March 25, 1930. R. L. LOOMIS 1,751,866

APPARATUS FOR MAKING FIBROUS MATERIAL

Filed May 11, 1929

Fig. 1.

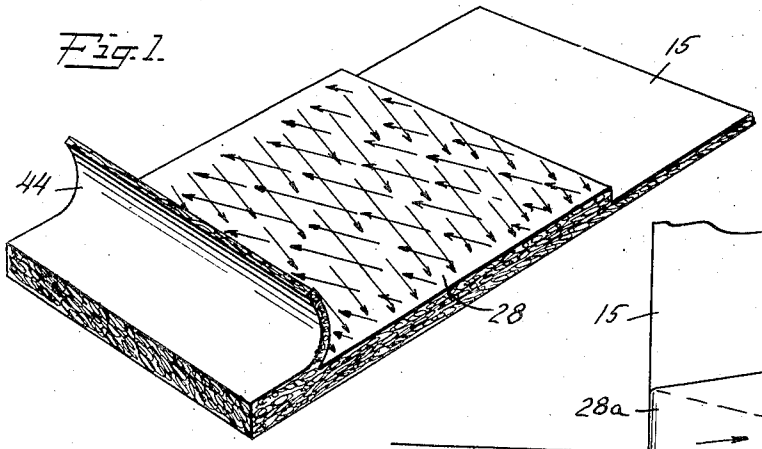


Fig. 2.

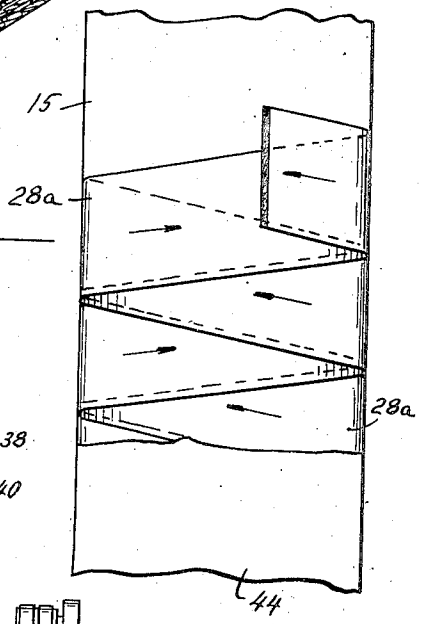


Fig. 4.

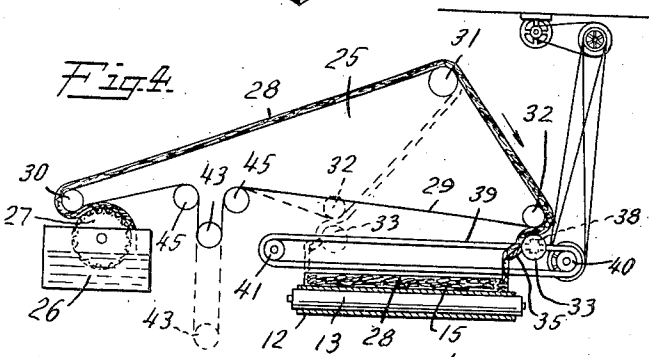


Fig. 3.

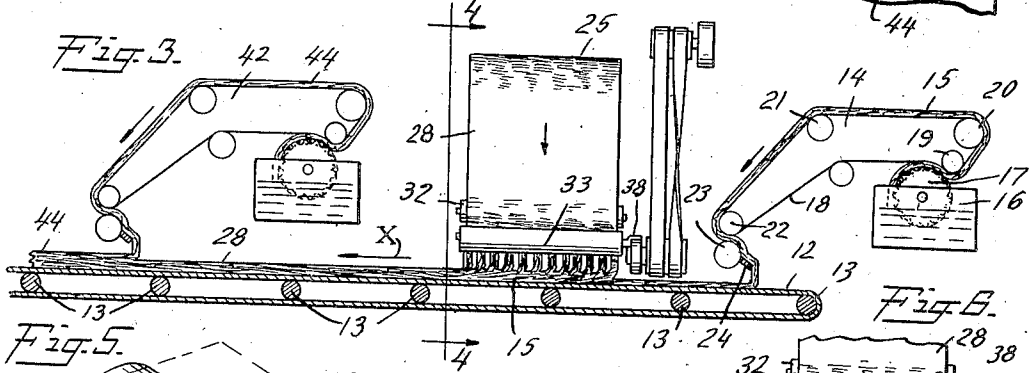


Fig. 6.

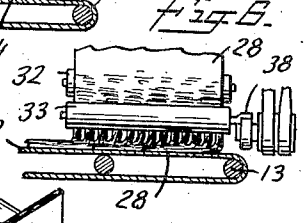


Fig. 5.

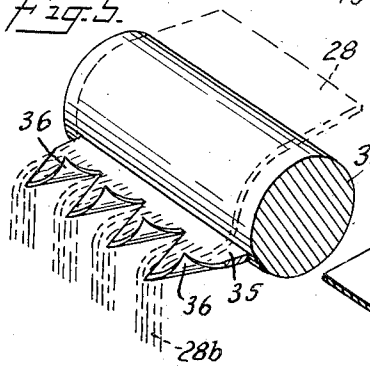
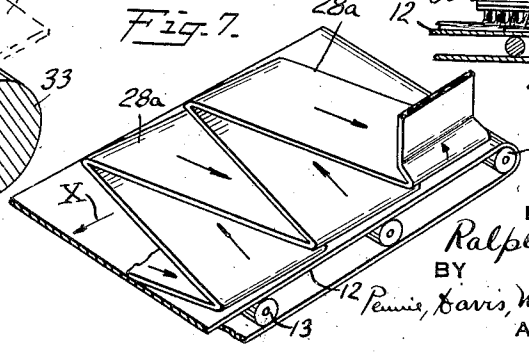


Fig. 7.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING FIBROUS MATERIAL

Original application filed August 5, 1926, Serial No. 127,291. Divided and this application filed May 11, 1929. Serial No. 362,163.

This invention relates particularly to relatively thick and rigid pulp board, adapted for use in the construction of buildings and for other purposes.

One object is to provide a laminated pulp board which includes facing or liner webs forming the opposite sides of the board, and a filler web interposed between the facing webs, the fibers of the facing webs extending longitudinally of the board, while the fibers of the filler web extend in different directions, crosswise of the board, the arrangement of the fibers being such that they collectively oppose strains tending to bend and crack the board in any direction. Other objects will appear hereinafter.

Of the accompanying drawings forming a part of this specification,—

Figure 1 shows in perspective, a portion of an incomplete pulp board constructed in accordance with the invention, one of the facing layers being partially broken away, and the remaining portion partially displaced.

Figure 2 is a top plan view of the same.

Figure 3 shows in elevation and somewhat diagrammatically, the apparatus hereinafter described.

Figure 4 is a section taken on the line 4—4 of Figure 3, looking toward the right and showing in side elevation and somewhat diagrammatically, the filler web-forming and delivering element hereinafter described.

Figure 5 shows in perspective one of the rolls shown by Figures 3 and 4, and the web-subdividing doctor hereinafter described.

Figure 6 is a view similar to a portion of Figure 3, the primary and secondary facing web-forming elements being omitted.

Figure 7 shows in perspective a portion of the conveyor and a portion of a laminated web formed thereon, without facing webs.

The same reference characters indicate the same parts in all of the figures.

A suitable apparatus for carrying out my invention is shown more or less diagrammatically, by Figures 3 and 4, and comprises an endless conveyor or belt 12, having an upwardly facing upper stretch and mounted on suitable rollers 13, means (not shown) being provided for moving the upper stretch in the direction indicated by the arrow x (Figure 3).

The apparatus comprises also a primary bottom web-forming element, designated as a whole by 14, including means for forming a bottom web 15 of pulp, and means for delivering the web to the conveyor. In this instance, the primary element includes a vat 16, supplied with pulp, and a cylinder mold 17, having a foraminous periphery rotatable in the vat and adapted to raise the beginning of the web 15 therefrom, and present it to an endless band 18, in a well known manner. The layer and band pass between the periphery of the cylinder mold and a couch roll 19, and are guided by rolls 20, 21 and 22 to a roll 23, supported above the conveyor 12. A doctor 24 detaches the web from the roll 23, so that the web is deposited on the conveyor 12 and is moved progressively endwise by the latter in a predetermined path, under an intermediate element of the apparatus, designated as a whole by 25. Either of the rolls supporting the band 18 may be positively driven to move the band and progressively feed the web.

The intermediate element, shown in elevation by Figure 4, is adapted to form and deliver a filler web 28. Said element includes a vat 26, supplied with pulp, a cylinder mold 27, rotatable in the vat and adapted to raise the beginning of the filler web 28 therefrom, and present it to an endless band 29. The web and band pass between the periphery of the cylinder mold 27 and a couch roll 30, and are guided by rolls 31 and 32 to a roll 33, supported above the conveyor 12. The axes of the rolls 32 and 33 are parallel with the path of the bottom web 15, and said rolls are reciprocated crosswise of said path, as indicated by full and dotted lines in Figure 4, so that they constitute reciprocating means for delivering the filling web 28, upon a portion of the bottom web 15, in a series of folds 28^a extending crosswise of the path of the moving bottom web. The movement of the bottom web, therefore, imparts a zigzag form to the filler web, the folds 28^a extending obliquely across the bottom web, as indicated by

Figure 2. The folds of the filler web include a series of top stretches, indicated by full lines, and a series of bottom stretches, indicated by dotted lines, in Figure 2, the bottom stretches contacting with the bottom facing web. The arrows in Figure 2 indicate the directions taken by the top and bottom stretches of the filler web. A doctor 35 detaches the filler web 28 from the roll 33, so that the web is deposited on the bottom web 15. As best shown by Figure 5, the doctor 35 may be provided with a series of upstanding knives 36, adapted to subdivide the filler web 28 into ribbons 28^b which are laid side by side on the bottom web.

The axes of the rolls 32 and 33 may be connected by any suitable means, so that they are permanently associated and caused to nip the interposed filler web. These rolls may be loosely rotatable, the progressive movement of the web being caused by positively rotating another roll, such as the roll 31. In this instance, the couple formed by the rolls 32 and 33 is connected by a member 38 (Figure 3) with a belt 39, running on pullyes 40 and 41, journaled in fixed bearings. The belt may be driven by any suitable means, first in one direction, and then in the opposite direction, so that it reciprocates the rolls 32 and 33 between the limits shown by the full and dotted lines in Figure 3, the direction of movement of the belt being automatically reversed at suitable intervals.

Finally the apparatus includes a secondary facing web-forming element, designated as a whole by 42, having means for forming a top facing web 44. This element may be in all essential particulars a duplicate of the element 14, and is spaced from the latter, so that the two elements are at opposite sides of the intermediate element 25.

The top facing web 44 is deposited by the delivering means of the secondary element 42, upon the top stretches of the moving filler web 28, and is moved longitudinally by the movement of the bottom and filler webs.

The laminated structure produced as above described, is carried from the secondary element 42 by the conveyor 12, and may be subsequently treated in any desired manner, to adapt it for use.

The band 29 of the intermediate element may be maintained at a uniform tension by a loose-weighted roll 43, supported in a bight of the band depending between two guide rolls 45.

The invention is not limited to the production of pulp board which includes the facing webs 15 and 44, and may be carried out by forming and depositing only the web 28 on a continuously moving support, such as the conveyor 12, as indicated by Figures 6 and 7, the primary and secondary facing web-forming and depositing elements 14 and 42 being omitted from an apparatus employed in practising the invention.

It will be seen that the invention is carried out by continuously forming an elongated web, or a plurality of webs of wet pulp, in which the grain of the pulp extends longitudinally, and depositing the same as formed on a moving support in such manner as to produce superimposed layers in which the grain extends in different directions, so that in the finished board, the tensile strength, due to the longitudinal direction or laying of the fibers, is balanced, the fibers extending in different directions, so that the board has equal, or approximately equal tensile strength and stiffness in a number of different directions, and does not have a superior tensile strength and stiffness in one direction only. This statement applies to board made as last described, with reference to Figures 6 and 7, as well as to board made as described with reference to Figures 3 and 4. The board may be made of any desired thickness. Owing to the fact that the layers are formed while the pulp is wet, they are better felted or caused to adhere to each other, than when layers of dry, or approximately dry pulp are superimposed on each other.

The object of subdividing the web 28 into ribbons before it is deposited on a moving support, is to enable it to be folded to form the described zigzag stretches without liability of forming wrinkles or irregular protuberances at and near the folds. The web may be subdivided into ribbons by any other suitable means.

This application is a division of my copending application, Serial No. 127,291, filed August 5, 1926 (now Patent No. 1,737,284 granted November 26, 1929). In the present application the claims are directed to the apparatus and in the parent application the claims are directed to the product and process.

I claim:

1. In a machine of the character described, means for slitting a moist pulp web and means for laying down overlapping folds of said moist pulp web.

2. In a multi-ply paper machine of the cylinder type, means for slitting a moist pulp web and means for laying down overlapping folds of said moist pulp web upon a moving conveyor.

3. In a machine for making a thick sheet of paper in continuous lengths, the combination of means for slitting a thin moist paper web, means for laying down overlapping folds of said moist pulp web, and means for spacing said individual folds from each other.

4. In a machine for making a thick sheet of paper from a single thin pulp web, the combination of means for slitting a thin moist pulp web, means for laying down over-

lapping folds of said moist pulp web, and means for spacing said individual folds in the machine direction of the finished sheet.

5. In a machine for making a fibrous sheet, the combination of means for slitting a pulp web and means for laying down overlapping folds of said pulp web in a direction transverse to the machine direction of the finished sheet, and means for spacing said individual folds in the machine direction of the finished sheet.

6. In a machine for making a faced fibrous sheet, the combination of means for slitting a pulp web and means for laying down overlapping folds of said pulp web, and means for facing said folds with a continuous moist pulp web.

7. In a multi-ply paper machine of the cylinder type, the combination of a conveyor continuously moving in a single direction, and a second continuously moving conveyor arranged above said conveyor, said second conveyor having its off-take roll above said first conveyor, and slitting means arranged between said off-take roll and said first conveyor.

8. In a multi-ply machine of the cylinder type the combination of a moving conveyor, means for delivering a moist pulp web to said conveyor and forming overlapping folds of said web on said conveyor, and means for slitting said web.

9. In a multiply paper machine of the cylinder type, the combination of a moving conveyor, a reciprocating feed device adapted to deliver a moist pulp web to said conveyor in overlapping folds, and means for slitting said web.

10. In a machine of the character described, means for longitudinally subdividing a moist pulp web and means for laying down overlapping folds of said moist pulp web.

11. In a machine for making a thick sheet of paper in continuous lengths, the combination of means for longitudinally subdividing a moist paper web, means for laying down overlapping folds of said moist paper web, and means for spacing said individual folds from each other.

12. In a machine for making a fibrous sheet, the combination of means for longitudinally subdividing a moist pulp web, means for laying down overlapping folds of said pulp web in a direction transverse to the machine direction of the finished sheet, and means for spacing said individual folds in the machine direction of the finished sheet.

13. In a machine for making a faced fibrous sheet, the combination of means for longitudinally subdividing a moist paper web, means for laying down overlapping folds of said pulp web, and means for facing said folds with a continuous pulp web.

14. In a multi-ply paper machine of the cylinder type, the combination of a conveyor continuously moving in a single direction, a second continuously moving conveyor arranged above said conveyor, said second conveyor having its off-take roll above said first conveyor, and means for longitudinally subdividing a web fed from said second conveyor, said means being arranged between said off-take roll and said first conveyor.

15. In a multi-ply machine of the cylinder type, the combination of a moving conveyor, means for delivering a moist pulp web to said conveyor and forming overlapping folds of said web on said conveyor, and means for longitudinally sub-dividing said web.

16. In a multi-ply paper machine of the cylinder type, a combination of a moving conveyor, a reciprocating feed device adapted to deliver a moist pulp web to said conveyor in overlapping folds, and means for longitudinally sub-dividing said web.

In testimony whereof I affix my signature.

RALPH L. LOOMIS.