July 10, 1923. 1,461,337

H. F. WEISS

WALL BOARD

Filed Feb. 26, 1919

Fig. 1

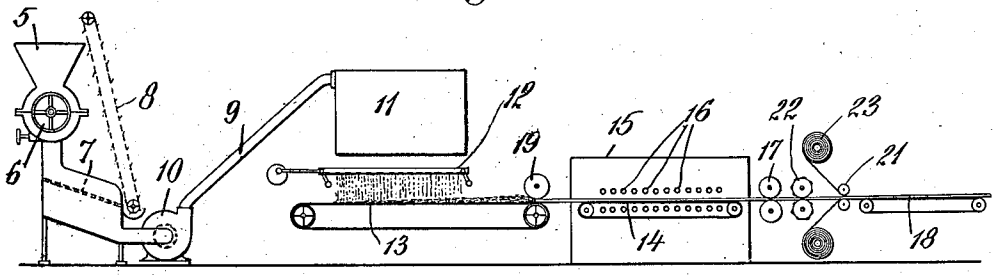


Fig. 2

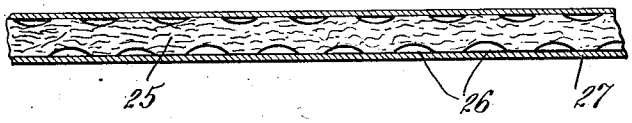


Fig. 3

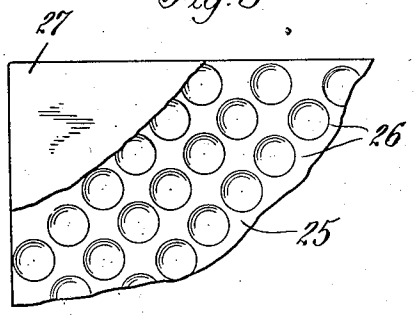
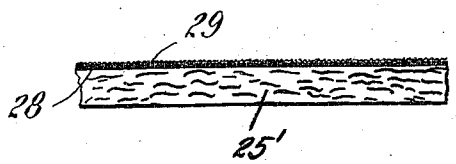


Fig. 4.



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UNITED STATES PATENT OFFICE.

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WALL BOARD.

Application filed February 26, 1919. Serial No. 279,288.

To all whom it may concern:

Be it known that I, HOWARD F. WEISS, a citizen of the United States, residing at Madison, in the county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Wall Boards; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to composite boards, and involves, as an article of manufacture, a new and improved composite board, as well as a new method of making composite board.

Composite board is extensively used as a building material by nailing or tacking it directly to the studding of a room, so that it may serve in place of lath and plaster as the inner wall of the room, being ornamented with paint or the like, as desired. Because of the very extensive field for composite board as a building material, it is usually designated in the trade as wall board.

The method in general practice, at the present time, of making wall board consists in beating wood fiber in water, and running this fiber while suspended in water over a paper machine, thus forming a sheet of paper similar to cardboard. Several sheets of this heavy paper are then glued together with a binder of some sort, usually sodium silicate, until a composite board of the desired thickness is built up. Although this is the usual method of manufacture, there are on the market to-day composite boards which differ therefrom in certain respects, but so far as I am aware, all of these composite boards require that the fiber used be first reduced to a pulp, and as this pulp is mixed in water, it must be pressed and the water evaporated from the pulp before the board can be made.

The present invention contemplates a new method of manufacturing composite board in which the fibrous or like material is not reduced to a pulp with water, but, on the contrary, is present throughout the process in a substantially dry and solid form. In accordance with the method of the invention, a mixture of fibrous material and a binding agent while in a substantially dry and solid condition is formed into the desired shape by compression, and then heated to soften the binding agent. Thereupon, the mixture is subjected to further compression, while the binding agent is still soft, and the article upon cooling forms the improved composite board of the invention.

In carrying out the invention, the fibrous material and binding agent are preferably mixed in a shredder which pulverizes the binder and shreds the fibrous material into a mass intimately mixed with small particles of binder. As the fibrous material, I may use wood waste in the form of shavings, saw-dust, chips, cork or the like, or I may use paper pulp or pulp screenings or similar fibrous material. As the binding agent, I may use solid coal tar pitch, asphalt, or any other suitable binding material. The fibrous material is substantially dry, preferably containing 10% or less of moisture. The fibrous material and binding agent are each placed in the shredder, or other suitable mixing machine, in a substantially dry and solid condition, and the shredding or mixing operation produces an intimate mechanical admixture of the two materials and at the same time shreds the woody material and breaks up the binding agent.

After the shredding and mixing operation, the mixture of fibrous material and binding agent is preferably screened, in order to separate the particles which are still in too coarse a condition for the subsequent operations. The coarse particles from this screening operation may be returned to the shredder. The material passing through the screen has been suitably pulverized and shredded, and, in accordance with the invention, is conveyed to a vibrating screen which sifts the mixture to a moving belt or other suitable receiver. This deposition of the mixed fiber and binder is continued until a layer of the desired thickness has been obtained. When this has been accomplished, the layer of the mixed materials is compressed, preferably by passing it between rolls, and the mixture is thereby squeezed into a compact mass, which is now in board form. The thus compacted mass is then heated by passing it into a hot chamber or through heating rolls until the binder softens, but at a temperature which will cause no distillation of the fiber. I have obtained good re-

sults by using a temperature of approximately 250° F. After the board has thus been heated to soften the binding agent, it is again compressed, preferably between rolls, until the desired thickness is obtained, after which it is allowed to cool in the air, and can then be cut to any desired dimension.

In Fig. 1 of the accompanying drawings, there is diagrammatically illustrated an arrangement of apparatus for carrying out the method of the present invention as a continuous process;

Figs. 2 and 3 of the drawings illustrate one form of the improved composite board of the invention, and

Fig. 4 illustrates a modified form of the board.

Referring to Fig. 1 of the drawings, the fibrous material and binding agent, each in a substantially dry and solid condition, are fed into the hopper 5 of a shredder 6. From the shredder, the mixed materials fall onto a screen 7, from whence the coarse particles are returned by a conveyor or elevator 8 to the hopper 5, while the mixture of finely divided binder and shredded fiber is blown through a conduit 9 by a fan 10 into a storage bin 11. From the storage bin the suitably prepared mixture of fiber and binder is fed on to the vibrating screen 12, from whence it is deposited on to a belt or conveyor 13. When a layer of fiber and binder of suitable depth has been obtained, it is passed through the compression rolls 19 which squeeze it into a compact mass of board-like form. The compact mass then passes onto a conveyor 14 within a heating chamber 15, wherein a sufficient temperature is maintained, as, for example, by means of heating pipes 16, to soften the binding agent. Upon emerging from the heating chamber 15 the board passes through compression rolls 17, whereby it is compressed to the desired thickness. The board now passes to the cooling table and conveyor 18, after which it may be cut into the desired sizes. The apparatus illustrated in Fig. 1 is such as to make the manufacture of the composite board a continuous process. Thus, the speed of the conveyor 13 and the amount of material deposited thereon from the vibrating screen 12 may be so proportioned that just the proper depth of material is deposited on the conveyor during the time that it is beneath the shower of material falling from the screen. It will be observed that the fibrous material and the binding agent are united to form the composite board, by a mechanical compression, while the binding agent is in a softened condition brought about by a suitable application of heat. The board thus comprises a compressed or compact sheet of shredded fibrous material firmly bounded together by a binding agent which is plastic when heated to a temperature of approximately 250° F., but which is solid at ordinary temperatures.

If desired, one or both sides of the improved composite board may be covered with paper or similar covering material. This not only adds to the stiffness of the board but also gives a surface which can be painted or otherwise decorated. The covering sheet may be added in any suitable manner, and in Fig. 1 of the drawings, I have illustrated a roll of paper 20 which, together with the board while still heated, is fed through the compression rolls 21, whereby the paper is securely stuck to the upper surface of the board. The lower surface of the board may obviously be covered with a similar sheet of paper.

A further improved feature of the present invention consists in pressing a series of indentations or pockets into one, or both, surfaces of the board, while the latter is still warm and in a plastic condition. This feature enables me to make a board which is very stiff and rigid but which is appreciably lighter in weight than when the indentations or depressions are omitted. Another important feature is that when a board thus indented is surfaced on both sides with a sheet of paper, it has in it a series of dead air cells which increase the resistance of the board to the passage of heat. This feature is desirable and important when the board is used for the lining of houses and other places where insulation is desired. As illustrated in Fig. 1 of the drawings, the indentations or depressions may be made by a pair of rolls 22, arranged intermediate the compression rolls 17 and 21, and provided with projections or protuberances for suitably indenting the plastic board as it passes through these rolls. It will of course be understood that the indenting rolls 22 may be dispensed with when it is not desired to employ this feature of the invention.

Figs. 2 and 3 of the drawings illustrate a composite board of the character herein described having the dead air spaces or cells mentioned in the preceding paragraph. The composite board itself, indicated by numeral 25, is a compressed mixture of shredded fibrous material and binder. Each surface of the board represented in Fig. 2 is indented, thus forming the depressions or pockets 26. The covering sheets 27, of paper, or the like, for each surface of the board enclose the depressions 26, thus forming the dead air spaces or cells referred to hereinbefore.

Instead of covering the composite board with a sheet of paper, or similar material, one or both surfaces of the board, after it has been heated and pressed, may be coated with a water-proof layer of pitch, or asphalt, and while this layer is still warm, crushed slate, stone, or similar mineral material, may

be spread upon the plastic coating. This treatment gives a board which is not only resistant to the weather but has a pleasing and attractive appearance, and is also fire-retardant. Such a board is represented in Fig. 4, where one surface of the board 25′ is covered with a layer of pitch 28, upon which is spread a layer of crushed stone 29.

The surface of the composite board may further be coated with a material that will prevent any passage of the binder to the surface of the board. Such coating materials are used in coating saturated felt which is afterwards printed on the surface with various colors to produce floor coverings, etc. After my improved composite board has been coated with such a material, it may be painted any desired color, or finished in a variety of ways.

I have found that by increasing the percentage of binder in the board, so that all of the wood particles are coated with it, a board can be made which is very resistant to the absorption of water and to the weather. Consequently, a board thus made can be used for outside construction. I have, furthermore, found that a board made of fiber bound together with an adhesive of pitch or asphalt in the manner herein described, shrinks and expands to a less extent than a board made of pulp formed in water. There is no hydrolyzing of the fiber, which tends to weaken the same, and make it more susceptible to injury by weather.

An important detail in the manufacture of composite board, such as I have herein described, is the selection of the binding agent. I have secured best results with and prefer to use a binder which has a high melting point (200° F. or over) and a minimum of brittleness. This requirement is found in certain pitches and asphalts. When a binder of this character is used, it is possible to make a board which will remain stiff at high room temperatures, but will still not be so stiff at low room temperatures as to be objectionable. In this connection, it is to be noted that pitches and asphalts are cheaper and more durable than rosins.

A board made in the manner herein described can be sawed and nailed in the same manner as the so-called wood pulp boards are now handled. Furthermore, the improved composite board of the present invention can be manufactured with a comparatively small investment in machinery and labor, and in addition permits of the use of very cheap raw materials.

I claim—

1. The method of manufacturing composite board by a continuous process, which comprises shredding fibrous material with a binding agent in a substantially dry and solid condition to produce an intimate mixture, forming the dry mixture into a layer of the desired thickness, compressing such layer, heating the same to soften the binding agent, and again compressing to consolidate the mixture into a board of non-hydrolyzed fiber.

2. The method of manufacturing composite board by a continuous process, which comprises subjecting a mixture of wood waste and a binding agent in a substantially dry and solid condition to a shredding operation, shaping the mixture into a continuous sheet and heating the same to a sufficiently high temperature to soften the binding agent, subjecting the mixture to compression while the binding agent is still soft, and cooling the article so formed.

3. The method of manufacturing composite board and the like, which comprises mixing fibrous material and a binding agent while in a substantially dry and solid condition, depositing said mixture to form a loose layer thereof, subjecting said layer to pressure so as to form a compact sheet of the mixture, subjecting the compact sheet to heat to soften the binding agent, and compressing the compact sheet while the binding agent is still soft to produce a board of non-hydrolyzed fiber.

4. A continuous method of manufacturing composite board and the like, which comprises compacting into a continuous sheet an intimate mixture of fibrous material and a binding agent while in a substantially dry and solid condition, subsequently heating the compact sheet to soften said binding agent, then compressing the compact sheet while the binding agent is still soft to produce a board of non-hydrolyzed fiber, and cooling the article so formed.

5. The method of manufacturing composite board and the like, which comprises compacting while in a substantially dry and solid condition a mixture of waste wood and a binder, subsequently heating the compact mixture to soften said binder, discontinuing the application of heat and then compressing the compact mixture while the binder is still soft.

6. The method of manufacturing composite board and the like, which comprises compacting into a continuous sheet an intimate mixture of shredded wood waste and pitch in a substantially dry and solid condition whereby to produce a mixture of non-hydrolyzed fiber, heating the compact mixture to soften the pitch, and subjecting the mixture to compression while the pitch is still soft.

7. The method of manufacturing composite board, which consists in forming an intimate mixture of fibrous material with a binding agent while in a substantially dry and solid condition into a layer of sufficient thickness, heating the layer to soften

the binder, and compressing the layer while hot to form a board of substantially non-hydrolyzed fiber.

8. The method of manufacturing composite board and the like, which comprises heating a substantially dry and solid mixture of fibrous material and a binding agent to a sufficiently high temperature to soften the binding agent, subjecting the mixture to compression and forming indentations in one or both surfaces therein while the binding agent is still soft, and cooling the article so formed.

9. The method of manufacturing composite board and the like, which comprises heating a substantially dry and solid mixture and a binding agent to a sufficiently high temperature to soften the binding agent, subjecting the mixture to compression and forming indentations in one or both surfaces thereof while the binding agent is still soft, and surfacing the article so formed with a covering sheet, whereby said indentations form dead air cells.

10. The method of manufacturing composite board and the like, which comprises treating a mixture of fibrous material and a dry and solid binding agent in a shredder, compacting the mixture thus treated while in a substantially dry and solid condition, heating the compact mixture to a sufficiently high temperature to soften the binding agent, subjecting the mixture to compression while the binding agent is still soft, and cooling the article so formed.

11. The method of manufacturing composite board and the like, which comprises heating a suitably shaped mixture of fibrous material and a binding agent for softening the binding agent, passing the heated mixture through compression rolls while the binding agent is still soft, and indenting the surface of the compressed article to form depressions therein.

12. As an article of manufacture, a composite board comprising a compressed mixture of fibrous material and a binding agent having surface depressions, and a surface covering enclosing said depressions.

13. As an article of manufacture, a composite board comprising a compressed mixture of fibrous material and a binding agent having a plurality of depressions in one or both surfaces thereof.

14. As an article of manufacture, a composite board comprising a compressed sheet of shredded wood waste bound together by pitch.

15. As an article of manufacture, a composite board composed of non-hydrolyzed fibrous material and a fusible binding agent, consolidated by heat and pressure.

In testimony whereof I affix my signature.

HOWARD FREDERICK WEISS.