14 percent 2-ethanol" should read -- 5-14 percent 2-ethoxy ethanol -- ; line 5, "15.02-69.7" should read -- 15.2-69.7 -- .

Signed and sealed this 12th day of December 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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