Dec. 11, 1923. 1,477,288

J. K. SHAW

APPARATUS FOR VARYING THE THICKNESS OF FIBER LAYERS

Filed April 29, 1920 2 Sheets-Sheet 1

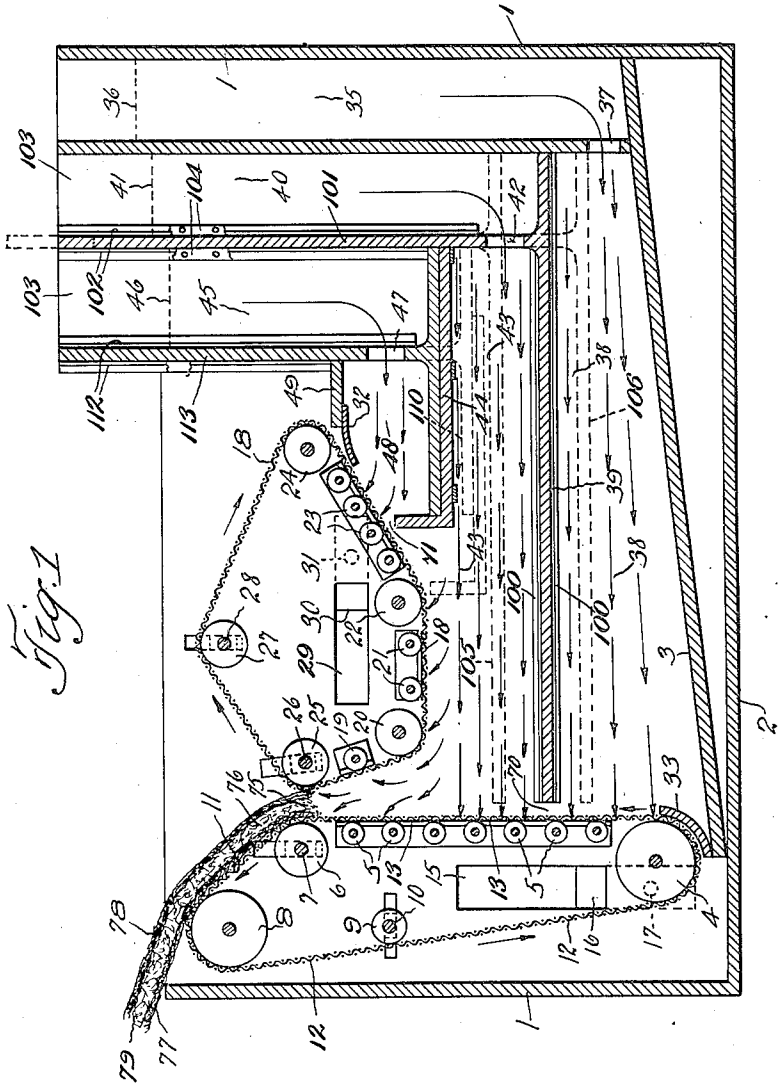


Fig. 1

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Fig. 2

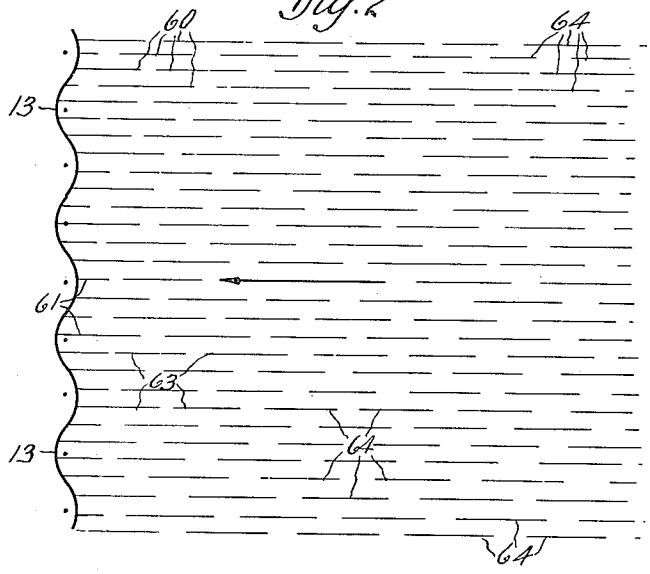


Fig. 4

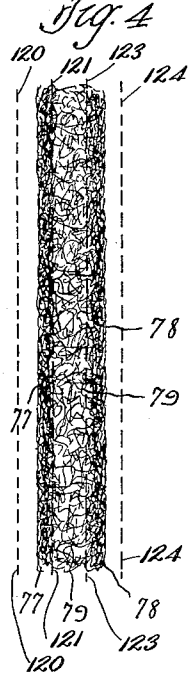
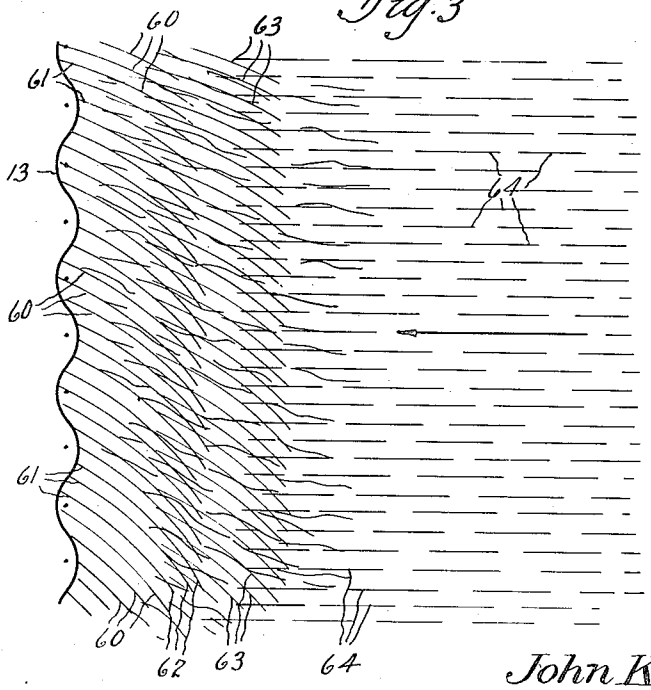


Fig. 3



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR VARYING THE THICKNESS OF FIBER LAYERS.

Application filed April 29, 1920. Serial No. 377,550.

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 Apparatus for Varying the Thickness of Fiber Layers; 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 process of and an apparatus for interlacing fibers preparatory to making fiber boards, and has for its object to provide a method and a means which will be more efficient in action and less expensive to operate than those heretofore proposed.

With these and other objects in view the invention consists in the novel steps and combinations of steps constituting the process, and in the novel parts, and combinations of parts constituting the apparatus, 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 made in accordance with this invention;

Figure 2 is a diagrammatic view illustrating the disposition of the individual fibers 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.

Referring to Figure 1, 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 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 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 substantially the same as that illustrated and claimed in my co-pending application #368,990, filed March 26, 1920 and entitled "Process of and apparatus for making fiber boards."

In this invention, on the other hand, I modify the construction of the partition 39 illustrated in my former application, by making the same adjustable along the length of the traveling screen 11, as is indicated in dotted lines in Figure 1. That is

to say, the partition 39 is provided with the water sealing members indicated as 100 so as to partially restrain the leakage from the space 43 into the space 38, and the partition 101 moves in the grooves or ways indicated at 102 with which the wall 103 of the channels 40 and 45 is provided. Secured to said wall 103 on each side of the ways 102 is the flexible water sealing means 104 shown in Figure 1 as having been broken away. It thus results that the said partition 39 may be moved from the full line position illustrated in Figure 1, to the dotted line position illustrated at 105, or to the dotted line position illustrated at 106.

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 assumes 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 3, 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 trasverse movement of the fibers 60, and that a third row of fibers 64 will become in time also interlaced or 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 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, 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 named 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 finished 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. Of course, if there is more than one intermediate channel such as 40, then the apparatus would have to be correspondingly changed to accommodate the same.

But the important feature to be emphasized in this invention is the fact that by adjusting the partition 39 along the length of the foraminous belt 11, as is indicated by the dotted lines at 105 and 106, the thickness of the layer 77 may be readily varied, as is indicated by the dotted lines 120 and 121, Figure 4. That is to say, in many classes of fiber boards it is very desirable indeed to not only provide different kinds of interlaced fibers in different portions of the board, but it is also very desirable to be able on the same machine to vary the thickness of one or more of these layers, to suit particular conditions. It will therefore be seen that if we shift the partition 39 into the dotted line position 105 we will reduce the thickness of the layer 79 and correspondingly increase the thickness of the layer 77. On the other hand, if we shift the said partition 39 into the position indicated by the dotted lines 106, we will reduce the thickness of the layer 77 and correspondingly increase the layer 79, as indicated by said dotted lines 120 and 121. Of course, the partition 44 may be adjusted up and down in the same manner as is the partition 39, and I have indicated this fact by the dotted lines 110. In this case the full lines 112 illustrate a slot, or way, to accomplish the adjustment of the vertical wall 113. When said partition 44 is thus adjusted up and down the layer 78 will be likewise varied in thickness in the same manner as will the layer 77, as is indicated by the dotted lines 123 and 124, Figure 4.

It will now be clear that I can, as is pointed out in my co-pending application above mentioned, produce by the process and apparatus just disclosed a fiber board interwoven throughout and having comparatively inexpensive fibers on its interior and comparatively expensive fibers on its exterior, and I can, by adjusting the partitions 39 and 44 in the manner disclosed, also, in a board of a given thickness, readily vary the thickness of each layer of fibers.

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

What I claim is:—

1. In a machine for making a fiber board of different layers of interlaced fibers the combination of a movable foraminous surface; a second movable foraminous surface; a plurality of chambers for floating different kinds of fibers to said surfaces; adjustable means separating said chambers and adapted to so vary their relations to the foraminous surfaces as to vary the thicknesses of the different fiber layers in the finished board; and means for compacting said layers together, between said surfaces, substantially as described.

2. In a machine for making a fiber board of different layers of different kinds of fibers, the combination of a plurality of movable foraminous surfaces; a plurality of chambers extending in directions transverse to the line of travel of said surfaces; restricted channels having openings communicating with said chambers; and partitions capable of being readily adjusted to vary the capacity of and separating said chambers, substantially as described.

In testimony whereof I affix my signature.

JOHN K. SHAW.