July 8, 1924.

1,500,207

J. K. SHAW

FIBER BOARD HAVING ORNAMENTAL SURFACES

Original Filed March 26, 1920 2 Sheets-Sheet 1

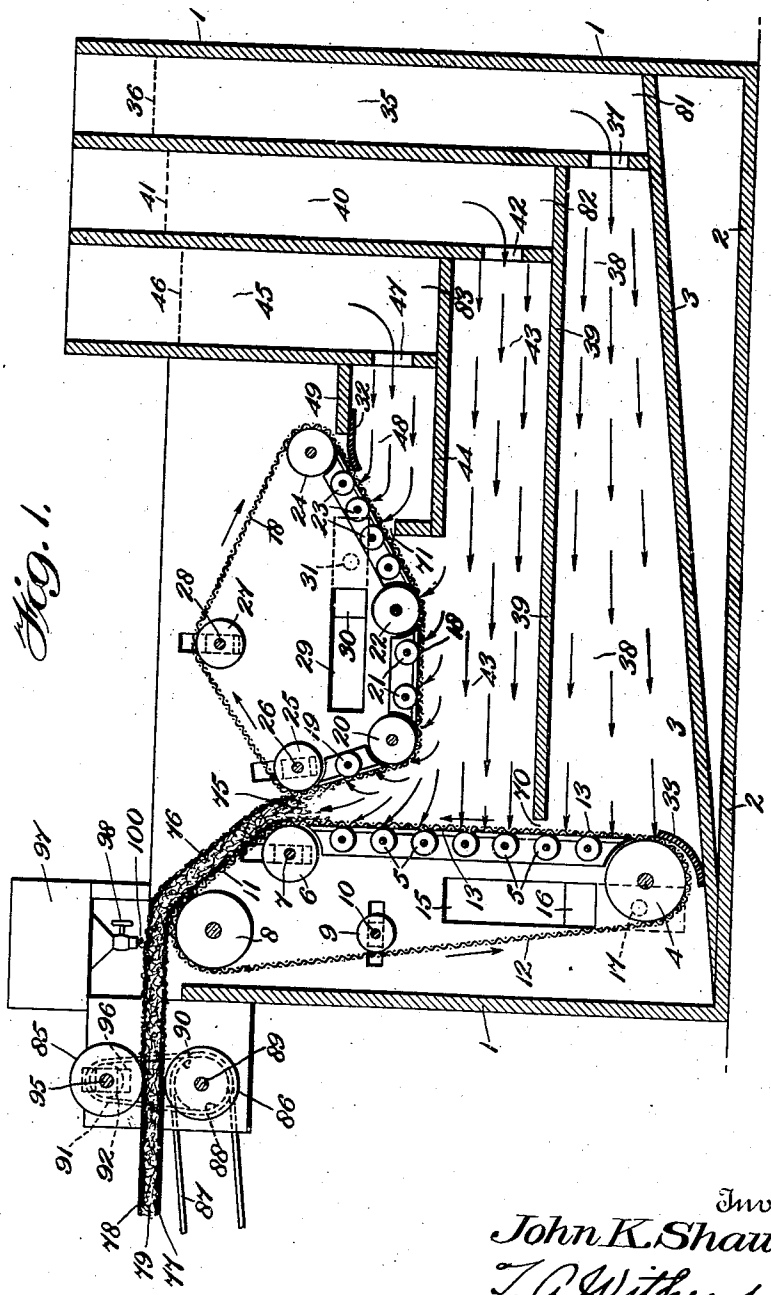


Fig. 1.

Inventor
John K. Shaw, by
T. G. Witherspoon
Attorney

July 8, 1924.

1,500,207

J. K. SHAW

FIBER BOARD HAVING ORNAMENTAL SURFACES

Original Filed March 26 1920 2 Sheets-Sheet 2

Fig. 2.

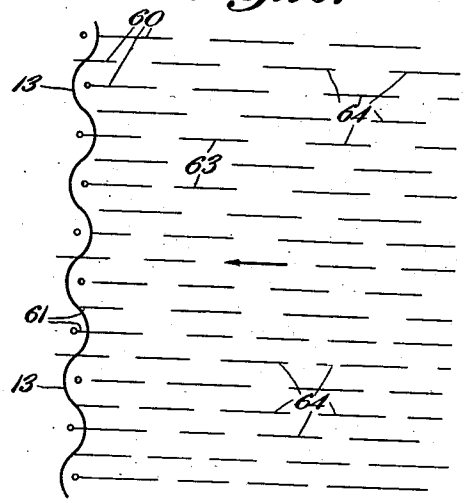


Fig. 4.

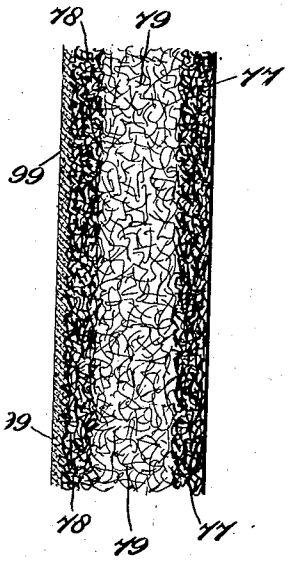
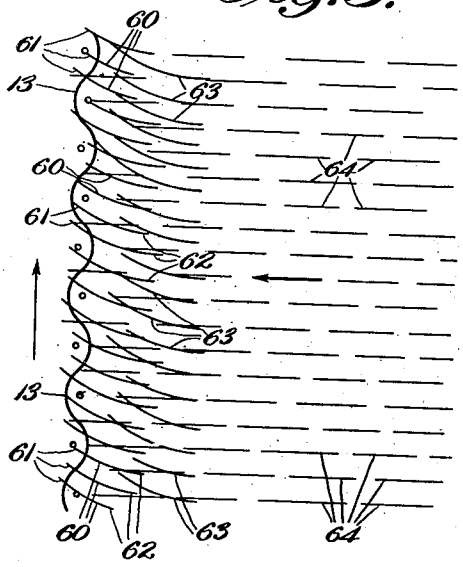


Fig. 3.



Inventor
John K. Shaw, by
T. C. Witherspoon
Attorney

Patented July 8, 1924. 1,500,207

UNITED STATES PATENT OFFICE.

JOHN K. SHAW, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO C. F. DAHLBERG, OF ST. PAUL, MINNESOTA.

FIBER BOARD HAVING ORNAMENTAL SURFACES.

Application filed March 26, 1920, Serial No. 368,992. Renewed January 9, 1923.

To all whom it may concern:

Be it known that I, JOHN K. SHAW, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Fiber Boards Having Ornamental Surfaces; 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 a fiber board composed of interlaced fibers with one surface covered with a stone like composition, and has for its object to provide a board of this character, which will be more efficient in action and less expensive to manufacture than those heretofore proposed.

With these and other objects in view the invention consists in the novel parts and combinations of parts constituting the finished board, all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views:—

Figure 1 is a diagrammatic sectional view of an apparatus suitable for making a fiber board in accordance with this invention;

Figure 2 is a diagrammatic view illustrating the disposition of the individual fibers during the making of the board, and before reaching the traveling surface;

Figure 3 is a view similar to Figure 2 illustrating the action of the traveling surface upon the individual fibers; and,

Figure 4 is a diagrammatic sectional view of a fiber board made in accordance with this invention, and before it passes the finishing rolls.

In order that the precise invention may be the more clearly understood it is said that fiber boards made of paper, and of various kinds of fibers have been heretofore proposed, but in so far as I am aware, no one prior to this invention has succeeded in providing layers of different kinds of interlaced fibers in the same board. In this invention, said layers constitute one integral mass of fibers intertangled together, and therefore, the fiber mass is devoid of the separated layers common in prior boards and which peel, or divide somewhat after the manner of the leaves of a book. Owing to this peeling or separating action, found in prior fiber boards, it has been found that when said boards are covered with a hard cementitious substance to give an ornamental appearance to the board, the outer layers of the latter would, in use, separate and carry the said ornamental substance with them, so that said prior boards have been found unsatisfactory.

In this invention, on the other hand, no separated layers exist in the finished board, all the layers of fibers being interlaced with each other, and therefore, when an ornamental cementitious substance like magnesium oxy-chloride is employed to coat the board, the latter does not peel, and the board can be practically applied to many uses for which the prior boards are unfit, as will appear more fully hereinafter.

1 indicates any suitable tank for holding the stock consisting of water and cooked fibers, 2 the bottom of said tank, 3 an inclined false bottom located above the bottom 2, 4 a roll or drum near the lower end of said false bottom 3, 5 a plurality of supporting rolls, 6 a guide and compression roll adjustable on the slide, or other movable means 7, 8 a guide roll similar to the roll 4, and 9 a guide and tensioning roll adjustable on the means 10. Passing over the rolls just mentioned is the endless foraminous belt or surface 11, conveniently made of wire cloth, and having the oppositely moving portions or runs 12 and 13. Between the runs 12 and 13 is located the water outlet 15, provided with the controlling means or gate 16 which may be suitably manipulated as by the handle or other device 17. Coacting with the foraminous surface or belt 11, and in close proximity thereto as regards one portion thereof, is the foraminous belt 18, passing over and around the series of guide rolls 19, 20, 21, 22, 23 and 24. Said belt 18 also passes over the compression and guide roll 25 coacting with the compression roll 6, and adjustably mounted on the movable means 26. 27 represents a tension and guide roll, adjustably mounted on the means 28, and 29 an outlet for the

water passing through the belt 18, controlled by the gate 30 and adjustable through the handle 31. 32 and 33 represent suitable water seals made of flexible material for the belts 11 and 18 respectively.

35 represents a channel or passage for water and fibers which may be maintained at any desired hydrostatic head 36, 37 an opening from the channel 35 into the tank space or chamber 38, and 39 a top or partition separating said chamber or space 38 from the remainder of the tank. 40 represents a second channel for water and pulp fibers, 41 the head thereof, 42 an opening from said channel into the tank chamber or space 43, and 44 a partition which with the partition 39 serves to separate said space 43 from the rest of the tank. 45 represents a third channel for water and fibers having a head 46, 47 an opening into the tank chamber or space 48, and 49 a partition coacting with the partition 44 to segregate said space 48 from the remainder of the tank.

The foregoing construction is, or may be the same as is described and claimed in my copending application, Serial Number 368,990, filed March 26, 1920, and entitled, Process of and apparatus for making fiber boards.

The operation of this machine will be understood from what follows:—

It is preferred to use long fibers, but of course, fibers of any usual length may be employed. By reason of the direction of flow of the water through the chambers 38, 43, and 48, and by reason of the natural tendency of the flowing water to laterally separate said fibers, the latter will be brought into positions more or less parallel to each other, and more or less perpendicular to the line of travel of the surface 13, while at the same time all of said fibers will occupy positions more or less staggered with relation to their neighbors as shown. Accordingly, a large percentage of the forward ends 61 of said fibers will first contact with said surface 13, and will be carried along by the belt from the positions shown in Figure 2, to those shown in Figure 3, for the rear ends 62 of said fibers will have lagged behind the front ends 61, in the water, so that the front row of said fibers assume a somewhat curved or bent shape. The second row, or those fibers 63 immediately following, and which have not reached the surface 13, but have reached the rear ends 62 of the fibers 60, are now forced by the oncoming water to contact at their forward ends against the curved fibers 60. And, as said fibers 63, originally, due to their parallel positions, as shown at 63 in Figure 2, were more or less staggered or interlaced with the fibers 60 before the latter became curved, it is evident that this interlacing or entangling action between the fibers 60 and 63 will be enhanced or increased by the oncoming water after said curvature takes place.

It results from the actions just described that said fibers 63 become, themselves, more or less curved, as indicated in Figure 3, due to the transverse movement of the fibers 60, and that a third row of fibers 64 which are also interlaced or staggered with the fibers 63 will become in time curved and entangled with the fibers 60 and 63 that have preceded said fibers 64. It thus results that owing to the floating of the fibers into parallel, interlaced or staggered positions, and in a direction transverse to the traveling surface 13, the entanglement of the fibers is continuous between successive rows; and the pressure of the water causes the whole to be very loosely assembled in their interlaced positions on said surface, thus forming an open mass of fibers more compact next to the wire than away from it. This mass is carried through the opening 70 into the space 43, with one or more partially curved and partially entangled layers, similar to the fibers 60 and 63, clinging to it.

In said chamber or space 43, other fibers similar to the fibers 64 become interlaced and entangled with the layers on the belt, and the process of entanglement and massing proceeds as before. In the meantime, other layers of fibers, in all respects similar to the layers 60, 63 and 64, are interlaced, entangled and massed on the traveling belt 18 from the space or chamber 48. This second mass of fibers are carried through the opening 71 by the belt 18, in a condition similar to the first mentioned mass that passes the opening 70, and the fibers in the space 43 interlace, and become entangled with said second mass in a manner similar to that described in connection with said first mentioned mass. The result is, owing to these parallel and staggered relations, the fibers in the space 43, constitute a third mass of fibers which are interlaced and entangled with each other, as well as with each of said first named masses.

As a result of the foregoing entanglements of the various fibers, and the motion of the surfaces 13 and 18, the mass of fibers are carried through the opening 75 between the compression or compacting rolls 6 and 25, and is formed into the sheet or board 76, all as will be readily understood.

An important feature of this invention resides not only in being able to thus interlace, or entangle the fibers in the body of the sheet, but also in being able to vary the kind, size and class of fibers in different portions of the sheet.

That is to say, I may feed to the channel 35, one kind of fibers, which may be relatively short or more expensive fibers, than are those fed to the channel 40, and I may

feed to the channel 45, the same class of fibers as are fed to the channel 35, or I may feed a totally different class of fibers. In other words, I may provide as many channels 35, 40 and 45 as there are different characters of fibers in the finished board, and I may place in the first channel 35 and in the last channel 45 any characters of fibers I desire, whereupon the board will be provided with an outer layer 77 corresponding to the fibers that are fed to the channel 35, with another outer layer 78 corresponding to the fibers that are fed to the channel 45, and with one or more intermediate layers 79 corresponding to the character of the fibers which are fed to the channel 40 and to any other channels which may be located intermediate of the channels 35 and 45.

But, the important feature to be emphasized in this invention is the fact that no matter how many kinds of fibers, or how many layers of fibers that are present in the finished board, the fibers of each layer will be interlaced or entangled with the fibers of its adjacent layer, so that the board will not consist of separate and distinct layers, as is common in ordinary fiber boards, and somewhat like the leaves of a book that can be peeled off, but its body portion will consist of fibers that are firmly interwoven, and its outer layers will be firmly interwoven with said body portion.

The interlacing process is facilitated by the fact that the openings 37, 42, and 47 are of a less area than are the spaces 38, 43, and 48 into which the fibers are led. In other words, the fibers must first pass through the openings at a relatively high velocity and in a comparatively close relation to each other; and they are then immediately released into a wider space where they take on a lesser velocity, and naturally spread out as they pass along with the water, thus assuming the parallel relations indicated in Figure 2.

I further prefer to permit a very large proportion of the water, say 90% of the same, to escape through the opening 15, while a very much smaller proportion, say 10%, escapes through the opening 29.

The gates 16 and 30 are conveniently manipulated to effect this division of the water, while maintaining the desired proper steady flow through the surfaces 13 and 18 to produce the desired results. But, of course, the proportions of water that escape through the two openings mentioned may be widely varied according to the results sought in the finished board.

The rolls 6 and 25 are readily adjusted by the means illustrated to produce any desired compression in the openings 75 between said rolls, so that the fiber board may be given any desired degree of porosity. In fact, by using relatively large fibers in the channel 40, and relatively fine fibers in the channels 35 and 45, I am enabled to control the air spaces in the body of the board, and thereby control its heat insulating qualities.

The heads 36, 41 and 46 of the liquid in the channels 35, 40 and 45 are so maintained that there will be a minimum tendency of liquid to flow between the chambers or spaces 38, 43 and 48. In other words, the pressures of the liquid in the last mentioned chambers are maintained as nearly equal as possible and thus a minimum tendency of the fibers to mix in the said interlaced spaces is secured.

From the foregoing it will be clear that my board is devoid of layers that will peel off, and is readily provided with any desired character of middle fibers 79 and any desired character of outer fibers 77 and 78. I prefer, in carrying out this invention, to pass the board between the finishing rolls 85 and 86 operated by any suitable means, such as the belt 87, operating the pulley 88, fast on the shaft 89, carrying the roll 86, and the pulley 90, also fast on the shaft 89, around which passes the belt 91 driving the pulley 92, rigid with the shaft 95 on which is mounted the roll 85. Said rolls 85 and 86 are adjusted to and from each other by any suitable means, as indicated by the dotted lines 96, so that any degree of compression may be exerted on the board. The pulley 92 is of a different diameter from the pulley 90 so that the roll 85 will run at a different angular speed from the gear 86.

97 represents any suitable supply of a cementitious substance 100, such for example, as the oxy-chlorides of magnesium, and said substance under the control of the means 98 is permitted to flow on to the surface 78 to form the stone like or cement like surface 99, which, owing to the different speeds at which the smooth rolls 85 and 86 run, will be highly polished.

In some cases I find it convenient to place comparatively little fiber stock in the channel 45, and to add said cementitious substance to the water therein, in which case the layer 78 will be impregnated with said substance and the stream 100, or layer 99, will take a deeper hold on the board, but in most cases, a fire proofing, or a waterproofing compound will be used in one or both of the channels 35 and 45.

The fiber boards made as above will have ornamental stone like surfaces which are readily set by adding sugar to the composition, and are readily colored, by known processes, to imitate different kinds of natural stones, and they are useful as wall coverings, panels, tiles, wainscoatings, and in a host of other places where artificial stone is now used. Such boards have a high heat insulating value, not found in artificial

stone, and this value may be readily increased by increasing the size of the fibers in the channel 40, so as to increase the size of the air cells in the layer 76 of the finished board.

It is obvious that those skilled in the art may vary the details of the board without departing from the spirit of the invention, and therefore, I do not wish to be limited to the foregoing disclosure, except as may be required by the claims.

What I claim is:—

1. A fiber board composed of a body portion of one kind of fiber interlaced with another kind of fiber covering said body portion; and a surface portion covered with a hard stone like composition having an ornamental surface, substantially as described.

2. The process of making an ornamental heat insulating panel which consists in providing a fiber board made of different kinds of fibers interlaced with each other and covering the same on one side with a composition containing magnesium oxy-chloride, substantially as described.

3. A fiber board composed of a body portion of relatively coarse fibers, surface portions of relatively fine fibers interlaced with said coarse fibers, and one of said surface portions covered with a cementitious material having an ornamental surface, substantially as described.

4. The process of making an ornamental heat insulating wall covering material which consists in forming a layer of interlaced fibers of one kind; a layer of interlaced fibers of another kind interlaced with said first mentioned fibers, and having higher heat insulating properties than said first layer; and coating one of said layers with a cementitious material having an ornamental surface, substantially as described.

In testimony whereof I affix my signature.

JOHN K. SHAW.