April 6, 1943. F. J. JOHNSON 2,315,713

MOLDED ARTICLE, BINDER, AND PROCESS OF MANUFACTURING THE SAME

Filed June 18, 1940

Fig:1.

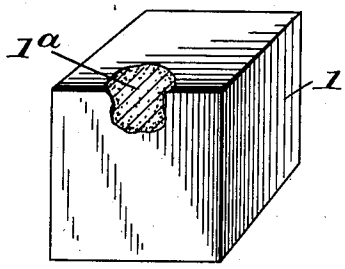


Fig:2.

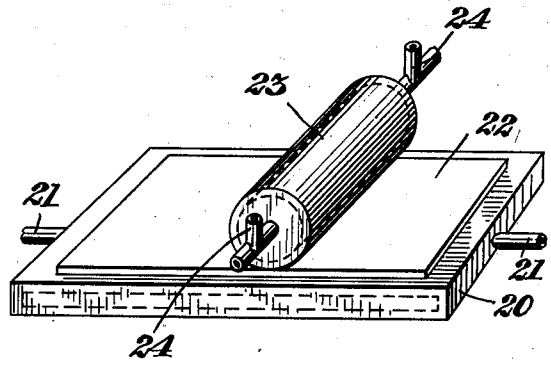


Fig:3.

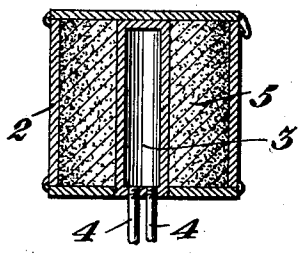


Fig:4.

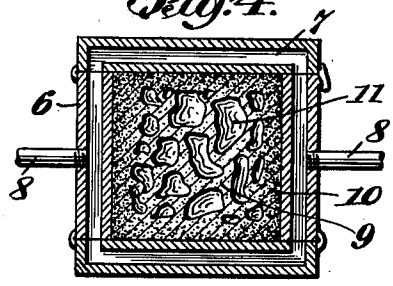
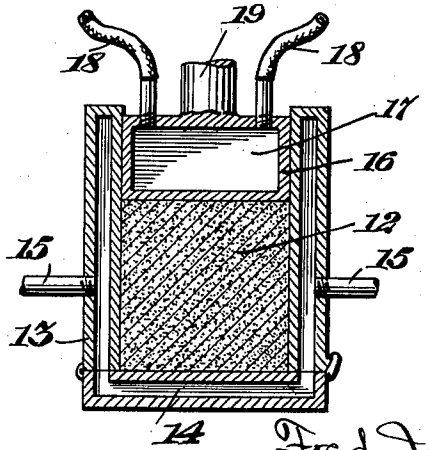


Fig:5



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Patented Apr. 6, 1943

2,315,713

UNITED STATES PATENT OFFICE

2,315,713

MOLDED ARTICLE, BINDER, AND PROCESS OF MANUFACTURING THE SAME

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Application June 18, 1940, Serial No. 341,101

16 Claims. (Cl. 18—47.5)

My invention relates to the manufacture of molded articles including the process for the manufacture thereof, and the new and particularly advantageous binder employed in such manufacture, and the said invention is fully disclosed in the following description and claims, taken in connection with the accompanying drawing.

My invention is based on a discovery that, by combining or admixing water glass (an aqueous solution of sodium silicate) together with a stearate, preferably zinc or other metallic stearate, an extremely desirable binding material results, to which may be added a wide variety of filling materials, thereby obtaining a variety of new and unexpected results having common characteristics, due to the presence of the binder, but varying somewhat in accordance with the filling material, or materials, employed. The resulting plastic material is molded in any desired manner and is thereafter dehydrated by air curing or by the application of heat with or without the simultaneous application of pressure, or in any other desired manner, to deprive the material of its moisture content. My improved molded articles find their largest use as building material in the forms of blocks, slabs or sheets, but as will be obvious, the material can be molded into any desired form, and as it may be made weather-proof by the selection of suitable filling material, it is adaptable for the manufacture of statuary, garden ornaments, tomb-stones and mortuary monuments, and a wide range of other uses.

In the accompanying drawing,

Fig. 1 illustrates a building block embodying my invention, and presenting a substantially dense and uniform character due to molding and air curing or drying.

Fig. 2 represents the application of my invention to the formation of sheets or slabs of the composite material and illustrates one method by which the application of heat for drying or dehydrating the same may be carried out.

Fig. 3 is a sectional view of a mold within which a block of the material may be held under pressure during dehydration, which in this instance is effected by means of a hollow core to which a heated medium is continuously supplied.

Fig. 4 represents a different form of mold having hollow walls supplied with a circulating heating medium and effecting the expansion of the entire molded mass during the dehydration thereof.

Fig. 5 is a sectional view of a somewhat similar mold, provided however with a movable plunger by means of which follow-up pressure may be continuously applied to the block of molded material within the mold during the dehydration thereof, for the purpose of increasing the density of the block.

In the formation of my improved base or binder, I preferably mix a solution of sodium silicate, or commercial water glass, with a metallic stearate, preferably zinc stearate, and I have found the following proportions to give satisfactory results, to wit:

	Parts by volume
Solution of sodium silicate in water	4
Zinc stearate	1

These ingredients are mixed and brought to a creamy consistency. To this mixture is added any one or more of a large number of bulk material or filling material, preferably in sufficient quantity to bring the plastic material to the consistency of bread dough, a porous consistency analogous thereto being produced by the frothy consistency of the binder mixture. This frothy condition of the binder is somewhat reduced by the addition of the filler, but may be again increased by the application of heat. The actual amount of filling material may be varied to a considerable degree in accordance with the results desired.

For the formation of blocks, sheets, slabs, etc., for use as building material, I have found suitable fillers to be asbestos, ground or crushed slate, marble dust, rock wool, glass wool, sand, sawdust, paper or paper pulp, ground seashell, and many other similar materials, inert or otherwise, or various combinations of two or more of these materials, according to the characteristics of the blocks or sheets desired and the use to which they are to be put.

For other uses, such as statuary, urns, garden ornaments and mortuary monuments, I have found that by adding to the above base, marble dust, ground slate, ground seashell and other like materials, very satisfactory products of good appearance are obtained with satisfactory resistance to atmospheric conditions.

After mixing the selected filling material, or materials, with the binder and bringing the same substantially to the consistency of bread dough, for example, the plastic material is dehydrated in one of many ways. For example, in the production of building blocks, the dough-like material is molded to the desired form as illustrated in Fig. 1 by the block 1, said blocks may be dehydrated by subjecting them to the action of

the atmospheric air, to wit, air drying. Under ordinary circumstances, such blocks will present a substantially uniform grainlike density, as indicated at *1a*, and there may be some shrinkage during the drying operation, which will be substantially uniform.

I prefer, however, to effect the dehydration of the blocks or other molded mass while they are confined within the mold in order that, first the size of the block may be accurately reached in the final article, secondly, a smooth, uniform and substantially impervious surface may be formed on the exterior of the molded article, and thirdly, the relative density of the finished article may be controlled by the relative amount of plastic material charged into a mold of given size, as well as by the consistency of the mixture.

In Fig. 3, for example, I have illustrated the mold at **2**, having a central core **3**, which can be continuously supplied with a heat medium, as steam heat, by means of pipes **4**, **4**. The plastic mass is charged into the mold and surrounds the core **3**. On the application of heat to the core, the moisture within the mass will be driven outwardly and the plastic mass will be compressed by the vaporized water as well as by the frothing of the binder mixture, against the outer surface of the mold where the greatest density of the block will naturally exist as the dehydration progresses, and as indicated in the drawing, in which the block is shown at **5**. It will be understood that the mold, while tight enough to confine the block, will permit the escape of excess moisture during the application of heat.

The advantages of dehydrating the plastic mass in the mold will be readily understood, as the exterior faces of the finished dried blocks will naturally partake of the character of the inner faces of the mold, and these may be varied to any desired extent. For example, the blocks may be formed of an exterior surface resembling stone where they are to be used in the wall of a building, while the inner surface may be smooth and polished or decorated in any desired designs provided on the inner face of the mold, in accordance with the desire of the manufacturer, thus making a light and strong building block which could be used if desired without further treatment on either the outer or inner faces of the wall in which it was used.

In Fig. 4 I have illustrated a mold in which the heating medium for the dehydration of the molded block is at the exterior instead of the interior of the plastic mass. In this instance the mold **6** is provided with the hollow wall, indicated at **7**, to which the heating medium, as steam or hot air, may be supplied, as by means of pipes **8**. The application of heat to the exterior of the block **9** necessarily vaporizes the water content of the mass and produces an expansion of the mass outwardly toward the inner surfaces of the mold. This, as shown in Fig. 4, has the effect of increasing the density of the block at the outer faces thereof, indicated at **10**, making it substantially impervious, while the interior of the block will be found, upon breaking it, to be filled with voids, indicated at **11**. This makes a very light block for all kinds of building purposes, which can be manufactured in any size or shape desired, and the faces may also be ornamented or decorated, as previously described.

It will be seen that an economy is effected in that, while the mold is charged fully with the dough-like plastic, the actual amount of material for each block is considerably less than the cubical contents of the mold. In actual practice it is found, however, that these blocks having the voids **11** hereinbefore described and formed of the plastic material, have ample strength to resist all the necessary stresses to which such building material will ever be subjected in normal use.

In some instances, however, it may be desirable to provide blocks of greater density, and this can be readily accomplished by such means, for example, as is illustrated in Fig. 5, in which I have shown a block **12** being formed within a mold **13**, having hollow walls, indicated at **14**, supplied with a heating medium by pipes **15**, and provided as shown in Fig. 5, with means for applying continuous pressure to the block during the drying operation. In this instance I have shown a plunger **16**, which is also hollow, as indicated at **17**, and supplied with a heating medium by means of pipes **18**, the plunger being connected with a rod **19** which may be operatively connected with a suitable ram or other power applying means, so that the material, represented by the block **12**, will be acted upon by the heat from the heating medium in the hollow walls and plunger, and will at the same time be continuously under the influence of pressure, so that as the moisture is driven out the material becomes more and more dense, and by this means or any other suitable condensing means, the production of blocks or other molded products, which are substantially of uniform density throughout, may be obtained, while at the same time a complete uniformity of size and the character of the exterior faces of the blocks is retained.

In some instances I have found it desirable to form the dough-like material as a flat sheet, plate or slab, which is admirable for roofing purposes, and also for floor tiles, wall tiles and many other purposes. It will be seen that in the selection of filling material, inert colored matter can also be introduced so as to produce these sheets as well as the blocks heretofore described, with any desired color or colors, or colored ornamentation, in accordance with preconceived designs. Obviously the sheets or slabs of material can be pressed or rolled and dried by air curing or, as I have illustrated in Fig. 2, they may be rolled between heated surfaces.

In Fig. 2, for example, I have shown a hollow metal bed at **20**, to which a heating medium, as steam or hot air, may be admitted continuously by pipes **21**, **21**, the dough-like material in such instances being spread on the bed **20** and rolled to the desired thickness, as indicated at **22**, by means of a hollow roller **23**, the interior of which is also provided continuously with a circulating heating medium, by means of suitable pipes **24**, **24**.

If desired, the expansion of the plastic material upon the application of heat, above referred to, may be availed of to produce novel forms from unconfined shaped sheets of the same, as such sheets or other portions may be partially dried by air-curing without heat and heat thereafter applied to produce a puffing of the material, by which it is obvious that a variety of ornamental articles may be made, having a predetermined outline and a form rounded out by such expansion after the hardening of the surface. For certain purposes, for instance, brickmaking etc., the mass may be mixed to a very stiff or dry powdered state and subjected to a high pressure, with or without heat.

It will readily be seen that there is practically

no limit to the variety and number of different articles which can be manufactured by the use of my improved material, and in accordance with my improved process, and practically any desired surface texture or color or ornamentation can be obtained without materially increasing the cost of production.

What I claim and desire to secure by Letters Patent is:

1. A binder for molded articles, consisting essentially of waterglass mixed with zinc stearate and brought to a creamy consistency.

2. A molded article consisting essentially of waterglass and a metallic stearate combined with a filling material.

3. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, forming the resulting mass in a mold, and treating the molded mass to dehydrate the same.

4. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, forming the resulting mass in a mold, and dehydrating the molded mass while confined in a mold.

5. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, forming the resulting mass in a mold, applying heat to the mold to expand said mass while confined therein to force it against the mold and produce a substantially impervious exterior surface, and to simultaneously produce voids in the interior of the mass.

6. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, forming the resulting mass in a mold, and dehydrating the molded mass by application of heat while confined in a mold.

7. A process for the production of molded articles, which consists in mixing waterglass with zinc stearate and bringing the mixture to a creamy consistency, adding filling material, forming the resulting mass in a mold, and treating the molded mass while confined in the mold to the action of heat within the plastic mass for the dehydration of the same and the expansion of the molded material to and against the walls of the mold.

8. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, and dehydrating the molded mass by simultaneous application of heat and continuous pressure.

9. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, rolling the mass into sheet form and dehydrating the sheet material so formed.

10. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, and bringing the mixture to a creamy consistency, adding filling material, rolling the mass into sheet form, and simultaneously applying heat to dehydrate the material.

11. A molded article composed of waterglass mixed with a metallic stearate, and filling material, and having a substantially impervious molded exterior surface, and having its interior provided with voids.

12. A molded article composed of waterglass, mixed with zinc stearate, and filling material, and having a smooth substantially impervious exterior surface, and having its interior provided with voids.

13. A process for the production of molded articles, which consists in mixing waterglass with a metallic stearate, bringing the mixture to a creamy consistency, adding filling material, forming the resulting mass, and dehydrating the same.

14. A process for the production of molded articles, which comprises mixing waterglass with a metallic stearate, bringing the mixture to a creamy consistency, adding filling material and bringing the mixture to a stiff condition, subjecting the mass to high pressure and dehydrating the same.

15. A molded article consisting essentially of waterglass mixed with a metallic stearate, and filling material, and having a substantially impervious exterior surface and a porous interior portion.

16. A molded article consisting essentially of waterglass mixed with a metallic stearate, and filling material and having a substantially impervious exterior surface and a hollow interior.

FRED J. JOHNSON.