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C. E. HITE

WALL PRODUCT AND APPARATUS FOR AND METHOD OF MAKING SAME

Filed April 21, 1924

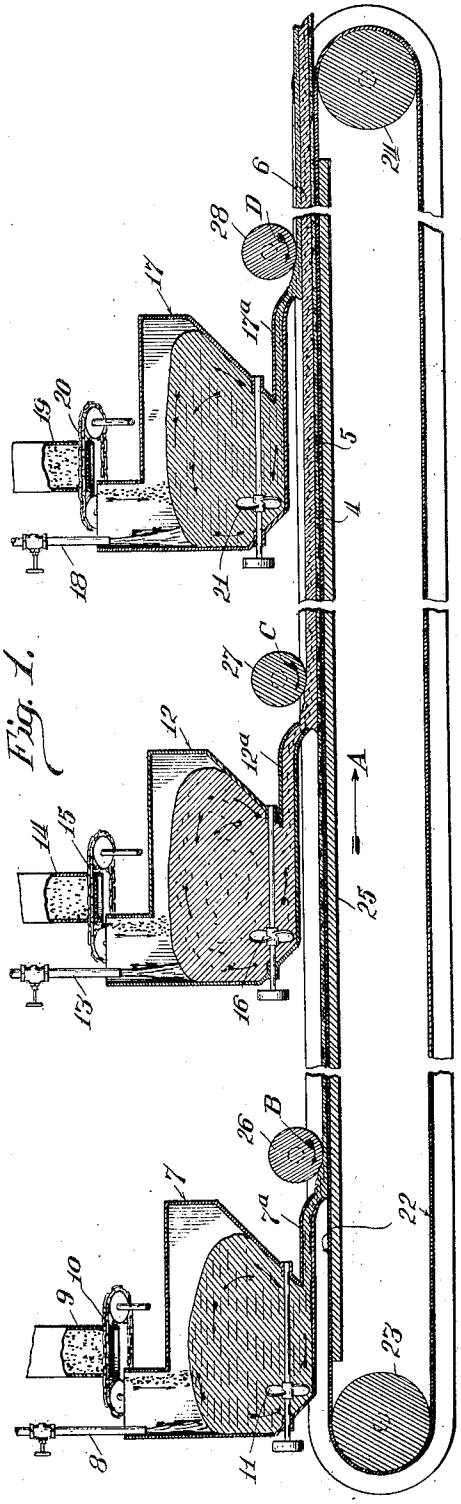


Fig. 1.

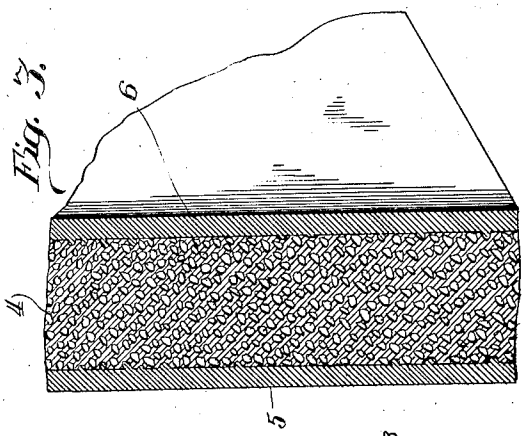


Fig. 3.

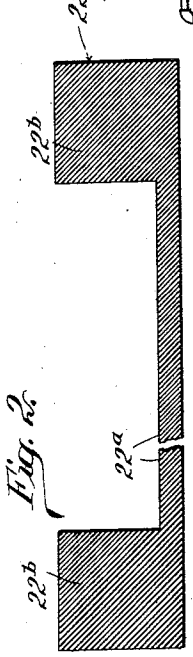


Fig. 2.

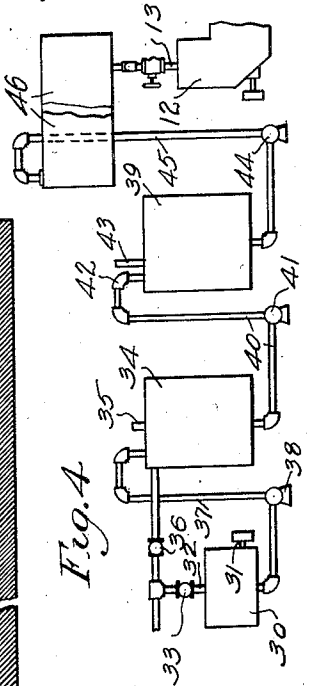


Fig. 4.

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UNITED STATES PATENT OFFICE.

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WALL PRODUCT AND APPARATUS FOR AND METHOD OF MAKING SAME.

Application filed April 21, 1924. Serial No. 707,966.

This invention relates to an improved wall product and apparatus for and method of making the same. The term "wall product" is used generically in the appended claims as meaning blocks, boards, panels or slabs of various kinds for use in the construction of walls, floors, roofs or other purposes. The invention relates particularly to a product, and the manufacture thereof, technically known in the art as "plaster block" which is a block laid up in mortar and largely used in the construction of partition walls.

Plaster blocks as ordinarily manufactured are approximately 12 inches wide, 36 inches long and 3 or 4 inches thick. They are usually made of a mixture of comminuted calcined gypsum and water. In order to reduce the cost of the materials used in their manufacture and to lessen their weight, it is common practice to incorporate in the mixture a filler of some cheap material, such as wood, excelsior, chips or cinders, and to provide two or three openings, approximately 2 inches in diameter, running lengthwise through the block. The several openings extending through the blocks materially weaken them, whereby the blocks are often broken or chipped when handled or when in transit. Furthermore, the openings in the blocks provide ready avenues for the passage of sound which is very objectionable. One of the objects of my invention is the provision of an improved wall product which will be economical to manufacture and light in weight without the use of any wood or other equivalent filling material and preferably without having any openings extending through it but which, nevertheless, will be strong and durable, and provide a practical and efficient obstruction to the passage of heat, cold and sound.

Because of the nature of the filling material heretofore used in the mixture for the blocks, the only practical way to manufacture them has been to cast them in individual molds equipped with suitable cores. As ordinarily carried out, this method of manufacture is slow and requires a large amount of manual labor; hence the cost of manufacturing is very considerable. Some attempts have been made to provide machines equipped with molds carried by an endless conveyor in combination with mechanism for inserting and withdrawing the cores for continuously casting blocks. Since the blocks must be set sufficiently to hold their shape before the cores can be withdrawn therefrom and the blocks can be discharged from the molds, it will be seen that the conveyor must be very long if it is to travel at a fair speed and the output of the machine per day is to be very great. The initial investment of capital in such a machine is not only large but the mechanical difficulties of operating it are very great. For instance, the weight of the product on the conveyor is, of course, very great and it is difficult to maintain the parts forming the molds tight so that the mixture will not run out before it sets; and the mechanisms for inserting and withdrawing the cores are complicated and it is difficult to maintain them in proper working order. Another object of my invention is to provide a wall product of such construction that it may be manufactured expeditiously by the use of very simple, reliably operating and relatively inexpensive machinery and with very little, if any, manual supervision.

A further object of my invention is the provision of an improved method whereby the manufacture of the improved wall product aforesaid may be carried out expeditiously and at a minimum expense.

Another object of my invention is the provision of apparatus of simple construction, efficient in operation and well adapted for continuously carrying out the manufacture of the improved wall product aforesaid.

My invention will be better understood from the following description of a preferred embodiment thereof taken in connection with the accompanying drawing wherein is illustrated a preferred form of apparatus suitable for practicing it and in which—

Fig. 1 is a diagrammatic view of the apparatus;

Fig. 2 is a transverse sectional view, on an enlarged scale, of the traveling mold employed in the apparatus;

Fig. 3 is a perspective view on an enlarged scale of a fragmentary portion of a block constructed in accordance with my invention; and

Fig. 4 is a diagrammatic view of the pre-

ferred form of apparatus for preparing the liquor for use in forming the core of my improved product.

Like characters of reference designate like parts in the several views.

The product comprises a light-weight, relatively porous composition core 4 preferably provided with dense composition protective facings 5 and 6 on its sides; the aforesaid product being obtained by forming the core of a plastic mixture in which the solids constitute the minor proportion, by weight, and by forming the facings of a plastic mixture in which the solids constitute the major proportion, by weight.

The composition facings 5 and 6 of the product may be made by casting a plastic mixture of comminuted calcined gypsum and water in the relative proportions of 60 and 40 per cent, by weight, respectively.

The materials for the core are preferably prepared in the following manner: A quantity of a suitable amylaceous material for example, corn starch, is mixed in a tank 30 by a mixer 31 of any approved type with a quantity of cold water introduced through a pipe 32 and valve 33 and thoroughly stirred until the starch is dissolved and the starch granules are separated one from another thus providing a starchy liquor. The starchy liquor is then placed in a suitable steam jacketed kettle 34 provided with suitable agitating means 35, and sufficient cold water is placed in the kettle to bring the water content of the liquor up to approximately 18 or 20 times as much, by weight, as that of the starch, the water being introduced through the pipe 32 and a valve 36. The transfer to the kettle 34 is preferably effected by means of a pipe 37 and pump 38. The agitating means in the kettle is then set in motion and heat is applied to bring gradually the temperature of the diluted liquor up to 190° F. The individual starch granules are burst and thoroughly mixed with the water whereby the starch and water are converted into a viscous agent of smooth uniform texture. The application of heat is then discontinued and sufficient cold water is introduced to bring the water content of the viscous agent up to substantially 31 times as much, by weight, as that of the starch material and at the same time to reduce the viscous agent to the desired temperature. The additional water may be added in the kettle 34 or the addition of such water may be effected in a second mixing tank 39 to which the liquor has been transferred through the medium of a pipe 40 and pump 41. If desired, some suitable acid may be added,—for example, one part of sulphuric acid for two hundred parts by weight of the liquor,—the acid being introduced through a pipe 42. The added water or water and acid are thoroughly mixed with the liquor by means of the agitating means 35 or by means of an agitator 43 in the tank 39. The diluted cooked paste may then be drawn from the kettle 34 or the tank 39 and thoroughly mixed with comminuted calcined gypsum in the proportion of approximately fifty pounds of the paste to forty pounds of the gypsum, the paste having meanwhile been transferred by a pump 44 through a pipe 45 to an elevated storage tank 46 substantially in accordance with my copending application Serial No. 707,965, filed April 21, 1924.

The apparatus preferably used for continuously manufacturing the product includes a mixer 7 in which the materials for the bottom facing are prepared, water being supplied from a pipe 8 and comminuted calcined gypsum from a source of supply 9 by a drag chain 10. The materials are thoroughly mixed in the mixer by continuously operating propeller blades 11. The materials for the core are prepared in a mixer 12 to which the amylaceous paste or the acidulated amylaceous paste is supplied from a pipe 13, the comminuted gypsum being supplied from a source of supply 14 by means of a drag chain 15. The paste and gypsum supplied to the mixer 12 are thoroughly mixed by the continuously operating beater blades 16. The materials for the top facing of the product are prepared in a mixer 17 supplied with water from a pipe 18 and with calcined gypsum from a source of supply 19 by means of a drag chain 20, the water and gypsum being thoroughly mixed by continuously operating beater blades 21. An endless mold 22 travels, in the direction indicated by the arrow A. over rollers 23 and 24. The mold of the form shown in cross-section in Fig. 2 and comprising a bottom portion 22^a and vertical side portions 22^b may be used. The mold may be formed of a fabric foundation material sufficiently yieldable to permit the mold to travel around its supporting rollers. The material for the mold is preferably impregnated or covered with rubber, or otherwise treated, so that the interstices of the fundation material will be filled and the interior of the mold will be smooth. The upper run of the mold may be supported in any desired manner, for example, by an under frame or table 25.

The plastic mixture for the bottom facing is continuously delivered from the mixer 7 through a discharge spout 7^a into the mold, the mixture being spread substantially uniformly in the bottom of the mold by a roller 26 which operates in the direction indicated by the arrow B. The plastic mixture for the core is continuously deposited from the mixer 12 through a discharge spout 12^a onto the top surface of the bottom facing, the mixture for the core being spread uniformly in the mold on said facing by a roller 27 which operates in the direction indicated by the arrow C. The plastic mixture for the top fac-

ing is continuously supplied from the mixer 17 through its discharge spout 17ª onto the top surface of the core, the mixture for said facing being uniformly distributed in the mold over the core by a roller 28 which operates in the direction indicated by the arrow D. The rollers 26, 27 and 28 operate at a fairly high speed. It will be noted that they rotate in a direction opposite to the direction of travel of the mold which prevents the mixtures from piling up in front of the respective rollers. The speed of the mold and the distance between the mixers 7 and 12 are such that the bottom facing hardens sufficiently to support the mixture for the core, when it is deposited onto the facing. Some of the mixture for the core, however, does work into the interstices of the facing which is desirable as it insures a good mechanical interlocking of the core and the facing. Likewise the distance between the mixers 12 and 17, with respect to the speed of the mold, is such that the core hardens sufficiently to support the mixture for the top facing, when the latter is deposited onto the core, and here also there is sufficient intermingling of the mixture for the facing with that of the core to insure a good mechanical bond between the facing and the core. By the use of acid as above specified, the time required for the setting of the core is very materially cut down, the acid being adapted to react with carbonates in the mixture to form nascent salts for effecting this result. If the gypsum is deficient in carbonates contained therein as impurities, such carbonates may be added as required. Since the mold is of considerable length and travels quite slowly, the cast laminated sheet-like product, by the time it reaches the delivery end of the mold, has set sufficiently to be self-supporting and therefore it may be cut into blocks of the desired size and either placed in a drying kiln to eliminate the moisture in excess of the water of crystallization or stored in a shed or a yard so that the excess moisture may evaporate. When plaster blocks are manufactured the mold may be made 3 or 4 inches deep and 36 inches wide and the product may be cut off in lengths of 12 inches.

The facings on the blocks will ordinarily be from 3/8 to 1/2 inch in thickness. The mixture for each facing sets into a sheet-like mass which is very hard and very dense. When the amylaceous material and the water for the paste used in preparing the mixture for the core are combined in the manner herein described, the resultant viscous agent is free of lumps and is of a smooth, uniform consistency. The particles of gypsum are thoroughly and uniformly distributed throughout the agent and are held in suspension while crystallization takes place. Because of the uniform distribution of the gypsum particles throughout the paste, the core of the product is very porous and, therefore, light in weight.

A block manufactured according to my invention is superior to the old style wood filled, cored block of the prior art for the following reasons: (*a*) The dense hard facings on the opposite sides of the porous core of uniform cellular construction provide a very strong structure capable of withstanding severe shocks and jolts without cracking or breaking. Shocks imparted to one facing are not transmitted to the other facing because of the shock absorptive capacity of the cellular core; consequently, the likelihood of breakage is reduced to a minimum. (*b*) Since the improved block is not cored, there are no avenues running through it for the passage of heat, cold, fire or sound. (*c*) Since lightness of weight is obtained by a cellular structure without the use of a wood filling material, the improved block is more fire-resisting. (*d*) The uniform cellular construction of the core with the innumerable dead air cells affords a practical and efficient obstruction to the passage of heat, cold or sound. (*e*) The construction of the improved block is such that it may be economically and expeditiously manufactured by the continuous mold method, requiring very simple and inexpensive machinery and very little, if any, manual supervision, thus doing away entirely with the individual molds, the expensive, complicated and unreliably operating mechanism for maintaining the mold parts tight and for inserting and withdrawing the cores from the respective molds, and all the delays and expense incident to the operation of such machinery; hence the cost of manufacture of the improved product is very much less than that of the old style blocks.

The relative quantities of the materials used in the core as herein set forth are the best known to me for accomplishing the desired results, but I do not intend to limit my invention to the relative quantities specified, as variations may be made, depending somewhat on the qualities of the materials and the strength and weight of the product desired, without departing from the principles of my invention.

I do not intend to limit my invention to the details of construction and the detail steps of manufacture shown and described, except only in so far as certain of the appended claims are specifically so limited, as it will be obvious to those skilled in the art that various modifications and changes therein may be made without departing from the principles of my invention.

While I have described herein specifically the manufacture of plaster blocks of a certain size, it will be apparent to those skilled in the art that other wall products such as boards, panels and slabs, differing materially

in thickness and size from the blocks mentioned, may readily be manufactured in accordance with the principles of my invention.

I claim:

1. The method of making a wall product which consists in casting a composition facing, casting in conjunction with said facing a plastic mass obtained by mixing acid, comminuted calcined gypsum containing an impurity adapted by reaction with the acid to hasten the setting of the gypsum, and a hydro-amylaceous paste capable of sustaining the particles of gypsum in suspension during setting, and then causing the product to be dried.

2. The method of making a wall product which consists in casting a facing consisting of comminuted calcined gypsum and water, casting in conjunction with said facing a plastic mass obtained by mixing comminuted calcined gypsum, sulphuric acid and a hydro-amylaceous paste capable of sustaining the particles of gypsum in suspension during setting, and then causing the product to be dried.

3. The method of continuously making a wall product which consists in casting and advancing a composition facing, preparing a mixture of sulphuric acid, comminuted calcined gypsum containing an impurity adapted by reaction with the acid to produce a salt and a hydro-amylaceous paste capable of sustaining the particles of gypsum in suspension during setting, casting a body of said mixture onto said facing, severing the resulting product into the desired lengths, and then causing it to be dried.

4. A unitary laminated wall product comprising in combination two dense hard composition facings, and an intermediate core of cellular texture secured to and protected by said facings and comprising the set product of a mixture including calcined gypsum as the major ingredient, acid, carbonate reacting with the acid to form a nascent salt in the mixture serving to accelerate the setting of the gypsum, and a hydro-amylaceous paste adapted to sustain the particles of gypsum in suspension during the setting of the mixture.

5. A unitary laminated wall product comprising in combination two dense hard facings formed of calcined gypsum and water, and an intermediate core of cellular texture secured to both of said facings by direct bonding therewith and comprising the set product of a mixture including calcined gypsum as the major ingredient, acid, carbonate reacting with the acid to form a nascent salt in the mixture serving to accelerate the setting of the gypsum, and a hydro-amylaceous paste adapted to sustain the particles of gypsum in suspension during the setting of the mixture.

CHARLES E. HITE.