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CLEANING PREPARATION AND METHOD OF
PREPARING THE SAME

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This invention relates to household and commercial cleaning preparations or compositions usable in water for wiping and scrubbing dishes, floors, walls, clothing and all manner of articles which must periodically be cleansed to remove grease, dirt and the like.

The object of the invention is to produce a cleaning composition, the ingredients whereof are substantially all cleaning materials, detergents and wetting agents, or soaps, usable with water, and the process of making the same, which composition comprises borax and other cleaning materials, such as synthetic detergents, inorganic detergents, soaps and the like.

The borax is specially treated in order to convert it from its commercial condition, in the form of crystals or granules, to enlarged masses. To such masses a detergent, soap or other cleaning compound is added, either as a mixture in the process of enlarging the crystals or granules of borax or after the crystals or granules have been enlarged.

The enlargement of the crystals or granules of commercial borax is accomplished by heating until the crystals or granules are substantially dry and then subjecting them to higher temperatures which cause the crystals or granules to enlarge or swell, resulting in the crystals or granules of borax acquiring a cellular structure in form resembling a light, homogeneous mass many times the size of the original crystals or granules of borax, the increased size varying from five to twenty times the original size of the borax crystals or granules.

The crystals or granules of borax may be treated in any suitable type of apparatus capable of subjecting the crystals or granules to an initial heat for the purpose of drying the same and subsequently after drying, subjecting them to increased heat to cause them to enlarge or swell, which enlargement occurs within several minutes under heating. The period of time from the commencement of enlargement of the borax crystals or granules to maximum enlargement occurs fairly rapidly, of the order of a few minutes.

The heat treatment in some instances is accompanied with constant stirring particularly when a quantity of borax crystals or granules is treated in a pan over a flame. Other suitable apparatus usable in carrying out the treatment of the borax can take the form of rotary drum, heated externally, with rotating paddles constantly moving through the mass of crystals and agitating the same. The type of apparatus is not particularly material to the practice of this

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invention and those expert in such matters can readily provide suitable devices which are capable of receiving a continuous flow of commercial borax, either mixed with a detergent, soap or the like or capable of process straight borax without admixture of other materials; initially heating the material so introduced into the apparatus until the same is dry; then continuing heating the borax, or mixture, until the borax enlarges, which usually occurs within a period of the order of five minutes after the material is dry. Such apparatus should also be provided with means to constantly agitate the borax or the mixture primarily for the purpose of reducing the material to pellets or smaller bodies.

The detergent which may be incorporated, associated or combined may consist of any of the well known detergents or soaps or detergents which also have wetting or wetting and emulsifying characteristics. Examples of detergents which may be mixed or combined with borax are:

1. Soaps; alkali salts of fatty acids.
2. Monobutyl phenyl phenol sodium monosulfate.
3. Monobutyl diphenyl sodium monosulfonate.
4. Dibutyl phenyl phenol sodium disulfonate.
5. Sulfated fatty acid amides.
6. Sodium alkyl aryl sulfonates.

Examples of inorganic detergents which may be mixed or combined with borax are soda ash, trisodium phosphate, tetra sodium pyro phosphate, sodium meta silicate, and sodium sesquicarbonate or the corresponding potassium compounds.

The soaps may be incorporated, associated or combined with the borax and may be any of the soaps usually used for cleaning purposes.

A series of examples are hereinafter set forth illustrating how the materials of this invention may be produced.

The final product consists of borax, the crystals or granules whereof are in enlarged condition substantially white, having a velvety texture (somewhat resembling that of powdered sugar) cellular throughout the entire mass, in contradistinction to a hollow body, initially capable of floating when placed upon the surface of a quantity of water, due to its porosity or large surface, but readily dissolving because the mass has considerable affinity for water and great contact surface and dissolving with an effervescent-like effect. The enlarged granules are individual masses generally varying in size, in contradistinction to a powder or cake, capable of retaining their individual forms when packed without

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lumping, possessing strength against crushing, although of varying sizes. The masses are capable of being packed and packaged and by reason of the enlarged volume, measured quantities thereof can be selected by the hand full. There is no substantial loss of cleaning properties during the process of enlargement nor are any of the components of the borax driven off during treatment.

The borax in its enlarged form, as well as the combination of borax and other compounds, is free of moisture and consequently when brought in contact with water will develop considerable heat. This is highly objectionable, particularly in instances where the user intends to measure by hand the amount of borax to be used. Should the user's hand be wet, the developed heat, due to the contact of the material and moisture, would be quite uncomfortable. It is therefore desirable to reintroduce moisture into the preparation and this may be done in varying ways. For instance the material may be passed through a water saturated atmosphere on a moving belt until it has taken up water to an amount until resaturated, or partially so, and which resaturation will vary as the capacity of the material is influenced by the ingredients of the preparation and the extent to which the material has been dehydrated during treatment in the entire process preceding resaturation, or it may be treated while spread in a thin layer with water in the form of a very fine spray. The spray may also be in the form of a solution of water and soap or detergent which will result in the soap or detergent being deposited or taken up by the surface of the enlarged particles of borax thereby producing a combination of enlarged masses of borax and soap or detergent.

BORAX AND TRISODIUM PHOSPHATE

Example 1

Equal proportions by weight of borax and trisodium phosphate are initially heated until the two compounds fuse producing a clear liquid which is determinable by observation. The temperature at which the material is heated is not particularly pertinent inasmuch as the heating must be continued until the materials are liquefied, but the temperature is of the order of 300° F. After the materials have liquified, heating is continued until boiling ceases, which indicates that superfluous water has been driven off, which includes most of the water of crystallization of both the borax and the trisodium phosphate. As soon as the material appears to be dry and tends to cling to the surface of the vessel in which it is heated, the entire mixture is then removed from the heating vessel and permitted to cool and set. When the mass is cooled, it is dry and brittle, and it may then be broken up, with any suitable form of apparatus until varying sized pellets and particles are produced. In this condition the material has not been enlarged. The broken up material is then put into a suitable vessel and heated until the particles swell or enlarge. The increase in volume is about 4 or 5 times the volume of the original mixture of the two compounds and approximately half the weight. In other words, if 200 grams of borax and 200 grams of trisodium phosphate were initially used, the product at this stage would weigh about 200 grams. The material then may be treated to reintroduce moisture, following the steps hereinbefore set forth.

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Example 2

A preparation having a lower pH value than Example 1, may be produced by using 80% of commercial borax and 20% of trisodium phosphate by weight and carrying out all of the steps set forth in Example 1. The degree of enlargement or swelling resulting from this example would be about six times, whereas that of Example 1 would be about 4 or 5 times the size of the original crystals or granules.

Example 3

A preparation having a lower pH value than that of Example 1, but higher than that of Example 2, may be produced by utilizing 75% of commercial borax and 25% of trisodium phosphate. The mixture is treated in the same manner as the material of Example 1, but the degree of enlargement or swelling is greater than that of Example 1.

BORAX AND ANHYDROUS SODA ASH

Example 4

80% of borax and 20% of anhydrous soda ash are mixed, with twice the amount of water, by weight, as borax. The material is heated until the borax and the anhydrous soda ash come into solution. The solution is then heated in a suitable vessel until dry. When the material is dry, it is further heated at a higher temperature until it swells or enlarges. The swelling or enlargement resulting in a volume about six times that of the original mixture.

Example 5

A preparation having a higher pH value than that of Example 4 may be produced by using equal parts of borax and anhydrous soda ash and about 1½ times, by weight, of water to the weight of the borax. The materials and the water are heated until both of the materials are in solution and the several steps of Example 4 are carried out, until the material has been dried, enlarged or caused to swell. The expansion is 2 or 3 times that of the original mixture.

BORAX AND TETRA SODIUM PYROPHOSPHATE

Example 6

75% of commercial borax and 25% of granular anhydrous tetra sodium pyro phosphate by weight are initially heated until the borax has melted. The tetra sodium pyro phosphate does not melt but remains in granules. The molten borax picks up the particles of tetra sodium pyro phosphate and holds them both within the body of the borax and on the surface. The material is then heated until dry, resulting in particles of tetra sodium pyro phosphate being coated or held in surface contact by borax. Heating is continued until the borax swells or enlarges to approximately 16 times the volume of the original borax crystals or granules. The final product is a mixture of tetra sodium pyro phosphate particles within enlarged or swollen borax, attached thereto or embodied therein.

BORAX AND SODIUM META SILICATE

Example 7

A mixture of 90% borax and 10% meta silicate crystals is heated to produce a liquid or fused mass. The mass is then further heated until dry and upon continued heat, the mass enlarges or

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swells to about 8 times the volume of the original mixture.

Example 8

A preparation having a higher pH value may be produced by using 75% borax and 25% sodium meta silicate (crystals), treated according to the steps set forth in Example 7. The swelling or enlargement is about 8 times that of the original mass.

Example 9

A mixture of 50% commercial borax and 50% sodium meta silicate (crystals) is prepared. This mixture is heated, which causes the borax and the meta silicate to fuse or liquify. This material is then dried by continued heating and on continued heating at an elevated temperature the material enlarges or swells in excess of 20 times the size of the original borax crystals or granules.

THREE PHASE MIXTURES

Example 10

A mixture of borax 50%, sodium meta silicate (crystals) 25% and soda ash 25%, is prepared. The mixture is heated until the borax liquifies, which results in the liquefaction of the metal silicate and the soda ash. This mixture is then further heated at an elevated temperature until dried and heating is continued at a still higher temperature until the material swells or enlarges. The degree of expansion is of the order of 8 times the size of the original borax crystals or granules.

Example 11

A mixture of borax 50%, sodium meta silicate (crystals) 25%, and tetra sodium phosphate 25% is prepared to which is added water in the amount of about 10 times the amount of the weight of the mixture. This preparation is heated until dried and continued heating will cause the material to enlarge or swell. The degree of expansion is about 4 times the size of the original borax crystals or granules.

BORAX AND BORIC ACID

Example 12

75% of commercial borax and 25% of boric acid (powder) by weight, are mixed and heated until the borax fuses. The boric acid will not dissolve but during liquefaction of the borax, the boric acid powder remains mixed with the liquid borax. The mixture is then further heated, preferably at an elevated temperature until dry and the heating is continued at a still higher temperature until the borax swells or enlarges. The degree of expansion of the borax is of the order of 5 times the size of the original commercial borax crystals or granules and the product has a lower pH value than that of Example 1.

This invention may also be utilized by first treating commercial borax crystals or granules until they are enlarged or swollen and thereafter applying by spraying a detergent, soap or wetting agent, the latter having cleaning characteristics.

A quantity of commercial borax in crystal or granular form is heated until dry and after the material is dry, it is further heated at an elevated temperature until the material swells or enlarges. It is constantly stirred during all of the heating steps which results in varying sizes—from pellets to grains. The enlargement of the borax is of the order of 20 times the initial size of the borax crystals or granules. A solution of suitable detergent which has the added characteristics of

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being a wetting and emulsifying agent is then prepared and sprayed upon the borax in its enlarged or swollen condition.

Suitable materials having the detergent, wetting and emulsifying characteristics are poly-ether alcohol condensates (known under the trade-mark Igepal CA) or sodium sulfonate of oleic acid ester of aliphatic compound (known under the trade-mark of Igepon AP Extra). A 25% solution of either of these materials is prepared and sprayed upon the enlarged masses of borax. The spray should be in very fine form and a sufficient amount thereof should be sprayed upon the enlarged borax in order to increase its weight by about 40%. Inasmuch as the enlarged borax masses are cellular and dry they will readily take up moisture and quantities of the material contained in the solution which is either absorbed into the surface of the borax or mechanically attaches itself thereto. The spray should be slowly applied to the borax masses in order to give it sufficient time to absorb moisture and avoid dissolving the borax masses. The same process may be followed in preparing a cleaning composition, the added active ingredient thereof responding to the following formula:

$C_{17}H_{33}CON-CH_2C_2H_4SO_3Na$ (known under the trade-mark Igepon T) a well known and widely distributed detergent. The same process may be followed in preparing a cleaning composition, the added active ingredient thereof being sodium alkyl aryl sulfonate (known under the trade-mark of Nacconol).

In the course of preparing the preparations set out in Examples 4 to 12, the materials from the very inception are constantly stirred in order to avoid fusion and to produce individual masses which will avoid caking in a single mass thereby avoiding subsequent breaking up of the mass. Constant stirring provides a continuous process for preparing the cleansing material of this invention. It is to be understood that it is preferred to apply heat of different temperatures. Under the steps of liquifying (where liquefaction is recommended) drying and finally heating causing the borax to swell. It is preferred to start the process with an initial temperature of approximately 200° F., raise the temperature to 400° to effect drying and to from 600° to 800° to cause enlargement or swelling of the borax. The temperatures may be disregarded and a visual observation may be made of the condition of the material to determine its desired condition. A higher temperature might be employed throughout the process (of the order of 600°) but that is deemed as an unnecessary waste of heating medium and gives less control of the operation. It will be found that if straight borax is used, the temperatures may be varied from initial heat of 200° to 400° for drying and of the order of 600° to enlarge or swell the borax crystals or granules. When other cleaning materials are added to the borax crystals or granules, they tend to alter the temperatures but the correct temperature can readily be determined by an initial visual observation and measuring the temperatures at the varying stages.

The invention in its broadest sense may be utilized in converting commercial borax crystals or granules into enlarged masses, following the process hereinabove described, and the utilization thereof, preferably after restoring water into the masses, as a cleaning agent. The borax, unassociated with other cleaning agents, is however, comparatively mild and lacking certain desirable

cleaning and detergent properties and in this condition does not have a very wide application, particularly in the commercial cleaning field and therefore the preferred form of utilization of this invention involves the use of borax, in the enlarged or swollen form, chemically or mechanically associated with other cleaning agents to provide the properties lacking in borax per se. The enlarged masses of borax crystals or granules may be mechanically mixed with other cleaning agents but inasmuch as there would be a tendency of the different materials in such a mixture to separate, such use of this invention is not recommended unless they are themselves restored to light density by spray drying or pulverizing to proper degree of fineness.

The foregoing examples contemplate the production of a product in which the material is heated to temperatures sufficient to drive out all water, but such removal of the entire water content is not essential. The amount of water which is driven off controls the degree of enlargement, swelling and porosity. In some instances, and for some purposes, it will be found that maximum enlargement, swelling and porosity is not desirable. The use of borax per se might be such an instance or the use of borax with meta silicate. It is to be understood that the degree of enlargement, swelling and porosity can be varied by the degree and extent to which the water is driven off in the final step. Commercial borax, for instance, carries a total of approximately 45% water. By drying the commercial borax at a temperature of the order of 200° F., approximately 40% of the water is driven off, but without any appreciable change in volume. When the last remaining 5% of water is removed, maximum enlargement, swelling or porosity results, but if only half of the such remaining 5% of water is removed, there is but partial swelling or enlargement of the borax crystals or granules, equal to about half of the maximum which can be obtained by driving off substantially all of the water. It will be evident that such operations provide a means of controlling the pellet or particle sizes of the finished product, whether such product is pure borax or mixtures with other cleansing compounds.

Another means of controlling the pellet or particle sizes of the finished product is to reduce the material, after it is dried, but before it is enlarged, by grinding to definite sizes and then heating these particles with stirring or agitation in order to cause them to enlarge or swell. For instance, if commercial borax, in crystal or granular form, is dried at about 200° F. and is then ground to a pre-determined size, say 100 or 200 mesh, it may then be further heated, at a temperature of the order of 600° F. in order to enlarge or swell the particles. The resulting particles will be smaller than those produced without the intermediate grinding—between drying and enlargement. The method of controlling the particle size is particularly advantageous with mixtures of borax and other cleaning compounds which tend to fuse to a liquid during drying and which are difficult to crystallize by continual evaporation of the water from the mass. This is particularly true of the phosphate and meta silicate mixtures with borax. It is therefore preferred with mixtures of such types that after fusion and heating to remove the bulk of the water, the resultant product is allowed to set and cool. The resultant glass like

mass is then ground to small sizes and then heated in order to enlarge or swell the particles and make them porous.

If it is desirous of merely mixing enlarged or swollen borax with a soap or synthetic detergent, this may be done by first reducing the soap or synthetic detergent to light density or to a fine powder and then mechanically mixing it with the enlarged or swollen borax. By reason of the fineness of the soap or synthetic detergent they tend to absorb into the masses of borax and thereby reducing, in large measure, any tendency of the material to separate or stratify.

Under this invention cleaning compositions can be produced of varying strengths, viz: having mild cleaning characteristics, such as required for cleansing or washing fine fabrics and such as have strong cleaning characteristics, for cleaning badly soiled, greasy or oily fabrics, machinery, tiles, floors and the like. Such cleaning compositions are prepared, under this invention, by controlling the pH value thereof. Thus, for instance, borax per se in its enlarged or swollen form is a mild cleaning preparation having a pH value of the order of 9, whereas the composition of Example 9 is a strong cleaning composition having a pH value of the order of 10.5. Conversely by incorporating boric acid the pH of the borax per se can be reduced below 9.

It will therefore be apparent to those expert in the chemical cleaning field that they may select any known cleaning preparation, whether soap, detergents, detergents having wetting characteristics or detergents having wetting and emulsifying characteristics and combining them with borax crystals or granules either during the process of enlarging the borax crystals or granules or by combining them with the previously enlarged or swollen borax crystals or granules. Such finished product when dropped or placed upon the surface of a quantity of water will initially float, but, because of their tremendous affinity for water will quickly break up and descend into the wash water and distribute and dissolve in the course of their descent through the body of water.

I claim:

1. A cleaning composition, being a bulk product, made up of irregularly shaped units, said units being capable of ready, independent movement without clinging together, which permits pouring a quantity from a larger bulk, said units upon introduction into water readily floating and capable of maintaining their independent identity without tendency to lump, disintegrating upon contact with water and dissolving, said units comprising sodium tetraborate in heat swollen form, light and exceedingly porous, of low bulk density, rehydrated with a water solution of a soap, and having a pH greater than 7.

2. The process of preparing a cleaning composition comprising a homogeneous, uniform mixture in heat swollen form, light and porous, of low bulk density, comprising at least 50% of borax and a member selected from the group consisting of a water soluble alkaline salt of sodium and potassium, having a pH greater than 7, by heating said borax and member simultaneously to dry state and further heating at an elevated temperature to secure such swollen form of the mixture.

3. The process of preparing a cleaning composition, being a bulk product, made up of irregularly shaped units, said units being capable of ready,

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independent movement without clinging together, which permits pouring a quantity from a larger bulk, said units, upon introduction into water, readily floating and capable of maintaining their independent identity without tendency to lump, disintegrating upon contact with water and dissolving, comprising simultaneously heating a member selected from the group consisting of a water soluble alkaline salt of sodium and potassium, and borax until the water of the borax is driven off and the mass swells to a porous and light condition, the amount of borax by weight to the unit being approximately not less than 50%, the alkaline salt having a pH of over 7.

4. A process for preparing a composition of matter comprising heating borax to a dry condition, adding thereto a member selected from the group consisting of a water soluble alkaline salt of sodium and potassium having a pH greater than 7, in substantially anhydrous form, heating the mixture until the mass swells.

5. The process of producing a cleaning composition, being a bulk product, the units whereof are generally irregular in shape, capable of ready, independent movement without clinging together, which permits pouring a measured quantity

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tity from the bulk, said units upon introduction into water readily floating and capable of maintaining their independent identity without tendency to lump, disintegrating upon contact with water and dissolving, comprising heat treating borax to dehydrate the same until swollen and then rehydrating the units with a water solution of a surface-active synthetic organic detergent.

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