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(54) **Lubricant composition.**

(57) A substantially soap-free lubricant composition, especially adapted for use as a lubricant for slat conveyors or conveyor belts, is disclosed comprising:

(a) a carboxylated nonionic of the general formula:

$$R-[O-(CH_2)_m]_n-COOM,$$

wherein R is a saturated or unsaturated alkyl group; m = 2-3; n = 3-7 and M is H, an alkali metal or alkanol amine cation;

(b) an acyl sarcosinate of the general formula:

$$RCON(CH_3)CH_2COOM,$$

wherein R is a C_{11}-C_{19} alkyl or alkylene group; and M is H, an alkali metal or alkanol amine cation; and

(c) water; and optionally

a conventional nonionic surfactant having an HLB value preferably between 10 and 12 for improved detergency.

The lubricant composition shows good lubricating ability, is low-foaming, insensitive to water hardness, has good cleaning efficiency and shows no tendency to cause blockage of distribution nozzles.

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This invention relates to a lubricant composition especially adapted for use as conveyor belt lubricant.

The majority of modern bottle filling and capping machines in food and other industries are equipped with slat or chain belt conveyors for transporting the bottles to and from the machines. During operation an aqueous lubricating solution is sprayed via jet nozzles onto the moving conveyor belt to effect smooth transport of the bottles and cleaning of the chain belt.

The traditional type of formulation for conveyor belt lubricants is based on fatty acid soap solutions, with or without other additives, such as sequestrants, surfactants, solvents, etc. Although soap itself is a very good lubricant, it suffers from problems of excessive foaming in soft water, or of calcium soap precipitation in hard water, which may cause blockages in the automatic lubricant systems, especially in the nozzles. In order to reduce this blocking tendency, high amounts of sequestrants have been used to soften the water, but under these conditions such formulations would again suffer from excessive foaming.

In hard water the use concentration of a lubricant containing a sequestrant, which is needed to prevent the blockage of nozzles, is determined by the water hardness. This often results in much higher concentrations of the lubricant being used than is necessary for adequate lubricity. However, a high concentration for this traditional type of formulation inevitably causes excessive foaming under these conditions.

In practice, foam can be a problem in three ways:

(i) It falls off the conveyor onto the floor beneath and builds up into an unsightly 'mountain' of suds.

(ii) It climbs up the bottles when they are held stationary on a moving conveyor. If the bottles are labelled, the label will be moistened by the foam and become more susceptible to physical damage. Even if this does not happen, it may cause

staining of the label after the foam has collapsed.

(iii) Foam on the bottom of washed bottles can cause problems with automatic bottle scanners.

Blackening of conveyor belts is another problem with poor lubricants. This could occur if clean bottles were held stationary on an initially clean conveyor lubricated with an inadequate product. It may also occur if soil, e.g. milk spillage, in the vicinity of bottle fillers, is not adequately emulsified or dispersed by the lubricant.

Hence, good lubricating ability, low foaming, insensitivity to water hardness, good cleaning efficiency and no tendency to blocking are essential properties for a good conveyor belt lubricant.

A further equally important requirement is that it should work under acid conditions. This is important, for example, in soft drinks bottling plants, where many products are acidic and will inevitably contaminate the conveyor, particularly in the vicinity of the bottle fillers.

The attainment of all these combined properties in conveyor lubricant compositions is a matter of difficult formulation.

Built soap formulations which exhibit good lubricity and satisfactory hard water tolerance are generally unsatisfactory, owing to their tendency to excessive foaming. Many materials which might be expected to defoam cold soap solutions were quite disappointing on examination and cannot be used. Moreover, the difficult and complex formulation needed to achieve the necessary requirements for a good conveyor lubricant tend to make the product rather expensive.

The present invention now provides an improved lubricant composition suitable for use as a conveyor belt lubricant based on a simple and cost-effective formulation.

The lubricant composition of the invention is substantially free from a fatty acid soap and comprises:

(a) a carboxylated nonionic of the general formula:

$$R-\left[O-(CH_2)_m\right]_n-COOM$$

wherein R is a saturated or unsaturated C_{14}-C_{20} alkyl group; m = 2-3; n = 3-7 and M is H, an alkali metal or alkanolamine cation;

(b) an acyl sarcosinate of the general formula:

$$R-C(=O)-N(CH_3)-CH_2-COOM$$

wherein R is a C_{11}-C_{19} alkyl or alkylene group; and M is H, an alkali metal or alkanolamine cation; and

(c) water.

Generally the carboxylated nonionic and acyl sarcosinate mixture in the composition of the invention is neutralized to give a product pH of between 7 and 11, preferably between 8 and 9, particularly about 8.5. Alkali hydroxides, such as sodium hydroxide and potassium hydroxide, or alkanolamines, such as monoethanolamine or diethanolamine , are examples of suitable neutralizing agents.

Advantageously, the weight ratio of carboxylated nonionic to acyl sarcosinate in the composition of the invention is from about 2:1 to 1:2. A preferred ratio is 3:2, which will give a product suitable for use in a wide range of water hardness, i.e. from zero to 3 mol m^{-3}.

The degree of alkoxylation (n) in the carboxylated nonionic molecule is important. A lower degree of ethoxylation causes an improvement in lubricity and a further reduction in foam, but at the expense of the composition becoming more sensitive to hard water. The degree of ethoxylation therefore should not be lower than 3. A higher degree of ethoxylation causes a reduction in lubricity and an increase in foam. The degree of ethoxylation therefore should not be higher than 7.

A preferred carboxylated nonionic is:

$$C_{18}H_{35}-\left[O-CH_2-CH_2\right]_5-COOM.$$

A preferred acyl sarcosinate is oleyl sarcosinate having the formula:

$$C_{17}H_{33}C(=O)-N(CH_3)-CH_2-COOM.$$

Apart from the components already mentioned, it may be desirable to also include in the lubricant composition of the invention a conventional nonionic surfactant compound, particularly a low-foaming nonionic surfactant. The incorporation thereof will have the effect of improved detergency, which can be of importance, e.g. in dairies.

Examples of suitable nonionic surfactants which may be used include in particular the liquid reaction products of ethylene oxide with C_6-C_{12} alkyl phenols or with aliphatic (C_8-C_{18}) primary or secondary linear or branched chain alcohols; and products made by condensation of ethylene oxide with propylene oxide or the reaction products of propylene oxide and ethylene diamine. Other so-called nonionic surfactants include long chain tertiary amine oxides and long chain tertiary phosphine oxide. Nonionics having an HLB value of from 10-12, preferably from 10.5-11, are particularly suitable, such as nonyl phenol condensed with 5-6 ethylene oxide groups (NP/5-6 EO).

Though any form would be possible, the lubricant compositions of the invention are preferably presented in liquid form. These liquids will generally comprise about 5-20% by weight of the active components (a) and (b), i.e. carboxylated nonionic and acyl sarcosinate, together. Higher active mixture contents may be presented as viscous liquid or paste-like products.

In use the composition of the invention is normally diluted with water to an active concentration of about 150-750 mg/liter. In liquid composition terms a dilution of from about 0.1-0.5% is normally applied.

Example 1

The following composition was prepared and tested against two commercial products, Jetloob® ex J.R. Grace and Zefa® Super H ex Lever Industrial.

Composition 1	% by weight
Akypo® RO50 (carboxylated nonionic)	9
Hamposyl® O (acyl sarcosinate)	6
KOH	1.6
Water	83.4

"Akypo® RO50" is $C_{18}H_{35}-\left[O-CH_2-CH_2\right]_5-COOH$ ex Chem-Y

"Hamposyl® O" is $C_{17}H_{33}C(=O)-N(CH_3)-CH_2-COOH$ ex W.R. Grace.

The Composition 1 of the invention and the commercial products were tested at various use concentrations and diluted with water of various degrees of hardness, for frictional drag (measure of lubricity), solution appearance and foam.

The results are illustrated in the following Table.

Table of Results

Test	Product	Use Conc.	Water Hardness (mol m^{-3})	Frictional Drag (kg)*	Solution Appearance	Foam **
a	Jetloob	0.33	1	2	slightly turbid	0/+
b	do.	0.25	1	3	turbid	0
c	do.	0.20	1	4	do.	-
d	do.	0.25	0	1.5	clear	++
e	do.	0.20	0.5	1	slightly turbid	0
f	Zefa	0.33	1	1	turbid	-
g	do.	0.25	1	4	do.	--
h	do.	0.33	0	1.5	clear	++
j	I	0.33	0	1.5	clear	0/+
k	I	0.25	0	1.75	clear	0
l	I	0.33	3	1	clear	-/0

* The drag was measured on 12 half filled one-litre milk bottles which were held stationary on a moving slat conveyor

** Foam code

++	excessive
+	acceptable
0	moderate
-	slight
--	none

The hardest water used in the tests with the commercial products was actually still relatively soft. Despite this, none of the products gave clear solutions when diluted to a concentration of 0.33% or less with it. The turbidity was due to calcium soap formation which would invariably cause jet nozzle blocking problems.

The tests a-e show that if "Jetloob" is diluted to a concentration of less than 0.33% in water of 1 mol m^{-3} hardness, lubricity will be only mediocre. That this was due to the hardness salts in the water rather than the low concentration is shown by the fact that 0.2% solution in 0.5 mol m^{-3} hard water gives good lubricity (cf. test e).

Both Jetloob and Zefa gave clear solutions in totally soft water (tests d and h). They would not cause jet blocking problems and could be used at low concentrations; unfortunately, however, they both foam excessively and therefore are unsuitable.

The Composition I of the invention was clearly superior to both commercial products Jetloob and Zefa in both hard and soft water.

Example II

The Composition I of Example I was also tested over a two-week period at various use concentrations in a problem area (relatively tall bottles with narrow bases). No problems were encountered at use concentrations down to 0.2% in soft water. The conveyors were noticeably cleaner with this product than with the soap-based products of the art.

Examples III - VI

The following examples are further illustrative lubricant compositions within the invention:

Composition	III	IV	V	VI
$C_{18}H_{35}-[O-CH_2-CH_2]_5-COOH$	4.5	6.0	3.0	3.0
$C_{17}H_{33}CON[CH_3]CH_2COOH$	3.0	9.0	12.0	12.0
KOH	1.0	1.5	1.6	-
Water	85.5	83.5	83.4	85.0
Nonyl phenol/5-6 ethylene oxide	6.0	-	-	-

The compositions IV - V are usable for soft water.

CLAIMS

1. A lubricant composition, characterized in that it is substantially free from fatty acid soap and comprises

(a) a carboxylated nonionic of the general formula:

$$R-\left[O-(CH_2)_m\right]_n-COOM$$

wherein R is a saturated or unsaturated C_{14}-C_{20} alkyl group; m = 2-3; n = 3-7 and M is H, an alkali metal or alkanol amine cation;

(b) an acyl sarcosinate of the general formula:

$$R-CON\ (CH_3)\ CH_2COOM$$

wherein R is a C_{11}-C_{19} alkyl or alkylene group; and M is H, an alkali metal or alkanol amine cation; and

(c) water.

2. A lubricant composition according to claim 1, characterized in that the carboxylated nonionic (a) and acyl sarcosinate (b) are present in a weight ratio of from about 2:1 to 1:2.

3. A lubricant composition according to claim 2, characterized in that said weight ratio of (a) to (b) is 3:2.

4. A lubricant composition according to claims 1-3, characterized in that it comprises 5-20% by weight of the active components (a) and (b) together.

5. A lubricant composition according to claims 1 - 4, characterized in that it has a pH value of between 7 and 11.

6. A lubricant composition according to claim 5, characterized in that the pH is between 8 and 9.

7. A lubricant composition according to any one of the preceding claims, characterized in that it further comprises a conventional nonionic surfactant.

8. A lubricant composition according to claim 7, characterized in that the nonionic surfactant has an HLB value of from 10 to 12.

9. A lubricant composition according to claim 8, characterized in that the HLB value is from 10.5 to 11.0.

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EUROPEAN SEARCH REPORT

Application number EP 81 10 5232

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	US - A - 3 766 068 (T.C. TESDAHL et al.) * The whole patent * --	1,5,6
A	US - A - 3 046 225 (J.L. MURRAY et al.) * Claims 1,2; column 2, line 54 - column 3, line 38 * --	1,7-9
A	FR - A - 1 423 085 (ET. KUHLMANN) ----	

CLASSIFICATION OF THE APPLICATION (Int Cl.³)

C 10 M 3/00
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TECHNICAL FIELDS SEARCHED (Int. Cl.³)

C 10 M 3/00
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CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28-10-1981	ROTSAERT