

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
23 December 2009 (23.12.2009)

PCT

(10) International Publication Number
WO 2009/155495 A1

(51) International Patent Classification:

C08L 91/00 (2006.01) *C09D 101/00* (2006.01)
C09D 4/00 (2006.01) *C09D 201/00* (2006.01)

(21) International Application Number:

PCT/US2009/047921

(22) International Filing Date:

19 June 2009 (19.06.2009)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

200810128864.6 20 June 2008 (20.06.2008) CN
200910148255.1 19 June 2009 (19.06.2009) CN

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(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available):

ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: AN AQUEOUS LUBRICANT EMULSION FOR MEDICAL OR APPARATUS AND A METHOD OF WASHING

(57) Abstract: An aqueous lubricant emulsion for medical or food apparatus, comprising: (a) 5 wt% to 30 wt% of a mineral oil; (b) 5 wt % to 30 wt% of an emulsifier system consisting of two emulsifiers selected from the group consisting of sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, oleyl alcohol ether, triethanolamine oleate, wherein the mass ratio of the two emulsifiers is in a range of 2:8 to 8:2; (c) 0.5 wt% to 5 wt% of one or more coemulsifiers selected from the group consisting of fatty alcohols, long-chain fatty acids, and diisooctyl succinate sulfonates; and (d) the balance of water. A method for washing medical or food apparatus including the step of subjecting the medical or food apparatus to a treatment using the lubricant emulsion according to the invention after a washing step for the medical or food apparatus is also described.



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AN AQUEOUS LUBRICANT EMULSION FOR MEDICAL OR APPARATUS AND A
METHOD OF WASHING

CROSS REFERENCE TO RELATED APPLICATIONS

5 This application claims priority to Chinese Patent Application No.
200810128864.6, filed on June 20, 2008 and Chinese Patent Application No.
200910148255.1, filed June 19, 2009.

BACKGROUND

10 In hospitals all around the world, medical apparatus, such as surgical instruments,
are utilized frequently every day. Rustiness and joint malfunction of the medical apparatus
is a problem that has existed for a long time. These problems can increase both operating
cost and may increase medical risk in procedures in hospitals. Hospitals derust the
apparatus by utilizing derusting agents, which requires significant labor in the supply
15 rooms. Because the derusting agents generally contain strong acid systems, the frequent
utilization of derusting agents will damage the surface of apparatus (e.g., by causing
plating on the apparatus and/or damage existing desired plating on the apparatus) which
shortens the service life of the apparatus.

20 In order to increase the quality of the medical apparatus after washing, improve
infection risk in hospitals, decrease the maintenance cost of the apparatus, prolong the
service life of the apparatus, and potentially decrease operating risk, some hospitals are
treating the medical apparatus after washing with lubricants. A lubricant forms a protective
film on the surface of the apparatus, which prevents oxygen gas in air from contacting a
stainless steel apparatus, but capable of being penetrated by high pressure water vapor.

25 Water-soluble lubricants are applied to surfaces in the metal processing industry.
U.S. Patent No. 7,273,833 relates to a water soluble lubricant used for metal cutting
processing which utilizes an amine group-containing polymer with a molecular weight of
1,000 – 1,000,000 as a lubricating ingredient; CN 1,138,620A discloses a water-based
coating liquid which has functions of lubrication, cooling, washing and anticorrosion and
30 uses turkey red oil, polyethylene glycol, alcohol, sorbic alcohol, boracic acid,
triethanolamine, ethylenediamine tetraacetic acid and water as raw materials. In U.S.
Patent No. 2,690,426, a hydrophilic, water-dispersible oil phase system used in the textile

industry and other industry fields is obtained by using a combination of a mineral oil and a polyoxyethylene sorbitan monostearic acid compound, with a further addition of polyoxyethylene stearyl alcohol, polyoxyethylene stearic acid or polyoxyethylene stearyl alcohol amine as a lubricating ingredient. These water-soluble lubricants used in the metal processing industry can not be used to treat medical apparatus due to degradation properties and/or component toxicity.

In the medical industry, aqueous lubricants are used for the surface lubrication of catheters, cannulas or puncture needles. For example, in U.S. Patent No. 6,046,143, an aqueous lubricant used for the surface lubrication of catheters discloses modified silicone resin as a lubricating ingredient. Additionally, WO/1999/047187 and U.S. Patent No. 5,688,747 also disclose water-based lubricating oils used for the surface treatment of catheters comprising silicone as a lubricating ingredient. However, silicone is used, which can be difficult to maintain as stable in an emulsion.

Therefore, a stable silica/silicone free aqueous lubricant used for the treatment of surgical medical apparatus after washing would be desirable.

SUMMARY OF THE INVENTION

One aspect of the invention is to provide a stable aqueous lubricant emulsion for medical apparatus is essentially free of silica and/or silicone and which can be kept stable for a long time (for example, with a shelf life of 2 years).

Another aspect of the invention is to provide a method for washing medical apparatus which can provides functions of anticorrosion and lubrication and is environmentally-friendly.

In one aspect, the invention provides an aqueous lubricant emulsion for a medical apparatus, in terms of the weight ratio based on the total weight of the emulsion, the emulsion comprising:

- (a) 5 wt% to 30 wt% of a mineral oil;
- (b) 5 wt% to 30 wt% of an emulsifier system consisting of two emulsifiers selected from the group consisting of sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, oleyl alcohol ether, triethanolamine oleate, wherein the mass ratio of the two emulsifiers is in a range of 2:8 to 8:2;

(c) 0.5 wt% to 5 wt% of one or more coemulsifiers selected from the group consisting of fatty alcohols, long-chain fatty acids and diisooctyl succinate sulfonates; and

(d) water. The composition may also comprise other optional additives, such as a defoamer, antirust agent, or film formers. All weight ratios described herein are in terms of the weight ratio based on total weight of the composition unless specified otherwise.

In another aspect, the invention provides an aqueous lubricant emulsion for a medical apparatus, in terms of the weight ratio based on the total weight of the emulsion, the emulsion comprising:

(a) 5 wt% to 30 wt% of a mineral oil;

(b) 5 wt% to 30 wt% of an emulsifier system consisting of (i) a combination of sorbitan fatty acid ester and polyoxyethylene sorbitan fatty acid ester, or (ii) a combination of oleyl alcohol ether and polyoxyethylene sorbitan fatty acid ester, or (iii) a combination of sorbitan fatty acid ester and triethanolamine oleate, wherein the mass ratio of the any of the combinations is in a range of 2:8 to 8:2;

(c) 0.5 wt% to 5 wt% of one or more coemulsifiers selected from the group consisting of fatty alcohols, long-chain fatty acids and diisooctyl succinate sulfonates; and (d) the balance of water. The composition may also comprise other optional additives, such as a defoamer, antirust agent, and film formers. All weight ratios are in terms of the weight ratio based on total weight of the composition unless specified otherwise.

The lubricant emulsion for medical apparatus described herein is an oil-in-water type emulsion which can be kept stable for a long time. In most embodiments, the emulsion is stable (e.g., a single phase emulsion) after storage for 3 months at a temperature of 0-5°C, or after storage for 3 months at a temperature of 37°C, or after storage for 2 months at a temperature of 54°C.

. The lubricant emulsion can be used after the washing of surgical medical apparatus and before sterilization. This emulsion has the functions of anticorrosion and lubrication, and thus the application of derusters is reduced greatly or eliminated. Additionally, the emulsion is essentially free of silicone or paraffin waxes and the ingredients are environmentally-friendly, degrade easily and convenient to apply during use.

In another aspect, the invention provides a method for washing medical apparatus using the lubricant emulsions described herein to treat the medical apparatus after washing. The method of the invention can provide anticorrosion and lubrication and is environmentally-friendly, which reduces and/or eliminates the use of derusters significantly, and prolongs the service life of the medical apparatus.

DETAILED DESCRIPTION

The present invention relates to an aqueous lubricant for medical apparatus, and particularly, to a non-silica gel type aqueous lubricant emulsion for the treatment of medical apparatus after washing. The invention further relates to a method for washing medical apparatus.

In the invention, unless specified otherwise, the term “medical apparatus” also includes food processing machines and dishware or the like, such as those used in the food processing industry and food service industry. The invention is applicable in the medical apparatus and medical industry, and the description as provided herein applies as well to a food apparatus as used in the food processing industry and food service industry.

Unless specified otherwise, the term “sorbitan fatty acid ester” is a product obtained by mono-esterifying or tri-esterifying an anhydrosorbitol and a higher fatty acid, wherein the fatty acid is preferably a saturated or unsaturated fatty acid with 12-18 carbon atoms. The term “polyoxyethylene sorbitan fatty acid ester” means a product formed by polymerizing a sorbitan fatty acid ester and ethylene oxide, wherein the polyoxyethylene has a polymerization degree of 20, and the fatty acid is preferably a saturated or unsaturated fatty acid with 12-18 carbon atoms.

Unless specified otherwise, the term “light white mineral oil” means a mineral oil with relatively low density and viscosity which is formed by necessary rigorous dewaxing and removal of impurities from hydroprocessed base oil, e.g., a saturated hydrocarbon type mineral oil with a viscosity of 10 to 50 mm²/s, and preferably 10 to 30 mm²/s at 40°C; and a density of 0.82 to 0.86 kg/m³, and more preferably 0.84 to 0.86 kg/m³ at 20°C.

Unless specified otherwise, the term “long-chain fatty alcohols” means fatty alcohols with amphiphatic properties, wherein the fatty carbon chains thereof generally have 10 carbon atoms or more, and straight chains or branched chains with 10-30 carbon atoms are preferable.

Unless specified otherwise, all of the percentages, parts and proportions in the invention are in terms of weight.

In most embodiments, an aqueous lubricant emulsion is provided for medical apparatus, and in terms of the weight ratio based on the total weight of the emulsion,
5 emulsion includes:

(a) 5 wt% to 30 wt% of a mineral oil, preferably a light white mineral oil, and more preferably, a light white mineral oil with a viscosity of 10 to 30 mm²/s at 40°C;

(b) 5 wt % to 30 wt% of an emulsifier system consisting of two emulsifiers selected from the group consisting of sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, oleyl alcohol ether, and triethanolamine oleate, wherein the mass ratio of
10 the two emulsifiers is in a range of 2:8 to 8:2;

(c) 0.5 wt% to 5 wt% of a coemulsifier being one or more selected from the group consisting of fatty alcohols (preferably, long-chain fatty alcohols), long-chain fatty acids, and diisooctyl succinate sulfonates; and

15 (d) water.

In preferred embodiments, the emulsifier system consists of (i) a combination of sorbitan fatty acid ester and polyoxyethylene sorbitan fatty acid ester, or (ii) a combination of oleyl alcohol ether and polyoxyethylene sorbitan fatty acid ester, or (iii) a combination of sorbitan fatty acid ester and triethanolamine oleate, wherein the mass ratio of the any of
20 the combinations is in a range of 2:8 to 8:2. In preferred embodiments, the balance of the composition is water.

According to some preferable embodiments of the invention, the lubricant emulsion of the invention further contains an antirusting agent as one optional other additive and the content thereof in the emulsion of the invention is preferably 0.1 wt% to 3
25 wt%. According to some further preferable embodiments of the invention, the antirusting agent is selected from one or more of the group consisting of sulfonates, organic carboxylic acids and salts thereof, organic phosphates, esters, organic amines and heterocyclic compounds.

According to some preferable embodiments of the invention, the lubricant emulsion of the invention further contains an auxiliary agent as another optional other additive. Examples of the auxiliary agent include, but not limited to film-forming agents,
30 preserving agents, pH regulators, and antifoaming agents.

The above film-forming agent mainly means water-soluble polymers, for example, one or more selected from the group consisting of polyvinyl alcohol (preferably with lower numbers of alcohol groups, and lower viscosity for the aqueous solution), water soluble celluloses and derivatives thereof, polyvinylpyrrolidone or the like. The content of the film-forming agent in the emulsion of the invention is preferably 0.01 wt% to 0.5 wt%.

The above preserving agent mainly means the preserving agents of one or more selected from the group consisting of alcohol or aldehyde type preserving agents, benzoic acid and derivatives thereof, thiazolidones/isothiazolidones, sorbic acid and salts thereof, hexamethylenamine, sodium hydroxymethyl glycinate, undecylenic acid and derivatives thereof or the like. The content of the preserving agent in the emulsion of the invention is preferably 0.5 wt% to 2.0 wt%.

The above antifoaming agent mainly means polyether type compounds. The content of the antifoaming agent in the emulsion of the invention is preferably 0.01 wt% to 1.0 wt%.

The pH regulator typically means an organic or inorganic alkali base. The content of the pH regulator in the emulsion of the invention is preferably 0.1 wt% to 1.0 wt%.

A milk white oil-in-water emulsion or water-in-oil emulsion can be obtained by subjecting the respective components in the invention to heating dissolution and to powerful homogenization processing. For example, the stable emulsions as described herein can be formed by the following process: heating an oil phase and a water phase to 75-90°C under a condition of stirring, respectively; transferring the oil phase to the water phase slowly and stirring the obtained mixture continually at this temperature for 30 min; and homogenizing the mixture (e.g., at a speed of 2800 RPM for 120 minutes) and cooling it naturally to room temperature so as to obtain a product. In an alternate process, the stable emulsions described herein can be formed by the following process: heating an oil phase and a water phase to 50-75°C, and more preferably 55-60°C, under a condition of stirring, respectively; transferring the water phase to the oil phase slowly and stirring the obtained mixture continually at this temperature for 30 min; and homogenizing the mixture e.g., at a speed of 2800 RPM for 120 minutes), adjusting the pH of the mixture, and cooling it naturally to room temperature so as to obtain a product. In certain embodiments, the heating of the oil and water phase is conducted in a temperature range in which phase transfer of the emulsion occurs (i.e., from water-in-oil to oil-in-water)

The oil-in-water type emulsion of the invention can be diluted in high multiples and has excellent stability, which can provide all-around lubrication and antirusting protection for the medical apparatus. All of the ingredients thereof are environment-friendly, degradable easily and applicable conveniently. The stability of the emulsion can be kept for at least 2 years.

Specific examples:

In the invention, all of the contents percentages are in terms of weight.

Raw material	Supplier
Light white mineral oil	Shanghai Xinkairun Lubricating Oil Technology Co., Ltd.
Benzotriazole	Nanjing Runyou Chemical Industry Co., Ltd
Tween/Span series	Guangzhou Runhua Food Additive Co., Ltd.
Antifoaming agent (Dow defax-123 or DF1760)	Dow Chemical (Shanghai) Co., Ltd.
Polyvinyl alcohol	Shanghai Anna Chemical Industry Co., Ltd
Methylparaben	Kunshan Huaxin Daily Chemicals Co., Ltd.
Propylparaben	Kunshan Huaxin Daily Chemicals Co., Ltd.
Triethanolamine	Shanghai Xiangshun Trading Co., Ltd.
Sodium diisooctyl succinate sulfonate	Qingte Chemical Co., Ltd.
Kathon CG	Shanghai Gaowei Chemical Co., Ltd.
rosin amine	Shanghai Saifu Chemical Development Co. Ltd.
Cetyl/Octadecyl alcohol	Shanghai Lvlv Trading Co. Ltd.
Oleic acid	
hydroxy ethyl cellulose	

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Example 1:

Light white mineral oil	Oil phase	15%
Tween 60/Span 80 (5.5/4.5)	Emulsifier	7.5%
Cetyl/Octadecyl alcohol	Coemulsifier	0.5%
Sodium diisooctyl succinate sulfonate	Coemulsifier	0.5%
Water		To 100%

Example 2:

Light white mineral oil	Oil phase	20%
Tween 60/Span 80 (6.5/3.5)	Emulsifier	10%

Cetyl/Octadecyl alcohol	Coemulsifier	1%
Sodium diisooctyl succinate sulfonate	Coemulsifier	2%
Benzotriazole	antirusting agent	1%
Polyvinyl alcohol	film-forming agent	1%
antifoaming agent	antifoaming agent	0.5%
Methylparaben/Propylparaben	preserving agent	1%
Water		To 100%

Example 3:

Light white mineral oil	Oil phase	10%
Tween 80/Span 20 (2.5/7.5)	Emulsifier	5%
Octadecyl alcohol	Coemulsifier	2%
Sodium diisooctyl succinate sulfonate	Coemulsifier	3%
Benzotriazole	antirusting agent	2%
Polyvinyl alcohol	film-forming agent	2%
antifoaming agent	antifoaming agent	0.5%
Kathon CG	preserving agent	0.2%
Water		To 100%

Example 4:

Light white mineral oil	Oil phase	15%
Tween 80/Span 65 (6/4)	Emulsifier	7.5%
Octadecyl alcohol	Coemulsifier	1%
Sodium diisooctyl succinate sulfonate	Coemulsifier	2%
rosin amine	antirusting agent	0.5%
Polyvinyl alcohol	film-forming agent	2%
antifoaming agent	antifoaming agent	0.5%
Kathon CG	preserving agent	0.2%
Water		To 100%

5

Example 5:

Light white mineral oil	Oil phase	15%
Tween 60/Span 80 (6.5/3.5)	Emulsifier	7.5%
Cetyl/Octadecyl alcohol	Coemulsifier	1%
Sodium diisooctyl succinate sulfonate	Coemulsifier	1%
Benzotriazole	antirusting agent	1%
Polyvinyl alcohol	film-forming agent	1%

antifoaming agent	antifoaming agent	1%
Methylparaben/Propylparaben	preserving agent	1%
Water		To 100%

Example 6:

Light white mineral oil	Oil phase	15%
Tween 20/Span 80 (5/5)	Emulsifier	7.5%
Cetyl/Octadecyl alcohol	Coemulsifier	1%
Sodium diisooctyl succinate sulfonate	Coemulsifier	1%
Benzotriazole	antirusting agent	1%
Polyvinyl alcohol	film-forming agent	1%
antifoaming agent	antifoaming agent	1%
Methylparaben/Propylparaben	preserving agent	1%
Water		To 100%

Example 7:

Light white mineral oil	Oil phase	15%
Tween 40/Span 40 (4.5/5.5)	Emulsifier	7.5%
Cetyl/Octadecyl alcohol	Coemulsifier	1%
Sodium diisooctyl succinate sulfonate	Coemulsifier	1%
Benzotriazole	antirusting agent	1%
Polyvinyl alcohol	film-forming agent	1%
antifoaming agent	antifoaming agent	1%
Sodium sorbate	preserving agent	1%
Water		To 100%

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Example 8:

Mineral Oil	15%
Span 80	2.7%
Tween 80	5.4%
Oleic acid	0.9%
DF1760	0.75%
Benzotriazole	0.8%
Methyl paraben	0.3%
Propyl paraben	0.2%
Hydroxy ethyl cellulose	0.02%
NaHCO ₃	0.03%
Water	To 100

Example 9:

Mineral Oil (LIGHT) 7#	20%
Span 80	4.5%
Oleyl alcohol ether with 5 EO	5.5%
Oleic acid	0.8%
DF1760	0.9%
Benzotriazole	0.8%
Methyl paraben	0.3%
Propyl paraben	0.2%
Hydroxy ethyl cellulose	0.02%
NaOH	0.05%
Water	To 100

Example 10:

Mineral Oil (LIGHT) 15#	10%
Span 80	2.25%
Tween 60	5.1%
Oleic acid	0.85%
DF1760	0.75%
Benzotriazole	0.8%
Methyl paraben	0.3%
Propyl paraben	0.2%
Hydroxy ethyl cellulose	0.02%
Triethanolamine	0.05%
Water	To 100

5 Example 11:

Mineral Oil (LIGHT) 15#	5%
Triethanolamine oleate	0.9%
Tween 60	3.6%
Oleic acid	2.7%
DF1760	0.6%
Benzotriazole	1.0%
Methyl paraben	0.3%
Propyl paraben	0.2%
Hydroxy ethyl cellulose	0.02%
Water	To 100

Example 12:

Mineral Oil (LIGHT) 15#	30%
Span 80	6%
Tween 60	12%
Oleic acid	2%

DF1760	1.0%
Benzotriazole	1.0%
Methyl paraben	0.3%
Propyl paraben	0.2%
Hydroxy ethyl cellulose	0.02%
Triethanolamine	0.1%
Water	To 100

Test of emulsion stability:

Comparative example:

According to the formulations of example 1 and example 13 in U.S. Patent No. 2,690,426, a transparent oil solution was obtained by dissolving respectively and mixing uniformly under a condition of stirring at room temperature, wherein the transparent oil solution was a water-soluble lubricating oil and stable under room temperature. In a ratio of 1:10 and 1:200 respectively, the oil solution was further poured into water under a condition of strong stirring and then stirred for 20 min to formulate aqueous emulsions which were broken 4 days later.

The primary emulsion and the 1:10 and 1:200 diluted emulsions thereof of according to the compositions described herein (such as Examples 1-8) were subjected to the same test as the comparative experiments. The primary emulsion and diluted emulsions were still stable after 4 days.

The various tests on the property of the emulsions according to the present invention are described as follows.

1. Centrifugal and accelerative test: After having been centrifuged for 60 min under a condition of 3500 rpm/min, the emulsions remained stable without demixing or precipitation;

2. After having been stored for 3 months at a low temperature of 0-5°C, the emulsions remained stable without demixing

After having been stored for 3 months at a high temperature of 37°C, the emulsions remained stable without demixing

After having been stored for 2 months at a high temperature of 54°C, the emulsions remained stable without demixing

3. Freeze-thaw test: A cycle was repeated by keeping a sample at -20°C for 12 hours, then thawing the sample at room temperature for 12 hours and then exposing the sample to -20°C. After ten Freeze-thaw cycles, the emulsions remained without demixing.

5 Toxicity validation: A toxicity test was carried out by Shanghai Municipal Center for Disease Prevention and Control. The test was carried out according to the corresponding sections in Chapters 2.3.1, 2.3.3, 2.3.8.4 in Disinfecting Technology Standard, 2002, Ministry of Health of China. The result indicated that this formulation was a non-toxic product without stimulation to skin or micronucleus inducing effect.

CLAIMS:

1. An aqueous lubricant emulsion for medical or food apparatus, comprising: (a) 5 wt% to 30 wt% of a mineral oil; (b) 5 wt % to 30 wt% of an emulsifier system consisting of (i) a combination of sorbitan fatty acid ester and polyoxyethylene sorbitan fatty acid ester, or (ii) a combination of oleyl alcohol ether and polyoxyethylene sorbitan fatty acid ester, or (iii) a combination of sorbitan fatty acid ester and triethanolamine oleate, wherein the mass ratio of the any of the combinations is in a range of 2:8 to 8:2; (c) 0.5 wt% to 5 wt %of one or more coemulsifiers selected from the group consisting of fatty alcohols, long-chain fatty acids, and diisooctyl succinate sulfonates; and (d) the balance of water.

2. The aqueous lubricant emulsion for medical or food apparatus according to claim 1, further comprising an additive, wherein the additive is an antirusting agent with a content of 0.1 wt% to 2 wt% of the total weight of the emulsion.

3. The aqueous lubricant emulsion for medical or food apparatus according to claim 2, wherein the antirusting agent is one or more selected from the group consisting of sulfonates, organic carboxylic acids and the salts thereof, organic phosphates, esters, organic amines and heterocyclic compounds.

4. The aqueous lubricant emulsion for medical or food apparatus according to claim 1, further comprising an additive wherein the additive is an auxiliary agent being one or more selected from the group consisting of film-forming agent, preserving agent and antifoaming agent.

5. The aqueous lubricant emulsion for medical or food apparatus according to claim 4, wherein the film-forming agent is one or more selected from the group of polyvinyl alcohol, water soluble celluloses and the derivatives thereof, and polyvinylpyrrolidone.

6. The aqueous lubricant emulsion for medical or food apparatus according to claim 4, wherein the preserving agent is one or more selected from the group consisting of

alcohol or aldehyde type preserving agents, benzoic acid and the derivatives thereof, thiazolidones/isothiazolidones, sorbic acid and the salts thereof, hexamethylenamine, sodium hydroxy methyl glycinate, and undecylenic acid and the derivatives thereof.

5 7. The aqueous lubricant emulsion for medical or food apparatus according to claim 4, wherein the antifoaming agent is a polyether type compound.

10 8. The aqueous lubricant emulsion for medical or food apparatus according to claim 1, wherein the mineral oil is a saturated hydrocarbon type mineral oil with a viscosity of 10 to 50 mm²/s at 40°C and a density of 0.82 to 0.86 kg/m³ at 20°C.

15 9. The aqueous lubricant emulsion for medical or food apparatus according to claim 1, wherein the mineral oil is a saturated hydrocarbon type mineral oil with a viscosity of 10 to 30 mm²/s at 40°C and a density of 0.84 to 0.86 kg/m³ at 20°C.

 10. The aqueous lubricant emulsion for medical or food apparatus according to claim 1, wherein the fatty alcohol is a linear or branched fatty alcohol with a fatty carbon chain containing 10-30 carbon atoms.

20 11. The aqueous lubricant emulsion for medical or food apparatus according to claim 1, wherein the long-chain fatty acid is a saturated or unsaturated linear fatty acid with a fatty carbon chain containing 10-30 carbon atoms.

25 12. An aqueous lubricant emulsion for medical or food apparatus, the emulsion comprising:

(a) 5 wt% to 30 wt% of a mineral oil;

(b) 5 wt% to 30 wt% of an emulsifier system consisting of two emulsifiers selected from the group consisting of sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, oleyl alcohol ether, triethanolamine oleate, wherein the mass ratio of the two

30 emulsifiers is in a range of 2:8 to 8:2;

(c) 0.5 wt% to 5 wt% of one or more coemulsifiers selected from the group consisting of fatty alcohols, long-chain fatty acids and diisooctyl succinate sulfonates; and

(d) water.

13. A method of washing medical or food apparatus comprising washing the
medical or food apparatus, and then treating the medical or food apparatus with the
5 aqueous lubricant emulsion according to any one of claims 1-12.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 09/47921

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - C08L 91/00; C09D 4/00; C09D 101/00; C09D 201/00 (2009.01) USPC - 106/243 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC(8) - C08L 91/00; C09D 4/00; C09D 101/00; C09D 201/00 (2009.01) USPC - 106/243 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched IPC(8) - C08L 91/00; C09D 4/00; C09D 101/00; C09D 201/00 (2009.01) (text search only) USPC - 106/243 (text search only) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) USPTO WEST (USPT, PGPB, EPAB, JPAB); Google Patent, Google Scholar, Dialog Web Search terms on page 8		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/027777 18 A1 (JOHNSON) 15 December 2005 (15.12.2005), para [0043]-[0046]	1-13
Y	US 2008/0125338 A1 (CORBETT, et al.) 29 May 2008 (29.05.2008), Abstract, para [0013], [0014], [0016], [0033]-[0039]	1-13
Y	US 2008/0124368 A1 (SARANGAPANI) 29 May 2008 (29.05.2008), para [0032], [0033]	5
Y	US 2006/0199896 A1 (WALTON, et al.) 07 September 2006 (07.09.2006), Abstract, para [0145]	7
Y	US 2008/0118626 A1 (MCWILLIAMS, et al.) 22 May 2008 (22.05.2008), para [0109]	8, 9
Y	US 2003/0228339 A1 (EL-NOKALY, et al.) 11 December 2003 (11.12.2003), para [0030], [0033], [0110]	10, 11
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 07 August 2009 (07.08.2009)		Date of mailing of the international search report 14 AUG 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 09/47921

continued from box B

Search terms:

mineral oil, paraffin oil, liquid paraffin , liquid petrolatum, lubricant, sorbitan fatty acid, fatty acid, fatty alcohol, water, aqueous, polyoxyethylene, oleyl alcohol, triethanolamine oleate, anti-rust, phosphate, sulfonates, carboxylic, amines, heterocyclic , medical, food, diisooctyl succinate, emulsion, emulsifiers, pva, polyvinyl alcohol, polyvinylpyrrolidone, cellulose, benzoic acid, thiazolidone, isothiazolidone, sorbic, anti-foaming, preservative, polyether, viscosity, density, washing