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Lubricant composition

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.

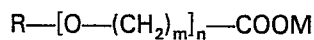
The attainment of all these combined properties in conveyor lubricant compositions is a matter of difficult formulation.

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.

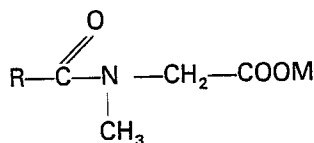
The lubricant composition of the invention is substantially free from a fatty acid soap and comprises:

(a) a carboxylated nonionic of the general formula:



wherein R is a saturated or unsaturated C₁₄—C₂₀ 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:



wherein R is a C₁₁—C₁₉ alkyl or alkylene group; and M is H, an alkali metal or alkanolamine cation; and (c) water.

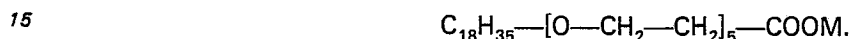
Generally the carboxylated nonionic and acyl sarcosinate mixture in the composition of the

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.

5 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:



A preferred acyl sarcosinate is oleyl sarcosinate having the formula:



25 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.

30 Examples of suitable nonionic surfactants which may be used include in particular the liquid reaction products of ethylene oxide with C₆—C₁₂ alkyl phenols or with aliphatic (C₈—C₁₈) 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, 35 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.

40 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

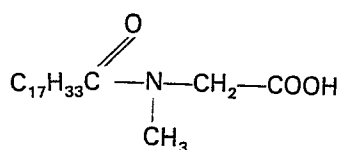
45 The following composition was prepared and tested against two commercial products, Jetloob® ex J. R. Grace and Zefa® Super H ex Lever Industrial.

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

60 "Akypo® RO50" is C₁₈H₃₅—[O—CH₂—CH₂]₅—COOH ex Chem-Y.

"Hamposyl® O" is

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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 and 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	++
i	l	0.33	0	1.5	clear	0/+
k	l	0.25	0	1.75	clear	0
l	l	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 1 of the invention was clearly superior to both commercial products Jetloob and Zefa in both hard and soft water.

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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.

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Examples III—V—

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

15	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
20	KOH	1.0	1.5	1.6	—
	Water	85.5	83.5	83.4	85.0
25	Nonyl phenol/5—6 ethylene oxide	6.0	—	—	—

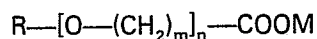
The compositions IV—V are usable for soft water.

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Claims

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

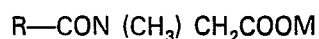
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wherein R is a saturated or unsaturated $C_{14}-C_{20}$ alkyl group; $m = 2-3$; $n = 3-7$ and M is H, an alkali metal or alkanol amine cation;

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(b) an acyl sarcosinate of the general formula:



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

45

(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.

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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.

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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.

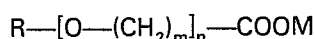
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Patentansprüche

1. Schmiermittel, dadurch gekennzeichnet, daß es praktisch frei ist von Fettsäureseife und
a) eine carboxylierte nicht-ionische Verbindung der allgemeinen Formel

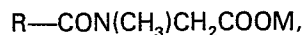
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worin R eine gesättigte oder ungesättigte C₁₄—C₂₀-Alkylgruppe, m = 2—3, n = 3—7 und M H, ein Alkalimetall- oder Alkanolamin-Kation ist,

5 b) ein Acylsarcosinat der allgemeinen Formel



10 worin R eine C₁₁—C₁₉-Alkyl- oder -Alkylengruppe und M H, ein Alkalimetall- oder Alkanolamin-Kation ist, und

c) Wasser umfaßt.

2. Schmiermittel nach Anspruch 1, dadurch gekennzeichnet, daß die carboxylierte nichtionische Verbindung (a) und Acylsarcosinat (b) in einem Gewichtsverhältnis von etwa 2:1 bis 1:2 vorliegen.

15 3. Schmiermittel nach Anspruch 2, dadurch gekennzeichnet, daß das Gewichtsverhältnis von (a) zu (b) 3:2 ist.

4. Schmiermittel nach den Ansprüchen 1 bis 3, dadurch gekennzeichnet, daß es 5 bis 20 Gew.-% der aktiven Bestandteile (a) und (b) zusammen enthält.

5. Schmiermittel nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß es einen pH-Wert 20 zwischen 7 und 11 hat.

6. Schmiermittel nach Anspruch 5, dadurch gekennzeichnet, daß der pH zwischen 8 und 9 ist.

7. Schmiermittel nach irgend einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es ferner ein herkömmliches nichtionisches Tensid enthält.

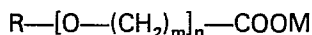
8. Schmiermittel nach Anspruch 7, dadurch gekennzeichnet, daß das nicht-ionische Tensid einen 25 HLG-Wert von 10—12 hat.

9. Schmiermittel nach Anspruch 8, dadurch gekennzeichnet, daß der HLG-Wert 10,5 bis 11,0 ist.

Revendications

30 1. Une composition lubrifiante, caractérisée en ce qu'elle est substantiellement libre de savon d'acide gras et comprend:

(a) un nonionique carboxylé de formule générale:



35 où R est un groupe alkyle C₁₄—C₂₀ saturé ou insaturé; m = 2—3; n = 3—7 et M est H, un métal alcalin ou un cation alkanolamine;

(b) un acyl sarcosinate de formule générale:



40 où R est un groupe alkyle ou alkylène C₁₁—C₁₉; et M est H, un métal alcalin ou un cation alkanolamine; et

(c) de l'eau.

45 2. Une composition lubrifiante selon la revendication 1, caractérisée en ce que le nonionique carboxylé (a) et l'acyl sarcosinate (b) sont présents dans un rapport de poids compris entre environ 2/1 et 1/2.

3. Une composition lubrifiante selon la revendication 2, caractérisée en ce que ledit rapport de poids de (a) à (b) est 3/2.

50 4. Une composition lubrifiante selon les revendications 1—3, caractérisée en ce qu'elle comprend 5—20% en poids des composants actifs (a) et (b) ensemble.

5. Une composition lubrifiante selon les revendications 1—4, caractérisée en ce qu'elle a une valeur de pH comprise entre 7 et 11.

6. Une composition lubrifiante selon la revendication 5, caractérisée en ce que le pH est compris 55 entre 8 et 9.

7. Une composition lubrifiante selon n'importe laquelle des revendications précédentes, caractérisée en ce qu'elle comprend, en outre, un surfactant conventionnel nonionique.

8. Une composition lubrifiante selon la revendication 7, caractérisée en ce que le surfactant nonionique a une valeur HLB comprise entre 10 et 12.

60 9. Une composition lubrifiante selon la revendication 8, caractérisée en ce que la valeur HLB est comprise entre 10,5 et 11,0.