

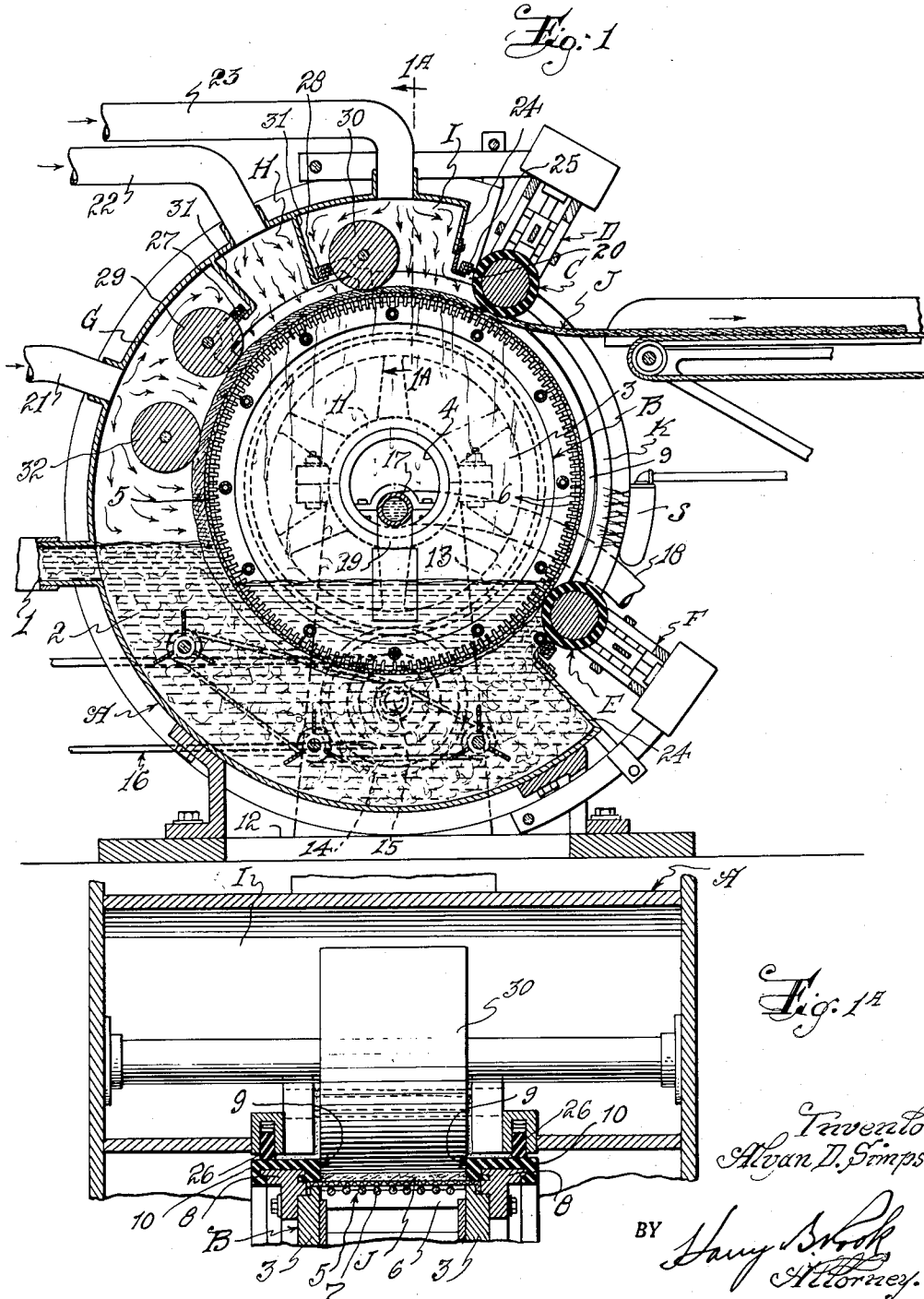
July 10, 1956

A. D. SIMPSON
POSITIVE PRESSURE MACHINE FOR FORMING CONTINUOUS
STRIPS OF FIBROUS MATERIALS

2,753,766

Filed Dec. 29, 1951

4 Sheets-Sheet 1



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Fig. 2

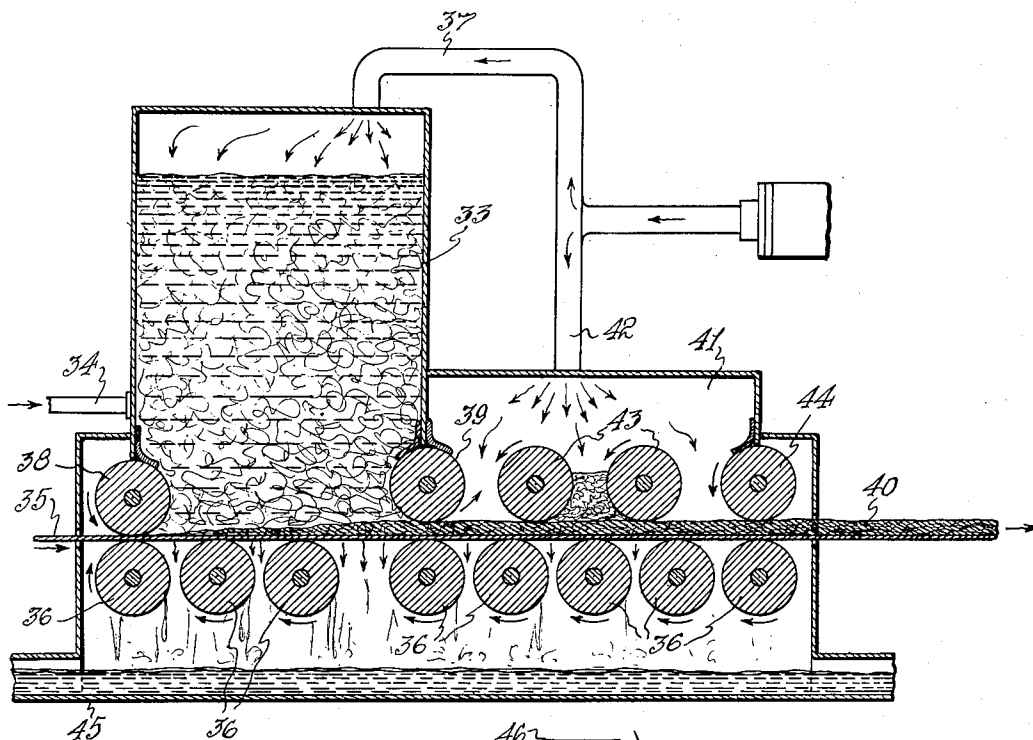


Fig. 3

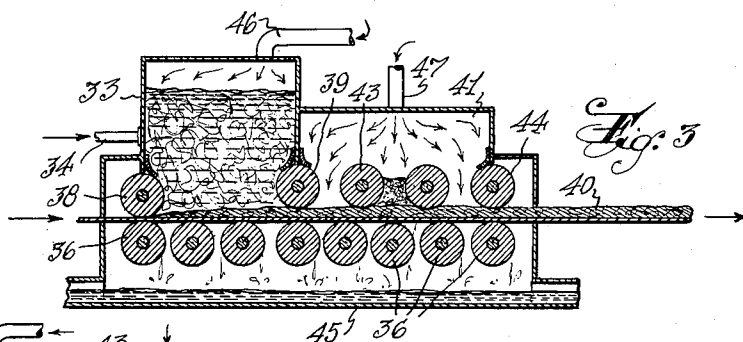
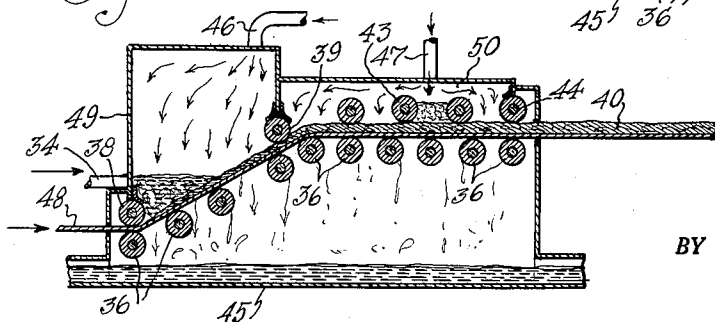


Fig. 4



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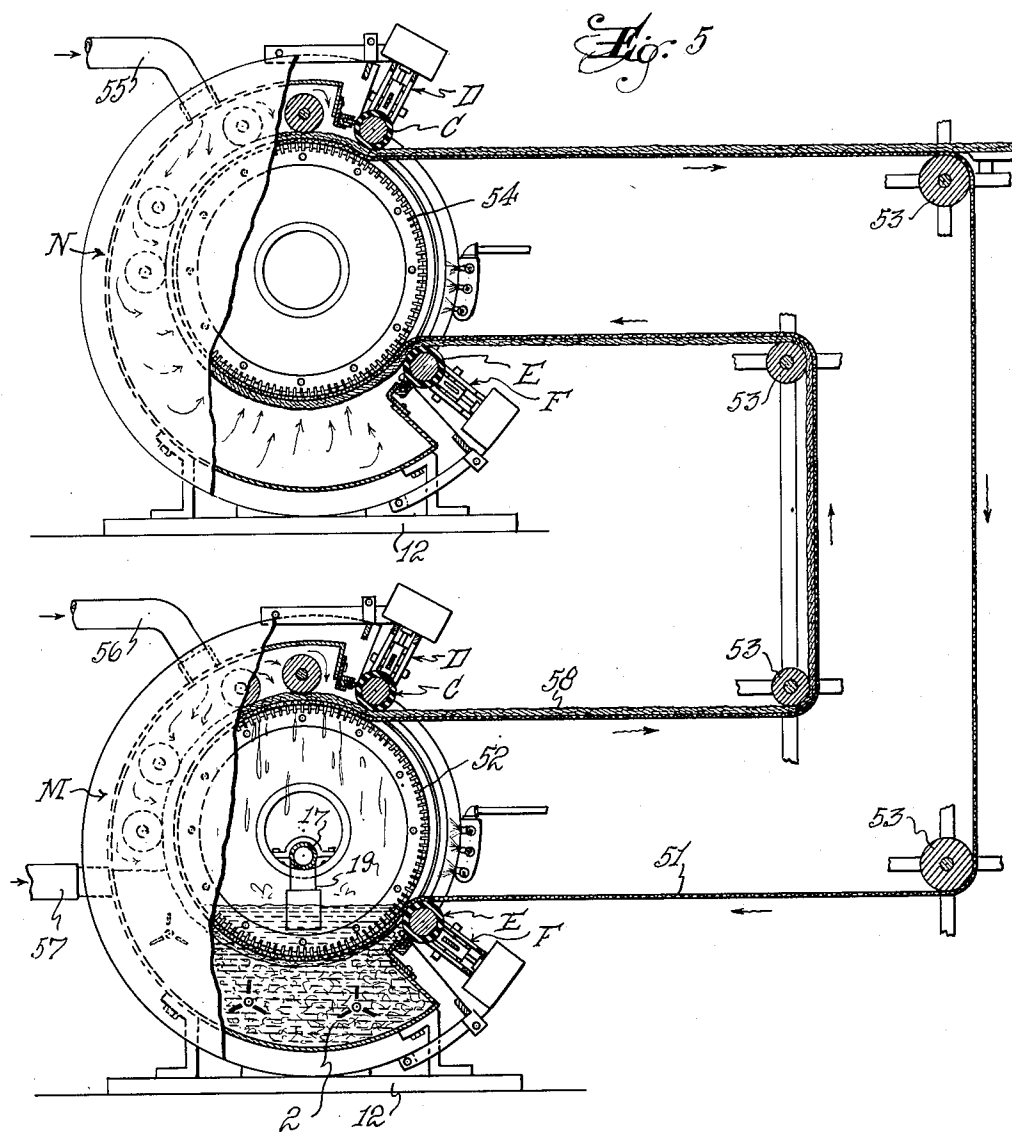
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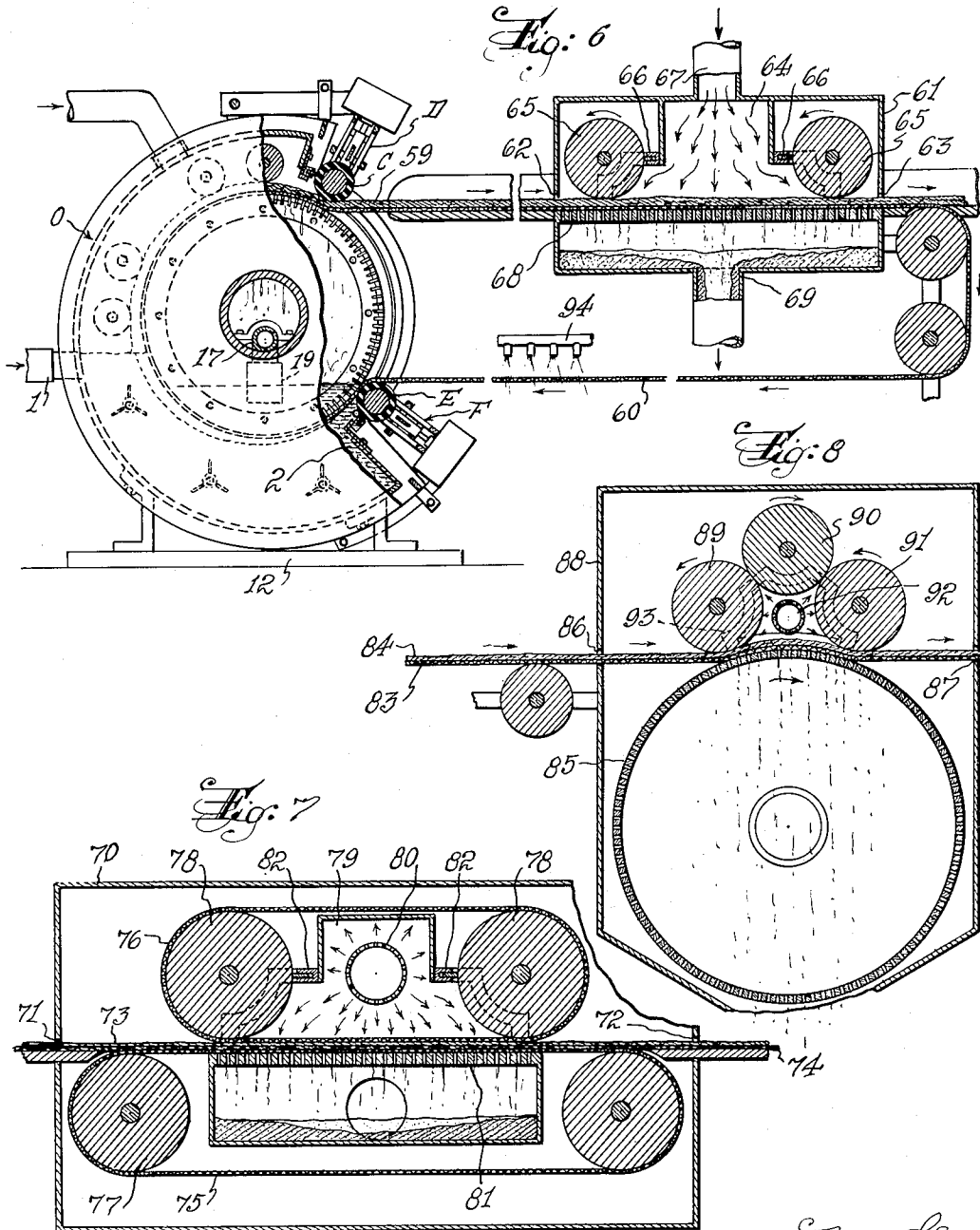
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4 Sheets-Sheet 4



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POSITIVE PRESSURE MACHINE FOR FORMING CONTINUOUS STRIPS OF FIBROUS MATERIALS

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Application December 29, 1951, Serial No. 264,035

2 Claims. (Cl. 92—43)

This application is a continuation-in-part of my co-pending application Serial No. 24,054 filed April 29, 1948, now Patent No. 2,581,210, and the invention relates in general to the manufacture of continuous strips of compositions of matter including fibers, for example, mixtures of asbestos and cement, wood pulp and a plastic composition, glass fibers or filaments and vinyl compounds, or similar materials. More particularly, the invention contemplates the deposit of material from a wet mix onto a perforate screen or like support so as to force the liquid from the mix through the screen and cause deposit of the solid matter in the mix in a layer on the screen, which layer is then moved out of the mix to permit draining of the liquid from the layer, positive air or other gas pressure, above atmospheric pressure, being applied to the surface of the mix and to the deposited layer to cause rapid flow of the liquid from the mix through the screen to produce rapid deposit of the solid matter from the mix on the screen, and also to rapidly force the liquid from the deposited layer to dry the layer when the layer is out of the mix.

A machine for forming continuous strips in the manner above described is claimed in the aforesaid application Serial No. 24,054, and in that machine the same air pressure is applied to the wet mix and to the deposited layer in one chamber.

A prime object of the present invention is to deposit the layer from the wet mix under one positive pressure and to dry the deposited layer under the same and under different pressures whereby, for example, material from the wet mix may be deposited under moderate or low pressure and can thereafter be subjected to substantially higher pressures to cause rapid drying of the layer.

Another object of the invention is to provide a machine of the character described wherein the perforate screen shall have the layer of material deposited thereon in one chamber and shall then convey said layer through one or more other chambers where gas pressures shall be applied to the deposited layer to dry the layer.

A further object of the invention is to provide in a machine of this character novel and improved means for subjecting the deposited layer to gas pressure whereby to rapidly and thoroughly dry the layer and at the same time protect the layer against injury during handling thereof.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

Figure 1 is a transverse central sectional view of a positive pressure machine for making continuous strips of material from a wet mix, constructed in accordance with the invention;

Figure 1a is a fragmentary enlarged longitudinal vertical sectional view approximately on the plane of the line 1a—1a of Figure 1;

Figure 2 is a schematic longitudinal sectional view through a machine embodying a modification of the invention;

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Figure 3 is a similar view showing another modification of the machine;

Figure 4 is a like view showing another form of the machine embodying the invention;

Figure 5 is a composite end elevational and transverse vertical sectional view through another machine embodying a modification of the invention;

Figure 6 is a view similar to Figure 5 showing another type of machine constructed in accordance with the invention;

Figure 7 is a schematic longitudinal vertical sectional view through a mechanism for drying a film or layer which has been deposited by suitable means such as that shown in Figures 1 and 2;

Figure 8 is a vertical longitudinal sectional view through another type of drying mechanism.

For the purpose of illustrating the principles of the invention, it has been shown in Figures 1 and 1a in conjunction with a machine of the type disclosed in the aforesaid co-pending application, Serial No. 24,054 and another co-pending application, Serial No. 217,906 filed March 28, 1951, now Patent No. 2,723,599. The machine includes a tank or casing A that has an inlet 1 for a wet mix 2 of a suitable composition of matter, for example a mixture of asbestos and cement, or a mixture of wood pulp and a synthetic resin, or a mixture of glass fibers or filaments and a vinyl compound. This mix may be of any suitable consistency and generally comprises solid particles such as asbestos or other fibrous material and cement or synthetic resins or other suitable substances all suspended in liquid; and the mix may be supplied to the tank in any suitable manner.

Rotatably mounted about a horizontal axis in the tank is a hollow cylindrical rotor drum B having solid end walls or plates 3 from which project coaxial tubular trunnions 4, and a perforated peripheral wall 5, which may be a screen, connecting said end walls. As shown, cross bars 6 are mounted in and extend between the plates 3 and have a plurality of circular rings or a helically wound wire 7 seated on their outer edges, the screen in turn being mounted on said rings or helically wound wire. Secured to the side plates 3 and projecting coaxially beyond the screen 5 are end rings 8 that preferably have covers 10 of resilient friction resistant material such as rubber or the like on their outer peripheries and on their inwardly facing ends which form inwardly facing circumferential shoulders 9 disposed in planes perpendicular to the axis of rotation of the drum and extending outwardly beyond the screen 5. Stainless steel rings 8 with shoulders 9 and with no covering have been found to work very well but are expensive to maintain due to wear of or injury to the steel.

The drum is located in the tank so that a lower portion thereof will be submerged in the mix 2 in the lower portion of the tank with the lowermost portion of the tank containing the mix extending at both sides of a vertical plane in which lies said horizontal axis of rotation of the drum, as best shown in Figure 1, and the drum may be rotatably mounted in any suitable manner as by journaling the trunnions 4 in bearings 11 that project upwardly from a base 12 on which the tank A is mounted, one of the trunnions being connected by a gear train 13, 14 to a drive shaft 15 which may be connected to any suitable source of power as by a belt and pulley 16.

With this construction, when the drum is rotated through the mix 2, the liquid from the mix will flow through the interstices in the screen 5 so as to cause a deposit of some of the solid matter in the mix on the screen, and as the drum continues to rotate, this deposited solid matter is elevated out of the mix into the upper portion of the tank where the liquid drains from the deposited layer downwardly into the drum from whence

the liquid is drained off through the hollow trunnions 4 by any suitable means such as a drain pipe 17 that extends through the hollow trunnions and has one end closed and the other end connected as by a hose 18 to a suitable pump. The pipe 17 has a branch 19 depending between the end plates 3 of the drum into the lower portion of the drum so that liquid may be withdrawn from the drum through said branch into the drainpipe and thence to a suitable discharge point. The layer of solid matter that is disposed on the periphery of the drum is removed through an opening 20 in the circumferential wall of the tank above the level of the mix.

The space in the tank above the level of the mix is divided into a plurality of pressure chambers G, H and I into each of which air or other suitable gas under pressure substantially in excess of atmospheric pressure, is supplied through the respective pipes 21, 22 and 23. The pressure supplied to these chambers may be the same or different; for example a low pressure could be supplied to the chamber G, a higher pressure to the chamber H and a still higher pressure to the chamber I. The pressure in the chamber G continuously exerted on the surface of the mix tends to accelerate the flow of liquid from the mix through the drum and at the same time to force some of the liquid from the deposited layer J on the upper portion of the drum; while the pressures in the chambers H and I may continue the forcing of the liquid from the deposited layer so that when the layer emerges from the tank, it will be substantially dried.

Suitable means is provided to prevent leakage through said opening 20 of both the wet mix and such air or gas pressure. As shown, a sealing roller C is journaled in a suitable mounting structure D identical with that disclosed in my co-pending application, Serial No. 217,906, adjacent the upper end of the opening 20 with its periphery in tight contact with the deposited layer on the screen 5 on the drum and adjustable toward and from the drum. At the other or lower end of the opening 20 is a similar roller E journaled in a mounting structure F that is identical with the structure D, the periphery of said roller contacting with the screen 5 at or below the level of the mix and adjustable toward and from said screen.

The rollers C and E cooperate with the shoulders 9 on the drum, as shown in Figure 1a, to form a part of said sealing means, and preferably the end surfaces of the rollers or said shoulders or both are covered with a suitable resilient friction resisting material, for example rubber or neoprene. As hereinbefore described, the shoulders 9 are formed by a cover 10 on the rings 8, and the rollers C and E which may be identical preferably are provided with a cover of the same or similar material. The rollers C and E may be lengthwise adjustable or longitudinally extendable and contractible to obtain and maintain proper contact between the rollers and the shoulders of the drum; and the contact between the rollers and the drum is maintained under pressure greater than the pressure inside the tank.

Means is also provided for sealing the junctions between the walls of the tank and the rollers C and E and drum, as well as for sealing the chambers G, H and I from each other; and this sealing means may be of the same general form as that disclosed in the co-pending application Serial No. 217,906. The side walls of the tank are shown as comprising two portions one of which is of a smaller diameter than the other, said arcuate portions being connected by radial portions 24. The opening 20 extends through the length of the arcuate portion of smaller diameter and has its end portions extending into each of the radial wall portions 24. Secured to said radial wall portions and the arcuate portion of the smaller diameter is a suitable holder K which is welded or otherwise secured in fluid tight relation to said tank walls. Within the holder is a sealing element L shown as having portions 25 in frictional contact with the peripheries and end surfaces of the rollers C and D, respectively, and

having other portions 26 longitudinally curved to conform to the periphery of the drum outwardly of the shoulders 9. The sealing element L and its holder K also have other portions 27 and 28 which cooperate with sealing rolls 29 and 30 that are journaled in the side walls of the tank so as to press upon the deposited layer J on the drum. As shown, the portions 27 and 28 of the sealing element are secured to transverse walls 31 which with the sealing rolls 29 and 30 separate the chamber H from the chambers G and I so that different pressures may be maintained in said chambers. It will be understood by those skilled in the art that any other suitable sealing means may be utilized.

More specifically describing the operation of the machine, the mix is fed into the tank A until the level rises above the roller E at the lower edge of the opening 20. The water showers or sprays S are then turned on and the rotor drum is started to revolve. This will cause a deposit of a very light or thin film on the screen of the solid matter in the mix, because of the small difference in level between the mix in the tank and the water within the rotor drum. When the drum is rotated sufficiently to bring this deposited film under the roller C at the upper edge of the opening 20, the compressed air is supplied through the pipe 21 into the space in the tank above the rotor drum. As the pressure builds up in this space, the air pressure causes the film to become thicker, due to the acceleration of the flow of liquid from the mix through the perforate drum, and as this film becomes thicker and better seals the screen 5 on the portion of the drum above the mix, it is possible to increase the air pressure above the drum. In this manner, the machine is brought to normal operation and the gas pressure, speed of the rotor drum and the mix concentration, are all adjusted so as to give the required thickness of the layer J at the desired production rate.

It should be noted that the compressed air in the space above the drum slowly works its way through the deposited layer on the screen 5 and thus forces the excess water out of said layer; and due to the heavy pressure and the relatively small area, there is a marked drying effect.

Another important factor is that while the filtered liquid within the drum may contain some solid matter, the constant influx of the liquid from the mix into the drum and the removal of the filtered liquid through the ends of the drum, prevent the clogging of the perforations in the drum and screen. Also, the constant presence of the water on the inside of the rotor drum tends to dampen or counteract the violent action that would otherwise take place as the result of the heavy air pressure on the mix tending to force the mix through the perforate drum. If there were no liquid within the drum, such violent action may cause the minute fibers and other solid particles to become wedged tightly in the interstices of the screen 5, and thereby make it difficult to remove the deposited layer at the desired rate of removal, in the particular instance, at the opening 20 in the tank. If particles were permitted to become wedged in the perforations or interstices of the screen or filtering membrane, it might be impossible to keep the screen or membrane clean with showers or fluid jets, as a consequence of which the perforations or interstices might become completely stopped up or clogged and no further deposit of the film would be possible.

With this construction, any desired gas pressure can be applied to the mix in the tank A to facilitate the deposition of the solid materials on the screen. For example where the solid matter in the mix can be easily and rapidly deposited at low pressure, the pressure in the chamber G will be only slightly above atmospheric. Such a low pressure may also be advantageous in reducing the amount of solids forced through the screen and lost in the discharge or white water side of the screen. The structure also permits preliminary drying in the chamber G at relatively low pressure and continued drying in the chambers H and I at successively higher pressures so that,

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if desired, the deposited layer J may be substantially completely dried by the time it leaves the chamber I. Such complete drying of the deposited layer would to a substantial extent reduce the necessity for drying of the layer in hot ovens as is commonly done with heretofore known methods. Such complete drying also results in considerable saving on freight charges for transportation of the material inasmuch as material of this general nature heretofore has contained large percentages of water on which, of course, freight charges have to be paid.

If desired, press rolls 32 may be located in any of the chambers to compress or smooth the deposited layer. In actual construction of a machine, it will be understood that all of the rolls preferably would be mounted for adjustment relative to the drum to vary pressures applied by the rolls to the deposited layer and to accommodate layers of different thickness.

A modification of the invention which is substantially the same as one form of machine shown in co-pending application Serial No. 24,054, is shown in Figure 2. This machine comprises a tank 33 into which the mix is fed from a supply pipe 34, the lower end of the tank opening onto a filtering screen or belt 35 which is movable in the direction of the arrows on supporting rollers 36. Gas under pressure is forced into the tank 33 above the mix into a pipe 37 so as to force the liquid from the mix through the screen 35, and a suitable sealing roll 38 is provided between the wall of the tank and the screen, while another sealing roll 39 is disposed between the wall of the tank and the deposited layer 40 of material. Extending beyond the tank and above the screen is a gas pressure chamber 41 to which gas under pressure is fed from a pipe 42, the pressure in this chamber serving to force the liquid from the deposited layer 40 in a manner similar to that in which the air pressure in the space above the rotor drum in Figure 1 forces the liquid from the layer J. Finishing or veneer-applying rollers 43 may be utilized if desired, and a sealing roll 44 similar to the roll C must be provided. The liquid that is drained from the mix and deposited layer is carried off through suitable pipes 45.

Figure 3 shows a similar machine with the exception that the tank 33 and pressure chamber 41 have gas pressure supplied from separate sources through the respective pipes 46 and 47. In Figure 2 the gas pressure is shown as supplied to both the tank and the pressure chamber from the same source, although the pressures in the tank and in the pressure chamber may be different.

Figure 4 shows a further modification of the machine of Figure 2 wherein the screen 48 is inclined upwardly across the bottom opening of the tank 49 so that the wet mix contacts with only the lower portion of the screen and the deposited layer on the upper portion of the screen in the tank is subjected to air pressure for partial drying. The screen is moved from the tank 49 through the pressure chamber 50 which corresponds to the pressure chamber 41 hereinabove described.

Another form of the invention is shown in Figure 5 where the reference character M generally designates a machine identical with that shown in Figure 1 with the exception that the screen is in the form of a continuous belt 51 which runs around the drum 52 and over idler rollers 53 and thence around the drum 54 of a machine N which is the same as the machine M except that there is no wet mix supply therefor. The machine N is purely a drying mechanism and has air under pressure supplied to the tank and at one side of the drum through a supply pipe 55. Air is supplied to the machine M through a pipe 56 corresponding to the pipe 21 of Figure 1, and the wet mix is supplied to the machine through a pipe 57 corresponding to the pipe 1 of Figure 1.

In operation of this machine, the solid materials in the wet mix are deposited on the screen 51 and then partially dried in the upper portion of the machine, after which the partially dried layer 58 is carried away from the

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machine by the screen and moved through the machine N where the layer is further dried. The pressure in the machine M may be low, primarily to facilitate deposit of the solid materials on the screen, and the air pressure on the machine N may be many times higher so as to rapidly dry the layer. In Figure 6 the machine O is identical with the machine M of Figure 5 and the deposited layer 59 is carried by a screen belt 60. The final drying operation on the deposited layer is carried out in a drying mechanism which includes a casing 61 having the respective inlet and outlet openings 62 and 63 for the screen belt and the deposited layer. A pressure chamber 64 which is sealed by rolls 65 and sealing elements 66 in the manner hereinbefore described, is provided within the casing 61 and has gas pressure supplied thereto through a pipe 67. A perforated supporting plate 68 is provided for the screen belt to resist the action of the gas pressure on the deposited layer and screen belt. The water is forced from the layer by the gas pressure and can be drained off in any suitable manner as through an outlet 69.

Figure 7 shows another drying mechanism which includes a casing 70 having the respective inlet and outlet openings 71 and 72 for the deposited layer 73 which is moved through the casing on the usual screen 74 to perforate belts 75 and 76. The belts are mounted on the respective sets of rollers 77 and 78 with one reach of each belt parallel to one reach of the other belt so as to grip the deposited layer between them. A gas pressure chamber 79 having an inlet 80 is disposed above the upper belt reach at the upper side of the deposited layer, while a supporting perforate plate 81 is disposed beneath the belt reach that underlies the deposited layer. Suitable sealing means 82 is provided for preventing escape of gas from the pressure chamber 79 except through the perforate belt. This form of the invention is advantageous in that the belt reaches protect the film and the screen from wear and damage as they pass through the drying chamber.

In Figure 8 is shown another drying mechanism wherein the screen 83 with the deposited layer 84 thereon is moved through the drying chamber by a perforate drum 85 over which the screen passes through inlet and outlet openings 86 and 87 in a casing 88. Journalled in the casing in peripheral contact with each other and to contact with the deposited layer, are three rolls 89, 90 and 91 which form between them a pressure chamber having a gas inlet 92. Suitable sealing means 93 is provided to prevent escape of the gas pressure from the pressure chamber formed by the rolls. It will be understood that the sealing means engages the periphery of the roll 85 between the rolls 89 and 91 and beyond the edges of the screen 83, in a manner similar to which the sealing element K, L engages the shoulders of the drum in the form of the invention shown in Figures 1 and 1a. The water forced from the deposited layer may drain through the large perforations in the drum 85 and thence to an outlet pipe, catch basin or other suitable means. It will be observed that this element permits the screen to be moved without a dragging action such as occurs with the form shown in Figure 6.

Where the screen belts are used for conveying the deposited layer, some flushing means such as indicated at 94 is desirable to wash the screen after the deposited layer has been removed therefrom and before the screen enters the wet mix for the next deposit.

It will be understood by those skilled in the art that while I have illustrated several now preferred embodiments of the invention, this is primarily for the purpose of illustrating the principles of the invention and many modifications and changes in the construction of the machines may be made within the spirit and scope of the invention.

I claim:

1. A machine for forming a continuous strip of material from a wet mix composed of solid matter and

liquid comprising a tank having a chamber in the lowermost portion thereof capable of holding such a mix and providing a space above the mix level, said tank having an opening in a wall extending above the mix level and being otherwise closed, a hollow cylinder having a foraminous circumferential wall and mounted in said tank to rotate on a horizontal axis with said lowermost portion of said tank extending at both sides of a vertical plane in which lies said axis so that a substantial portion of the lowermost part of the periphery of the lower half of said foraminous wall will be disposed in said lowermost portion of said chamber and submerged in the mix and the upper portion of said foraminous wall will be disposed in said space above the mix and in juxtaposed relation to said opening so that the interior of said cylinder communicates with said opening, means to make fluid-tight the space between said mix and said cylinder and said tank wall except through said foraminous wall at said opening, means dividing said space above the mix level into a plurality of gas chambers, one side of each of which comprises said circumferential wall of said cylinder, the first chamber being a continuation of the mix chamber immediately above the mix level and the second chamber being disposed between said first chamber and said opening in the tank wall, said dividing means providing a seal against passage of gas under pressure from either of said chambers into the other, means for supplying gas pressure to said first chamber substantially above atmospheric pressure to first force a deposit of liquids from said mix onto the portion of said foraminous wall that is submerged in

said mix and to force liquid from the layer of mix on the portion of the foraminous wall that is above the mix level in said first chamber, means for supplying high gas pressure to the other chamber to further dry said layer, said layer being moved during rotation of said cylinder out of the mix to the first chamber and then to the second chamber, means for removing from said cylinder and tank the liquid that passes through said foraminous wall in both of said chambers, and means for guiding the deposited continuous layer or strip from the cylinder through said opening in the tank wall.

2. A machine as defined in claim 1 wherein said means for dividing said space into a plurality of chambers includes partitions extending inwardly from the side walls of the tank toward said cylinder in spaced relation to the mix level, sealing rolls adjacent each of said walls so that their peripheries have fluid tight contact with said cylinder and the deposited layer of mix on said foraminous wall, and sealing means between said walls and the peripheries and the ends of said rolls.

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