252. COMPOSITIONS.

99

Examiner

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ALKALINE DETERGENTS

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This invention relates generally to alkaline detergents for cleaning tin, the detergent containing a combination of corrosion inhibiting agents.

It is a well known fact that many highly alkaline detergents, while performing excellently as cleaners, can not be used for cleaning tin, since the alkalies corrode and dissolve the tin quite readily.

My alkaline detergent composition is useful in all cases where a highly alkaline detergent is required. In the fabrication of tin plate or articles made therefrom, it is often necessary to apply grease in the forming operations. This may be removed by the use of a highly alkaline cleaning solution in accordance with the present invention without attacking the tin. The detergent composition may be used in the washing of dairy equipment, milk cans and bakery pans.

I have found that detergent compositions containing large proportions of alkali-metal metasilicate, for example sodium metasilicate, and also substantial amounts of caustic, for example sodium or potassium hydroxide, may be used for cleaning tin while preventing corrosion thereof, provided that the composition contains certain combinations of inhibiting agents. The addition of the sodium hydroxide or other caustic to the sodium metasilicate increases the alkalinity of the composition, thereby rendering it even more effective in cleaning than a composition containing sodium metasilicate alone. However, the increased alkalinity imparted to the composition by the sodium hydroxide increases the tendency of the tin to corrode. It is essential in order to inhibit the corrosion of tin by this strongly alkaline detergent to use a combination of inhibiting agents, as will be pointed out more particularly hereinafter, because it has been found that neither of the inhibiting agents taken singly will effectively inhibit the corrosion of tin. In addition to sodium metasilicate and sodium hydroxide or equivalent substances, my detergent composition contains three corrosion inhibiting agents. One of the inhibiting agents is an alkali-metal perborate, for example sodium perborate. A second inhibiting agent is a water-soluble salt of zinc, for example zinc sulphate. The third inhibiting agent is a water-soluble salt of calcium, for example calcium chloride.

A specific example of my detergent composition is:

EXAMPLE

	Per cent
Sodium metasilicate	53
Sodium hydroxide	33
Sodium perborate	10
Zinc sulphate	2
Calcium chloride	2

This composition has been tested to determine its corrosion effect on tin. A 1% aqueous solution of the detergent composition was made up and strips of tin were immersed in the solution for one hour, while maintaining the solution at boiling temperature (100° C.). The tin strips were weighed before and after immersion and the loss in weight determined. It was found that the loss in weight using the detergent of the example was 0.1 mg., the orignal tin strip weighing approximately 5 grams. This small loss in weight under the conditions of test shows that the combination of inhibiting agents effectively inhibited the corrosion of the tin.

While the combination of zinc sulphate and calcium chloride when added to sodium metasilicate, sodium hydroxide and sodium perborate is effective in inhibiting corrosion of tin, I have found that neither zinc sulphate nor calcium chloride when added alone to a detergent containing sodium metasilicate, sodium hydroxide and sodium perborate will effectively inhibit the corrosion of tin. This is shown by the following table, giving the results obtained by testing in the same manner as described in connection with the example:

Table

Na_2SiO_3	NaOH	$NaBO_3$	$ZnSO_4$	$CaCl_2$	Loss
					Mg.
55	33	10	2	.....	7.1
55	33	10	.....	2	11.8

It will be seen from the table that the loss in weight when using zinc sulphate alone was 7.1 mg., whereas the loss in weight when using calcium chloride alone was 11.8 mg. This is in contrast to the loss of only 0.1 mg. when using

both zinc sulphate and calcium chloride as given in the example.

In my detergent composition, the alkali-metal silicate, for example sodium metasilicate, may amount to about 30 to 90% by weight of the entire composition but is preferably from about 40 to 60%. The alkali-metal hydroxide, for example sodium hydroxide, is between about 5 and 55% and preferably between about 20 and 40%. The higher proportions of sodium hydroxide are used where very high alkalinity is desired, in order to more effectively clean the tin. The alkali-metal perborate, for example sodium perborate, constitutes about 3 to 20%, preferably from about 5 to 15% or more specifically from about 7 to 12% of the composition. The water-soluble salts of zinc and calcium are each used in amounts of at least about 1% and may constitute 10% or even higher percentages of the composition. Preferably each is between about 2% and 7%. The total of the zinc salt and the calcium salt is from about 2 to 10% or even higher but preferably between about 3% and 7%.

For washing bakery pans or milk cans, I may use a detergent composition such as given in the example. The detergent composition is dissolved in water to form a solution of a strength between ¼ of 1% and 3%, preferably a 1% solution. The articles may be boiled in the cleaning solution for an hour, if need be, without corroding the tin.

The corresponding potassium salts may be used to replace or partially replace the sodium metasilicate, sodium hydroxide or sodium perborate. In place of zinc sulphate, I may use any other water-soluble zinc salt and in place of calcium chloride I may use any other water-soluble calcium salt, since the action of inhibiting corrosion depends upon the metal of the inhibiting agent rather than upon any particular salt of the metal. I may, for example, use zinc chloride, zinc nitrate or zinc acetate in place of zinc sulphate and I may use calcium nitrate, calcium acetate or calcium bromide in place of calcium chloride.

Other agents which aid in the cleaning operation, such as soap, casein, deflocculating agents, wetting agents, abrasives and the like, may be added to the detergent composition containing alkali-metal metasilicate, alkali-metal hydroxide, alkali-metal perborate, a water-soluble zinc salt and a water-soluble calcium salt.

The present invention deals only with alkaline detergents which are to be used in cleaning tin. The combination of inhibiting agents of the example, which have been shown by tests to inhibit the corrosion of tin, have been tested in a similar manner in cleaning aluminum. It has been found that this detergent composition, although effective in inhibiting corrosion of tin, is not effective in inhibiting corrosion of aluminum.

The invention is not liimted to the preferred examples, which have been given merely for illustrative purposes, or to the preferred proportions, but may be otherwise embodied or practiced within the scope of the following claims.

I claim:

1. An alkaline detergent for cleaning tin, comprising by weight about 30 to 90% alkali-metal metasilicate, about 5 to 55% alkali-metal hydroxide, about 3 to 20% alkali-metal perborate, about 1 to 10% of a water-soluble zinc salt and about 1 to 10% of a water-soluble calcium salt.

2. An alkaline detergent for cleaning tin, comprising by weight about 40 to 60% alkali-metal metasilicate, about 20 to 40% alkali-metal hydroxide, about 5 to 15% alkali-metal perborate, about 2 to 7% of a water-soluble zinc salt and about 2 to 7% of a water-soluble calcium salt.

3. An alkaline detergent for cleaning tin, comprising by weight about 30 to 90% alkali-metal metasilicate, about 5 to 55% alkali-metal hydroxide, about 3 to 20% alkali-metal perborate, about 1 to 10% zinc sulphate and about 1 to 10% calcium chloride.

4. An alkaline detergent for cleaning tin, comprising by weight about 30 to 90% sodium metasilicate, about 5 to 55% sodium hydroxide, about 3 to 20% sodium perborate, about 1 to 10% of a water-soluble zinc salt and about 1 to 10% of a water-soluble calcium salt.

5. An alkaline detergent for cleaning tin, comprising by weight about 40 to 60% sodium metasilicate, about 20 to 40% sodium hydroxide, about 5 to 15% sodium perborate, about 1 to 10% zinc sulphate and about 1 to 10% calcium chloride.

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