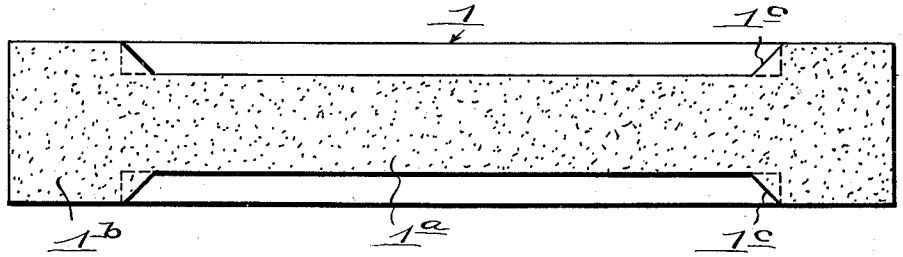
Nov. 4, 1930. E. C. LOETSCHER 1,780,623

PROCESS FOR MANUFACTURING BUILDING MATERIAL OF VARYING DENSITIES

Filed July 26, 1929

Fig. 1



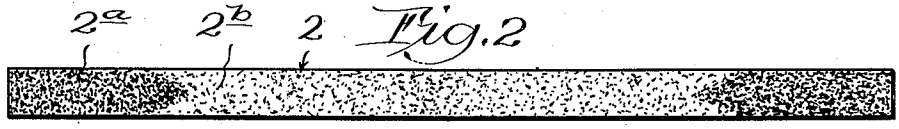


Fig. 2

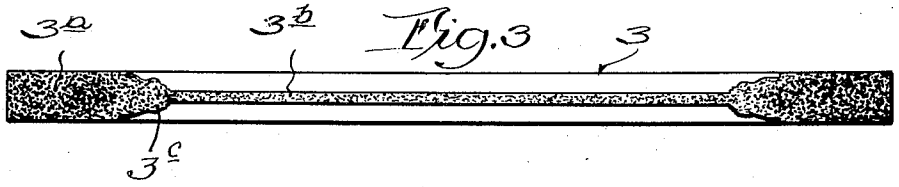


Fig. 3

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Patented Nov. 4, 1930 1,780,623

UNITED STATES PATENT OFFICE

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PROCESS FOR MANUFACTURING BUILDING MATERIAL OF VARYING DENSITIES

Application filed July 26, 1929. Serial No. 381,197.

This invention relates to improvements in processes for manufacturing doors and like mill products from cellulose fibre compressed to the density of solid wood, and capable of use as a substitute therefor.

The object of the present invention is to provide a process which will make possible the production of articles having the fibrous material compressed to a relatively greater density throughout some portions than others. This feature is particularly advantageous in a door, for example, which requires that the outer edge portions be of considerably greater density than the central or interior portions, not only to protect the edge and corners against denting and marring, but also to provide a sufficient and firm anchorage for the screws used for applying hinges, locks or other hardware that may be used in the hanging of the door. The increased density would ordinarily be confined to those portions where the need exists, since there is no particular necessity of increasing the weight beyond the ordinary requirements of strength and rigidity. Thus in a door, the edges or outer portions only need be of increased density, and to a depth such that the screws will hold firmly, whereas they would not in the fibrous material of less density. Similarly in other articles, the region of increased density would be coextensive with the conditions attending its use.

The accompanying drawings disclose the application of the process to the making of a door, in which

Figure 1 is a view in cross section through the mat of fibrous material before it is compressed to form a door of uniform thickness;

Figure 2 is a cross sectional view through the mat after it has been compressed to the final thickness of the door; and

Figure 3 is a cross sectional view of a panel door construction made by the same process.

The simplest type of door to be made in accordance with the process would be manifestly one of uniform thickness such as shown in Figure 2, and consisting essentially of a rectangular slab say, 1½ inches thick. To make a door of this type, a pulp of any suitable cellulose fibrous substance, such as cornstalk, wood shavings, or the like, would be prepared. From this pulp, a mat 1 would be formed (Figure 1) in a suitable mold or form having the same outside dimensions as the door but of considerably greater depth. The bottom of the mold or form is elevated throughout its central portion, as is the corresponding portion of a follower board which is laid on top of the pulp mass after it is placed in the form and pressure applied to it for squeezing the excess water from the pulp, thereby giving the mat a definite shape although still containing considerable moisture. The bottom wall of the mold or form is preferably perforated or screened to permit the water to drain from the mat, and if desired a chamber or enclosure is provided below the mold and maintained under a partial vacuum to aid in the removal of the excess moisture. A form, such as just described, is disclosed in a prior application filed by me on April 17, 1929, and bearing Serial No. 355,992.

As thus formed, the mat 1 has a relatively thin central portion 1^a of say three inches in thickness, and surrounding marginal portions 1^b of approximately twice the thickness of said central portion, say 5 or 6 inches, distributed symmetrically on each side. In forming the mat, the thinner central or interior portion is preferably increased gradually in thickness to that of the thicker outer portion forming intermediate beveled faces 1^c, 1^c, although the increase may be more abrupt as by the formation of square shoulders around the outer edge portions, as shown in dotted lines in Figure 1.

After the mat has been formed, it is removed from the mold and placed in a hydraulic press equipped with hollow platens having both steam and water connections so that the material can be heated and cooled while under pressure. Polished steel plates are preferably placed between the platens and the faces of the material to insure smooth surfaces, and prevent the otherwise possible adherence of the fibrous material to the platens.

The surfaces of the platens (or plates, if used) are perfectly flat so that upon com-

pression the central portion as well as the thicker outside portion of the mat will be reduced to a slab 2 (Figure 2), the same thickness throughout, namely, 1½ inches. But since the initial thickness of the outer or marginal portions of the mat is considerably greater than that of the central portion, it follows that the density of the material around the edges of the door will be proportionally greater, that is, of sufficiently greater density to insure the firm holding of the screws that are driven into the material for mounting of the hinges and other hardware to be subsequently applied to the edge portions of the door.

Subsequent to compression, the surface of the finished slab would reveal no variation between the portions of different densities so that the heavier areas of shading 2^a in Figure 2 are indicative of the portions of greater density and show the gradual merging of the portions of greater density into the less dense central portion 2^b, this being particularly true when the thickness of the edge portions of the mat taper off to the thinner central portion.

This is mentioned because it might be presumed off-hand that the thicker edge portions would tend to flatten out when pressure is applied with the result that excess thickness would tend to spread laterally so that the slab would eventually assume a uniform density throughout. But in actual practice this has not been found to be true and for the reason that once the fibres have been brought into ultimate contact they become so interlaced that the mat will undergo considerable compression in the direction of its thickness without lateral expansion or movement. It is therefore on account of this peculiar property of cellulose fibre substance that a mat of initially varying thickness can be reduced to a slab of uniform thickness but of varying density without altering its external appearance or otherwise lessening its utility as a structural unit.

By this process, a considerable saving in material is obtained, since an excess is only required throughout the denser edge portions, while the remainder of the door is of sufficient density to afford the strength and durability otherwise required. By way of comparison, it might be said that a door made of a compressed fibrous material according to the method herein disclosed, would have the strength and density equal to or even greater than pine throughout all portions except its edges where its density would be equal or greater than that of hardwood. Thus the edges are not only rendered suitable for the application of hardware but capable of resisting the blows and hard knocks which doors are usually subjected to, but without materially increasing their weight beyond normal requirements.

In practice, the surface of the doors would be treated somewhat more elaborately than is here disclosed, as for instance, by coating the surface with a solution of bakelite varnish, bakelized paper or a natural varnish before it is compressed. The purpose of this treatment is to provide a smooth finished surface which can be enameled or painted without further preparation, or if desired, grained, in imitation of a natural wood. Processes for the treatment of surfaces in the production of articles produced from compressed cellulose materials are dealt with in other applications filed by me, and therefore need not be here fully disclosed.

In Figure 3 I have disclosed a panelled door 3 which may be made by the same process, except that the thickness of the initial mat would be proportioned to ultimate thickness of the denser outer edge portions 3^a, the relatively thin central panel 3^b and the ornamental molding 3^c surrounding the panel. However, a panelled door would require especially prepared platens or dies conforming to surface contour of the door, but otherwise the outer edges would be of the desired increased density. In fact, it would be possible to proportion the thickness of the mat so that the outer edge portions and the central panel would be of the same or varying densities, and the portions between and including the molding be of a still different density.

Manifestly, the process is applicable to the manufacture of articles other than doors, and to the formation of portions of varying densities in different portions of such articles, depending on their use, and in some instances on the amount of abuse.

Having set forth a preferred embodiment of my invention, I claim:

1. A process for manufacturing articles of fibrous material consisting of molding a mat of the fibre pulp with predetermined portions of substantially increased thickness, and compressing the mat to the ultimate thickness of the article to be made, but with the initially thicker portions compressed to a substantially greater density than the initially thinner portions.

2. A process of manufacturing articles of cellulose fibre consisting of forming a mat of the fibre pulp having one portion of substantially greater thickness, and compressing the mat in the direction of its thickness to a slab of uniform thickness.

3. A process for manufacturing articles of fibrous material consisting of molding a mat of the fibre pulp with predetermined portions of substantially increased thickness, and compressing the mat to the ultimate thickness of the article to be made, the thicker portions of the mat being compressed to a greater degree than the remaining portions and to a proportionally greater density.

4. A process of manufacturing articles of cellulose fibre consisting of forming a mat of the fibre pulp having its edge portions of substantially twice the thickness of the remaining portion thereof, and compressing the mat in the direction of its thickness to a slab of uniform thickness.

5. In the process of manufacturing articles of cellulose fibrous material consisting of forming a mat of fibre pulp and compressing the mat to the final thickness of the article in a press, of the steps of building up the outer edge portions of the mat to a substantially increased thickness whereby the density of the material throughout the corresponding finished article after compression will be of relatively greater density than the remaining portions of the article.

6. In the process of manufacturing a door or the like from cellulose fibre consisting of preparing a mat of the fibre pulp with its outer edge portions of substantially greater thickness than the central portion, compressing the mat to the final thickness of the door in a press provided with platens adapted to compress the outer edge portions to a relatively greater density than the central portion.

Signed at Dubuque, Iowa, this 22 day of July, 1929.

EMIL C. LOETSCHER.