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**COMPOSITION FOR INHIBITING STRESS CRACKS IN PLASTIC ARTICLES AND METHODS OF USE THEREFOR**
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- (56) Prior Art Documents  
**WO 92/13048**  
**WO 92/13049**
- (57) Claim

1. An aqueous cationic diamine-based lubricant composition having a pH greater than 8 including a synthetic diamine lubricant, a water-soluble amine as a hydrotrope agent for said diamine lubricant where the diamine lubricant is unneutralized.

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<p>(51) International Patent Classification <sup>5</sup> : <b>C10M 173/02 // (C10M 173/02, 129:40, 133:06, 133:08, 149:12), C10N 40:00</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 95/00608</b> (43) International Publication Date: 5 January 1995 (05.01.95)</p>
<p>(21) International Application Number: PCT/CA94/00342 (22) International Filing Date: 20 June 1994 (20.06.94) (30) Priority Data: 083,632 28 June 1993 (28.06.93) US (71) Applicant: DIVERSEY CORPORATION [CA/CA]; One Robert Speck Parkway, Mississauga, Ontario L4Z 3S9 (CA). (72) Inventor: ROSSIO, Charles, E.: 1578 Monroe Street, Carlton, MI 48117 (US). (74) Agent: WOODLEY, John, H.: Sim &amp; McBurney, Suite 701, 330 University Avenue, Toronto, Ontario M5G 1R7 (CA).</p>	<p>(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p> <p style="text-align: center; font-size: 2em; font-weight: bold;">687828</p>	
<p>(54) Title: COMPOSITION FOR INHIBITING STRESS CRACKS IN PLASTIC ARTICLES AND METHODS OF USE THEREFOR</p>		
<p>(57) Abstract</p> <p>Alkaline lubricants for use with glass, aluminum and PET containers and other articles of manufacture are prepared from water-soluble amines. Fatty acid lubricants prepared herefrom are rendered highly dilutable by employing myristic acid as at least a portion of the fatty acid component thereof. Synthetic diamine lubricants are prepared by using the water soluble amines as the hydrotrope for the synthetic diamine, without the neutralization thereof.</p>		

COMPOSITION FOR INHIBITING STRESS CRACKS IN  
PLASTIC ARTICLES AND METHODS OF USE THEREFOR  
BACKGROUND OF THE INVENTION

Field of the invention:

5            This invention relates to bottle washing and lubricant compounds which can, inter alia, inhibit the stress crack formation ordinarily encountered when exposing a poly (alkaline) terephthalate article, such as a beverage bottle, to an alkaline environment. Traditionally, "fatty acid" lubricants have been used for this purpose. Fatty acid lubricants disclosed in the past include those that have been

10           efficacious in conjunction with various types of containers, ie. cans, glass and PET articles. Such lubricants are "universal" lubricants in their application to various beverage containers and their ability to inhibit the stress cracking ordinarily encountered with PET articles.

             However, none of these fatty acid lubricants have to date been entirely

15           satisfactory and the production costs for such lubricants are relatively high. One of the problems is that as the stress cracking properties of the lubricants has been enhanced, the dilutability of the lubricants has diminished.

             Accordingly, and in part because of the cost of raw materials, the art has looked to alternatives for fatty acid lubricants, ie. synthetic diamine lubricants.

20           These lubricants provide adequate lubricity, cleaning and the like and are much lower in production cost. However, the ability to inhibit or minimise the stress cracking capabilities of PET articles in an alkaline environment and the corrosivity has in the past, rendered these lubricants suspect.

             Thus, while providing high dilution capabilities it would also be desirable to

25           provide a synthetic diamine lubricant which is stress crack inhibiting whilst being still applicable to other types of beverage containers.

             It is to these purposes to which the present invention is directed.



Thus, while providing high dilution capabilities, it would also be desirable to provide a synthetic diamine lubricant which is stress crack inhibiting, while being still applicable to other types of beverage containers.

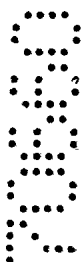
It is to these purposes to which the present invention is directed.

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SUMMARY OF THE INVENTION

In an aspect of the present invention there is provided an improved highly alkaline aqueous synthetic diamine lubricants with a pH greater than 8 and lubricant concentrates from which the lubricants are prepared, by admixing with the synthetic diamine a water-soluble amine hydrotrope for the synthetic diamine. Preferably, the water soluble amine is an ethoxylated amine. By using an ethoxylated amine the stress crack inhibition capabilities of the diamine is enhanced.

10



In accordance with another aspect of the invention, in an aqueous lubricant composition of the type having a pH greater than 8 and a lubricant component which must be either hydrotroped or saponified, the improvement which comprises a water-soluble amine as a hydrotrope-saponifying agent, the water-soluble amine having at least six carbon atoms, and wherein the lubricant component is not neutralized.

For a more complete understanding of the present invention reference is made to the following detailed description and accompanying examples.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 In accordance with an aspect hereof a cationic diamine-based lubricant at a pH greater than 8, generally includes:

- (a) a diamine lubricant,
- (b) a water-soluble amine hydrotrope, and
- (c) water.

15 The lubricant is prepared from a lubricant concentrate including, by weight:

- (a) from 0.5 to 15 percent of the diamine,
- (b) from 1 to 45 percent of the hydrotrope, and
- (c) from 40 to 95 percent of water.

Preferably, the concentrate includes:

- 20 (a) from 2 to 10 percent of the diamine.
- (b) from 5 to 20 percent of the hydrotrope, and
- (c) from 60 to 90 percent of water.

The lubricant is prepared by diluting the concentrate with water in a volumetric ratio of concentrate to water ranging from 1/200 to 1/2000 and, preferably, from 1/500 to 1/1000.

Heretofore, and as shown in the prior art, synthetic diamine lubricants have been neutralized with a weak



acid, such as acetic acid or the like. Herein, no such neutralization occurs. Rather, the unneutralized diamine, which is alkaline, is hydrotroped into aqueous solution using the water soluble amine. It is noteworthy that, traditionally, the synthetic diamine lubricants are oil soluble. Therefore, the use of the water-soluble amine enables the formation of an water-soluble lubricant having a pH greater than 8 therefrom.

Any water-soluble amine which can hydrotrope the diamine can be used herein. Among the useful amines are monoamines, diamines, triamines, tetraamines, pentaamines and the like. These amines may be substituted or unsubstituted. Preferably, ethoxylated amines are employed.

Representative of the useful amines are those water-soluble amines enumerated hereinabove.

Preferably, the hydrotrope or solubilizing agent is an oxyalkylated amine solubilizing agent selected from the group consisting of oxyalkylated N-alkylamines and oxyalkylated N-alkyl-alkylenediamines.

The oxyalkylated amine solubilizing agent is selected from the group consisting of oxyalkylated N-alkylamines, and oxyalkylated N-alkyl-alkylene diamines. Examples of oxyalkylated N-alkylamines are the oxyalkylated fatty amines such as oxyalkylated N-cocoamine, N-stearylamine, N-palmitylamine, and the like. The N-alkyl group should have from 8 to 24 carbon atoms, preferably 12-20 carbon atoms, and more preferably, 15-18 carbon atoms. This group may be unsaturated, having from 1-4 sites of unsaturation, preferably 1-2 sites of unsaturation. Such amines correspond to the formula: R - NHC where R is a  $C_{11} - C_{24}$  alkyl or alkenyl group.

The polyolalkylene ether portion of the oxyalkylated N-alkylamine is preferably derived completely from ethylene oxide, and is thus a polyoxethylated N-alkylamine. However, block and heteric polyoxyethylene/polyoxypropylene copolymeric N-alkylamines are also suitable, particularly, those block





contains unsaturation. Examples of suitable diamines are oleyldiamine, linoleyldiamine, stearyldiamine, 2-ethyl-dodecane diamine, and the like. Such diamines are available from several commercial sources, oleyldiamine, for example, as Adogen® 572 from Sherex Chemical. Mixtures of diamines may be used.

Within the practice of the present invention the water soluble hydrotrope is, preferably, selected from the group consisting of tallow (ethoxylated) amine, cocoa (ethoxylated) amine and mixtures thereof.

The lubricant solutions, which are advantageously supplied in the form of concentrates which are subsequently diluted for use, also may contain additional ingredients such as corrosion inhibitors, bacteriocides, fungicides, mildewcides and other antimicrobial agents, such as quaternary ammonium compounds and the like. Likewise, the composition may contain sludge preventing compounds, to obviate the sludge encountered in breweries on glass and cans.

In preparing the synthetic amine lube, the components are mixed together at ambient temperatures.

The pH of the lubricant is equal to or greater than 8 so that it can be considered as an alkaline lube.

It has been observed that the synthetic diamine lube exhibits enhanced lubricity, and depending upon the choice of water soluble amine can inhibit stress cracking in PET articles at high dilution. Because of the alkaline nature of the lubricant it is effective in neutralizing acidic spillages such as soda pop and the like. Also, these amine lubes exhibit reduced corrosivity.

For a more complete understanding of the present invention, references made to the following non-limiting examples. In the examples, which are to be construed as illustrative, rather than limitative, of the present invention, all parts are by weight absent indications to the contrary.



EXAMPLE I

This example illustrates the preparation of a synthetic diamine lubricant in accordance with the present invention.

5           Into a suitable container equipped with stirring means and at ambient temperatures were mixed the following:

Ingredient	Amt., pbw
Synthetic Diamene <sup>(1)</sup>	9.5
10    Quaternary Ammonium Compound <sup>(2)</sup>	9.0
Water-Soluble Amine Hydrotrope <sup>(3)</sup>	10.0
Water	72.0

15           <sup>(1)</sup> an alkyl diamine sold by Sherex Chemical under the name ADOGEN 572

<sup>(2)</sup> a commercially available product sold by Stepan under the name BTC 2125

20           <sup>(3)</sup> a coconut (ethoxylated) amine sold by Sherex Chemical under the name VARONIC K215

          The utilization of the water soluble amines and, in particular, the ethoxylated amines, enables the production of synthetic diamine lubricants which can be used on various containers and articles with a lessening of corrosivity, excellent lubricity, cleaning and the like.

25           Although preferred embodiments of the invention are described herein in detail, it will be understood by those skilled in the art that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.



## THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An aqueous cationic diamine-based lubricant composition having a pH greater than 8 including a synthetic diamine lubricant, a water-soluble amine as a hydrotrope agent for said diamine lubricant where the diamine lubricant is unneutralized.
2. A composition according to claim 1, wherein the water-soluble amine is selected from the group consisting of ethoxylated amines, and oxyalkylated N-alkyl-alkylenediamines.
3. A composition according to claim 2 wherein the water-soluble amine is coconut (ethoxylated) amine.
4. A concentrated lubricant composition consisting of a composition according to any one of claims 1 to 3 wherein the composition includes:
- (a) from 0.5 to 15% of the diamine;
  - (b) from 1 to 45% of the hydrotrope;
  - (c) from 40 to 95% water.
5. A concentrated lubricant composition according to claim 4 wherein the composition includes:
- (a) from 2 to 10% of the diamine;
  - (b) from 5 to 20% of the hydrotrope;
  - (c) from 60 to 90% of water.
6. A diluted lubricant composition including a concentrated lubricant composition according to either claim 5 or 6 diluted in water in a volumetric ratio of concentrated lubricant composition to water from 1:200 to 1:2000.
7. A method for treating beverage containers, said method including the use of the lubricant composition of any one of claims 1 through 6.

DATED: 11 December, 1997

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## INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/CA 94/00342

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 5 C10M173/02 //(C10M173/02, 129:40, 133:06, 133:08, 149:12), C10N40:00

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 5 C10M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	WO,A,92 13048 (ECOLAB INC.) 6 August 1992 see page 7, line 16 - line 23 see page 11, line 27 - line 30 see page 12, line 14 - line 16 see page 12, line 19 - line 23 see page 13, line 4 - line 14 ---	1,2,4
A	US,A,5 073 280 (C.E. ROSSIO) 17 December 1991 cited in the application see claims 12,14 see column 5, line 62 see column 7, line 12 - line 15 ---	1-3,5,6
	-/--	

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

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\*O\* document referring to an oral disclosure, use, exhibition or other means

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\*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

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Date of the actual completion of the international search

18 August 1994

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

 Intern. Patent Application No  
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A	WO,A,92 13049 (ECOLAB INC.) 6 August 1992 see page 8, line 10 - line 15 see claims 2,8 ---	1
A	US,A,5 009 801 (M. WIDER) 23 April 1991 cited in the application see claims 10,13 -----	1-3,5,6

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