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ALKALINE CLEANING COMPOSITION

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This invention relates to an alkaline cleaning composition, and more particularly to a cleaning solution suitable for use in automatic bottle washing machines wherein of necessity hard water is employed.

It is quite desirable to use strong caustic alkali solutions for bottle washing because the material has a sterilizing effect, and also has a strong cleaning action which becomes effective, without the necessity of rubbing, wiping or abrasive force, to remove grease and other dirt. In hard water, however, strong caustic soda solution has the disadvantage that the calcium and magnesium of the hard water will precipitate on the bottles and the automatic machinery ordinarily employed, to form an adherent carbonate film.

In washing bottles or other shaped articles, on a large scale, the operation is usually carried out on a continuous metal conveyor passing through a strong, hot, caustic alkali solution. The conveyor is equipped with means for holding the objects to be washed, these being usually pockets or hooks. When pockets are employed, the objects are carried through in them, the pockets being full of hot caustic solution during the passage through the solution. Thereafter the objects are discharged from the pockets and rinsed in rinsing water. The wet conveyor pockets are refilled with fresh objects and the cycle repeated. Usually the rinse water is fresh water containing some magnesium and calcium hardness and this hardness is precipitated upon the conveyor pockets and chains, or upon the hooks, if hooks are used. This precipitation occurs when the conveyor covered by a film of hard water enters the strong caustic solution. The caustic causes the precipitation of the calcium and magnesium in the form of a hard adherent film and this operation is repeated every time the conveyor re-enters the solution. As a result, a continuous and ultimately serious building up of scale on the conveyor pockets, hooks, and other objects occurs, and this also tends to occur on the bottles or other objects which are entering the solution, either because they are partially wetted with hard water by contact with the wet conveyor parts, or otherwise wet, or due to the proximity of the wetted conveyor parts during the precipitation operation.

If orthophosphate is added to the caustic alkali solution, the precipitate of calcium and magnesium is in the form of an insoluble phosphate, but this film likewise is adherent to the conveyor and the articles being conveyed. Furthermore, the presence of orthophosphate will permit an additional precipitation in the rinse bath.

The addition of alkali metal pyrophosphate to the caustic soda bath results in the formation of an adheret calcium pyrophosphate scale when hard water is contacted.

It has now been discovered, however, that if a cleaning composition is made up of a predominant proportion of caustic alkali, and alkali metal pyrophosphates and orthophosphates are added thereto in a carefully controlled relationship, the hard water impurities may be precipiated as phosphates at such a slow rate that the film is totally eliminated or may be reduced to such an extent that it is not appreciable.

The preferred composition consists essentially of the following:

	Per cent
Caustic soda (commercial)	82.5
Tetrasodium pyrophosphate (anhydrous)	10.0
Trisodium phosphate (crystalline)	7.5

This composition should be employed in concentrations sufficient to give at least a 1% caustic soda solution in the water, and preferably is employed with a concentration of caustic soda from 1.5% upwards.

The amount of tetrasodium pyrophosphate should be at least as much as the trisodium phosphate, and should not be more than over four times as much as the trisodium phosphate. This means a ratio of pyrophosphate P_2O_5 to orthophosphate P_2O_5 between approximately 3-to-1 and 12-to-1. The caustic alkali is preferably at least 70% of the total of the alkali and phosphate ingredients, and is not greater than approximately 94%.

As an example of a substantially minimum caustic alkali concentration, a composition may be employed containing:

	Per cent
Caustic soda	70
Tetrasodium pyrophosphate	20
Trisodium phosphate	10

On the other hand, a composition employing:

	Per cent
Caustic soda	94
Tetrasodium pyrophosphate	4
Trisodium phosphate	2

was satisfactory at the other end of the range. This means a range of orthophosphate

P_2O_5 of from approximately 0.35% to approximately 1.9%, and a pyrophosphate P_2O_5 content from approximately 2.1% to 10.6%.

Phosphoric or pyrophosphoric acids or acid salts may be employed, provided the caustic alkali is provided in sufficient excess to make up for the loss of alkalinity thus introduced.

The concentration of the aqueous solution of the cleaning composition will depend of course upon the hardness of the water employed. For example, with water containing about 800 P.P.M. of hardness, a caustic soda concentration of about 3% is preferred.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom.

What we claim as new, and desire to secure by Letters Patent, is:

1. A composition of matter for use on automatic washing machinery employing hot detergent solutions in connection with hard water consisting essentially of a predominant proportion of a caustic alkali, a relatively small proportion of an alkali metal pyrophosphate and an alkali metal orthophosphate, the amount of the caustic alkali being at least 70% of the specified ingredients, and the ratio of pyrophosphate P_2O_5 to one part of orthophosphate P_2O_5 being between approximately 3 to 12 parts by weight, whereby scale formation on the automatic washing machinery is substantially prevented.

2. A composition of matter for use on automatic washing machinery employing hot detergent solutions in connection with hard water consisting essentially of:

	Per cent by weight
Sodium hydroxide	70–94
Anhydrous sodium pyrophosphate	20– 4
Crystalline sodium orthophosphate	10– 2

3. A composition of matter for use on automatic washing machinery employing hot detergent solutions in connection with hard water consisting essentially of:

	Per cent by weight
Caustic soda	80–85
Anhydrous tetrasodium pyrophosphate	9–12
Crystalline trisodium orthophosphate	6–10

4. A cleaning composition for use on automatic washing machinery employing hot detergent solutions in connection with hard water comprising from 70 to 94 parts by weight of an alkali metal hydroxide, approximately 2.1 to 10.6 parts by weight of P_2O_5 in the form of pyrophosphate, and from approximately 0.35 to 1.90 parts by weight of P_2O_5 as orthophosphate.

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