Feb. 22, 1955 C. P. MANNHEIM 2,702,761

METHOD OF IMPREGNATING FIBER INSULATION BOARD

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Fig. 1.

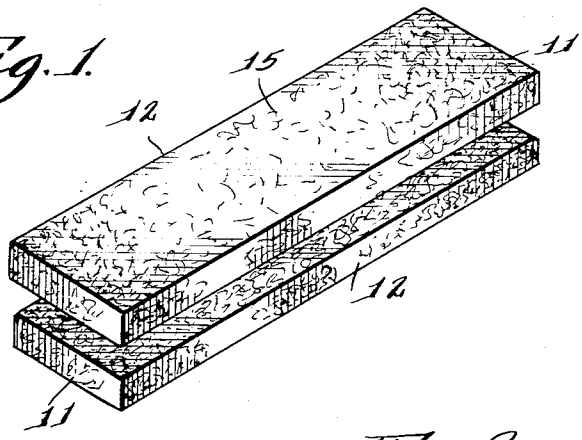


Fig. 2.

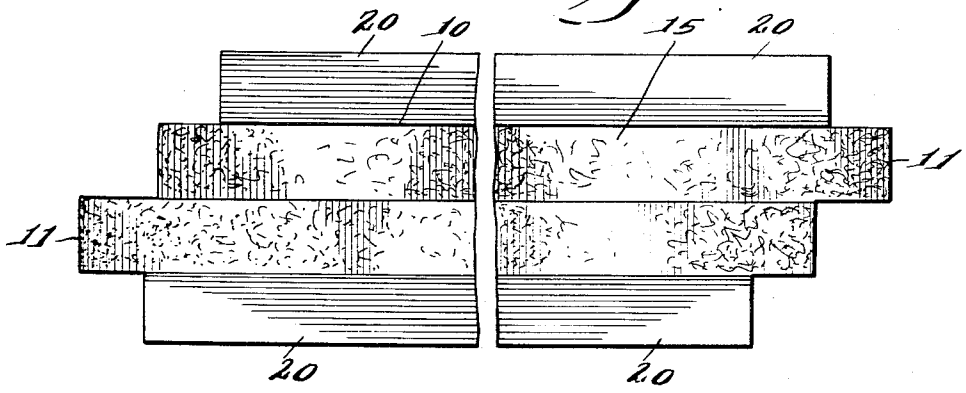
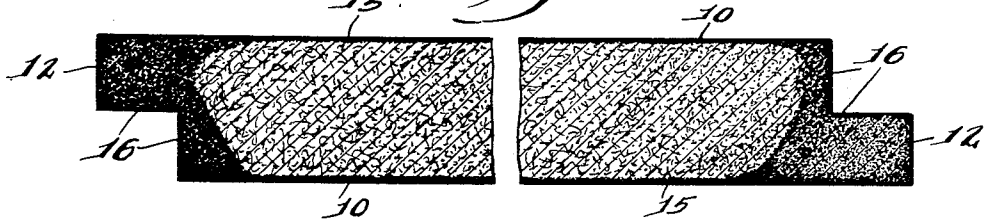


Fig. 3.



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METHOD OF IMPREGNATING FIBER INSULATION BOARD

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4 Claims. (Cl. 117—43)

This invention relates to the improvement in that type of roofing and siding products which are manufactured of a core of fiber insulation board provided on a face with a weather-resisting surfacing. Such weather-resisting surfacings usually comprise granules of the general type of roofing granules adhered by asphalt, and generally patterned as with mortar joint simulation to form a brick or stone pattern, or the like.

In the manufacture of these products, various additional features are incorporated by various manufacturers. In general, the units are rectangular, about 16 inches wide and 4 feet long, but, as mentioned, this varies with the different manufacturers. Usually, at least the long edges of the units are shiplapped. Some manufacturers shiplap both the long and short edges. Usually the blanks or cores of fiber insulation board are treated to impart rigidity and weather resistance. This generally comprises a surface saturation or impregnation with an asphalt or other bituminous substance. It is the general practice that the treatment of the cores to impart rigidity and weather resistance, in some form, is a limited saturation or impregnation with asphalt applied in different ways by different manufacturers, it being understood that the most common method is that of merely dipping or passing the core element through a heated asphalt bath so that all the surfaces are saturated or impregnated to a limited extent with asphalt.

Ordinarily such coated blanks then have a further coating of asphalt applied to one of the broad surfaces, and the weather-resistant granular material is then suitably applied to this coating and embedded therein to be adhered to the face of the unit. The units are then processed to provide such mortar simulating lines, or the like, as are desired in the finished product.

In the coating of the insulating cores with asphalt, as above referred to, it results that the surface saturation or impregnation of the fiber board core is more or less uniform, although it has been noted that in general there is slightly greater penetration of the asphalt into the edges of the core than into the faces, which results from the basic structure of fiber insulation boards whereby the porosity is greater in the direction inwardly from the edges than inwardly from the faces.

In the use of these insulating siding products as manufactured in general, as above described, it has been found that for best results, for various reasons the edge portions should be substantially completely impregnated with the protective asphalt. The face of the unit is protected not only by the original coating of the blank, but it is further protected by the additional coating of asphalt material in which the granules are embedded. The edges of the units do not have the additional protection of the granular adhering coating, and according to past procedures there has been no treatment whereby the edges of the cores might be sufficiently impregnated without excessively impregnating the faces of the cores.

It is the particular object of this invention to provide a manufacturing procedure whereby, in the regular production of insulating siding, the edge portions of the cores may be suitably and sufficiently impregnated to impart the desired additional strength and weather-resistance required without undue impregnation or saturation of the cores inwardly from their broad faces. That is, it is a procedure for differentially saturating the core but in a single saturating operation. It has been determined that by pre-heating a limited portion of a piece of fiber insulating board it is possible to differentially saturate the board due to the fact that the pre-heated portion will absorb asphalt more readily than does the unheated portion or portion which is relatively cooler.

Particularly an object of this invention is the provision of a process for obtaining differential impregnation of fiber insulation board with a thermoplastic saturant, and wherein through the heating of selected portions of such board, where it is desired that the impregnation shall be more complete, to bring about differential absorption of molten thermoplastic saturant whereby a predetermined selected portion of the sheet of fiber insulation board is more completely impregnated than is other portions of such board.

The specific steps of procedure provided for achieving the objects of the invention involve the pre-heating of limited predetermined portions of a sheet of fiber insulating board, followed by immersion of such prepared sheet of board in a bath of the molten thermoplastic saturant while the pre-heated portions of the board are still heated with respect to the rest of the sheet, and finally, subjection of the sheet to a surface wiping or squeegeeing operation and suitable cooling to solidify the thermoplastic saturant.

Herein, in order to avoid confusion with respect to the use of the terms, attention is directed to the fact that the words "impregnation" and "saturation" are in general relatively loosely used terms, and therefore it is desired to point out specifically the sense in which such are herein used. For the purposes hereof, the term "impregnate" or "impregnation" is used in the sense of physical incorporation in the structure, that is, herein the asphalt flows into the interior interstices between the fibers of a piece of fiber insulation board when such is placed in a bath of melted asphalt. The term "saturate" or "saturation" comprises a complete impregnation, that is, such is used in the sense that when a piece of board is impregnated, as above, to incorporate the maximum of the asphalt to fill the interstices between the fibers of the board structure, such is then considered "saturated" board. As used herein, a 75% saturation exists where the board has been impregnated with 75% of the amount of saturant required to completely fill the fiber interstices or completely saturate the board. It is to be understood, of course, that absolute saturation is substantially impossible, but for the purposes hereof a sheet is considered to be saturated when it has absorbed all of the saturant which can be taken up by the sheet in ordinary manufacturing procedures.

In the accompanying drawings, Figure 1 is a perspective of a unit; Figure 2 is an edge elevation of the end faces of a fiber insulating board blank; and

Figure 3 is an elevation of the side or long edges of a fiber insulating board blank.

In the drawings the more heavily shaded portions indicate those portions which have been impregnated with the saturant in accordance in the procedure of the processes hereof.

In the drawings the fiber insulating board blank is identified by numeral **10**. This blank is shown as a shiplapped board on its long edges and short edges, the shiplapped tongues of the long edges being identified by numerals **11** and on the short edges by the numerals **12**. The impregnated face portions are identified as **15** and impregnated edge portions as **16**.

To accomplish the objects of the invention hereof, the blank edges are subjected to heat to raise the temperature of the edges above the temperature of the remainder of the sheet. It must be understood that the objects hereof will not be achieved if the entire fiber board core sheet is heated, since if the entire core is heated the degree of saturation of the broad faces will be increased to substantially the same extent as is the saturation of the edge portions. To obtain the differential impregnation of the edge portions of the core and faces thereof, it is necessary that the edge portions only be heated, and that provision be made for preventing the body portion of the core interiorly of the edges from being heated.

The object desired is obtained in a practice manner by heating the core sheet, as in an oven or the like, so that all the edge portions may be heated at one time, but

with the faces protected from appreciable heating by the use of heat insulation interposed for such purpose. This object may be achieved by applying to each broad face of the fiber board core **10** a sheet of fiber insulation board or the like **20** which, as is evident, dimensionally should be slightly less than the length of and width of the core **10**, less twice the depth of the respective rabbets of the shiplap. Assuming the width of the core sheet in Figure 1 to be 16 inches and the long edges of the rabbets as having a depth of three-fourths inch, then the width of the insulating sheet **20** will be about 13 to 13½ inches.

When an assembly comprising a core sheet with an insulating sheet such as **20**, applied to each of the broad faces thereof, is placed in an oven at an elevated temperature, it will be readily understood that the periphery or edge portions of the core sheet will be heated, whereas, due to the protection afforded by insulating sheet **20**, the body portion of the core sheet **10** will be substantially unaffected.

According to the specific procedure which has been worked out, the edges of the core are raised to a temperature of about 425 to 450° F. This temperature is not critical, but the edge temperature must be raised sufficiently to obtain the desired penetration but should not be raised to such temperature as will cause charring of the fiber, in connection with which most fiber boards will char at a temperature of around 500°.

The steps involved in the processing hereof comprise the selective heating of the edges of a core **10** by the procedure just above described, whereupon the core, with its edge portions at substantially the elevated temperature set out, is passed into a bath of molten thermoplastic saturant, which conveniently is a suitable asphalt; for example, a pressure still tar having a melting point (ball and ring) of about 137° to 142° F., penetration at about 90 to 115° F., and a flash point (Cleveland open cup) of about 480° F., which asphalt bath, for the purposes hereof, should be carried at a temperature of around 400° F.

The fiber board core with the edge portions preheated, as above described, when submerged in an asphalt bath such as above described, for any reasonable period, will show a definite differential of impregnation as between the preheated edge portions and the the portion interior thereof which was not preheated. For the usual fiber insulating board core, it will be found that an immersion for about 15 seconds will provide an impregnation at the preheated edge portions amounting to approximately 80% saturation, a quarter inch tongue portion being completely impregnated. That is, with the saturant extending entirely through the tongue portion, whereas, on the other hand, the impregnation of the relatively cooler faces, interiorly of the edge portions, will extend only to a depth of about .07 inch inwardly from the surface. The foregoing is with reference to a core board approximately one-half inch in thickness, so that the tongue of the shiplap is approximately one-quarter inch thick, so that obviously, since in accordance with the procedure set out, the tongue portion becomes impregnated throughout, the saturant penetrates into the preheated portion to a depth of at least one-eighth inch, or 0.125 inch. It has been pointed out that the face portions of the core **10**, which are protected from heating by the application of the insulating sheets **20**, are penetrated to a depth of only approximately 0.07 inch, so that the preheating of the edge portions causes the saturant to penetrate to about twice the depth compared to the parts of the sheet which are not heated.

After the core **10** has been submerged in the molten thermoplastic, it is then removed and passed through wiping rolls, or squeezed to remove any excess saturant on the surfaces, and then the sheet may either cool naturally or may be subjected to forced cooling.

The processing of the fiber board core for insulating siding, roofing or the like, in accordance with the foregoing, accomplishes a plurality of objectives. By having a high degree of saturation of the edges, the edges of the sheet are stiffened, and they are protected against penetration of water into the body of the sheet from the edges. Where the edge portions are 80% saturated, it results that actually the outer portions are substantially 100% saturated, with the degree of saturation decreasing slightly inwardly away from the extremities of the sheet. It is, of course, preferable to retain as high a degree of insulation as possible so that the product serves two functions, one, as an exterior covering for a building or the like, and the other as insulation against heat transmission. Since the face of the finished product, as previously described, is protected by the application of a coating of asphalt in which the surfacing material is embedded, the holding down of the penetration of the saturant to a depth of approximately 0.07, as above referred to, provides ample weather protection in conjunction with the additional asphalt surface coating which is applied. This limited penetration of the saturant into the face portions of the core obviously leave the interior portions of the core to function as heat insulation.

The process as described herein shows a very considerable saving of asphalt as compared with ordinary impregnation procedure, as has been heretofore practiced, and which comprised merely the submerging of the core in the molten thermoplastic, whereby substantially uniform penertation of all parts of the core resulted, and according to which either the faces of the cores were oversaturated or the edge portions under saturated. If the conditions of saturation were such that the quarter-inch tongues would be completely impregnated to something like 80% saturation, then the body portion would be impregnated to substantially the same degree, requiring a large amount of saturant and largely destroying the insulating value of the interior body portion of the core piece.

By the practice of the invention hereof, it is possible to obtain a differential degree of impregnation, according to which the heated edge portions are penetrated by the saturant to about twice the depth of the penetration of the saturant into the protected and consequently unheated interior portion of the core. This process obviously results in achieving the desired substantially complete saturation of the edge portions of the core, with the consequent stiffening and protection against the penetration of water, and, at the same time, results in quite a considerable saving of the thermoplastic saturant used, since over the large areas of the face surfaces of the sheet the penetration is restricted to a relatively shallow depth with the consequent saving as compared with the penetration similar to the penetration of the saturant into the edge portions, which would consume nearly twice the amount of saturant as used in the practice of the inventions hereof.

While the foregoing description has been substantially limited to the description of the impregnation of the fiber insulation board with asphalt, it is to be understood that the principles described are merely representative, and are applicable generally. For example, the core sheet, or sheet which is impregnated, may be a board-form sheet composed of various fibers—wood fibers, bagasse fibers, glass fibers, asbestos fibers and the like. Also, the sheet may be composed of elements other than fibers, the process being generally applicable to any sheet having a structure incorporating connected porosity or interstices between the elements comprising such sheet. Also other saturants may be used instead of asphalt, as, for example, various asphaltic type saturants, thermoplastic resins, rosin, solid waxes, and other thermoplastic solids which will be known to those skilled in the art. Finally, while the description deals in particular with the greater degree of saturation of the edge portions of the core, achieved through the heating of the edge portions, the teachings hereof may be alternatively applied to the reverse situation. That is, selected inner portions of the core may be more highly saturated than the edge portions through the heating of selected inner portions of the sheet as compared with the other portions and/or edge portions.

The inventions hereof having been described in full detail, I claim:

1. The process for impregnating a porous sheet material to different degrees of saturation in predetermined different parts thereof and comprising the steps; applying heat to limited pre-selected portions of the sheet without appreciably raising the temperature of the remainder of the sheet, and whereby the temperature of such preselected portions of the sheet is raised relative the remainder of the sheet, then with the sheet differentially so heated, immersing the sheet in hot fluid thermoplastic saturant and removing the sheet from the hot fluid thermoplastic saturant upon the lapse of the period of

time predetermined to result in the depth of saturation desired.

2. The process for impregnating a fiber insulation board to substantially saturate the edge portions thereof to a greater degree of saturation than that of the saturation of the field of the face surfaces, and comprising the steps of heating the edge portions of the sheet of fiber board to a temperature appreciably above the temperature of the remainder of the body of the fiber insulating board, and immersing the fiber insulating board with its edge portions so heated relative the remainder of the body of such sheet in hot fluid thermoplastic saturant for a limited predetermined time sufficient to obtain a predetermined limited impregnation of the field portions of the faces of such sheet, and whereby due to the relative higher temperature of edge portions of such sheet, a deeper and more complete impregnation of such heated edge portions is obtained.

3. The method of obtaining differential absorption in different portions of a structural board having inter-connected porosity throughout the body thereof and comprising the steps of applying protective insulating bodies against pre-selected portions of surfaces of such sheet of material, subjecting such assemblage of structural board and heat insulating bodies to heat, for a predetermined time and at a predetermined temperature, to heat those portions of the structural board not protected by the heat insulating material to a temperature which is higher than the temperature of the portions thereof protected by the heat insulating material, and then immersing the so differentially heated structural board in hot fluid

thermoplastic saturant for a limited predetermined time whereby impregnation of a sheet is of its surfaces only without impregnation throughout the sheet, removing the board from the saturant bath and allowing the impregnated board to cool.

4. The process for differentially impregnating a porous body of material in different preselected portions thereof and comprising the steps; applying heat insulation material to selected portions of the surface of the body, subjecting the such selectively insulated body to heating conditions and heating the body to a predetermined degree, removing the protective heat insulation material promptly entering the heated porous body into a heated fluid body of thermoplastic saturant, and removing the porous body from the heated body of thermoplastic saturant upon expiration of the period of time requisite for obtaining a desired limited impregnation of the fluid thermoplastic saturant measured inwardly from the exterior surfaces thereof.

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