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(54) **AQUEOUS LUBRICANT COMPOSITION COMPRISING A MONOAMINE**

MONOAMINE ENTHALTENDE WÄSSRIGE SCHMIERMITTELZUSAMMENSETZUNG VERWENDBAR ZUM SCHMIEREN VON TRANSPORTBÄNDERN

COMPOSITION LUBRIFIANTE AQUEUSE RENFERMANT UNE MONOAMINE

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EP-A- 0 260 508
EP-A- 0 372 628
WO-A-93/18121
DE-A- 4 244 536
DE-A- 4 444 598
US-A- 4 929 375

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EP 0 988 358 B1

Description

[0001] The invention relates to lubricant compositions which derive their lubricating properties from monoamines, especially coco-monoamines, and are suitable, in particular, for lubricating conveyor belts in the food and beverage industry. Specifically, the invention relates to such lubricant compositions free of soap.

[0002] In the food and beverage industry, e. g. in breweries or bottling operations at mineral water sources, bottle cleaning, filling and labelling is carried out mainly by automation. As a rule, high-performance lubricants need to be used on the bottle conveyor facilities to guarantee problem-free conveying of the bottles. The filling performance of filling equipment has increased over the years as a result of technological progress. Requirements regarding the performance of the belt lubricants have increased correspondingly. In parallel, greater environmental awareness of the users has resulted in a demand for more environmentally and userfriendly chemicals particularly when these are sprayed openly in premises, as is the case with belt lubricants, and where the lubricant liquid dripping off the belt may pass directly into the effluent (waste water) from the plant.

[0003] In the art, soap-based lubricants have many times been suggested, and are in general use today.

[0004] A major disadvantage of soap-containing lubricants is their sensitivity to hard water. Soaps tend to react with water hardness forming salts (mainly Ca^{2+} or Mg^{2+} salts), to form the so-called lime soaps which are difficult to dissolve or even insoluble and strongly reduce the lubrication performance of the lubricant. Frequently, this leads to the formation of deposits on the conveyor belts and finally to operating problems. To avoid this precipitation of lime soap, strong complexing agents (such as EDTA) are added to soap-containing lubricants or the application needs to be restricted to very soft water (which, however, is not generally available). For ecological reasons, the use of strong complexing agents in lubricants which pass into the waste water discharged from the plant is undesirable, since these complexing agents have poor biological degradability. EDTA especially is practically not biodegradable.

[0005] Soap-based lubricant also have other disadvantages, since they can promote the proliferation of germs and other microorganisms.

[0006] There have been attempts in the art at solving these problems, through alternative lubricants which comprise no soap. Generally, these alternative lubricants attempt to replace soap with specific amino compounds.

[0007] In EP-B1 0 044 458, a soap-free lubricant composition is disclosed which contains no complexing agent. The lubricant composition comprises alkyl polyether carboxylic acid salts combined with acyl sarcosinates.

[0008] From EP-B1 0 260 508, a method for lubricating a conveyor belt is known, which comprises the steps of lubricating the belt with a soap-free lubricant based on neutralized primary fatty amines, and cleaning the belt with cationic cleaning agents or organic acids. The reason for this is that the amines used for lubrication form precipitates with anions, which strongly reduce the lubricating effect and can clogg spray nozzles etc.
From EP-B1 0 372 628 and EP-A1 0 538 916 another substitute for soap-based lubricants is known, which is based on di- or polyalkyl amines or corresponding di- or polyalkyl aminoalkyl carboxylic acids. The aqueous lubricating solutions made from these compounds are used at pH-values between 5 and 8.

[0009] EP-B1 0 384 282 (which has been consolidated with EP 0 593 420) discloses the use of secondary and/or tertiary amines and/or salts thereof in lubricating formulations for PET or PC bottles. Generally, the amines are used as such, without the addition of surfactant, complexing agent or cosolvent.

[0010] WO 94/03562 discloses the use of polyamine derivatives of fatty amines and/or salts thereof. It is claimed that these amines are per se not very sensitive to process water anions such as sulfate, bicarbonate etc. The examples show that the lubricants of WO 94/03562 were only tested at low alkalinity (pH below 8), and were not tested with respect to their water hardness resistance. As such, the fatty amine salt-based lubricants of this art would not be expected to provide sufficient lubrication combined with the absence of precipitation problems in hard water application.

[0011] In DE-C2 42 44 536, it is suggested to base a soap-free lubricant on mainly two components, one of which is an alkyl diamine, optionally neutralized with an organic acid, and the other of which is a polyether carboxylic acid. The lubricants can be used between pH 6.5 and 7. The lubricant solution is made from a corresponding concentrate by adding soft water.

[0012] In DE-A1 43 15 21 (and corresponding EP 0 623 666) of the present applicant, it has been suggested to prepare soap-free lubricants on the basis of polyamines, which can optionally be combined with organic acids, to adjust the pH of the concentrate to between 4 and 8.

[0013] The fatty monoamines suggested in EP 0 260 508 provide a better lubricating effect, at comparable concentrations, than the di-, tri- and polyamines later suggested in the art, as above discussed. The di- and higher amines of the younger art are more expensive than the monoamines of EP 0 260 508, since they are made from these monoamines. The di- and higher amines of the younger art avoid some of the precipitation problems, in the presence of carbonate, sulfate and especially phosphate anions, which EP 0 260 508 suggests to deal with by an extra cleaning step.

[0014] Lubricating solutions based on diamines or higher amines can be used without the extra cleaning efforts described in

[0015] EP 0 260 508. However, diamines and especially higher amines create increased foaming problems, as com-

pared with monoamines. One therefore generally has to use defoaming agents in such products, but even then, such products produce large amounts of foam in practical application.

[0016] An important parameter in determining the quality of any such lubricant is the sliding friction coefficient provided by the diluted lubricating solution as actually used. Generally, a sliding friction coefficient between 0.10 and 0.14, at customary amine concentrations of the order of 100 ppm in the actual use solution, is achievable with state of the art diamine and higher amine based lubricants. A value of 0.10 would be considered very good; a value higher than 0.14 would be considered unacceptable.

[0017] It would be much easier to reach sliding friction coefficients at around 0.10 or even smaller, with monoamines as suggested in EP 0 260 508, but at the necessary concentrations in the actual use solution, reaction between monoamines and anions such as carbonate, sulfate and phosphate is so massive and fast, already in the central dosing unit, that sieves and nozzles of the spray applicator system are clogged within very short.

[0018] Apparently, the steps suggested in EP 0 260 508, which require a lot of extra effort, especially in switching the spray system from lubricant to cleaning composition and back, have prevented the industry from adopting this approach. Rather, the trend over the last decade has been in developing new lubricants based on other amines, i. e. di-, tri- and higher amines, to deal with the precipitation problem.

[0019] Against this background, it is an important object of this invention to provide an aqueous lubricating solution (and a concentrate for making this solution), which makes it possible to achieve sliding friction coefficients of 0.10 and less, as low as 0.08 and even down to about 0.06.

[0020] It is another important object of this invention to provide an aqueous lubricating solution (and a concentrate for preparing it), which uses monoamines as the lubricating agent without being sensitive to problems caused by deposits in the presence of anions such as carbonate, sulfate and phosphate.

[0021] It is a further important object of this invention to provide an excellent aqueous lubricating composition (and a concentrate for preparing it) at reduced cost, and especially without any need for extra cleaning steps or the use of acidic or complexing cleaning solutions.

[0022] Further objects and advantages of the invention will be notable from the following discussion and description of preferred embodiments.

[0023] The invention focusses, like EP 0 260 508, on the use of neutralized primary fatty amines, which have excellent lubricating properties. It thus turns away from the accepted wisdom in the art, that the use of monoamines is best avoided, and di- and higher amines should instead be used.

[0024] Instead of permitting a certain build-up of solid precipitate deposits in the apparatus, then remove the lubricant solution from the system, add a cleaning solution to the system, dissolve the deposits and then again replace the cleaning solution by the lubricating solution, as in EP 0 260 508, the invention teaches to already prevent the formation of such deposits, and thus removes the need for dealing with them after they have started to build up in the apparatus.

[0025] To achieve this, the invention discloses an aqueous lubricant concentrate composition, usable for the preparation of an aqueous lubricating solution for lubricating conveyor belts and conveyor chains in the food and beverage industry, comprising at least one fatty monoamine compound as the main lubricating agent; further comprising (in weight-%, based on total concentrate) 0.1 to 99 % of a fatty monoamine compound and 0.01 to 50 % of a deposition-preventing component capable of preventing the deposition of solids from the lubricating solution under lubricating application conditions at least to such an extent that said lubricating application is not impaired by such depositions, without impairing the lubricating film-forming properties of the aqueous lubricating solution; said deposition-preventing component comprising one (or more) amphoteric tenside(s), one (or more) anionic tenside(s) and one (or more) non-ionic tenside(s), said concentrate further comprising sufficient acid to provide a pH lower than 8 to the concentrate, and optionally comprising a disinfectant, and other customary additives.

[0026] Instead of "deposition-preventing component", terms like "deposit-preventing agent", "anti-deposition compound" and "dispersant" may be used, in the context of this invention. Such somewhat varying terminology reflects the great variability of the inventive lubricant addivites, and all these terms should be regarded as synonyms. As suggested and claimed here, this deposition-preventing component is part of the aqueous lubricant concentrate composition, and is present in the concentrate when this is mixed with the process water, in the central dosing unit of the lubricant spray system. It would of course be possible to, instead, add such a deposit-preventing agent separately, in the central dosing unit, or add it to the process water, and such embodiments, while presently considered uneconomical, should be considered as equivalent embodiments of the invention's preferred embodiment that comprises both monoamine compound and the anti-deposit compound in the same concentrate.

[0027] In any case, the definition of the deposit-preventing compound or dispersant as used in this specification is that it either completely prevents the formation of solid precipitate, e. g. by neutralizing the anions before they can react with the monoamine content of the concentrate, or at least prevents the formation of aggregates of solid precipited particles, which aggregates would be large enough to be retained by sieves, or incapable of passing through nozzles. The agent is also capable of preventing the formation of deposits of such solids on sieves, in nozzles, etc. which would block or clogg said sieves, nozzles, etc.

[0028] The exact mechanism by which the invention achieves its objects is not yet completely clarified, and it is possible that several somewhat different mechanisms are involved, likely depending at least partly on the choice of deposit-preventing agent. It is thus possible that with some agents of the invention, no solid precipitate particles are ever formed, whereas in other cases, very small microparticles are formed which, however, are prevented from aggregating or agglomerating and/or from settling on sieves, in nozzles, etc., to form clogging deposits. In the most preferred embodiments it is however notable that the aqueous lubricating solutions, as made up ready for use, remain completely clear to the naked eye, i. e. do not at all get cloudy, at least over the usual residence times of the aqueous solution in the apparatus and actually much longer, often for weeks.

[0029] It is therefore presently surmised, although the applicant does not want to be bound to any specific scientific theory, that the anti-deposit compounds of the invention actually prevent the formation of particles big enough to be visible to the naked eye, although what appears to be clear solutions may in fact be micro-dispersions or micro-suspensions.

[0030] The deposit-preventing compounds as according to the present invention comprise tensides (other than soap), also known as surface active agents. Conventional soaps are not to be understood as comprised by the term "tenside" in the context of this specification. Generally, the invention uses anionic, non-ionic and amphoteric tensides, since these do not only suggest themselves for use with glass bottles, metal cans etc., but also for use with PET and PC bottles, which show high sensitiveness to cationic tensides. Of course, where this is no problem, such as in the handling of glass bottles, cationic tensides can also be used.

[0031] One reason why the use of such tensides, combined with monoamines, to prevent the deposit of solid precipitates in the presence of anions, has not before been suggested, is probably that tensides generally counteract the formation of the necessary lubricating film on the conveyor belt or conveyor chain. To achieve the necessary lubrication, a sufficiently thick and effective film of aqueous lubricating solution must be formed on the surface of the belt or chain.

[0032] Tensides, especially in high concentration, can weaken or even destroy this film, and thus reduce the lubricating effect of the amine.

[0033] The invention is thus also based on the surprising finding that in the presence of tensides, the harmful deposits are not formed from the reaction of monoamines and anions, while still, a highly efficient and persistent lubricant solution film is formed on the belt or chain.

[0034] Among the tensides which have been found to provide the desired effect, are ether carboxylic acids, fatty alcohol alkoxylates, and a variety of amphoteric substances such as amphoteric alkyl monoamine or polyamine carboxylates, betaines, sulfobetaines and the like. Details will be discussed hereinafter, and are also the subject matter of various of the attached claims.

[0035] One important aspect of the invention is that tensides which per se show no anti-deposition effect, and which are uneffective when used alone, provide improved anti-deposition efficiency when combined with each other, to form a multi-compound anti-deposition component. Thus, some amphoteric, anionic and nonionic tensides have been tested and found to have, per se, no pertinent dispersing or anti-deposition effect. However, when combined, they exhibit excellent such effects.

[0036] The inventive products use dispersing systems comprising at least one amphoteric tenside combined with at least one anionic tenside and at least one nonionic tenside. In these, the relativ content of anionic tenside(s) is often higher than that of nonionic tenside(s), and the content of amphoteric tenside is generally the lowest of the three.

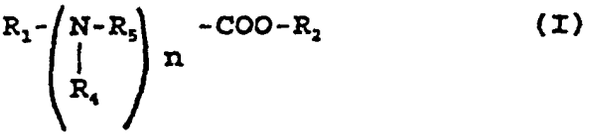
[0037] The concentration of anti-deposition agent or compound in the concentrate is 0.01 to 50%, and that of the lubricating amine agent ranges from 0.1 to 99%. Often, it is about two times the concentration of the amine. It is preferred that it should not be higher than three times the amine concentration, to avoid negative effects on the lubricating film. Another consideration is that the addition of tenside generally reduces the lubricating effect of the amine. Monoamines, especially coco-monoamine, provide even much lower friction coefficients (down to 0.03) in the absence of tensides. However, the concentration will be selected, in practise, to optimize the anti-deposition effect and this will be generally feasible without approaching harmful tenside concentrations.

[0038] The presently preferred embodiments use specific tensides (except soap) as the deposit-preventing compound. Such preferred embodiments will now be described in more detail.

[0039] All embodiments of the invention use a combination of (at least) one amphoteric , (at least) one anionic and (at least) one nonionic tenside as the deposit-preventing component.

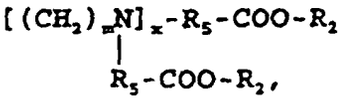
[0040] Herein, the amphoteric tenside can be selected from a variety of compounds, especially those corresponding to one of the following general formulae (I) - (III).

[0041] One preferred class of amphoteric tensides corresponds to the general formula (I)



(I)

wherein R_1 is a linear, branched, saturated or unsaturated alkyl residue with 8 to 22 carbon atoms, or a corresponding alkoxy residue; R_2 is H, Na, K or $N(R_3)_3$ with R_3 = alkyl or hydroxyalkyl; R_4 is H, alkyl, hydroxyalkyl, R_5-COO-R_2 or



wherein R_5 is alkylene or hydroxyalkylene, n and m are integers from 1 to 10 and x is an integer from 1 to 50.

[0042] More specifically, a preferred dispersant comprises an alkyl monoamine carboxylate corresponding to the general formula (I), wherein R_1 is cocoalkyl, R_4 is H, R_5 is ethylene, R_2 is H and n is 1.

[0043] Such alkyl monoamine carboxylates can be obtained under the tradename "Amphoram® CP1" from CECA Atochem S.A., France.

[0044] The presently most preferred amphoteric tenside is an alkyl polyamine carboxylic acid corresponding to the general formula (I), wherein R_1 is cocoalkyl, R_2 and R_4 are H, R_5 is propylene, and n is 2. This product can be obtained under the tradename "Triamphoram® CP1", also from CECA Atochem S.A.

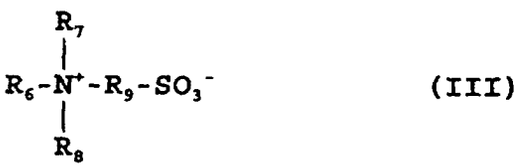
[0045] An alternatively preferred class of amphoteric tensides comprises betaines of the general formula (II),

(II)

wherein R_6 is R_1 or R_1-CONH-$(CH_2)_n$, R_1 and n having the same meaning as in formula (I), and R_7 and R_8 are equal or different alkyl or hydroxyalkyl substituents. Of these betaines, some compounds have been found to be specifically advantageous. In these, R_6 is cocoalkyl and R_7 and R_8 are hydroxyethyl, or R_6 is cocoamidopropyl and R_7 and R_8 are methyl.

[0046] Such dispersants can be obtained under the tradenames "Tegotain® N192" from Goldschmidt, Germany, "Amphotensid® B4" from Zschimmer und Schwarz, also Germany, and "Amphoteen® 24" from Akzo Nobel.

[0047] Also alternatively, the amphoteric tenside can advantageously comprise a sulfobetaine corresponding to the general formula (III)



(III)

wherein R_6, R_7 and R_8 have the same meaning as in formula (II), and R_9 is linear or branched alkyl or hydroxyalkyl. Preferably, R_6 is lauryl, R_7 and R_8 are methyl and R_9 is 2-hydroxypropyl, or R_6 is cocoamidopropyl, R_7 and R_8 are methyl and R_9 is 2-hydroxypropyl.

[0048] Such sulfobetaines (or sultaines) can be obtained from Witco/Rewo Chemische Werke GmbH, Germany, under the tradename "Rewoteric® AM HC", and from Rhone Poulenc, France, under the "Mirataine® CBS" tradename.

[0049] The anionic tenside of the presently most preferred embodiment of the invention can broadly be selected from the class of anionic polyether compounds. Suitable such polyether compounds comprise alkyl polyether carbonic acids, alkyl polyether sulfates and sulfosuccinates, and alkyl polyether phosphates. Instead of an alkyl group, the polyether compound can have a comparable alkylamido group.

[0050] The most preferred anionic tensides are presently selected from alkyl polyether carbonic acids and alkyl polyether sulfates.

[0051] It is specifically preferred that the dispersant comprises an alkyl polyether compound corresponding to the general formula (IV)

$$R_1\text{-}[O\text{-}R_{10}]_p\text{-}O\text{-}(R_{11})\text{-}COO\text{-}R_2 \qquad (IV)$$

wherein R_1 and R_2 have the same meaning as in formula (I), R_{10} and R_{11} are alkyl residues, and p is an integer from 1 to 20.

[0052] Especially, R_1 is oleyl, R_{10} is ethylene and R_{11} is methylene,
p is 5 to 9 and R_2 is H.

[0053] Such dispersants can be obtained from KAO, Japan under the tradenames "Akypo® RO 50" (p=5), "Akypo® RO 90" (p=9), and "Akypo® RLM 100".

[0054] As an alternative anionic tenside, the dispersant may comprise a compound of the general formula (V)

$$R_1\text{-}[O\text{-}(CH_2)_n]_m\text{-}OSO_3\text{-}R_2 \qquad (V)$$

wherein R_1 and R_2 have the same meaning as in formula (I), and n and m are integers from 1 to 10. More specifically preferred, R_1 is a natural, a Ziegler synthetic, or an oxosynthetic alkyl, n is 2, m is 1, 2 or 3 and R_2 is sodium.

[0055] Such compounds can be obtained from Manro Products Ltd., England, under the "Manro® BES" tradename. A preferred product is "Tensagex® DLM 970", obtainable from Hickson, England.

[0056] Suitable alkylpolyether phosphates comprise "Marlopor® FC" from Hüls, Germany.

[0057] In another preferred class of anionic tenside, i.e. the alkyl polyether sulfosuccinates, a very advantageous product is "Tensuccin® HM 935" from ICI, an alkylpolyethoxysulfosuccinate-disodium salt.

[0058] Suitable alkylamido polyether sulfosuccinates comprise "Lankropol® KS6" from Akcros.

[0059] The third element in the presently most preferred embodiments is a nonionic tenside. This can for example be a nonionic fatty alcohol alkoxylate, an alkylpolyglucoside or an alkylpolyether carbonic acid monoalkylolamide.

[0060] Preferred alkyl polyalkoxylates comprise "Synperonic® LF/RA 30" from ICI, England, and "Plurafac® LF 431" from BASF, Germany. Plurafac® is a (-OCH_3)-terminated fatty alcohol alkoxylate.

[0061] Preferred alkyl polyglucosides can be obtained from Henkel, Germany, under the "Glucopon" tradename, especially as "Glucopon® 600 CSUP".

[0062] Preferred alkylpolyethercarboxy-monoalkylolamides comprise KAO's product "Aminol® A 15".

[0063] "Synperonic® LF/RA 30" and "Plurafac® LF 431" are presently most preferred.

[0064] Presently, the best inventive combination (as far as dispersing performance is concerned) comprises an amphoteric tenside like "Triamphoran® CP1", an alkyl polyether carboxylic acid anionic tenside like "Akypo RO 50", and either an alkyl polyalkoxylate such as "Plurafac® LF 431" or an alkyl polyether carboxylic acid monoethanolamide, such as "Aminol® A 15". In these, there is generally a smaller amount (based on overall concentrate, with about 3% coco-monoamine and about 3,5% formic acid) of about 1% amphoteric tenside, combined with about 3% anionic and about 2% nonionic tenside.

[0065] Generally, the relative amounts of monoamine lubricating agent (or agents) and deposit-preventing compound (or compounds) will be selected, so that the amount of dispersant is high enough to prevent deposit formation, but not so high that the lubricating film-forming properties of the diluted lubricating solution suffer. To achieve this, different dipersants may have to be combined to experimentally determine the best selection.

[0066] To advantageously influence the storage stability and flow properties of the lubricant concentrates, the formulations may additionally contain solubilisers in the form of mono- or polyhydric alcohols (usually lower aliphatic alcohols or glycols) or polyalkyleneglycols.

[0067] The formulation will generally further contain a disinfectant, such as 4,4-Dimethyl oxazolidine.

[0068] The pH of the concentrate is below neutrality. To achieve this, a suitable excess amount of acid, usually formic, acetic or lactic acid, is added, to provide a pH lower than 8.

[0069] For the preparation of the lubricant concentrates according to the invention, the individual components can generally be used in acid or salt form.

[0070] The appropriate amount of demineralised water is introduced into a mixing vessel equipped with a stirrer. Subsequently, the components in the acid or the salt form are added. Generally, this takes the form of addition of a preformed concentrate comprising all components. However, it is of course possible to prepare an aqueous lubricant composition of this invention by adding the individual components to the water one by one.

[0071] The superior properties of the lubricant composition according to the invention will now be shown in further detail by way of the following examples, in association with the attached drawing. In the drawing

Fig. 1 represents a diagramatic representation of a bottle conveyor facility on which the reported experiments were carried out

Fig. 2 shows a graphic representation of the sliding friction coefficients achieved with different lubricants and lubricant compositions.

[0072] For the turbidity tests reported below, Ladenburg town water (25° total German water hardness, 15° carbonate hardness, 10° non-carbonate hardness) was used.

Comparative Examples 1 - 7;

Examples 8 - 19

[0073] Concentrates were made up from 3% coco-monoamine; 3,5% formic acid; various deposition-preventing compounds at varying overall amounts, and as defined in the TABLE, plus completely demineralized water (to 100%). Percentages here and in the TABLE are based on total concentrate composition.

[0074] Examples 8-19 correspond to the invention.

TABLE

Example	Amphoteric tenside	Anionic tenside	Nonionic tenside	Anti-deposition effect
1 (Comparative)	9% Triamphoram® CP 1	-	-	-
2 "	-	5,6% Akypo® RO 50	-	-
3 "	-	-	5,6% Plurafac® LF 431	-
4 "	4,2% Triamphoram® CP 1	3% Akypo® RO 50	-	++
5 "	-	3% Akypo® RO 50	2,6% Plurafac® LF 431	+
6 "	-	4% Akypo® RO 50	2% Plurafac® LF 431	++++
7 "	4,8% Triamphoram® CP 1	-	2,6% Plurafac® LF 431	+
8	1% Triamphoram® CP 1	3% Akypo® RO 50	2% Plurafac® LF 431	+++++
9	1% Triamphoram® CP 1	3% Akypo® RO 50	4% Glucopon® 600 CSUP	++++
10	1% Triamphoram® CP 1	3% Akypo® RO 50	2% Synperonic® LF/RH 30	++
11	1% Triamphoram® CP 1	3% Akypo® RO 50	2% Aminol® A 15	+++++

12	1% Triamphoram®CP 1	7,7% Tensuccin®HM 935	2% Plurafac®LF 431	++++
13	1% Triamphoram®CP 1	4,3% Tensagex® DLM 970	2% Plurafac®LF 431	+++
14	1% Triamphoram®CP 1	3% Akypo® RLM 100	2% Plurafac®LF 431	++
15	1% Amphoram®CP 1	3% Akypo®RO 50	2% Plurafac®LF 431	+
16	2% Amphoteen®24	3% Akypo®RO 50	2% Plurafac®LF 431	++
17	2% Amphotensid®B4	3% Akypo®RO 50	2% Plurafac®LF 431	+
18	1,3% Rewoteric®AM HC	3% Akypo®RO 50	2% Plurafac®LF 431	+
19	2,6% Triamphoram®CP 1	3% Akypo®RO 50	1% Plurafac®LF 431	++++

[0075] The TABLE shows, for each example, the anti-deposition (or deposition-preventing) effect in terms of the turbidity (and, in case, precipitation) observed, when a 0.3% solution of the concentrate in Ladenburg town water was left standing. Turbidity was determined by inspection (non-apparative). The symbols in the corresponding column in

the TABLE have the following meanings:

-	turbidity visible immediately; precipitates forming after 1 hour
+	strong precipitation, after 24 hours
++	strong precipitation, after 48 hours
+++	some precipication after 96 hours
++++	no turbidity visible for 7 days, later some turbidity and little precipitation
+++++	no or very little turbidity after more than 14 days

[0076] Compositions with at least four "+" would be regarded as commercially fully usable. Compositions with inferior test results may, however, also be suitable under corresponding conditions (e.g. where softer water is easily available).

[0077] To determine the lubricating performance of lubricants according to the invention and their individual components, an in-house bottle conveyor facility was used, as is illustrated diagramatically in Fig. 1. The belt speed and the spray volume per unit of time were kept constant during the measurements. The lubricant solutions were prepared from said local (Ladenburg) town water (25° German hardness). A 0.3% aqueous solution (by weight) of the lubricant concentrate was used for the comparative measurements.

[0078] A lubricant composition according to the invention was made up (similar to Example 8 above) as follows:

Component

[0079]

A	3% Coco-monoamine
B	1% Coco- $(NH\text{-}CH_2\text{-}CH_2\text{-}CH_2)_3\text{-}COOH$
C	3% Oleyl-$(O\text{-}CH_2\text{-}CH_2)_5\text{-}O\text{-}CH_2\text{-}COOH$
D	2% alkoxylated fatty alcohol, ether capped
E	3% formic acid, 85% in water
F	88% water, demineralized.

(pH < 7)

[0080] (A is "Armeen® CD" from Akzo; B is "Triamphoram® CP1" from CECA Atochem S.A.; C is "Akypo® RO 50" from KAO Corp., Japan; D is "Plurafac® LF 431" from BASF AG, Germany.)

[0081] For comparison of lubricating efficiency, several mono-, di- and triamines were formulated without the inventive dispersant, as follows:

3% amine
3% acetic acid, 60% in water
84% water, demineralized

[0082] Fig. 2 shows the sliding friction coefficients of various application solutions (at 90 ppm amine) of mono-, di- and triamines, and of the inventive solution (similar to Example 8). The sliding friction coefficient K represents a measure of the performance of the lubricant and is calculated using the formula

$$K=F/G$$

K	sliding friction coefficient
F	force measured on the measuring facility of the bottle conveying plant (Fig. 1)
G	weight of the bottles used in the test.

[0083] The lower the sliding friction coefficient, the greater the lubricating effect. Fig. 2 clearly shows that coco-monoamine provides the lowest sliding friction coefficient (K = 0.03, glass).

[0084] However, coco-monoamine formulated without the inventive dispersant is unusable in practise, due to the above-discussed precipitation problems. With sliding friction coefficiency at K = 0.075 (glass) and 0.102 (PET), the inventive product similar to Example 8 is decidedly superior as compared to the di- and triamines, which presently form the industrial standard. An improvement of the order of 0.2 units in the sliding friction coefficiency in practise means a very relevant improvement.

[0085] The inventive monoamine-based products produce practically no foam in application. This is a major benefit, since the known and presently used di- and triamine-based products generate huge volumes of foam. These foams are very stable, and have to be removed by rinsing. This causes increased effort and expenditure, and also puts increased strain on the plant and municipal waste water systems.

Claims

1. An aqueous lubricant concentrate composition, usable for the preparation of an aqueous lubricating solution for lubricating conveyor belts and conveyor chains in the food and beverage industry, comprising at least one fatty monoamine compound as the main lubricating agent; further comprising (in weight-%, based on total concentrate) 0.1 to 99 % of a fatty monoamine compound and 0.01 to 50 % of a deposition-preventing component capable of preventing the deposition of solids from the lubricating solution under lubricating application conditions at least to such an extent that said lubricating application is not impaired by such depositions, without impairing the lubricating film-forming properties of the aqueous lubricating solution; said deposition-preventing component comprising one (or more) amphoteric tenside(s), one (or more) anionic tenside(s) and one (or more) non-ionic tenside(s), said concentrate further comprising sufficient acid to provide a pH lower than 8 to the concentrate, and optionally comprising a disinfectant, and other customary additives.

2. The concentrate according to claim 1, wherein the monoamine compound comprises at least one primary fatty amine, such as a C_8-C_{22} fatty amine, and especially a C_{12}-C_{18} fatty amine.

3. The concentrate according to claim 2, wherein the fatty amine comprises, and preferably substantially consists of, coco-monoamine compounds.

4. The concentrate according to any one of claims 1 to 3, further comprising a lower alkyl carboxylic acids such as formic acid, acetic acid and lactic acid, in an amount at least sufficient to neutralize the amine content of the concentrate.

5. The concentrate according to claim 4, having a pH-value between 3 and 8, preferably between 4 and 7.

6. The concentrate according to claim 1, wherein the concentrate comprises at least one of an amphoteric alkyl monoamine or polyamine carboxylic acid or carboxylate, or a betaine, especially an alkyl or alkylamido betaine or sulfobetaine.

7. The concentrate according to claim 1, wherein the concentrate comprises at least one of a non-ionic fatty alcohol alkoxylate, a fatty amine alkoxylate, an alkyl polyglucoside and an alkyl polyether carbonic acid monoalkylolamide.

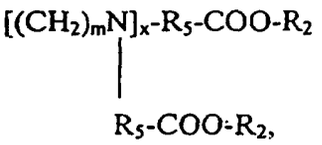
8. The concentrate according to claim 1, wherein the concentrate comprises at least one anionic polyether compound, especially at least one of

   - an alkyl polyether carbonic acid,
   - an alkyl polyether sulfate,
   - an alkyl polyether sulfosuccinate,
   - an alkyl polyether phosphate or
   - a corresponding alkylamido polyether compound.

9. The concentrate according to claim 5, wherein the deposition-preventing component comprises at least one compound of the general formula (I)

$$R_1\text{-}\left(\begin{array}{c}\text{N-}R_5\\ |\\ R_4\end{array}\right)_n\text{-COO-}R_2 \qquad \text{(I)}$$

wherein R_1 is a linear, branched, saturated or unsaturated alkyl residue having 8 to 22 carbon atoms or a corresponding alkoxy residue, R_2 is H, Na, K or $N(R_3)_3$, wherein R_3 is alkyl or hydroxyalkyl, R_4 is H, alkyl, hydroxyalkyl, R_5-COO-R_2 or

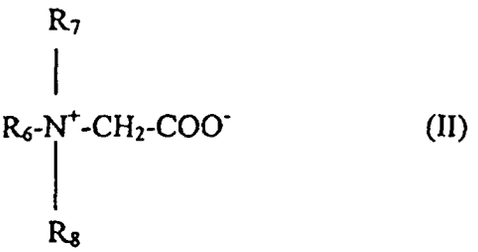


R_5 is alkylene or hydroxyalkylene, n and m are integers from 1 to 10, x is an integer from 1 to 50.

10. The concentrate according to claim 9, wherein the deposition-preventing component comprises an alkyl amine carboxylic acid corresponding to the general formula (I) wherein R_1 is cocoalkyl, R_4 is H, R_5 is ethylene, R_2 is H and n is 1.

11. The concentrate according to claim 9, wherein the deposition-preventing component comprises an alkyl polyamine carboxylic acid corresponding to the general formula (I), wherein R_1 is cocoalkyl, R_4 is H, R_5 is ethylene, R_2 is H and n is 3.

12. The concentrate according to claim 6, wherein the deposition-preventing component comprises a betaine of the general formula (II)



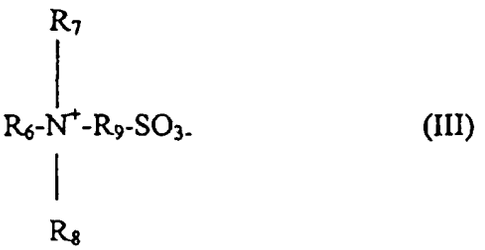
(II)

wherein R_6 is R_1 or $R_1CONH-(CH_2)_n$, with R_1 and n having the same meaning as in formula (I), and R_7 and R_8 are equal or different alkyl or hydroxyalkyl substituents.

13. The concentrate according to claim 12, wherein R_6 is cocoalkyl and R_7 and R_8 are hydroxyethyl.

14. The concentrate according to claim 12, wherein R_6 is cocoamidopropyl, and R_7 and R_8 are methyl.

15. The concentrate according to claim 6, wherein the deposition-preventing component comprises a sulfobetaine corresponding to the general formula (III)



(III)

wherein R_6, R_7 and R_8 have the same meaning as in formula (II), and R_9 is linear or branched alkyl or hydroxyalkyl.

16. The concentrate according to claim 15, wherein R_6 is lauryl, R_7 and R_8 are methyl and R_9 is 2-hydroxypropyl.

17. The concentrate according to claim 15, wherein R_6 is cocoamidopropyl, R_7 and R_8 are methyl, and R_9 is 2-hydroxypropyl.

18. The concentrate according to claim 7, wherein the deposition-preventing component comprises a C_8-C_{22} alkylolalkoxylate.

19. The concentrate according to claim 8, wherein the deposition-preventing component comprises an alkyl polyether compound corresponding to the general formula (IV)

$$R_1\text{-}[O\text{-}R_{10}]_p\text{-}O\text{-}(R_{11})\text{-}COO\text{-}R_2 \qquad (IV)$$

wherein R_1 and R_2 have the same meaning as in formula (I), R_{10} and R_{11} are alkylene and p is an integer from 1 to 20.

20. The concentrate according to claim 19, wherein R_1 is C_9-C_{11} alkyl, R_{10} is ethylene, R_{11} is methylene or ethylene, p is 3 to 9 and R_2 is H.

21. The concentrate according to claim 19, wherein R_1 is C_{16}-C_{22} alkyl or alkenyl, especially oleyl, R_{10} is ethylene, R_{11} is methylene or ethylene, especially methylene, p is 5 to 9, and R_2 is H.

22. The concentrate according to claim 8, wherein the deposition-preventing component comprises a compound of the general formula (V)

$$R_1\text{-}(O\text{-}(CH_2)_n]_m\text{-}OSO_3\text{-}R_2 \qquad (V)$$

wherein R_1 and R_2 have the same meaning as in formula (I), and n and m are integers from 1 to 10.

23. The concentrate according to claim 22, wherein R_1 is a natural, Ziegler synthetic or oxosynthetic alkyl, n is 2, m is 1, 2 or 3 and R_2 is sodium.

24. The concentrate according to any one of claims 1 to 21, comprising (in weight-%, based on total concentrate):

- 0.5 to 10 %, and most preferred 1 to 5 %, fatty monoamine compound,
- 0.1 to 15 %, and most preferred 1 to 10 %, of the deposition-preventing component,
- sufficient acid, especially lower alkyl carboxylic acid, to provide a pH lower than 8 to the concentrate,
- in case, further customary additives,
- and water.

25. An aqueous lubricant composition, especially for belt or chain conveyors in the bottling industry, comprising the concentrate ingredients defined in any one of claims 1 to 24 plus a major amount of water, and especially containing between 10 and 500, preferably about 90 ppm of monoamine lubricating agent.

26. Use of the concentrate according to any one of claims 1 to 24, for preparing an aqueous lubricating solution, especially as defined in claim 25, wherein the concentrate contains from 1 to 30 % by weight, based on total concentrate, of a fatty monoamine lubricating agent, especially coco-monoamine and the lubricating solution has a sliding friction coefficient, at about 90 ppm monoamine concentration, of less than 0.10, preferably less than 0.08.

Patentansprüche

1. Eine wässrige Schmiermittelkonzentratzusammensetzung, die zur Herstellung einer wässrigen Schmiermittellösung zum Schmieren von Förderbändern und Förderketten in der Lebensmittel- und Getränkeindustrie verwendet werden kann, umfassend mindestens eine Fettsäuremonoaminverbindung als das hauptsächlich schmierende Agens, die (in Gewichtsprozent basierend auf dem gesamten Konzentrat) 0,1 - 99 % Fettsäuremonoaminverbindung und 0,01 - 50 % einer Abscheidungs-verhindernden Komponente umfasst, welche in der Lage ist, die Abscheidung von Feststoffen aus der Schmiermittellösung unter Schmiermittelanwendungsbedingungen mindestens in dem Ausmaß zu verhindern, dass besagte Schmiermittelanwendung durch solche Abscheidungen nicht beeinträchtigt wird und ohne dass die schmierenden, filmbildenden Eigenschaften der wässrigen Schmiermittellösung beeinträchtigt werden, wobei besagte Abscheidungs-verhindemde Komponente ein oder mehrere amphotere Tenside, ein oder mehrere anionische Tenside und ein oder mehrere nicht-ionische Tenside umfasst und besagtes Konzentrat zusätzlich ausreichend Säure umfasst, um zu gewährleisten, dass das Konzentrat einen pH von weniger 8 aufweist, und wobei besagtes Konzentrat optional ein Desinfektionsmittel und andere übliche Zusatzstoffe umfasst.

2. Konzentrat gemäß Anspruch 1, wobei die Monoaminverbindung mindestens ein primäres Fettsäureamin wie z.B. ein C_8-C_{22} Fettsäureamin, und insbesondere ein C_{12}-C_{18} Fettsäureamin umfasst.

3. Konzentrat gemäß Anspruch 2, wobei das Fettsäureamin Coco-Monoaminverbindungen umfasst und bevorzugt im wesentlichen daraus besteht.

4. Konzentrat gemäß einem der Ansprüche 1 - 3, das zusätzlich Niederalkylcarboxylsäuren wie z.B. Ameisensäure, Essigsäure und Milchsäure in einer Menge umfasst, die mindestens ausreicht, den Amingehalt des Konzentrates zu neutralisieren.

5. Konzentrat gemäß Anspruch 4, das einen pH-Wert zwischen 3 und 8, und bevorzugt zwischen 4 und 7 aufweist.

6. Konzentrat gemäß Anspruch 1, wobei das Konzentrat mindestens eine amphotere Alkylmonoamin- oder Polyamincarboxylsäure oder -carboxylat oder ein Betain, insbesondere ein Alkyl- oder Alkylamidbetain oder Sulfobetain umfasst.

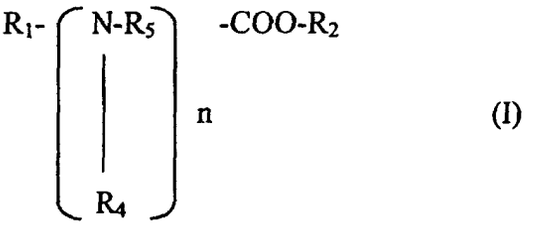
7. Konzentrat gemäß Anspruch 1, wobei das Konzentrat mindestens ein nichtionisches Fettalkoholalkoxylat, ein Fettsäureaminalkoxylat, ein Alkylpolyglycosid und ein Alkylpolyethercarbonsäuremonoalkylolamid umfasst.

8. Konzentrat gemäß Anspruch 1, wobei das Konzentrat mindestens eine anionische Polyetherverbindung, insbesondere mindestens

   - eine Alkylpolyethercarbonsäure,
   - ein Alkylpolyethersulfat,
   - ein Alkylpolyethersulfosuccinat,
   - ein Alkylpolyetherphosphat oder
   - eine entsprechende Alkylamidpolyetherverbindung

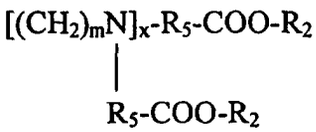
   umfasst.

9. Konzentrat gemäß Anspruch 5, wobei die Abscheidungs-verhindemde Komponente mindestens eine Verbindung der allgemeinen Formel (I) umfasst:



(I)

wobei R_1 ein linearer, verzweigter, gesättigter oder ungesättigter Alkyrest ist, der 8 bis 22 Kohlenstoffatome aufweist oder ein entsprechender Alkoxyrest ist, R_2 Wasserstoff, Na, K oder $N(R_3)_3$ ist, wobei R_3 ein Alkyl oder Hydroxyalkyl ist, R_4 Wasserstoff, Alkyl, Hydroxyalkyl, R_5-COO-R_2 oder

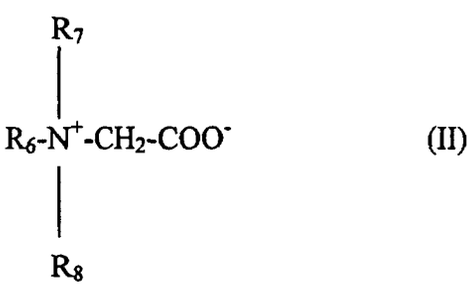


ist, R_5 ein Alkandiyl oder Hydroxyalkandiyl ist, n und m ganzzahlige Zahlen von 1 bis 10 und x eine ganzzahlige Zahl von 1 bis 50 sind.

10. Konzentrat gemäß Anspruch 9, wobei die Abscheidungs-verhindemde Komponente eine Alkylamincarboxylsäure entsprechend der allgemeinen Formel (I) umfasst, wobei R_1 Cocoalkyl, R_4 Wasserstoff, R_5 Ethylen, R_2 Wasserstoff und n der Zahl 1 entsprechen.

11. Konzentrat gemäß Anspruch 9, wobei die Abscheidungs-verhindemde Komponente eine Alkylpolyamincarboxylsäure entsprechend der allgemeinen Formel (I) umfasst, wobei R_1 Cocoalkyl, R_4 Wasserstoff, R_5 Ethylen, R_2 Wasserstoff und n der Zahl 3 entsprechen.

12. Konzentrat gemäß Anspruch 6, wobei die Abscheidungs-verhindemde Komponente ein Betain der allgemeinen Formel (II)



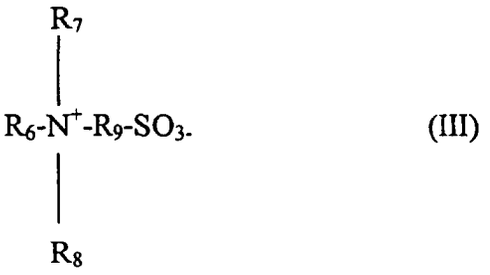
(II)

umfasst, wobei R_6 gleich R_1 oder $R_1CONH-(CH_2)_n$ entspricht und R_1 und n die gleiche Bedeutung wie in Formel (I) haben, und R_7 und R_8 gleiche oder unterschiedliche Alkyl- oder Hydroxyalkylsubstituenten darstellen.

13. Konzentrat gemäß Anspruch 12, wobei R_6 Cocoalkyl und R_7 und R_8 Hydroxyethyl entsprechen.

14. Konzentrat gemäß Anspruch 12, wobei R_6 Cocoamidpropyl und R_7 und R_8 Methyl entsprechen.

15. Konzentrat gemäß Anspruch 6, wobei die Abscheidungs-verhindernde Verbindung ein Sulfobetain der allgemeinen Formel (III)



(III)

umfasst, wobei R_6, R_7 und R_8 die gleiche Bedeutung wie in Formel (II) haben, und R_9 ein unverzweigtes oder verzweigtes Alkyl oder Hydroxyalkyl ist.

16. Konzentrat gemäß Anspruch 15, wobei R_6 Lauryl, R_7 und R_8 Methyl und R_9 2-Hydroxypropyl entsprechen.

17. Konzentrat gemäß Anspruch 15, wobei R_6 Cocoamidopropyl, R_7 und R_8 Methyl und R_9 2-Hydroxypropyl entsprechen.

18. Konzentrat gemäß Anspruch 7, wobei die Abscheidungs-verhindernde Komponente ein C_8-C_{22} Alkylolalkoxylat umfasst.

19. Konzentrat gemäß Anspruch 8, wobei die Abscheidungs-verhindernde Komponente eine Alkylpolyetherverbindung der allgemeinen Formel (IV)

$$R_1\text{-}[O\text{-}R_{10}]_p\text{-}O\text{-}(R_{11})\text{-}COO\text{-}R_2 \qquad \text{(IV)}$$

umfasst, wobei R_1 und R_2 die gleiche Bedeutung wie in Formel (I) haben, R_{10} und R_{11} ein Alkandiyl sind und p eine ganze Zahl von 1 bis 20 ist.

20. Konzentrat gemäß Anspruch 19, wobei R_1 einem C_9-C_{11} Alkyl, R_{10} Ethylen, R_{11} Methylen oder Ethylen, p einer Zahl von 3 bis 9 und R_2 Wasserstoff entsprechen.

21. Konzentrat gemäß Anspruch 19, wobei R_1 einem C_{16}-C_{22} Alkyl oder Alkenyl, insbesondere Oleyl, R_{10} Ethylen, R_{11} Methylen oder Ethylen, insbesondere Methylen, p einer Zahl von 5 bis 9 und R_2 Wasserstoff entsprechen.

22. Konzentrat gemäß Anspruch 8, wobei die Abscheidungs-verhindernde Komponente eine Verbindung der allgemeinen Formel (V)

$$R_1\text{-}[O\text{-}(CH_2)_n]_m\text{-}OSO_3\text{-}R_2 \qquad \text{(V)}$$

umfasst, wobei R_1 und R_2 die gleiche Bedeutung wie in Formel (I) haben und n und m ganze Zahlen von 1 bis 10 sind.

23. Konzentrat gemäß Anspruch 22, wobei R_1 einem natürlichen Alkyl, einem synthetischen Ziegleralkyl oder einem oxo-synthetischen Alkyl, n der Zahl 2, m den Zahlen 1, 2 oder 3 und R_2 Natrium entsprechen.

24. Konzentrat gemäß einem der Ansprüche 1 bis 21, umfassend (in Gewichtsprozent, basierend auf dem Gesamtkonzentrat):

- 0,5 bis 10 %, und am meisten bevorzugt 1 bis 5 %, eine Fettsäuremonoaminverbindung,
- 0,1 bis 15 %, und am meisten bevorzugt 1 bis 10 %, einer Abscheidungs-ver hindernden Komponente,
- ausreichend Säure, insbesondere eine Niederalkylcarboxylsäure, um zu ge währleisten, dass das Konzentrat einen pH von weniger als 8 aufweist,
- optional weitere übliche Hilfsstoffe,
- und Wasser.

25. Eine wässrige Schmiermittelzusammensetzung, insbesondere für Gurt- oder Kettenförderer in der Flaschenindustrie, umfassend die Konzentratsinhaltsstoffe, wie sie in einem der Ansprüche 1 - 24 definiert sind, und zusätzlich eine größere Menge Wasser, wobei die Zusammensetzung insbesondere zwischen 10 und 500, bevorzugt ca. 90 ppm des Monoamin-Schmiermittelagens enthält.

26. Verwendung eines Konzentrats gemäß einem der Ansprüche 1- 24 zur Herstellung einer wässrigen Schmiermittellösung, insbesondere wie in Anspruch 25 definiert, wobei das Konzentrat von 1- 30 Gew.-%, basierend auf dem Gesamtkonzentrat, eines Fettsäuremonoaminschmiermittelagens, insbesondere Coco-Amin, enthält und die Schmiermittellösung bei einer Monoaminkonzentration von ca. 90 ppm einen Gleitreibungskoeffizienten von weniger als 0,10, bevorzugt weniger als 0,08 aufweist.

Revendications

1. Composition de concentré lubrifiant aqueux, utilisable pour la préparation d'une solution de lubrification aqueuse pour lubrifier des bandes de transporteur et des chaînes de transporteur dans l'industrie alimentaire et des boissons, comprenant au moins un composé mono-amine gras comme agent lubrifiant principal ; comprenant de plus (en % en poids sur la base du concentré total) 0,1 à 99 % d'un composé mono-amine gras et 0,01 à 50 % d'un composant anti-dépôt capable d'empêcher le dépôt des solides de la solution de lubrification dans les conditions d'application de lubrification au mois dans une mesure telle que ladite application de lubrification ne soit pas affectée par lesdits dépôts, sans affecter les propriétés filmogènes lubrifiantes de la solution lubrifiante aqueuse ; ledit composant anti-dépôt comprenant un (ou plusieurs) agent(s) tensio-actif(s) amphotère(s), un (ou plusieurs) agent(s) tensio-actif(s) anionique(s) et un (ou plusieurs) agent(s) tensio-actif(s) non-ionique(s), ledit concentré comprenant de plus suffisamment d'acide pour assurer un pH inférieur à 8 au concentré, et en option comprenant un désinfectant, et d'autres additifs habituels.

2. Concentré selon la revendication 1, **caractérisé en ce que** le composé mono-amine comprend au moins une amine grasse primaire, tel qu'une amine grasse C_8-C_{22}, et en particulier une amine grasse C_{12}-C_{18}.

3. Concentré selon la revendication 2, **caractérisé en ce que** l'amine grasse comprend et de préférence consiste essentiellement en composés de coco-monoamine.

4. Concentré selon l'une des revendications 1 à 3, comprenant de plus un acide carboxylique alkyl inférieur comme l'acide formique, l'acide acétique et l'acide lactique, en quantité au moins suffisante pour neutraliser la teneur en amine du concentré.

5. Concentré selon la revendication 4, ayant une valeur de pH entre 3 et 8, de préférence entre 4 et 7.

6. Concentré selon la revendication 1, **caractérisé en ce que** le concentré comprend au moins l'un d'un acide carboxylique ou carboxylate monoamine ou polyamine alkyl amphotère ou une bétaïne, en particulier une alkyl ou alkylamido bétaïne ou sulfobétaïne

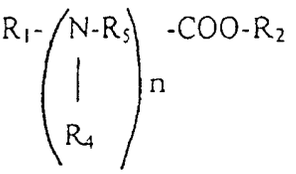
7. Concentré selon la revendication 1, **caractérisé en ce que** le concentré comprend au moins l'un d'un alkoxylate d'alcool gras non-ionique, un alkoxylate amine gras, un polyglucoside alkyl et un monoalkyloamide d'acide carbonique polyéther alkyl.

8. Concentré selon la revendication 1, **caractérisé en ce que** le concentré comprend au moins un composé de polyéther anionique, en particulier au moins l'un de :

- un acide carbonique polyéther alkyl
- un sulfate polyéther alkyl

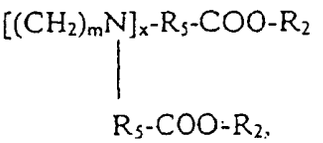
- un suifosuccinate polyéther alkyl,
- un phosphate polyéther alkyl ou
- un composé d'alkylamido polyéther correspondant.

9. Concentré selon la revendication 5, **caractérisé en ce que** le composant anti-dépôt comprend au moins un composé de la formule générale (I).



(I)

où R_1 est un résidu alkyl ramifié, linéaire, saturé ou non saturé ayant 8 à 22 atomes de carbone ou un résidu alkoxy correspondant, R_2 est H, Na, K ou $N(R_3)_3$, où R_3 est alkyl ou hydroxyalkyl, R_4 est H, alkyl, hydroxyalkyl, R_5-COO-R_2 ou

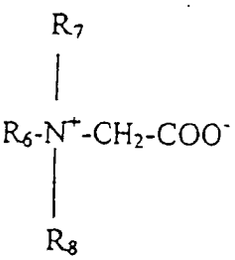


R_5 est de l'alcoylène ou hydroxyalcoylène, n et m sont des nombres entiers de 1 à 10, x est un nombre entier de 1 à 50.

10. Concentré selon la revendication 9, **caractérisé en ce que** le composant anti-dépôt comprend un acide carboxylique alkyl amine correspondant à la formule générale (I) où R_1 est un cocoalkyl, R_4 est H, R_5 est de l'éthylène, R_2 est H et n est 1.

11. Concentré selon la revendication 9, **caractérisé en ce que** le composant anti-dépôt comprend de l'acide carboxylique alkyl polyamine correspondant à la formule générale (I) où R_1 est un cocoalkyle, R_4 est H, R_5 est de l'éthylène, R_2 est H et n est 3.

12. Concentré selon la revendication 6, **caractérisé en ce que** le composant anti-dépôt comprend une bétaïne de la formule générale (II).



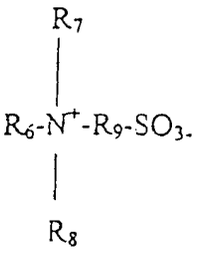
(II)

où R_6 est R_1 ou $R_1CONH-(CH_2)_n$, R_1 et n ayant la même signification qu'à la formule (I), et R_7 et R_8 sont des substituants alkyle ou hydroxyalkyle égaux ou différents.

13. Concentré selon la revendication 12, **caractérisé en ce que** R_6 est un cocoalkyle et R_7 et R_8 sont de l'hydroxyéthyle.

14. Concentré selon la revendication 12, **caractérisé en ce que** R_6 est un cocoamidopropyle, et R_7 et R_8 sont du méthyle.

15. Concentré selon la revendication 6; **caractérisé en ce que** le composant anti-dépôt comprend une sulfobétaïne correspondant à la formule générale (III)



(III)

où R_6, R_7 et R_8 ont la même signification qu'à la formule (II), et R_9 est un alkyle ou hydroxyalkyle linéaire ou ramifié.

16. Concentré selon la revendication 15, **caractérisé en ce que** R_6 est du lauryle, R_7 et R_8 sont du méthyle et R_9 est 2-hydroxypropyle.

17. Concentré selon la revendication 15, **caractérisé en ce que** R_6 est du cocoamidopropyle, R_7 et R_8 sont du méthyle et R_9 est 2-hydroxypropyle.

18. Concentré selon la revendication 7, **caractérisé en ce que** le composant anti-dépôt comprend un alkyloalkoxylate C_8-C_{22}.

19. Concentré selon la revendication 8, **caractérisé en ce que** le composant anti-dépôt comprend un composé alkyl polyéther correspondant à la formule générale (IV)

$$R_1\text{-}[O\text{-}R_{10}]_p\text{-}O\text{-}(R_{11})\text{-}COO\text{-}R_2 \qquad (IV)$$

où R_1 et R_2 ont la même signification qu'à la formule (I), R_{10} et R_{11} sont de l'alcoylène et p est un nombre entier de 1 à 20.

20. Concentré selon la revendication 19, **caractérisé en ce que** R, est un alkyle C_9-C_{11}, R_{10} est de l'éthylène, R_{11} est du méthylène ou de l'éthylène, p est de 3 à 9 et R_2 est H.

21. Concentré selon la revendication 19, où R_1 est un alkyle ou alcényle C_{16}-C_{22}, en particulier oléyle, R_{10} est de l'éthylène R_{11} est du méthylène ou de l'éthylène, en particulier du méthylène, p est de 5 à 9 et R_2 est H.

22. Concentré selon la revendication 8, **caractérisé en ce que** le composant anti-dépôt comprend un composé de la formule générale (V)

$$R_1\text{-}[O\text{-}(CH_2)_a]_m\text{-}OSO_3\text{-}R_2 \qquad (V)$$

où R_1 et R_2 ont la même signification qu'à la formule (I), et n et m sont des nombres entiers de 1 à 10.

23. Concentré selon la revendication 22, **caractérisé en ce que** R_1 est un alkyle naturel, synthétique Ziegler ou oxosynthétique, n est 2, m est 1, 2 ou 3 et R_2 est du sodium.

24. Concentré selon l'une des revendications 1 à 21, comprenant (en % en poids, sur la base du concentré total) :

- 0,5 à 10 % et de préférence 1 à 5 % de composé monoamine gras,
- 0,1 à 15 % et de préférence 1 à 10 % du composant anti-dépôt,
- suffisamment d'acide, en particulier de l'acide carboxylique alkyle inférieur, pour assurer un pH inférieur à 8 au concentré,
- si besoin est, d'autres additifs habituels
- et de l'eau.

25. Composition lubrifiante aqueuse, en particulier pour les transporteurs à bande ou à chaîne dans l'industrie de l'embouteillage, comprenant les ingrédients de concentré définis dans l'une des revendications 1 à 24, plus une quantité importante d'eau, et contenant en particulier entre 10 et 500, de préférence environ 90 ppm d'agent lubrifiant monoamine.

26. Utilisation du concentré selon l'une des revendications 1 à 24 pour préparer une solution lubrifiante aqueuse, en particulier selon définition à la revendication 25, **caractérisée en ce que** le concentré contient de 1 à 30 % en poids, sur la base du concentré total, d'un agent lubrifiant monoamine gras, en particulier coco-monoamine et la solution lubrifiante a un coefficient de frottement avec glissement, à une concentration d'environ 90 ppm de monoamine, inférieure à 0,10, de préférence inférieure à 0,08.

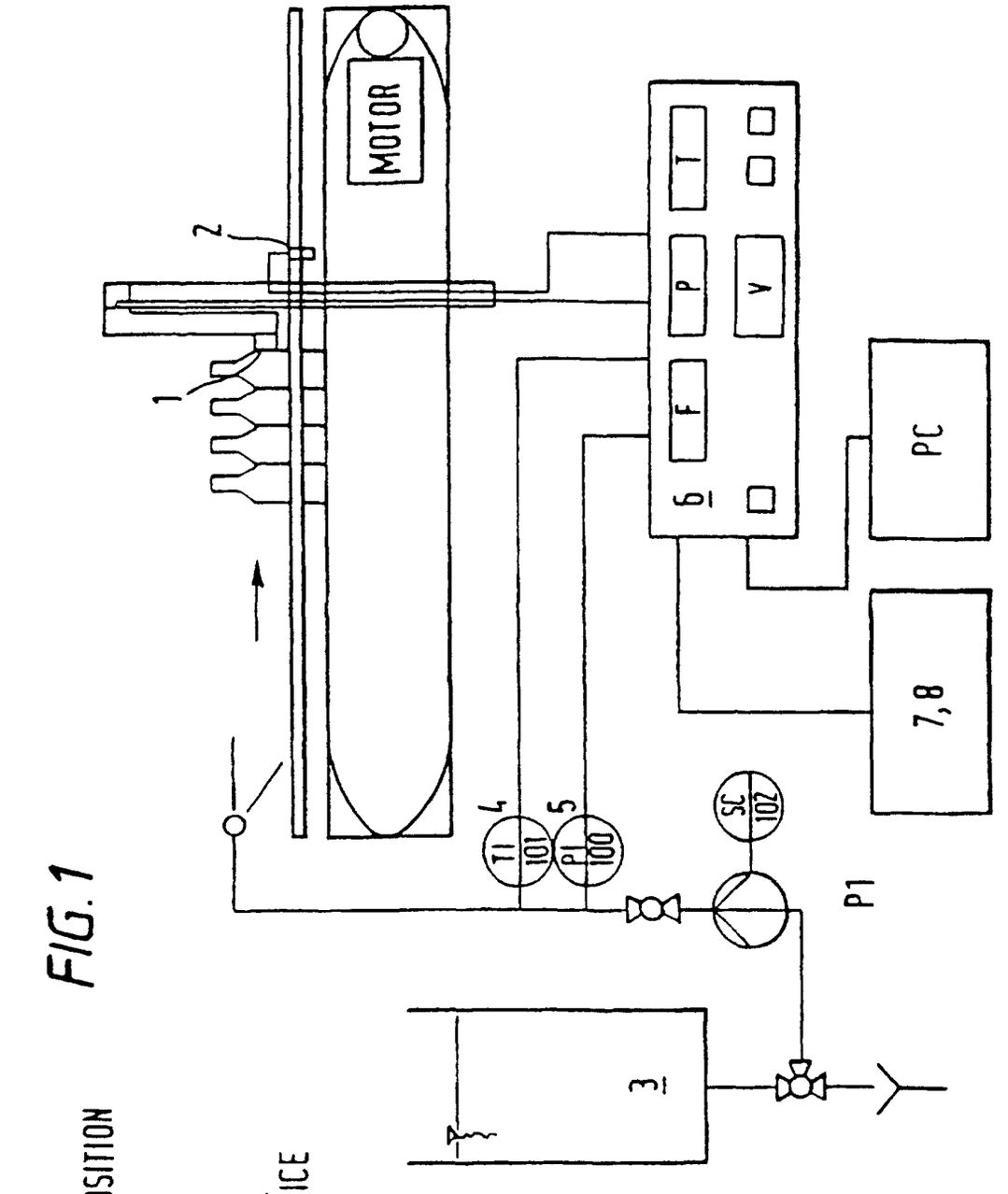
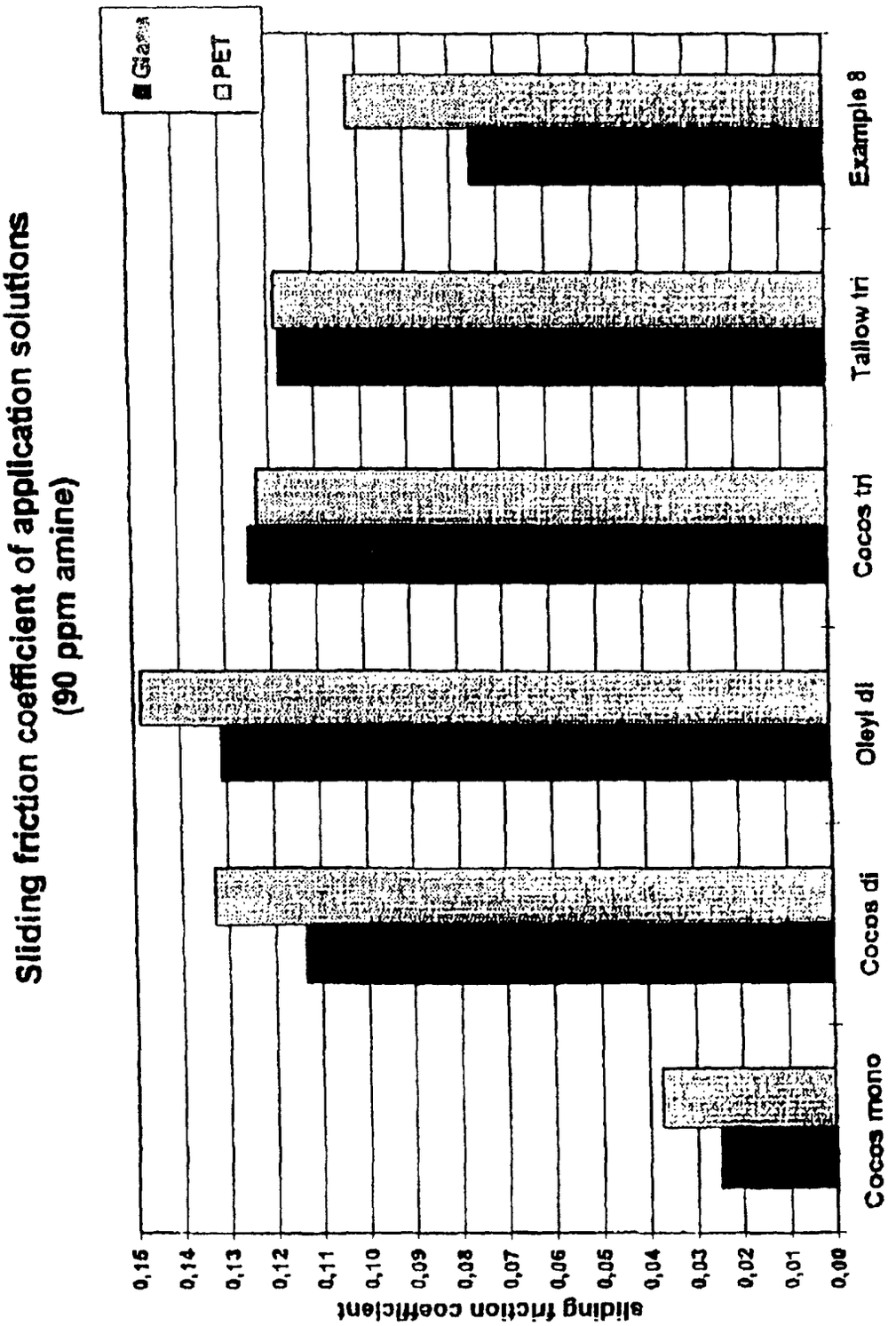


FIG. 1

1. FORCE
2. VELOCITY
3. AQUEOUS COMPOSITION
4. TEMPERATURE
5. PRESSURE
6. INDICATOR
7. MULTI-CHANNEL
8. RECORDING DEVICE

FIG. 2


Sliding friction coefficient of application solutions
(90 ppm amine)
Glass
PET
sliding friction coefficient
0,15
0,14
0,13
0,12
0,11
0,10
0,09
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0,00
Cocos mono
Cocos di
Oleyl di
Cocos tri
Tallow tri
Example 8