

Description

The present invention relates to a cleaning agent and method for removal of rosin-base solder fluxes and more particularly to a cleaning agent and method for removal of rosin-base solder fluxes for assembly.

5 A rosin-base solder flux is used in production of modules for printed circuit boards, printed wiring boards or the like. Generally soldering is conducted to promote the union between the substrate and pins and to prevent oxidation in contact points which impairs electrical conductivity. Rosin-base fluxes are employed to accomplish the soldering as desired. After soldering, a cleaning agent is used to remove only the flux selectively and completely. When the cleaning agent fails to completely remove the flux, the
10 remaining flux adversely affects the soldering, giving disadvantages of circuit corrosion, reduction of electrical insulating properties on board surfaces and eventual breakdown of circuits. To eliminate such potential disadvantages, the residual flux, particularly the activator present therein, is usually removed by a proper cleaning agent.

Halogenated hydrocarbon solvents such as trichloroethylene, trichlorotrifluoroethane and like flons have
15 been heretofore used as cleaning agents for removal of rosin-base fluxes. However, stringent regulations for control of such halogenated hydrocarbon solvents have been laid down to solve or alleviate the environmental pollution problems such as the depletion of ozone layer. Currently there is an urgent demand from the electric machine industry for development of cleaning agents for fluxes as a substitute for flons.

In recent years, various halogen-free cleaning agents for fluxes have been developed. For example,
20 alkali saponification type cleaning agent has been proposed. Such cleaning agent, which is in the form of an aqueous solution, does not have a problem of being inflammable, but has the drawback of having a low cleaning efficiency such that the board should be contacted with the solution for a long period of time with heating, and there is a danger that the metal parts of the board may be corroded. On the other hand, non-alkali saponification type cleaning agents have also been proposed. DE-C-858485 discloses a composition
25 for removing of solder flux comprising phosphoric acid and a nonionic surfactant. However, no cleaning agent has been provided which can completely fulfil all property requirements for cleaning agents including cleaning property, toxicity, odor, inflammability, etc.

For this reason, we conducted an intensive research in an attempt to solve the foregoing problems and consequently found that when a specific glycol ether compound and a nonionic surfactant is conjointly used
30 as the essential ingredients, the foregoing problems can be solved. Based on this finding, we accomplished the invention described in Japanese Patent Application No. Hei 1-291905.

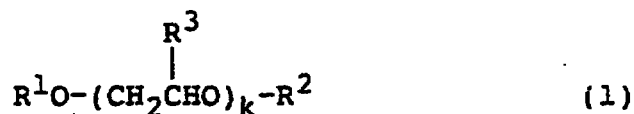
If the cleaning properties of a cleaning agent for removing solder fluxes is substantially retained when the cleaning agent is diluted with water, such diluted cleaning agent in the form of an aqueous solution or emulsion has the advantages of being less inflammable, being inexpensive and considerably reducing the
35 load of waste water treatment. The specification of the above Japanese patent application discloses that the cleaning agent described therein can be used as diluted with water. However, there is a tendency that the cleaning ability of said cleaning agent is reduced when it is used as diluted with water.

It is an object of the present invention to provide a halogen-free cleaning agent for removal of solder fluxes which has an excellent cleaning property, especially when used as diluted with water, and which is
40 substantially satisfactory in characteristics meeting the environmental quality standard, odor, inflammability, etc.

We conducted extensive research to achieve the foregoing object and found that a cleaning agent comprising as active ingredients a specific glycol ether compound, a nonionic surfactant and a phosphate anionic surfactant surprisingly is free of all the above-mentioned problems. We have accomplished the
45 present invention based on this novel finding.

According to the present invention, there is provided a cleaning agent for removal of a rosin-base solder flux, the cleaning agent comprising a mixture of

(A) at least one glycol ether compound represented by the formula (1)



55 wherein R¹ is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, R² is an alkyl group having 1 to 5 carbon atoms, R³ is a hydrogen atom or a methyl group and k is an integer of 2 to 4,
(B) a nonionic surfactant, and

(C) a phosphate anionic surfactant.

The present invention also provides a cleaning method for removing a rosin-base flux, the method comprising bringing the above cleaning agent into contact with the rosin-base flux.

Examples of the glycol ether compounds of the formula (1), i.e., Component (A) of the cleaning agent for the rosin-base solder flux of the invention, are diethylene glycol monomethyl ether, diethylene glycol dimethyl ether, diethylene glycol monoethyl ether, diethylene glycol diethyl ether, diethylene glycol methyl ethyl ether, diethylene glycol monopropyl ether, diethylene glycol dipropyl ether, diethylene glycol methyl propyl ether, diethylene glycol ethyl propyl ether, diethylene glycol monobutyl ether, diethylene glycol dibutyl ether, diethylene glycol methyl butyl ether, diethylene glycol ethyl butyl ether, diethylene glycol propyl butyl ether, diethylene glycol monopentyl ether, diethylene glycol dipentyl ether, diethylene glycol methyl pentyl ether, diethylene glycol ethyl pentyl ether, diethylene glycol propyl pentyl ether, diethylene glycol butyl pentyl ether; the corresponding tri- or tetraethylene glycol ethers; and the corresponding di-, tri- or tetrapropylene glycol ethers, etc. These compounds are usable singly or at least two of them can be used in a suitable combination.

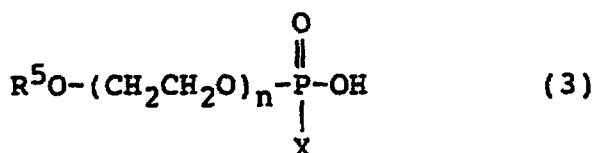
The nonionic surfactant, i.e., Component (B) of the cleaning agent for rosin-base solder flux of the invention, can be selected without particular limitation from various known surfactants in so far as it has nonionic characters. Typical examples thereof are polyoxyethylene alkyl ether wherein the alkyl group has at least 6, particularly 6-22, carbon atoms, polyoxyethylene phenyl ether, polyoxyethylene alkylphenyl ether and like polyethylene glycol ether-based nonionic surfactants; polyethylene glycol monoester, polyethylene glycol diester and like polyethylene glycol ester-based nonionic surfactants; adducts of ethylene oxide and higher aliphatic amine; adducts of ethylene oxide and fatty acid amide; sorbitan fatty acid ester, sugar fatty acid ester and like polyhydric alcohol-based nonionic surfactants; fatty acid alkanol amide; the corresponding polyoxypropylene-based nonionic surfactants; and polyoxyethylene-polyoxypropylene copolymer-based nonionic surfactants. These nonionic surfactants are usable singly or at least two of them can be used in combination.

Among the above-exemplified surfactants, polyethylene glycol ether-based nonionic surfactants are desirable in view of the cleaning property of the cleaning agent, and more preferable are surfactants represented by the following formula (2)



wherein R^4 is a straight- or branched-chain alkyl group having 6 to 20 carbon atoms, preferably 10 to 14 carbon atoms, phenyl group, or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms and m is an integer of 2 to 20, preferably 3 to 16.

As the phosphate anionic surfactant, i.e., Component (C) of the invention, various known phosphate anionic surfactants can be used without particular limitation. Preferable examples thereof are surfactants represented by the following formula (3)



wherein R^5 is a straight- or branched-chain alkyl group having 5 to 20 carbon atoms, phenyl group, or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms, n is an integer of 0 to 20, preferably 3 to 16 and X is a hydroxyl group or a group represented by the formula (4)



wherein R^6 is a straight- or branched-chain alkyl group having 5 to 20 carbon atoms, phenyl group, or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms and n is as defined above, or salts thereof. Examples of such salts are metal salts such as sodium salt and potassium salt, ammonium salts, alkanolamine salts such as monoethanolamine salt, diethanolamine salt or triethanolamine salt and the like.

Particularly preferred phosphate anionic surfactants are polyoxyalkylene phosphate surfactants of the formula (3) wherein R^5 is a straight- or branched-chain alkyl group having 10 to 15 carbon atoms, n is an

integer of 8 to 12 and X is a hydroxyl group or a group of the formula (4)



5 wherein R^5 is a straight- or branched-chain alkyl group having 10 to 15 carbon atoms and n is an integer of 8 to 12.

The polyoxyalkylene phosphate surfactants represented by the formula (3) and the salts thereof are widely marketed, for example, under the tradenames of "PLYSURF" series (products of Dai-ichi Kogyo Seiyaku Co., Ltd.), "N-1000FCP", "RA-574" and "RA-579" (products of Nihon Nyukazai Kabushiki Kaisha) and the like.

10 There is no specific restriction on the proportions of said glycol ether compound (A), nonionic surfactant (B) and phosphate anionic surfactant (C). The cleaning agent of the invention preferably contains a mixture comprising:

about 10 to about 95 wt.% of Component (A),
15 about 5 to about 90 wt.% of Component (B), and
about 0.1 to about 90 wt.% of Component (C),

and more preferably contains a mixture comprising:

about 50 to about 90 wt.% of Component (A),
about 10 to about 60 wt.% of Component (B), and
20 about 0.5 to about 60 wt.% of Component (C). In each case, the total of Component (A), Component (B) and Component (C) must add up to 100 wt.%.

When required, the cleaning agent of the invention may contain additives such as defoaming agent, anti-oxidizing agent or the like. Such additive, if used, is added in an amount of about 0.1 wt.% or less based on the weight of the cleaning agent of the invention.

25 The cleaning agent of the invention comprising the glycol ether compound (A), the nonionic surfactant (B) and the phosphate anionic surfactant (C) is used for removing rosin-base fluxes, particularly those for assembly. Fluxes to be removed by the cleaning agent of the invention include inactive rosin fluxes consisting essentially of rosin, modified rosin or like rosin compound, and active rosin fluxes consisting essentially of such rosin compound and an activator (e.g. organic or inorganic acid salts of amine
30 compounds such as triethanolamine hydrochloride, triethylene-tetramine hydrochloride, cyclohexylamine hydrochloride, aniline hydrochloride, etc.). Significant effect is produced by the cleaning agent of the invention especially when it is used for removing active fluxes for assembly.

The cleaning agent of the invention can be brought into contact with the rosin-base flux on a substrate such as printed circuit board and the like by the following methods. The cleaning agent of the invention
35 consisting of the active ingredients, i.e., a mixture of the glycol ether compound (A), the nonionic surfactant (B) and the phosphate anionic surfactant (C) is used as it is, or used in the form of an aqueous solution having a concentration of the mixture of the active ingredients in the range of about 10% by weight or more but less than 100% by weight, preferably about 70% by weight or more but less than 100% by weight. The substrate may be directly immersed in the thus obtained aqueous solution or in the active ingredients per
40 se. Alternatively the aqueous solution may be sprayed over the substrate to flush it therewith, or the active ingredients per se or the aqueous solution may be brought into contact with the rosin-base flux on brushing by mechanical means. A suitable method is selected from these methods.

The cleaning agent of the invention is applied under the conditions suitably determined according to the concentration of the active ingredients in the cleaning agent to be used, the proportions of the active
45 ingredients, the kind of a flux to be removed, and the like. Usually the cleaning agent of the invention is brought into contact with a flux at a temperature and for a period of time effective to remove the flux. The temperature for cleaning is usually in the range of from room temperature to about 80°C, and is preferably between about 50°C and about 70°C. For removal of a flux on a substrate by the immersion method at a temperature of e.g. about 60°C, the substrate bearing a flux is usually immersed in the cleaning agent of
50 the invention for about 1 to about 5 minutes, whereby the flux can be eliminated effectively.

Following the cleaning operation, the substrate is then washed with water as a finishing step, whereby the cleaning agent possibly remaining on the substrate is completely washed away. Such rinsing leads to high level of cleanness.

Such rinsing can be carried out in various ways, such as, by dipping in running water, dipping in water
55 under application of ultrasonic wave, spraying with water or the like. Rinsing is conducted at a temperature and for a period of time effective to remove the cleaning agent and to thereby achieve a high degree of cleanness. The rinsing is usually conducted at a temperature ranging from room temperature to about 70°C. When the rinsing is conducted by showering or dipping, the time required for completion of the

rinsing is usually about 30 seconds to about 5 minutes. In any event, the rinsing is continued until the substrate becomes clean enough for a particular purpose.

The cleaning agent of the invention can exhibit a flux-removing effect higher than or at least as high as conventional halogenated hydrocarbon type cleaning agents and can accomplish a high degree of flux removal.

The present invention can additionally provide the following advantages.

(i) The cleaning agent of the invention is halogen-free and does not pose the ozone depletion problem as caused by flon-type cleaning agents.

(ii) The cleaning agent of the invention, containing the glycol ether compound of the formula (1), is slightly inflammable in the absence of water. However, an explosion-proof cleaning apparatus specially designed is not required and commercially available conventional cleaning apparatus for flons is useful as it is or as slightly modified because the glycol ether compound has an flash point of about 70 °C and is classified as "a petroleum of the third kind" stipulated by the Japanese Fire Services Act.

(iii) The cleaning agent of the invention, when used as diluted with water, can achieve the advantages, for example, of reducing the danger of inflammation, rendering the agent less expensive and considerably reducing the load of waste water treatment while retaining sufficient cleaning ability.

(iv) The cleaning agent of the invention emits very low degree of odor, hence satisfactory in this regard as well.

According to the invention, there are provided a halogen-free solder flux-cleaning agent outstanding in a cleaning property and fully satisfactory in properties meeting environmental quality standard in respect of environmental disruption, inflammability, odor, etc. as well as a cleaning method using the solder flux-cleaning agent.

The present invention will be described below in more detail with reference to the following examples.

Example 1

A cleaning agent of the invention was prepared by admixing 68 parts by weight of diethylene glycol dimethyl ether and 10.8 parts by weight of polyethylene glycol alkyl ether nonionic surfactant (trade name "NOIGEN ET-135", a surfactant of the formula (2) wherein R^4 is a branched chain alkyl group having 12 to 14 carbon atoms and m is 9, product of Dai-ichi Kogyo Seiyaku Co., Ltd.), 1.2 parts by weight of mono-(polyoxyethylene alkyl ether)phosphate (a) (a surfactant of the formula (3) wherein R^5 is a C_{12} straight-chain alkyl group, n is 16 and X is a hydroxyl group) and 20 parts by weight of pure water.

A rosin-base flux (trade name "Resin Flux #77-25", product of LONCO Co., Ltd.) was applied to the entire surface of a fine-pattern printed circuit board prepared from a copper-clad laminate and dried at 130 °C for 2 minutes and the board was subjected to soldering at 260 °C for 5 seconds to produce a test board.

The test board was immersed in the foregoing cleaning agent at room temperature for 1 minute and the degree of removal of the flux was inspected with the unaided eye and evaluated according to the following criteria. Table 1 shows the results.

A : The flux was removed to a satisfactory extent.

B : A little quantity of the flux remained unremoved.

C : A considerable quantity of the flux remained unremoved.

Subsequently, the test board was washed with showering water and dried, and the cleanness (concentration of the residual ions) of the test board was determined according to MIL P 28809 with use of an Omega-meter 600 SE (trade name for a product of KENKO Co., Ltd.). Table 1 shows the results.

Examples 2 to 8 and Comparative Example 1

The degree of removal of flux and the cleanness of the test board were evaluated in the same manner as in Example 1 with the exception of changing the composition of the cleaning agent or the cleaning temperature as shown in Table 1. Table 1 shows the results.

Examples 9 to 19 and Comparative Example 2

The degree of removal of flux and the cleanness of the test board were evaluated in the same manner as in Example 1 with the exception of changing the kind of surfactant(s) as shown in Table 1.

In Table 1, the surfactants used are as follows.

- "NOIGEN EA-120", (product of Dai-ichi Kogyo Seiyaku Co., Ltd., polyethylene glycol nonylphenyl ether nonionic surfactant, a surfactant of the formula (2) wherein R^4 is a nonylphenyl group and m is 5)
- "NOIGEN EA-143" (product of Dai-ichi Kogyo Seiyaku Co., Ltd., polyethylene glycol dodecylphenyl ether nonionic surfactant, a surfactant of the formula (2) wherein R^4 is a dodecylphenyl group and m is 10)
- "SORGEN TW20" (product of Dai-ichi Kogyo Seiyaku Co., Ltd., polyoxyethylenesorbitan monolaurate, the average number of moles of ethylene oxide added is 12)
- "EPAN420" (product of Dai-ichi Kogyo Seiyaku Co., Ltd., polyoxyethylene-polyoxypropylene block copolymer)
- (a): Mono(polyoxyethylene alkyl ether)phosphate (a surfactant of the formula (3) wherein R^5 is a C_{12} straight-chain alkyl group, n is 16 and X is a hydroxyl group)
- (b): Di(polyoxyethylene aralkyl ether)phosphate (a surfactant of the formula (3) wherein R^5 is a nonylphenyl group, n is 10 and X is $C_9H_{19}-C_6H_4-O(CH_2CH_2O)_{10}-$)
- (c): Mono(polyoxyethylene aralkyl ether)phosphate (a surfactant of the formula (3) wherein R^5 is a nonylphenyl group, n is 18 and X is a hydroxyl group)
- (d): Mono(polyoxyethylene alkyl ether)phosphate ammonium salt (a surfactant of the formula (3) wherein R^5 is a dodecyl group, n is 14 and X is a hydroxyl group and wherein the two hydroxyl groups thereof are neutralized with ammonia)
- (e): Mono(polyoxyethylene alkyl ether)phosphate sodium salt (a surfactant of the formula (3) wherein R^5 is a dodecyl group, n is 14 and X is a hydroxyl group and wherein the two hydroxyl groups thereof are neutralized with sodium hydroxide)

(f): Lauryl phosphate

Table 1

Component (A)	Component (B)	Component (C)	Cleaning agent composition (A)/(B)/(C)/water (wt.%)	Cleaning temp. (°C)	Degree of Removal	Degree of cleanliness Contamination of equivalent NaCl (µg/inch)
Ex.1 DEGDME	NOIGEN ET-135	(a)	59.5/9.45/1.05/30	Room temp.	A	6.8
Ex.2 DEGDME	NOIGEN ET-135	(a)	59.5/9.45/1.05/30	50	A	3.7
Ex.3 DEGDME	NOIGEN ET-135	(a)	49/17.5/3.5/30	50	A	3.3
Ex.4 DEGDME	NOIGEN ET-135	(a)	33.95/33.95/2.1/30	50	A	4.4
Ex.5 DEGDME	NOIGEN ET-135	(a)	28/21/21/30	50	A	6.5
Ex.6 DEGDME	NOIGEN ET-135	(a)	42.5/6.75/0.75/50	50	A	8.8
Ex.7 DEGDME	NOIGEN ET-135	(a)	85/13.5/1.5/0	50	A	3.1
Ex.8 DEGDME	NOIGEN ET-135	(a)	21/14/35/30	50	A	6.5
Ex.9 DEGDME	NOIGEN ET-135	(a)	59.5/9.45/1.05/30	50	A	3.8
Ex.10 DEGDME	NOIGEN EA-120	(a)	59.5/9.45/1.05/30	50	A	4.1
Ex.11 DEGDME	NOIGEN EA-120	(a)	59.5/9.45/1.05/30	50	A	5.3
Ex.12 DEGDME	NOIGEN EA-143	(a)	59.5/9.45/1.05/30	50	A	3.8

Table 1 (continued)

Component (A)	Component (B)	Component (C)	Cleaning agent composition		Cleaning temp. (°C)	Degree of cleaning of contamination of equivalent NaCl (µg/inch ²)
			(A)/(B)	(C)/water (wt.%)		
Ex.13 DEGDME	SORGEN TW20	(a)	59.5/9.45/1.05/30	50	A	4.8
Ex.14 DEGDME	EPAN 420	(a)	59.5/9.45/1.05/30	50	A	5.1
Ex.15 DEGDME	NOIGEN ET-135	(b)	59.5/9.45/1.05/30	50	A	3.6
Ex.16 DEGDME	NOIGEN ET-135	(c)	59.5/9.45/1.05/30	50	A	3.5
Ex.17 DEGDME	NOIGEN ET-135	(d)	59.5/9.45/1.05/30	50	A	3.7
Ex.18 DEGDME	NOIGEN ET-135	(e)	59.5/9.45/1.05/30	50	A	3.7
Ex.19 DEGDME	NOIGEN ET-135	(f)	59.5/9.45/1.05/30	50	A	4.5
Comp. Ex.1 DEGDME	NOIGEN ET-135	None	49/21/0/30	50	B	10.8
Comp. Ex.2 DEGDME	NOIGEN EA-120	None	49/21/0/30	50	B	11.5

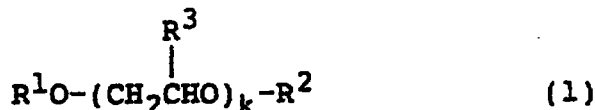
DEGDME: Diethylene glycol dimethyl ether

DEGMBE: Diethylene glycol monobutyl ether

DEGDDE: Diethylene glycol diethyl ether

Claims

1. A cleaning agent for removal of a rosin-base solder flux, the cleaning agent comprising a mixture of
(A) at least one glycol ether compound represented by the formula (1)



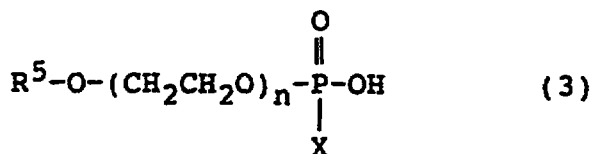
wherein R^1 is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, R^2 is an alkyl group having 1 to 5 carbon atoms, R^3 is a hydrogen atom or a methyl group and k is an integer of 2 to 4,
(B) at least one nonionic surfactant, and
(C) at least one phosphate anionic surfactant.

2. A cleaning agent according to claim 1 wherein the nonionic surfactant is a surfactant represented by the formula (2)

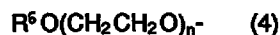


wherein R^4 is a straight- or branched-chain alkyl group having 6 to 20 carbon atoms, phenyl group or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms and m is an integer of 2 to 20.

3. A cleaning agent according to claim 2 wherein R^4 is a straight- or branched-chain alkyl group having 10 to 14 carbon atoms, phenyl group, or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms and m is an integer of 3 to 16.
4. A cleaning agent according to any one of claims 1-3 wherein the phosphate anionic surfactant is a polyoxyalkylene phosphate surfactant represented by the formula (3)



wherein R^5 is a straight- or branched-chain alkyl group having 5 to 20 carbon atoms, phenyl group, or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms, n is an integer of 0 to 20 and X is a hydroxyl group or a group represented by the formula (4)



wherein R^6 is a straight- or branched-chain alkyl group having 5 to 20 carbon atoms, phenyl group, or a phenyl group substituted with a straight- or branched-chain alkyl group having 7 to 12 carbon atoms and n is as defined above, or a salt thereof.

5. A cleaning agent according to claim 4 wherein R^5 is a straight- or branched-chain alkyl group having 10 to 15 carbon atoms, n is an integer of 8 to 12 and X is a hydroxyl group or a group of the formula $R^6O-(CH_2CH_2O)_n-$ wherein R^6 is a straight- or branched-chain alkyl group having 10 to 15 carbon atoms and n is an integer of 8 to 12.
6. A cleaning agent according to any one of claims 1-5 wherein the mixture comprises
(A) about 10 to about 95 wt.% of the glycol ether compound,
(B) about 5 to about 90 wt.% of the nonionic surfactant, and



(C) about 0.1 to about 90 wt.% of the phosphate anionic surfactant, the total of (A), (B) and (C) adding up to 100 wt.%.

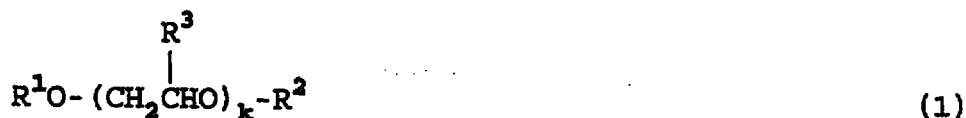
7. A cleaning agent according to claim 6 wherein the mixture comprises
 (A) about 50 to about 90 wt.% of the glycol ether compound,
 (B) about 10 to about 60 wt.% of the nonionic surfactant, and
 (C) about 0.5 to about 60 wt.% of the phosphate anionic surfactant,
 the total of (A), (B) and (C) adding up to 100 wt.%.

8. A cleaning agent according to any one of claims 1-7 which is in the form of an aqueous solution containing the mixture at a concentration of about 10 wt.% or more but less than 100 wt.%.

9. A cleaning method for removing a rosin-base solder flux, the method comprising bringing a cleaning agent according to any one of claims 1-8 into contact with the flux on a substrate.

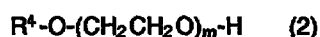
Patentansprüche

1. Reinigungsmittel zur Entfernung eines Löt-Flußmittels auf Kolophonium-Basis, umfassend eine Mischung von
 (A) mindestens einer Glycolether-Verbindung, die durch die Formel (1)



dargestellt wird, worin R^1 ein Wasserstoffatom oder eine Alkylgruppe mit 1 bis 5 Kohlenstoffatomen ist, R^2 eine Alkylgruppe mit 1 bis 5 Kohlenstoffatomen darstellt, R^3 für ein Wasserstoffatom oder eine Methylgruppe steht und k eine ganze Zahl von 2 bis 4 ist,
 (B) mindestens einem nicht-ionischen Tensid und
 (C) mindestens einem anionischen Phosphat-Tensid.

2. Reinigungsmittel nach Anspruch 1, in welchem das nichtionische Tensid ein Tensid ist, das dargestellt wird durch die Formel (2)



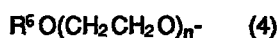
worin R^4 eine gerad- oder verzweigt-kettige Alkylgruppe mit 6 bis 20 Kohlenstoffatomen, eine Phenylgruppe oder eine mit einer gerad- oder verzweigt-kettigen Alkylgruppe mit 7 bis 12 Kohlenstoffatomen substituierte Phenylgruppe darstellt und m eine ganze Zahl von 2 bis 20 ist.

3. Reinigungsmittel nach Anspruch 2, in welchem R^4 eine gerad- oder verzweigt-kettige Alkylgruppe mit 10 bis 14 Kohlenstoffatomen, eine Phenylgruppe oder eine mit einer gerad- oder verzweigt-kettigen Alkylgruppe mit 7 bis 12 Kohlenstoffatomen substituierte Phenylgruppe darstellt und m eine ganze Zahl von 3 bis 16 ist.

4. Reinigungsmittel nach irgendeinem der Ansprüche 1 - 3, in welchem das anionische Phosphat-Tensid ein Polyoxyalkylenphosphat-Tensid ist, das dargestellt wird durch die Formel (3)



worin R^5 eine gerad- oder verzweigt-kettige Alkylgruppe mit 5 bis 20 Kohlenstoffatomen, eine Phenylgruppe oder eine mit einer gerad- oder verzweigt-kettigen Alkylgruppe mit 7 bis 12 Kohlenstoffatomen substituierte Phenylgruppe ist, n eine ganze Zahl von 0 bis 20 darstellt und X eine Hydroxylgruppe oder eine Gruppe ist, die durch die Formel (4) dargestellt wird

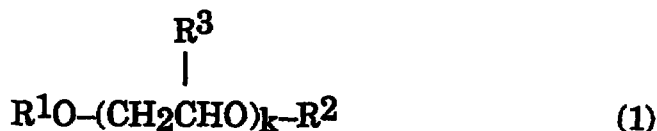


worin R^5 eine gerad- oder verzweigt-kettige Alkylgruppe mit 5 bis 20 Kohlenstoffatomen, eine Phenylgruppe oder eine mit einer gerad- oder verzweigt-kettigen Alkylgruppe mit 7 bis 12 Kohlenstoffatomen substituierte Phenylgruppe bedeutet und n wie oben definiert ist, oder ein Salz davon.

5. Reinigungsmittel nach Anspruch 4, in welchem R^5 eine gerad- oder verzweigt-kettige Alkylgruppe mit 10 bis 15 Kohlenstoffatomen ist, n eine ganze Zahl von 8 bis 12 darstellt und X eine Hydroxylgruppe oder eine Gruppe der Formel $R^5 O(CH_2CH_2O)_n$ ist, worin R^5 eine gerad- oder verzweigt-kettige Alkylgruppe mit 10 bis 15 Kohlenstoffatomen darstellt und n eine ganze Zahl von 8 bis 12 ist.
6. Reinigungsmittel nach irgendeinem der Ansprüche 1 - 5, in welchem die Mischung umfaßt
 - (A) etwa 10 bis etwa 95 Gew.-% der Glycolether-Verbindung,
 - (B) etwa 5 bis etwa 90 Gew.-% des nicht-ionischen Tensids und
 - (C) etwa 0,1 bis etwa 90 Gew.-% des anionischen Phosphat-Tensids,
 wobei die Summe von (A), (B) und (C) 100 Gew.-% ergibt.
7. Reinigungsmittel nach Anspruch 6, in welchem die Mischung umfaßt
 - (A) etwa 5 bis etwa 90 Gew.-% der Glycolether-Verbindung,
 - (B) etwa 10 bis etwa 60 Gew.-% des nicht-ionischen Tensids und
 - (C) etwa 0,5 bis etwa 60 Gew.-% des anionischen Phosphat-Tensids,
 wobei die Summe von (A), (B) und (C) 100 Gew.-% ergibt.
8. Reinigungsmittel nach irgendeinem der Ansprüche 1 - 7, das in Form einer wäßrigen Lösung vorliegt, die die Mischung in einer Konzentration von etwa 10 Gew.-% oder mehr, aber weniger als 100 Gew.-% enthält.
9. Reinigungsverfahren zur Entfernung eines Löt-Flußmittels auf Kolophonium-Basis, umfassend das Kontaktieren eines Reinigungsmittels nach irgendeinem der Ansprüche 1 - 8 mit dem Flußmittel auf einem Substrat.

Revendications

1. Agent de nettoyage pour enlever un flux de brasage à base de colophane, l'agent de nettoyage comprenant un mélange de :
 - (A) au moins un composé de type éther glycolique représenté par la formule (1)



dans laquelle R^1 est un atome d'hydrogène ou un groupe alkyle ayant 1 à 5 atomes de carbone, R^2 est un groupe alkyle ayant 1 à 5 atomes de carbone, R^3 est un atome d'hydrogène ou un groupe méthyle et k est un entier de 2 à 4,

(B) au moins un agent tensioactif non ionique, et

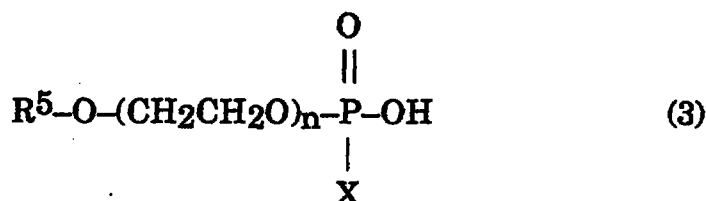
(C) au moins un agent tensioactif anionique de type phosphate.

2. Agent de nettoyage suivant la revendication 1, dans lequel l'agent tensioactif non ionique est un agent tensioactif représenté par la formule :



dans laquelle R^4 est un groupe alkyle à chaîne droite ou ramifiée ayant 6 à 20 atomes de carbone, un groupe phényle ou un groupe phényle substitué par un groupe alkyle à chaîne droite ou ramifiée ayant 7 à 12 atomes de carbone et m est un entier de 2 à 20.

3. Agent de nettoyage suivant la revendication 2, dans lequel R^4 est un groupe alkyle à chaîne droite ou ramifiée ayant 10 à 14 atomes de carbone, un groupe phényle ou un groupe phényle substitué par un groupe alkyle à chaîne droite ou ramifiée ayant 7 à 12 atomes de carbone et m est un entier de 3 à 16.
4. Agent de nettoyage suivant l'une quelconque des revendications 1 à 3, dans lequel l'agent tensioactif anionique de type phosphate est un agent tensioactif de type phosphate de polyoxyalkylène représenté par la formule :



dans laquelle R^5 est un groupe alkyle à chaîne droite ou ramifiée ayant 5 à 20 atomes de carbone, un groupe phényle ou un groupe phényle substitué par un groupe alkyle à chaîne droite ou ramifiée ayant 7 à 12 atomes de carbone et n est un entier de 0 à 20 et X est un groupe hydroxy ou un groupe de formule (4) :



- dans laquelle R^6 est un groupe alkyle à chaîne droite ou ramifiée ayant 5 à 20 atomes de carbone, un groupe phényle ou un groupe phényle substitué par un groupe alkyle à chaîne droite ou ramifiée ayant 7 à 12 atomes de carbone et n est tel que défini plus haut, ou un sel de celui-ci.
5. Agent de nettoyage suivant la revendication 4, dans lequel R^5 est un groupe alkyle à chaîne droite ou ramifiée ayant 10 à 15 atomes de carbone, n est un entier de 8 à 12 et X est un groupe hydroxy ou un groupe de formule $\text{R}^6\text{-O}-(\text{CH}_2\text{CH}_2\text{O})_n$ dans laquelle R^6 est un groupe alkyle à chaîne droite ou ramifiée ayant 10 à 15 atomes de carbone et n est un entier de 8 à 12.
6. Agent de nettoyage suivant l'une quelconque des revendications 1 à 5, dans lequel le mélange comprend :
- (A) environ 10 à environ 95% en poids du composé de type éther glycolique,
 - (B) environ 5 à environ 90% en poids de l'agent tensioactif non ionique, et
 - (C) environ 0,1 à environ 90% de l'agent tensioactif anionique de type phosphate,
- le total de (A), (B) et (C) faisant 100% en poids.
7. Agent de nettoyage suivant la revendication 6, dans lequel le mélange comprend :
- (A) environ 50 à environ 90% en poids du composé de type éther glycolique,
 - (B) environ 10 à environ 60% en poids de l'agent tensioactif non ionique, et
 - (C) environ 0,5 à environ 60% de l'agent tensioactif anionique de type phosphate,
- le total de (A), (B) et (C) faisant 100% en poids.
8. Agent de nettoyage suivant l'une quelconque des revendications 1 à 7, qui est sous la forme d'une solution aqueuse contenant le mélange à une concentration d'environ 10% en poids ou plus, mais inférieure à 100% en poids.
9. Procédé de nettoyage pour enlever un flux de brasage à base de colophane, comprenant la mise en contact d'un agent de nettoyage suivant l'une quelconque des revendications 1 à 8 avec le flux sur un substrat.

