June 17, 1930. E. H. STREETER 1,763,910

SUCTION BOX

Filed May 9, 1929

Fig. 1.

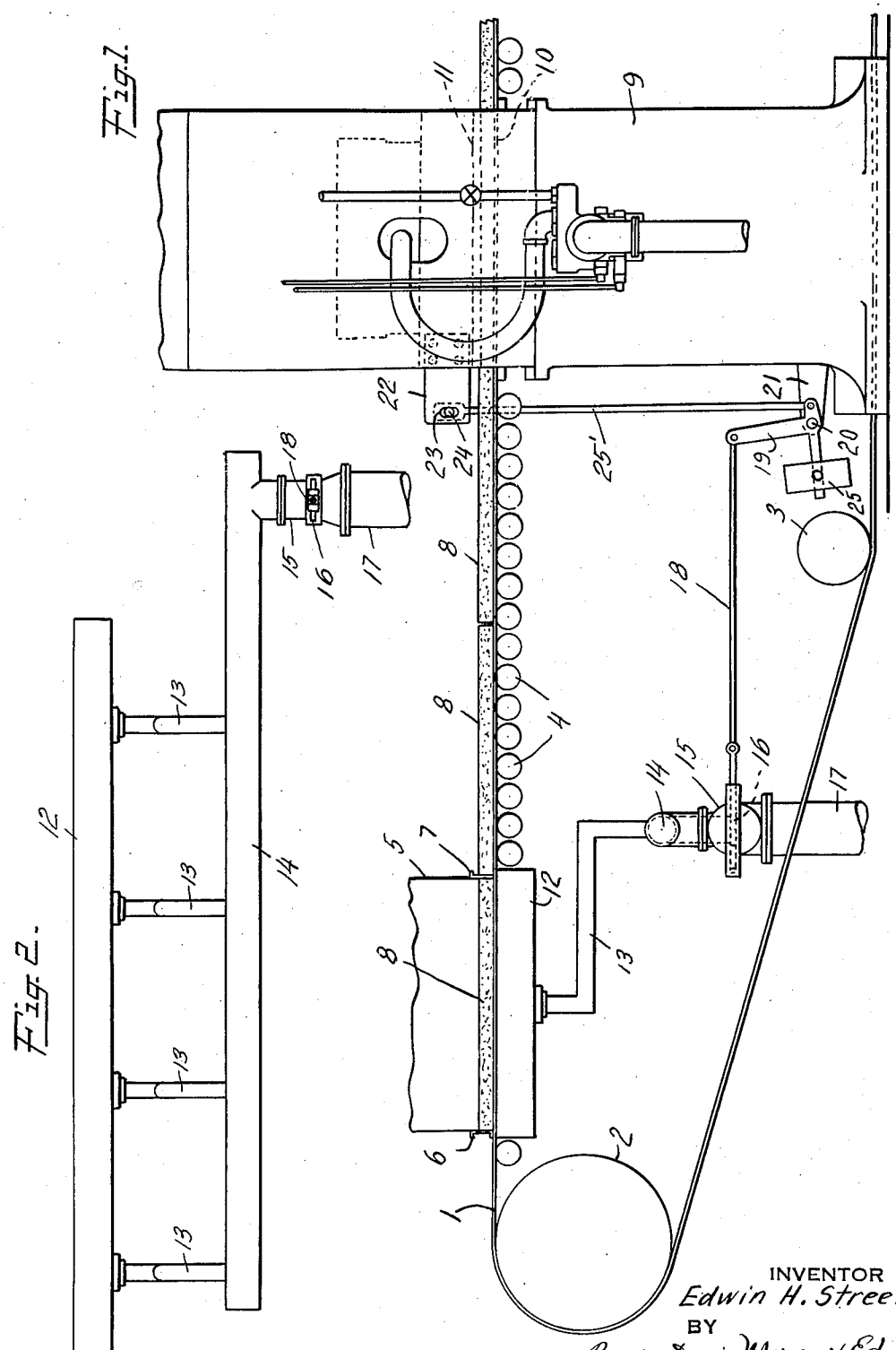


Fig. 2.

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UNITED STATES PATENT OFFICE

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SUCTION BOX

Application filed May 9, 1929. Serial No. 361,563.

In the manufacture of certain types of wall board, wood is reduced to a pulp or fiberless mass and water added thereto to form a slurry. This slurry, containing about 95 percent or 96 percent water by dry weight, is flowed on to a screen and formed into a level and uniform layer. It is then passed through a press to remove a substantial portion of the water and form the pulp into sheets. The damp sheets are then passed through a dryer to reduce the water content to about 8 percent, which is the desired water content in the final product.

A press particularly adapted for this purpose is disclosed in the patent to Adam Ziska, Jr., No. 1,690,152, granted November 6, 1928. This press consists of a lower stationary platen, an upper movable platen and suitable means for removing the water that is extracted from the sheet during the pressing operation. I have found that the capacity of the press can be greatly increased if some of the water is removed from the stock before it reaches the press. It is necessary that the stock originally be sufficiently fluid to flow properly so as to arrange itself in a substantially uniform and level layer when it is delivered to the screen. However, as soon as the stock is arranged on the screen, a substantial portion of the moisture may be removed before it reaches the press without injury to the product.

Various means may be employed for this purpose. A suction box may be arranged on the screen forwardly of the press or the stock may be passed through squeeze rolls to extract a portion of the moisture. The stock reaching the press with its moisture content reduced can be passed through the press in a smaller space of time and as the entire operation must be timed by the period required for pressing the sheets, the capacity of the plant may be materially increased in this manner.

The removal of a portion of the moisture before pressing also tends to improve the product by smoothing it out on the top and bottom and by redistributing some of the finer fibers in the stock. This operation also produces an incipient felting of the fibers and fiber aggregates and thus delivers the stock to the press in a better condition for producing dense, compact wall board.

My invention comprises the above described process wherein a liquid slurry of pulp is flowed on to a screen and permitted to arrange itself in a substantially uniform and even layer, a portion of the moisture removed substantially immediately and the pulp then pressed to further reduce the moisture content and form a sheet. It also comprises suitable apparatus including a suction box arranged under the screen forwardly of the press and adapted to extract a substantial amount of moisture from the pulp after it has flowed on to the screen.

In the drawings I have illustrated, somewhat diagrammatically, one form of the invention.

Fig. 1 is a side elevation of a portion of the sheet forming apparatus showing the invention applied; and

Fig. 2 is an elevation of the suction box and associated parts at right angles to Fig. 1.

Referring to the drawings the reference numeral 1 designates a screen which is preferably of Fourdrinier wire forming an endless conveyor passing over suitable rolls or pulleys 2 arranged at opposite ends of the machine. The roll at the right hand end of the machine is not shown but the operation of the screen will be understood by those skilled in the art. Additional guide rolls 3 may be arranged on the return flight of the screen and the operative flight, in which the pulp slurry is placed on the screen, may be provided with a plurality of supporting rolls 4. Arranged over the screen is a flow box 5 by means of which the pulp slurry is placed on the screen in a substantially uniform and even layer. Various types of apparatus may be employed for this purpose and in the drawings I have merely diagrammatically illustrated the pulp feeding means. The apparatus preferably employed for this purpose is the flow box disclosed and claimed in my copending application, serial No. 159,834, filed January 8, 1927 (now patent No. 1,712,852, granted May 14, 1929), which

travels transversely of the screen during the intervals when the screen is at rest to deposit the pulp. A suitable deckle 6 is arranged at one end of the flow box and a movable deckle 7 is carried on the other end of the flow box traveling across the screen with the flow box and separating the pulp slurry into sheets 8.

The screen 1 is intermittently driven and is adapted to pause for a predetermined time after each movement, the movement of the screen being equal to the width of the layer of pulp deposited on the screen upon each reciprocation of the flow box. At a point beyond the flow box the screen passes through a press which is preferably of the type shown in the Ziska patent referred to above and consists of a frame 9 carrying a lower stationary platen 10 and an upper movable platen 11. In order to simplify the disclosure of the present application the means for reciprocating the upper platen 11, the detailed construction of the platens whereby the water may be removed from the sheet and the details of applying suction and pressure to the sheet during the pressing operation are omitted as these features are clearly described in the Ziska patent.

Immediately beneath the flow box I provide a suction box 12 which is adapted to remove a considerable portion of the moisture from the pulp slurry after it has been deposited on the sheet in a substantially even and uniform layer, and before it is fed to the press. While the detailed construction of the suction box may vary it is air tight and is provided with a perforated top, preferably formed of a heavy plate of perforated brass over which the screen 1 passes. A plurality of drain pipes 13 are connected to the suction box and these pipes in turn are connected to a header 14. The header is in turn connected to a valve casing 15 having a valve 16 communicating therewith and the other side of the valve casing is connected to a suitable drain 17. The valve is shown as a reciprocating gate valve, but other types of valves may be employed. The drain pipe 17 is also connected to a vacuum pump or other means for exhausting the suction box. The application of suction is controlled by the valve 16 and this valve is in turn controlled by the movement of the upper platen of the press. A link 18 is connected to the valve stem and this link is in turn connected to one arm of a bell crank lever 19 which is pivoted at 20 on a bracket 21 carried by the frame of a machine. A second bracket 22 is carried by the upper platen of the press and this bracket is provided with an elongated slot 23 adapted to receive a rod or pin 24 carried by link 25′ connected to the other arm of the bell crank lever 19. Bell crank lever 19 is provided with an arm adapted to receive a counterweight 25.

In operation at each pause of the screen 1, one section of board is submitted to the pressing operation to reduce its moisture content and the damp sheets removed from the press are then delivered to a suitable dryer (not shown) to reduce the moisture content of the sheet to its desired final moisture content. During each pause of the screen a layer of pulp is also delivered to the opposite end of the screen by the flow box 5. As stated above, this pulp is in the form of a slurry containing 95 percent to 96 percent of moisture. Immediately after the pulp is arranged in a layer on the screen, a portion of the moisture is withdrawn by suction applied to the suction box 12 to reduce the moisture content and enable the pressing operation to be more quickly performed. As stated above, this removal of moisture before pressing also smoothes the top and bottom of the pulp layer and redistributes some of the finer fibers so as to produce an improved product. It also produces an insipient felting of the fibers and fiber aggregates. With the parts in the position shown in Fig. 1 of the drawings, the platen 11 is in its uppermost position and the valve 16 is closed by weight 25 so that no suction is applied to the suction box. As the platen moves downwardly the valve remains in closed position until the upper end of the slot 23 contacts with the pin 24 and during the last part of the downward movement of the upper platen the link 25′ is depressed turning the bell crank lever 19 in a clockwise direction and opening the valve 16 to exhaust the suction box and remove moisture from the pulp layer immediately above the suction box, by suction. At the end of the downward movement of the platen 11, the pin 24 is in the uppermost position in the slot 23 and weight 25 is raised. As the platen 11 moves upwardly, weight 25 closes the valve during the first portion of the upward movement. Pin 23 then stays at the upper end of slot 24, until the valve is closed. During the latter part of the upward movement of platen 11, after the valve has closed, the pin assumes the position intermediate the ends of the slot, shown in Fig. 1 of the drawings. This alternate opening and closing of the valve 16 is repeated upon each movement of the platen so that the layer of stock just deposited on the screen by the flow box is submitted to suction and a portion of the moisture removed therefrom before the pressing operation.

I claim:

1. The process of making fiber board which comprises forming a slurry of pulp containing sufficient water to permit it to flow and form a substantially uniform layer, depositing the pulp on an intermittently moving screen in a layer, withdrawing a portion of the moisture therefrom, feeding

the screen between the platens of a press to withdraw additional moisture from the pulp slurry and form a sheet, and then drying the sheet to its final moisture content.

2. The process of making fiber board which comprises forming a slurry of pulp containing substantially 95 percent of moisture, depositing the pulp on an intermittently moving screen in a layer, withdrawing a portion of the moisture therefrom, and feeding the screen between the platens of a press to withdraw additional moisture and form a sheet.

3. The process of making fiber board which comprises forming a slurry of pulp containing substantially 95 percent of water, depositing the pulp on an intermittently moving screen in a layer, applying suction to the layer of pulp to withdraw a portion of the moisture therefrom, and then pressing the pulp layer to withdraw additional moisture and form a sheet.

4. Apparatus for making wall board comprising an intermittently moving screen, and means adjacent the screen for applying suction to a layer of pulp on the screen.

5. Apparatus for making wall board comprising a screen, a press through which said screen passes, a suction box arranged forwardly of the press, and means controlled by the movement of the press for exhausting the suction box.

6. Apparatus for making wall board comprising a screen, a press through which said screen passes, a suction box arranged forwardly of the press, means controlled by the movement of the press for exhausting the suction box, a valve for controlling said suction box, and control means for said valve operated by said press.

7. Apparatus for making wall board comprising a screen, a press through which said screen passes, a suction box arranged forwardly of the press, means controlled by the movement of the press for exhausting the suction box, a valve for controlling said suction box, control means for said valve operated by said press, a pivoted lever connected to said valve and a link connecting said lever to a movable part of the press.

8. Apparatus for making wall board comprising a screen, means for depositing a layer of pulp on the screen, a suction box beneath the screen at the point where the layer of pulp is deposited, a press through which the screen is adapted to pass after the layer of pulp has been deposited thereon, and control means for said suction box operatively connected to said press.

In testimony whereof I affix my signature.

EDWIN H. STREETER.