UNITED STATES PATENT OFFICE.

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METHOD OF MANUFACTURING SOLID TOILET AND HOUSEHOLD SOAPS IN CAKE OR POWDER FORM.

1,342,783. Specification of Letters Patent. Patented June 8, 1920.

No Drawing. Application filed June 23, 1917. Serial No. 176,622.

To all whom it may concern:

Be it known that I, OTTO VOLZ, a citizen of the Kingdom of Wurttemberg, German Empire, and resident of Berlin, Germany, have invented certain new and useful Improvements in Methods of Manufacturing Solid Toilet and Household Soaps in Cake or Powder Form, of which the following is a specification.

The market value of soap or soap powders was hitherto determined by their contents of fatty acid simply. The practical value of a soap, however, is determined by the ratio between its price and its washing capacity on the one hand, and its degree of injuriousness on the other. The practical value of a soap may be recognized in a reliable manner by measuring its sudding power and the inner friction in the sud. According to numerous recent researches it is entirely wrong to ascribe the cleansing effect of soap mainly to the chemical action of the free alkali. For this reason it is not advisable to employ free alkali, in more than the necessary small quantities or traces, as the injurious effect of such free alkali on tissues is comparatively high.

The additions heretofore made to pure soaps, that is to say to alkali salts of the fatty acids resulted almost in all instances in a reduction of the cleansing capacity of such soaps, and for this reason such fillers are considered in industry, commerce and trade as adulterations. As fillers of this kind various vegetable materials, such as grain and cellulose meals, sugar, also potato flour, or inorganic compounds such as waterglass, common salt, chlorid of potassium, chalk and talcum. All of these materials, with the exeception of waterglass, have hardly any cleansing or washing value, and therefore the admixture of such materials to pure soap will mean a reduction of the quality of the later practically in direct proportion to the amount of such admixture, as they merely increase the bulk, but reduce the washing power.

With waterglass the washing effect is based upon hydrolysis and the liberation of caustic alkali; at the same time, however, free silica is precipitated in the form of sharp edged crystals, which embed themselves as injurious bodies into the tissue treated. For this reason the use of waterglass and soaps containing waterglass is unsuited for the care of the human body.

It has also been suggested to produce an independent washing medium which should possess its own washing power and be worked up with fatty acids into the form of soap, by stirring finely divided, dry vegetable matter, chiefly such containing vegetable albumen, at ordinary temperature into an excess of highly concentrated alkali. The cleansing effect of such product is due mainly to the fact that a considerable excess of highly concentrated alkali which renders the use of the said product actually dangerous, is employed, as the inventors, apparently, still considered the effect of the caustic alkali as the sole active agent in the washing process. This method is, practically, nothing else but a solidification of caustic alkali (the same as may be performed with alcohol with the aid of stearate of sodium). As the albuminates of alkalis will not hydrolyze in their aqueous solutions, the cleansing effect of this solidified caustic alkali is due merely to the action of the excess of free alkali.

Owing to its too great excess of free caustic alkali this product cannot be worked up with ready made soaps into neutral commercial soap ready for use. In combination with fatty acids the product obtained by treating dry vegetable matter with highly concentrated caustic alkali will not yield washing or toilet soaps which are perfectly satisfactory. Besides in such case only pure fatty acids, free from all neutral fat could be used, as the process forbids all heating, and the presence of traces even of such neutral fats would cause a heating with the alkalis. Lastly such soaps are not of a permanent form, as they may not be heated, and can therefore not be made up to serve as soaps of a better quality.

If, however, contrary to the hereinbefore described methods vegetable matter, which will swell in alkalis, such as wood pulp, cotton or their derivates (viscose, cellulose, cellulose hydrates, artificial silk and the like), starch flour or vegetable matter containing starch (potatoes, horse chestnuts,

acorns, Indian corn and the like) are treated moist (in a fresh condition) or dried, in a suitable manner with dilute alkalis preferably while being heated. By reacting with the alkali employed and swelling they change into their respective alkali salts. If the colloidal products obtained are treated with a second material having a colloidal tendency and a decided adsorbing power, such as, for example, clay, kaolin (China clay), talcum or corresponding mixtures of such swellable vegetable matter and adsorbent colloid substances are treated in the manner indicated with dilute alkali, neutral or practically neutral (*i.e.* containing almost no free caustic alkali) products are obtained, which will behave in soap in a manner quite analogous to the latter. These products may be mixed with soap in a surprisingly high ration without the composite product losing in its washing power to a corresponding degree. The said products therefore do not act in the composite soap merely as fillers. This is also apparent from the fact that such compounds, when pressed into cakes or bars of soap will undergo during storage less change of form and loss in weight than such made of pure soap, while, as is well known, soaps filled in the customary manner, will lose considerably when stored both in form and weight by drying.

These surprising properties of the new product may be explained by the adsorbing power of the second colloid substance for slimes, in this case the colloidal, alkalized vegetable matter. The drying up and the splitting up in soapy water are considerably retarded, whereas the forming of a sud is assisted by the very presence of these substances.

The washing effect of pure soap consists, as generally known, in that the alkali salt of the fatty acid will partly hydrolyze in aqueous solution, *i. e.* split up into free alkali and free fatty acid. This splitting up is, with pure soaps, comparatively small as even small quantities of free fatty acid will prevent the further hydrolyzing process. If, now, beside the pure soap, the alkali salt of a swellable vegetable substance of the hereinbefore named kind is present, it is my belief that, the fatty acid will, at the very moment it is liberated approach the alkali which is but slightly bound to the vegetable substance, and in again forming soap therewith, it will immediately disappear. By thus binding the freed fatty acid, which would prevent the continuance of the weak hydrolysis, in nascent state, further soap molecules are given an opportunity to hydrolyze, whereby the washing effect of the fatty acid alkali is increased to such extent, that the soap made according to the new method possesses a much higher washing power than should be expected in view of its contents of fatty acid alkali. The organic swelling matter which is liberated during such processes will by its colloidal jelly-like form assist the emulgent properties of the soap solution and thereby also its washing power, and will thus increase the protective action of the sud preventing a wear of the tissue, on which protective action, as is generally known, beside the action of the alkali split off in hydrolysis, the cleansing effect of soap depends. The presence of the various colloidal substances, both the organic substances in form of alkali compounds and the second substances employed to absorb these compounds, thus assists in the washing process in a favorable manner, both in sudding and in the general effect of the soap, and in the protective action against wear by the mechanical friction between the threads.

As the hardness of the water employed for washing, first and last rinsing will frequently have an unfavorable effect on the sudding and the general action of the soap by the formation of insoluble magnesium and calcium compounds, it will be advisable to add at the same time, if necessary, a carbonate of alkali, which will counteract such unfavorable effect.

The proportion of the mixture of alkalized vegetable matter and adsorbing colloidal substances is determined by the properties desired in the soap to be produced. For soaps, which are intended for the care of the human body a larger addition of talcum or the like is advisable, because these substances, as hereinbefore said, will by reason of their adsorbing properties delay a too rapid splitting up of the alkalized carbohydrates, so that the soap sud has a more neutral effect. For laundry and household soaps, and also for soap powders with which this is less important, the quantity of the adsorbent colloidal substance may be correspondingly reduced.

Example of the manufacture of a toilet soap containing 48–50% of fatty acid:

1. 80 kg. of finely pulverized coffee dregs saponified with 5 kg. soda lye of 40° Bé, or 70 kg., dry, crumbled sulfite cellulose moistened with 6.66 kg. soda lye, and
2. 100 kg. finely pulverized talcum or kaolin, and
3. 110 kg. potato flour or Indian corn meal, and
   90 kg. water or
   220 kg. raw, grated potato mash, containing only 50% moisture (own water)

are introduced in a suitable manner into

32 kg. caustic alkali of 40° Bé, at a temperature of 50–60° C. and made to swell; the colloidal mass obtained is thereupon worked up with about 630 kg. of a well dried

soap containing 75–78% fatty acid, such as grain-soap or palmseed-soap, or other suitable soaps and 15 kg. of 98% potash or some other alkali carbonate in place of a part of the potash, and finally molded into the desired shape.

Preferably an emulsion consisting of a soap solution and non saponifiable fats (vaseline, lanolin) is added to the caustic alkali solution used for swelling the vegetable matter before such swelling process in order to render the colloidal paste for further treatment more loose and less tough, and, on the other hand, to slightly overfatten the finished soap by means of a non-saponifiable fat, because thereby a further protective effect against the injurious action of the hydrolyzed alkali is obtained in the washing process.

In such cases, in which it is desired to divide the adsorbent matter extra finely inorganic, bodies possessing an adsorbent power may be produced in the swollen product itself, by the substances intended to be swollen being divided into two parts and the one part being soaked and swollen in a calculated quantity of lime water or a watery paste of an oxid of the earth alkali metals, while the other part is soaked and swollen with a calculated quantity of a solution of an alkali silicate (or alkali carbonate) with or without an addition of caustic alkali, whereupon finally both parts are well mixed with each other after having been swollen. In consequence thereof the respective earth alkali metal oxid compound will be precipitated in a jelly-like form in such mixture, especially when alkali silicates have been employed, and this precipitate will, by its finely divided state greatly contribute toward increasing the inner friction of the sud when the soap is being used. The amorphous silicate precipitate will have a favorable action similar to that of the well known addition of graphite to lubricating oils.

The finished colloidal soaps may be pulverized in known manner and may be put on the market as soap powders either pure or mixed with carbonate of alkali. But also the intermediate products, the swollen products of a colloidal character may be added to the bodies for soap powder, while these are still warm and liquid, whereupon the colloidal soap powder is finished in the usual manner.

I claim:

1. A cleansing composition consisting of a soap with which is incorporated a gelatinous mixture containing a gelatinized vegetable carbohydrate, a dilute alkali and a colloidal argillaceous adsorbent.

2. A cleansing composition consisting of a soap with which is incorporated a gelatinous mixture containing a gelatinized starch, a dilute alkali and a colloidal argillaceous adsorbent.

3. A cleaning composition consisting of a product resulting from combining about 630 kilograms of well dried soap containing from about 75 to about 78 per cent. of fatty acid, with which soap is incorporated a gelatinous mixture prepared by introducing a mixture composed of about 70 kilograms of sulfite of cellulose in about 6.66 kilograms of soda lye, about 2.1 kilograms of kaolin, about 3.1 kilograms of potato flour, and about 90 kilograms of water, into about 32 kilograms of caustic alkali of about 40° of Bé, at a temperature of about from 50 to 60° C.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

OTTO VOLZ.

Witnesses:

HENRY HASPER,

ALLEN F. JENNINGS.