April 21, 1953 D. L. SCHUBERT ET AL 2,635,301

WEB OR MAT FORMING DEVICE

Filed Sept. 30, 1948 6 Sheets-Sheet 1

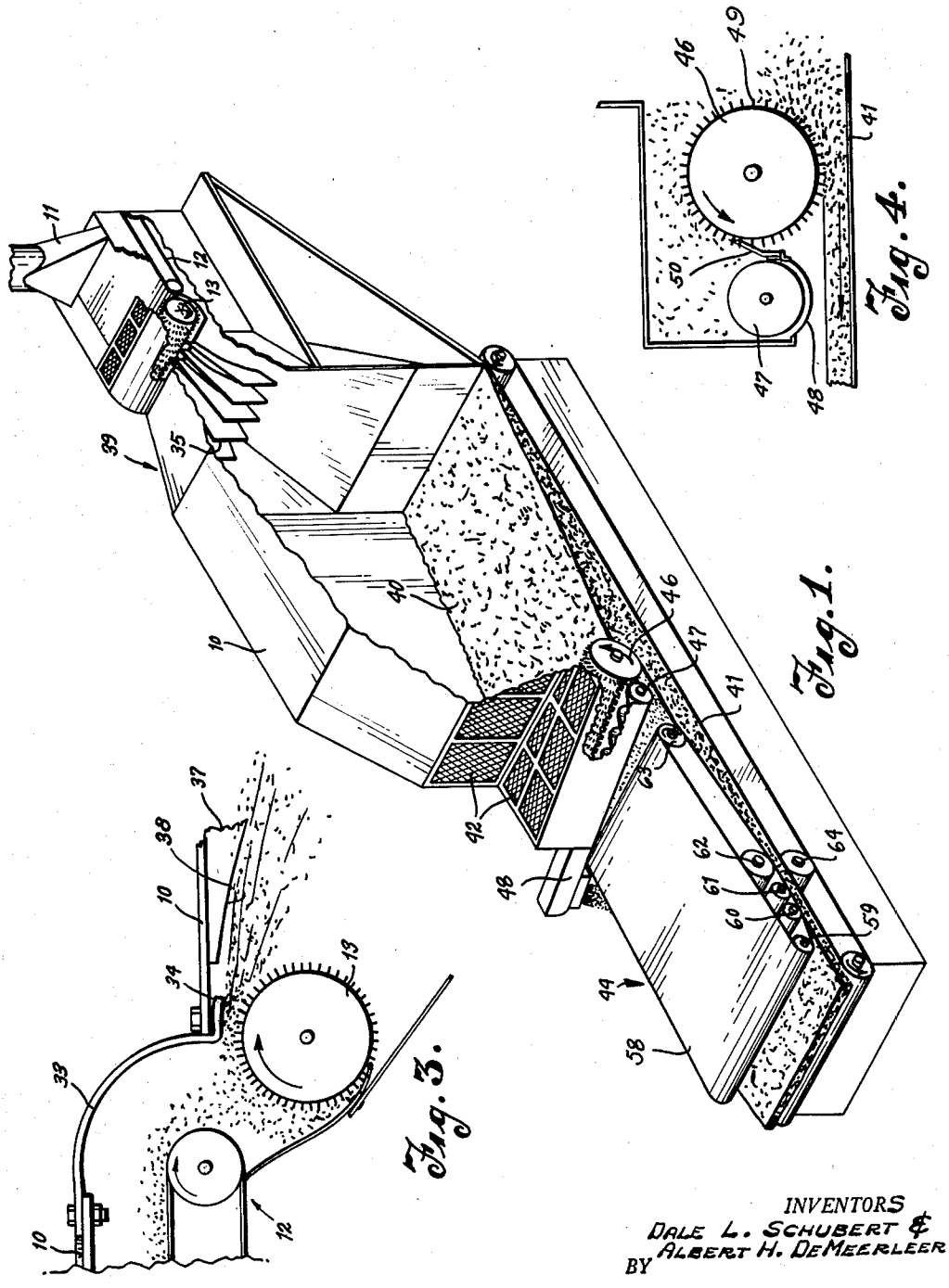


Fig. 1.

Fig. 4.

Fig. 3.

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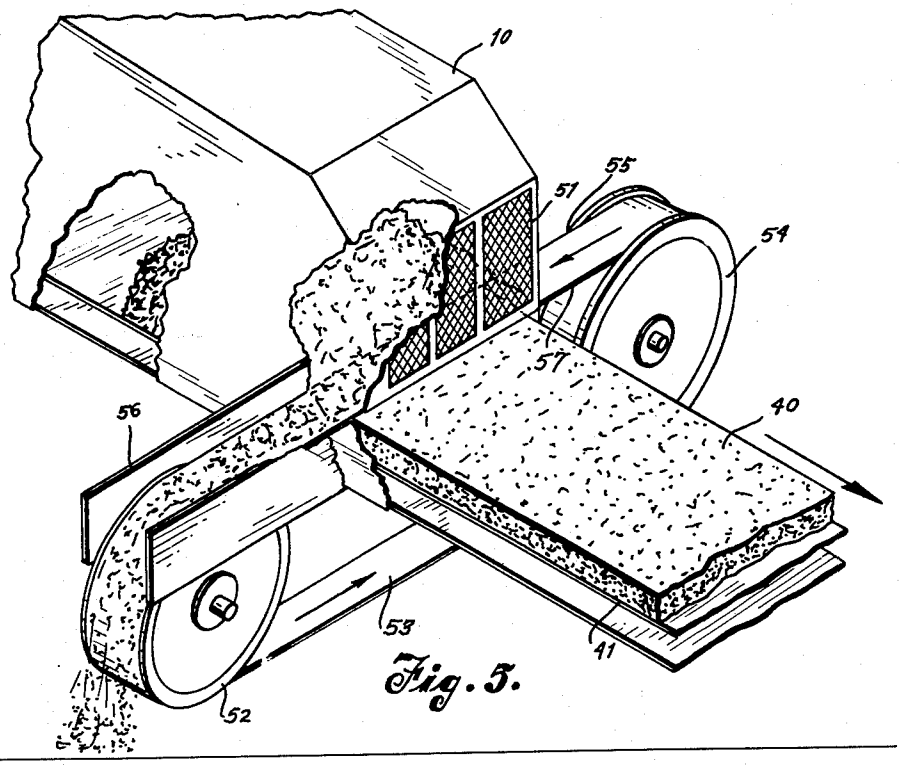


Fig. 5.

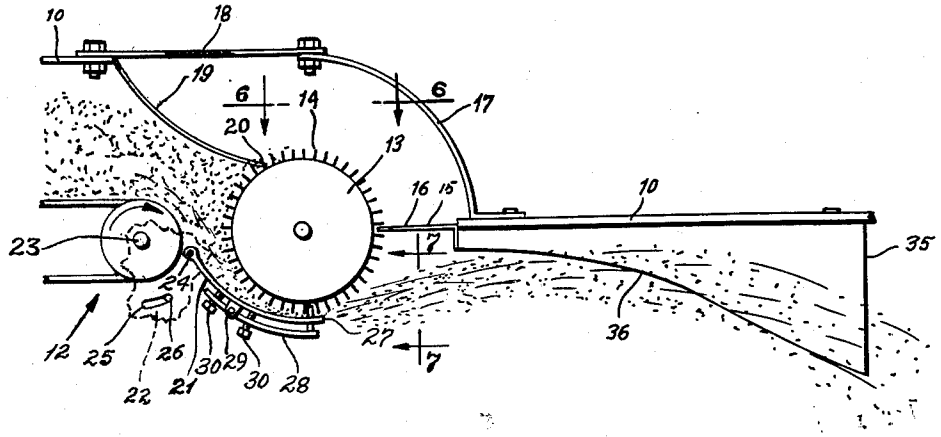


Fig. 2.

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WEB OR MAT FORMING DEVICE

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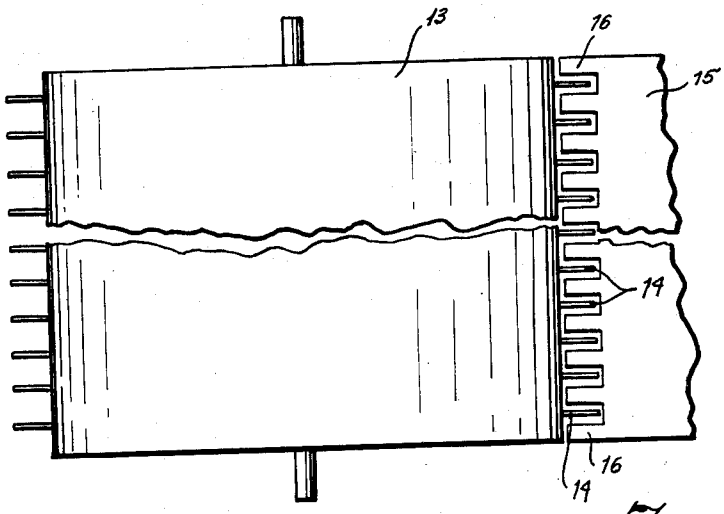


Fig. 6.

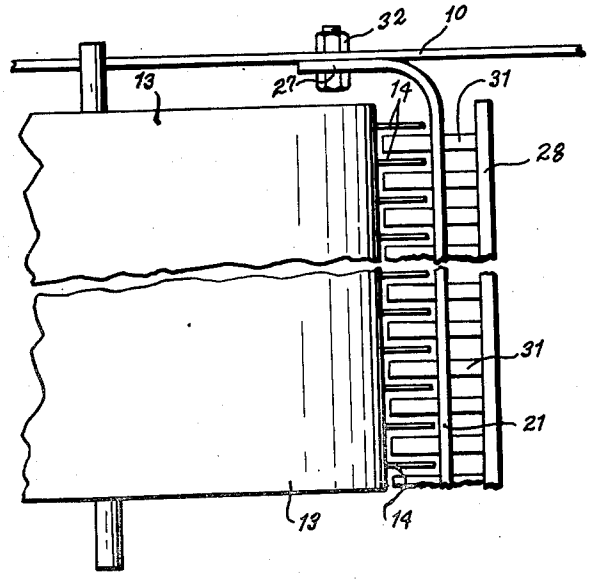


Fig. 7.

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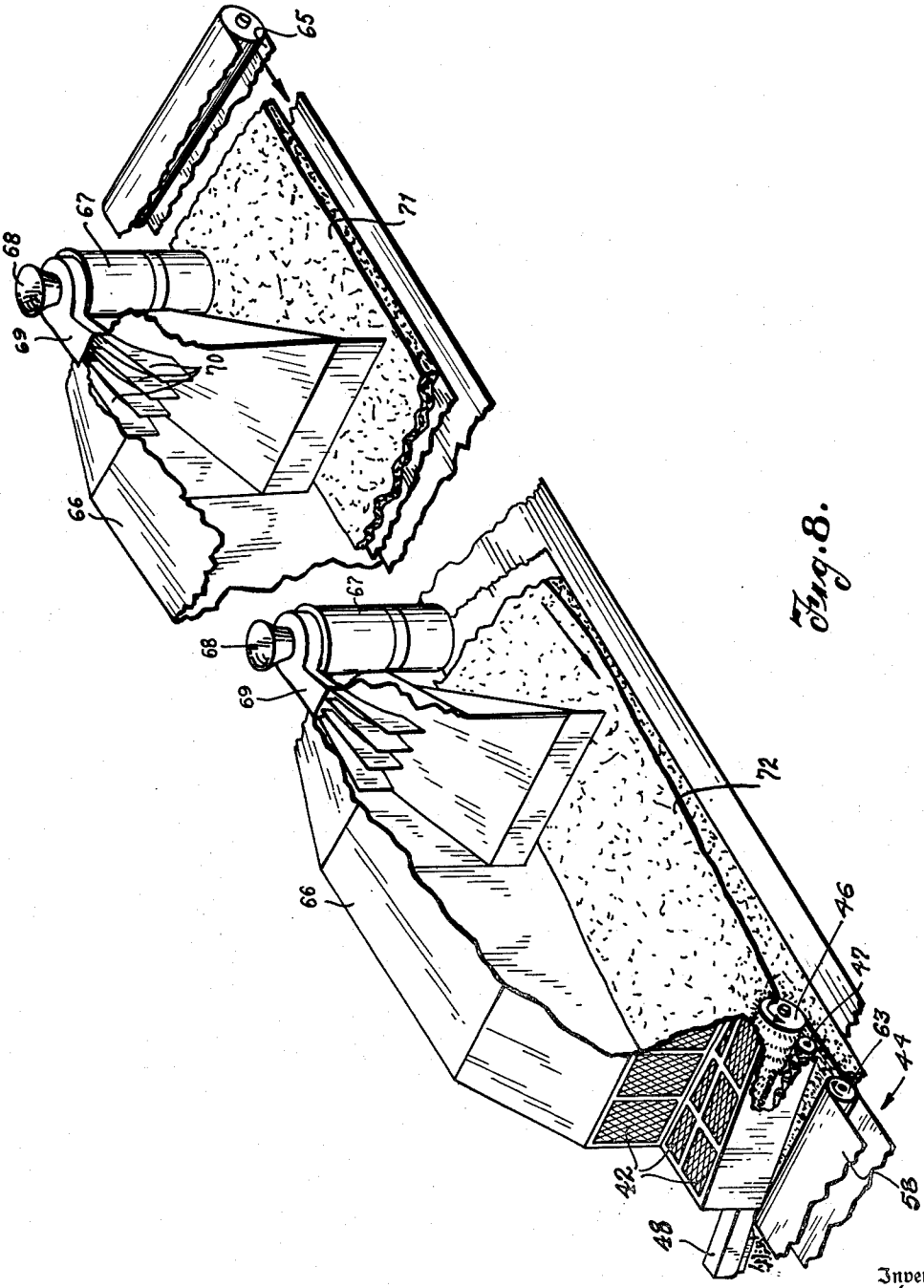


Fig. 8.

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WEB OR MAT FORMING DEVICE

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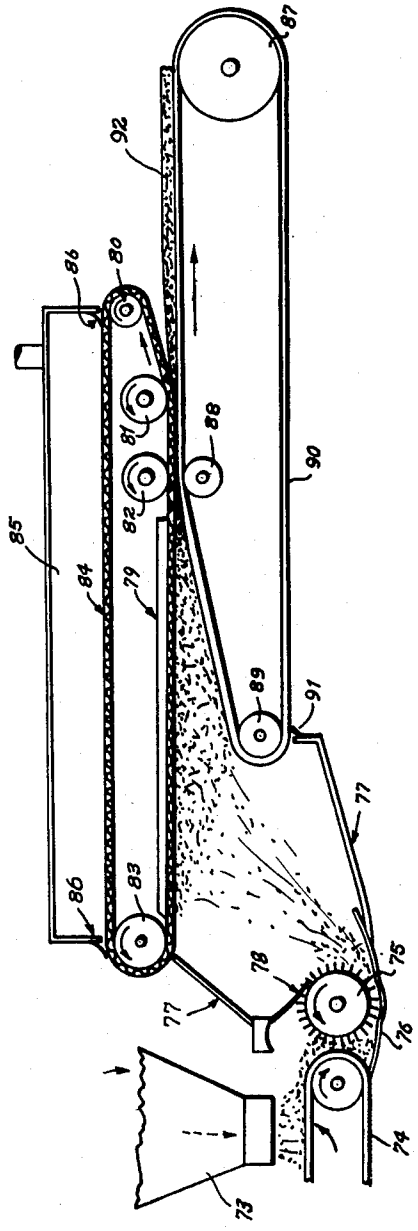


Fig. 9.

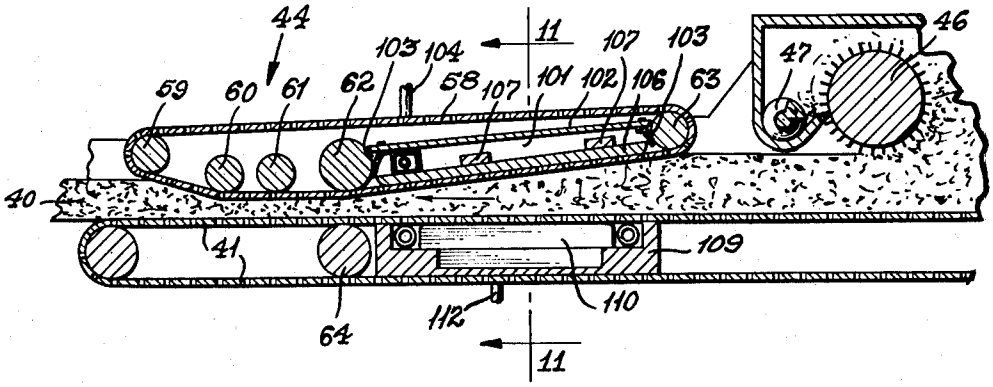
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WEB OR MAT FORMING DEVICE

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Fig. 10.



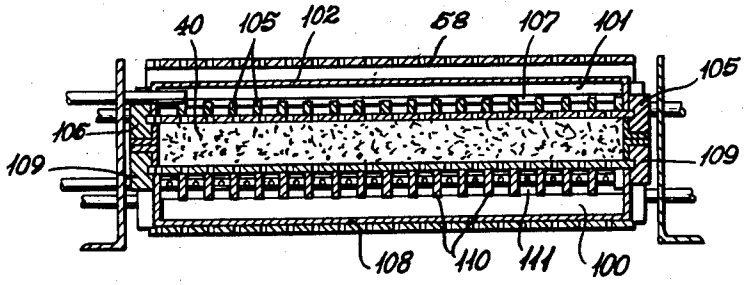


Fig. 11.

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Patented Apr. 21, 1953 2,635,301

UNITED STATES PATENT OFFICE

2,635,301

WEB OR MAT FORMING DEVICE

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Application September 30, 1948, Serial No. 51,938

3 Claims. (Cl. 19—156)

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This invention relates to a mat or web forming device and more particularly to a device for providing or laying up a mat of lignocellulose material. Such lignocellulose material may be such annual products as straw, sugar cane, corn stalk, and the like. However a most suitable product is the fiber obtained from trees and hereinafter reference will be made to wood fibers but it is to be understood that this term is being employed as illustrative of lignocellulose materials and not as a limitation.

There are a number of mechanical grinders or fibrators on the market today to grind or provide fibers from wood products. These are sold under various trade names by various companies. By way of illustration, suitable devices are sold by companies generally known as: Bauer, Allis-Chalmers, Sprout-Waldron, Sutherland and Robinson Mfg. Co. These grinders are preferably fed with steamed or chemically treated chips and mechanically fibered wood is exhausted in a continuous process.

It is an object of this invention to take such mechanically fibered wood products and lay them up in a mat or web so that they can be pressed to form hardboard products. Generally, a suitable binder is admixed with the wood fiber so that the final products will have the desired cohesion between the aggregate particles. A typical binder giving desired results is a thermoset type such as a phenol-aldehyde which sets up under the desired heat and pressure. The type of binder indicated is the type that is commonly employed in the plywood industry to adhere together the various veneers which make up the plywood panel. This type of adhesive is employed where there is so-called hot-pressing of the panels or plywood. As the present invention does not involve any particular adhesive, only one type of the many adhesives which may be employed is described and that by way of example.

While the thickness of the mat to be provided will vary with the material employed and the nature of its treatment, it can be stated that in a general way a mat from about 5 to 8 inches thick is provided if a finished hardboard having a thickness of approximately a quarter of an inch is desired. It is an object of this invention to intermesh or intertwine the various individual fibers so that a substantially uniform mat or web is provided to provide the desired strength to the final hardboard product.

As this invention is particularly useful in connection with providing a web or mat, it is an

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object of this invention to provide a relatively traveling supporting means and means to toss unmatted wood fibers into the air and allow the same to descend by gravity or to be urged toward the relatively traveling belt by reasons of a vacuum means and lay up a web or mat on the supporting member and to provide a web or mat of a desired thickness.

It is a further object of this invention to provide a mat where a relatively slight longitudinal angle is provided during formation of the mat, so that there will not be too steep an incline to the mat as it is being formed. This eliminates balls of material being formed which, if formed, can roll down and ruin the uniformity of the mat.

As an illustration, a mat to be formed for making a hardboard will be in the nature of approximately 8 feet long, four feet wide, and a thickness of approximately 5 to 8 inches. Obviously, the dimensions given are determined by the desired dimensions of the end product but they are illustrative of a type of mat to be formed.

It is a further object of this invention to provide a traveling surface, such as a cylindrical surface, or an oval surface, or a caterpillar type endless moving bed, with tines thereon so that matted wood fiber can be unmatted and air separated to provide a felt or mat of substantially uniform thickness and wherein the individual fibers are intertwined and matted to provide a mat of substantial strength and uniformity to the end of obtaining the greatest strength in the final hardboard product.

It is a further object of this invention to provide such traveling tines in combination with adjustable restricted passageways so as to adjust the volume of wood fibers which are fed to a relatively moving supporting means therefor on which the mat is being laid up.

It is a further object of this invention to provide comb means in association with said tines so as to adjust the throw or tossing of the fibers in their air separation.

It is a further object of this invention to provide deflector vane means disposed in the flow of wood fibers as said fibers are being air separated and to thus control the height or thickness of the mat crosswise considered.

It is a further object of this invention to provide a diverging discharge chute for the unmatting driven tines to minimize the length of the rotor supporting the tines. By shortening the length of the unmatting rotor, the same is suit-

able to high speed work and the quality of the mat produced thereby is increased.

It is a further object of this invention to provide a mat of an initial thickness slightly greater than that finally desired and to scrape off or remove a portion of the upper surface thereof to produce a final mat of a predetermined uniform thickness.

It is a further object of this invention to provide a traveling scraper, which may be in the nature of a traveling endless band or a driven rotor in combination with a conveyor, which may be in the nature of a screw type conveyor or an endless traveling belt.

The above mentioned general objects of this invention together with others inherent in the same are accomplished by the devices set forth in the accompanying drawings throughout which like reference numerals indicate like parts:

Figure 1 is a perspective view, with parts broken away, of a device embodying this invention;

Fig. 2 is a fragmentary view, partly in section and partly in elevation, and on a larger scale than Fig. 1 showing an unmatting rotor and a fragment of associated parts;

Fig. 3 is a view somewhat similar to Fig. 2 showing a modified form of an unmatting rotor that may be employed in this invention and substituted for the corresponding parts shown in Fig. 2;

Fig. 4 is a fragmentary view partly in elevation and partly in section and on a larger scale than Fig. 1 and showing the mat scraper member and some of the parts associated therewith;

Fig. 5 is a fragmentary perspective view illustrating a modified form of a mat scraping means employed to remove excess material over a predetermined thickness of mat;

Fig. 6 is a fragmentary plan view taken substantially on broken line 6—6 of Fig. 2;

Fig. 7 is a fragmentary elevational view, taken substantially on broken line 7—7 of Fig. 2;

Fig. 8 is a perspective view, with parts broken away, of a device embodying a modified form of this invention;

Fig. 9 is a somewhat schematic view with parts in elevation of a still further modified form of this invention;

Fig. 10 is a longitudinal sectional view, with parts in elevation, taken through a precompressor 44 of Fig. 1 and showing details omitted from Fig. 1 in interest of clarity; and

Fig. 11 is a sectional view taken substantially on broken line 11—11 of Fig. 10.

Referring now to Fig. 1 of the drawings, a housing 10 is employed. Ground fiber is delivered to the device from the inlet conduit means 11. This device is designed for continuous production and the capacity of the device should be coordinated or synchronized with production of fiber from a grinder or grinders so that the grinder output is slightly in excess of the amount of material to provide a mat of a given thickness. Thus the inlet conduit 11 is connected to the desired size of grinder or the desired number of grinders.

Alined with inlet conduit means 11 to receive material exhausting therefrom is a conveyor means 12 (see also Fig. 2). The conveyor 12 delivers wood fiber to rotor 13 either under said rotor 13 as shown in Figs. 1 and 2 of the drawings or over said unmatting rotor 13 as indicated in Fig. 3 of the drawings.

While the rotor 13 is shown as a cylindrical member having a plurality of projecting tines 14 on its periphery, it is to be understood that spiders may support the cylindrical surface which mounts the tines 14 or an endless track of the caterpillar type may be employed to mount said tines 14 as a mechanical equivalent of the cylindrical member 13. The tines 14 are disposed in a succession of circular paths for purposes which will be described.

Referring now to Fig. 6 which is a fragmentary view taken substantially on broken line 6—6 of Fig. 2, a comb 15 has teeth 16. The teeth 16 scrape rotor 13 and the space between the teeth 16 provide a passageway for tines 14 to travel therethrough. The purpose of the comb 15 is to prevent discharge of material out of the housing 10.

If it is desired to enclose all parts of the rotor 13, then a cover 17 and screen means 18 are employed (see Fig. 2). The purpose of screen means 18 is to vent out any air under pressure caused by reason of the movement of the rotor 13 in the space directly below the cover 17.

Another comb 19 having teeth 20 confines the wood fiber therebelow. An arcuate plate 21 is disposed in spaced relation to the under side (as shown in Fig. 2) of the rotor 13. Preferably the plate 21 is angularly movable toward the rotor 13 and is also movable with the conveyor 12 away from the rotor 13. This may be accomplished by providing a plate 22 at each end of the machine and each plate 22 rotatably supports the cross shaft 23 of the conveyor means 12 and also pivotally supports, by pivot means 24, one end of the plate 21. The plate 22 is provided with a keyhole slot 25. The plate 22 is connected to the main housing by reason of a cap screw 26. Thus when cap screw 26 is loosened, the plate 22 and parts carried thereby may be moved relatively to the rotor 13 and the desired size of throat between the rotor 13 and the arcuate plate 21 may be obtained. The end portion 27 of the plate 21 (see Fig. 7) is secured to the main frame or housing 10 by nut and bolt means 32 operating in a keyhole slot in the main housing 10, so that the plate 21 can be adjusted about the pivot means 24 (see Fig. 2) and can also move with the plate 22 and after a desired adjustment has been made, then the portion 27 can be again secured to the main frame or housing 10 and a desired adjustment which has thus been made can be maintained.

Preferably an arcuate plate 28 is pivoted to the plate 21 by pivot means 29. A desired angular position between plate 28 and plate 21 may be obtained by proper adjustment of the set screws 30 which are threaded in the plate 28. The plate 28 carries a comb 31.

As shown in Fig. 7, which is a fragmentary view looking in the direction of the arrows 7—7 of Fig. 2, the comb 31 scrapes the surface of the rotor 13 between the alined tines 14 and the space between the teeth of the comb 31 permits travel of the tines 14 therethrough. The comb 31 projects through an opening in the plate 21 so that the comb 31 can be moved radially toward and away from the rotor 13.

The purpose of the comb 31 is to provide resistance to the discharge of fibers from the rotor 13 as fibers are pulled through the openings between the teeth of the comb 31. They will be unmatted thereby and positive means is provided to prevent a ball or mat of fibers from being discharged from the rotor 13. It is desirable that the fibers be unmatted and discharged as single fibers so that by air separation the fibers can be

caused to form a mat in which the individual fibers are intertwined and thus we have stability and interweaving of the fibers in forming the mat. Under many circumstances the comb 31 will be adjusted so as to be inoperative and the size of throat between rotor 13 and plate 21 will control the unmatting of fibers.

Instead of discharging the fibers below the rotor 13 as is indicated in Figs. 1 and 2 of the drawings, they may be discharged over the rotor 13 as is indicated in Fig. 3 of the drawings. In Fig. 3 of the drawings, a plate 33 is employed which plate will be used in place of cover 17 and screen means 18 and bolted to the main frame or housing 10. The plate 33 has an arcuate shape portion 34 which forms a throat or passageway between such portion 34 and the rotor 13. The size of the throat between the portion 34 and the rotor 13 may be adjustable as indicated with the under feed as shown in Fig. 2. In the interest of simplicity, no adjustment is shown in Fig. 3 of the drawings for the arcuate shape portion 34 of the plate 33 in view of the showing of adjustable means in connection with the plate 21 of Fig. 2. Also a comb functioning similar to the comb 31 may be employed in connection with an over feed if desired.

As the wood fiber is being discharged from the rotor 13, it passes between a plurality of fiber directing vanes 35. The vanes 35 which are shown in Figs. 1 and 2 of the drawings are of a shape so that the discharging wood fiber from the rotor 13 strikes an arcuate portion 36 and thus the material does not tend to hang on the vanes. The vanes 37 shown in Fig. 3 of the drawings are of slightly different shape but again the vanes 37 are provided with an arcuate portion 38 for the same purposes as the arcuate portion 36 of the vanes 35.

As appears in Fig. 1 of the drawings, the vanes 35 diverge outwardly similar to the throat portion 39 of the housing 10.

It has been found desirable to employ a rotor 13 having a length less than the width of the mat 40 being formed. When the rotor 13 is short, it is more suitable for high speed work and at high speed it has an output to provide a thickness of mat 40 greater than desired for hard board of the same width as the rotor 13 and hence the reason for the throat 39. Furthermore, if vanes 35 are employed, greater control obtains for providing a mat 40 of substantially uniform thickness crosswise considered.

In Fig. 1 of the drawings, the side walls of the housing 10 are broken away in the interest of clarity. However, the side walls of the housing 10 act as side guides against which the mat 40 is laid up. Thus the vanes 35 can be shaped so that a suitable amount of material is laid up at the sides as well as at the middle of the mat 40 crosswise considered.

The bottom of the housing 10 is provided with a relatively moving member on which the mat 40 is laid up. This may be readily accomplished by providing a conveyor means 41 which functions as the bottom of the housing member 10. Thus we have a relatively moving member on which a mat is laid up which relatively moves so far as the source of wood fibers being delivered from the rotor 13 is concerned. The various fibers which are provided by mechanically fibering or grinding wood are heterogeneous. They are different in weight and are different in size. Thus they will be tossed different amounts by the rotor 13—some will be tossed further than others. The mat 40, as it is formed, has its upper surface angularly inclined upwardly, longitudinally considered, as respects its bottom surface and with the apex of the angle toward the rotor 13. If this angle is too great then there will be a tendency for balls of wood fiber to be formed which will roll downwardly on the top of the mat 40 and generally in a direction toward the rotor 13 and if we have any balls so formed, an imperfect mat is formed. However, where the rotor 13 is driven at relatively high speed such as in the neighborhood of three thousand R. P. M., there will be such a difference in the rate of travel of the individual fibers that the fibers in falling down, give much the same appearance as a snow storm. This prevents too steep a longitudinal angle of the mat 40 and very satisfactory results obtain.

As there is considerable turbulence of air in the housing 10 due to the rotation of the rotor 13, preferably screen means 42 is provided to exhaust air from within the housing 10. Also the top of the housing 10 decreases in height as the distance increases from the rotor 13 to thus generally follow the path of the falling wood fibers. As shown, the various portions of the top of the housing 10 are inclined, however, an arcuate shape may be employed if desired.

In order to insure a mat of a predetermined and uniform thickness, preferably the mat is formed to an initial thickness over that desired and then the excess over the predetermined thickness is scraped off or removed. In Figs. 1 and 4, the scraper device comprises a driven rotor 46 and a driven screw conveyor 47. A trough 48 cooperates with screw conveyor 47 so that materials being moved by the screw conveyor 47 will be delivered from right to left as viewed in Fig. 1 of the drawings and to a suitable discharge means. The rotor 46 may be similar in construction to the rotor 13 and is provided with a plurality of tines 49 disposed in a plurality of successive circular paths. Also a scraper or comb member 50 is provided which may be similar in construction to either of the members 15 or 19 (see particularly Fig. 6 of the drawings for details of comb 15). The rotor 46 throws the wood fiber backwardly and upwardly and those fibers going upwardly ride over the top of the rotor 46 and down comb member 50 to the driven screw 47 and then are discharged to the left of the machine as viewed in Fig. 1 of the drawings. From the conveyor 47, wood fiber can then be moved by any appropriate conveyor means and returned to the inlet conduit means 11.

Preferably, the rotor 46 and the screw 47 are not directly crosswise of the mat 40. They are at a slight angle thereto and the discharge end of the rotor 46 is further away from rotor 13 than is the other end of said members. Thus grooves which have a tendency to form by reason of the tines 49 on the rotor are in effect wiped out and a more uniform surface obtains on the mat 40 as it leaves the rotor 46. Also if there are any voids, this angular position of members 46 and 47 moves sufficient material to fill in voids. The rotor 46 is positioned in vertical spaced relation to the top lap of the conveyor means 41 so that the lowermost portion of the path of travel of the tines 49 determines the final thickness of mat. Thus, if the device is designed to make more than one thickness of mat, the rotor 46 must be mounted for relative vertical adjustment as respects the top lap of the conveyor 41.

Referring now to Fig. 5 of the drawings, which shows a fragmentary perspective view of a modified form of scraper means which may be used in place of the scraper means just described in connection with Fig. 1, the main housing or frame 10 is given the same number as in the previous figures. Also the conveyor means 41 is given the same number. The housing 10 is is provided with a wall 51 which is in spaced relation to the upper lap of conveyor means 41 and the spacing is the same as the thickness of the final mat 40. A driving pulley 52, connected to a source of power not shown, and a driven pulley 54 support a conveyor belt 53. This conveyor belt may be formed of metal or it may be a conveyor belt having a metallic edge portion 55. The upper lap of the conveyor belt 53 travels in a trough 56. The edge 57 of the conveyor belt 53 rides in close proximity to the inner surface of the wall 51 and at an elevation in alinement with the lower edge of said wall 51. As the mat 40 passes under the top lap of the conveyor belt 53, edge 55 functions to cut off any excess surplus material in the mat 40 over a given predetermined thickness and such excess material is removed by the belt conveyor 53. The belt conveyor 53 thus functions as a cutter and as a conveyor belt. Preferably, there is thus employed a combination cutter and conveyor belt. However, if it is desired to use two members instead of one, then a traveling or a reciprocating cutter knife would be employed instead of the cutting edge 55 of the conveyor belt 53 and the same would be followed by a suitable conveyor belt or other type of fiber removing means to remove fibers cut off from the mat 40 over a predetermined thickness. Fibers discharging from the trough 56 may be returned to the inlet conduit means 11.

If the mat is to be later pressed in a hot press, it is desired to provide a precompressor so as to decrease the necessary opening of the press to receive the mats 40 to be pressed. As illustration of precompressor, we have shown the precompressor 44 which operates on the mat 40 after it leaves the scraper, either that shown in Figs. 1 and 4 of the drawings or that shown in Fig. 5 of the drawings. This precompressor 44 may comprise an endless traveling belt 58, a driving roll 59, and a plurality of driven rolls 60, 61, 62, 63 and 64. Preferably, the conveyor belt 41 is supported by a driven roll 64 at the point of greatest pressure between the conveyor belt 58 and the upper lap of the conveyor means 41. The chamber provided between the conveyor belt 58 and the conveyor belt 41 gradually decreases to the point of greatest pressure where rolls 62 and 64 are opposite each other. The rolls 60 and 61 provide holding of the same size chamber provided between rolls 62 and 64 and then the chamber opens between roll 60 and roll 59.

The various parts of the precompressor 44 which have been described are illustrated in Figure 1 of the drawings and other portions of the precompressor are shown more in detail in Figs. 10 and 11. The traveling belts 41 and 58 are preferably foraminous or perforate belts so that steam from steam chests 100 and 101 may pass through said belts and contact the mat 40. It has been found that there is less spring-back if a mat has its fibers subjected to heat and moisture, and hence greatest utility of the precompressor 44 obtains if it is applied as indicated by the details thereof in Figs. 10 and 11.

The steam chest 101 comprises an upper wall 102 which wall 102 is sealed at its ends by sealing means 103 against rolls 62 and 63. The steam chest 101 is connected to a source of steam under pressure by conduit 104. In order to prevent escape of steam laterally end sealing means 105 are employed (see particularly Fig. 11). Within the steam chest 101 are a plurality of laterally spaced grids 106 which are supported by cross braces 107. From this construction steam passes downwardly from steam chest 101 into mat 40 and can only escape by passing through a portion of said mat 40. Thus the upper surface of the mat 40 can be subjected to heat and moisture.

Preferably the lower side of mat 40 is also subjected to heat and moisture and the parts of the steam chest 100 are similar to parts employed in connection with steam chest 101. The steam chest 100 comprises a lower wall 108, end sealing means 109, a plurality of laterally spaced grids 110, cross braces 111 and steam entrance conduit 112.

While the mat 40 may be subjected to heat and moisture by subjecting the same thereto at other locations or by forming the mat from steamed fibers, it is found most desirable to associate the steam heating step at the location of the precompressor 44.

In laying up a mat and then precompressing it, as has been described, plates may be laid on the conveyor 41 and a unit or section of mat may be laid up on each plate. However, our device has been designed for continuous operation and hence means will be provided to transfer the laid up mat as it leaves our machine for further processing. As the transfer means, which picks up the precompressed mat as it leaves our machine, forms no part of this invention nor the types of presses which press the mat, they are not further described.

Referring now to the form of the invention shown in Fig. 8 of the drawings, the conveyor 65 forms the bottom wall of a housing 66 and such parts correspond respectively to conveyor 41 and housing 10 of the previous figures. In Fig. 8 of the drawings, the main distinction between the construction there shown and that previously described is that the material is laid up as a mat as it is discharged from the grinders. As illustrative of the plurality of grinders, there is shown grinders 67. Wood chips are delivered into the inlet conduit of the grinders 67 at a predetermined rate of flow which will be determined by the rate of travel of the conveyor means 65, the desired thickness of mat, and the capacity of the grinders 67. As the product is at its greatest rate of density before entering the grinders 67, it is desirable to control the capacity of the device at the grinders. This is obviously also true of the construction shown in the previous figures.

Grinders to provide mechanical wood fibers generally have a relative speed of substantially thirty-six hundred revolutions per minute between the cutting plates. With this relative speed, the wood fibers that are thrown out of the discharge chutes 69 obtain a relatively high rate of travel and may be tossed for air separation much like they are tossed by the rotor 13 of the previous figures. In the form of the invention shown in Fig. 8, there is employed a plurality of grinders 67 and each lays its own layer of the mat as the traveling belt 65 provides relative motion between itself and a plurality of alined grinders. The means for distributing, crosswise considered, the wood fibers that are being discharged from a given grinder embody

vanes 70 which function similarly to the vanes 35 and 37 of the previous figures. In other words, the layer of mat 71 is laid up by the first grinder and successive layers are laid thereon by successive grinders until the mat reaches the grinder which is last in the series, and then there is a mat 72 which corresponds to the felt 40 just before it reaches a scraper means.

As the scraper means employed in connection with Fig. 8 of the drawings may be identical with those previously described, a fragment of the scraper means shown in Fig. 1 is illustrated and the parts shown are given the same numbers in Fig. 8 as they are given in Fig. 1. Also, as the same precompressor may be employed in connection with the construction of Fig. 8, a fragment of a precompressor is shown and the parts indicated are given the same numbers as in Fig. 1 of the drawings. Thus, in the interest of brevity, only fragments of parts of the previous figures are illustrated in Fig. 8 and where shown are given the same numbers as in the previous figures to incorporate the same by reference.

Referring now to the form of the invention shown in Fig. 9 of the drawings, hopper 73 represents a source of wood fiber to be laid up as a mat. Wood fiber is delivered from the hopper 73 to the belt of the conveyor 74, a fragment of which is shown. The rotor 75 is driven by means not shown and is similar in construction to the rotor 13. An arcuate baffle plate 76 is disposed below the rotor 75. The arcuate baffle plate 76 may be adjustable as disclosed in connection with the plate 21 of Fig. 2, but such details of course do not relate to the novelty of the construction of Fig. 9 and hence are not shown. Fragments of the housing 77 are somewhat schematically shown. A comb 78 functions similar to the comb 19 of Fig. 2. A perforate grid 79 is disposed in the path of travel of wood fiber being discharged from the rotor 75. A traveling conveyor comprises a driving roll or sheave 80 (connected to a source of power not shown), driven rolls or sheaves 81, 82, 83, and perforate or screen-like endless belt 84.

A vacuum is provided through the lower lap of the belt 84 and this may be accomplished by providing a vacuum chamber 85, connected to suitable pumping means not shown, and sealing means 86 between the walls forming the vacuum chamber 85 and the belt 84.

A second conveyor comprises driving roll or sheave 87 (connected to a source of power not shown), driven rolls or sheaves 88 and 89, and an endless belt 90. Preferably sealing means 91 are provided between the housing 77 and the belt 90. The sealing means 86 and 91 may be in the nature of packing to prevent the passage of air therepast.

As the wood fiber is tossed by rotor 75 into the air and in a direction toward the grid 79 it is retained against the belt 84 because of the vacuum means. A negative pressure is provided which will be sufficient to retain the desired thickness of mat on the underside of the belt 84. The vacuum may be adjusted to produce mats of different thicknesses as desired. As the upper lap of the belt 90 and the lower lap of the belt 84 travel to the right, as viewed in Fig. 9, the mat is progressively moved in the same direction. Due to the fact that the said laps of said belts converge toward each other as they approach driven rolls 82 and 88, there is a precompressor at such area. The point of greatest pressure will be between driven rolls 82 and 88. Driven roll 81 maintains this pressure for a desired period which is determined by the spacing between rolls 81 and 82. Thereafter the bottom lap of belt 84 diverges away from the top lap of belt 90 and there is thus formed a precompressed mat 92. The precompressed mat 92 is delivered from conveyor 90 to any suitable place similar to that described in connection with the preceding forms of our invention.

An advantage of the form of the invention illustrated in Fig. 9 of the drawings is that the thickness of mat may be adjusted by adjusting the minus pressure provided in vacuum chamber 85 and in turn against the lower lap of the perforate conveyor belt 84. The minus pressure is self adjusting due to the mat building up thicker on one portion of the mat causing less air passage at that portion and in turn the slowing of the building up of the mat at such portion. This eliminates the need of scraping or removing excess material to provide a mat of a given thickness.

Throughout the various forms of the invention the conveyor belts, as 41 of Figs. 1, 4, 5, conveyor belt 65 of Fig. 8, and conveyor belts 90 and 84 of Fig. 9 may be driven at variable speeds to control the thickness of a mat if wood fibers are being provided at a variable rate. However, it has been found preferable to run the various conveyor belts at a uniform speed and to control the amount of wood fiber that is being delivered by control of the amount of chips that are being delivered to the grinders. As previously indicated, there is the greatest density of product at this location and hence the more practical it is to provide controls at such location.

From the various foreging illustrations of devices embodying the invention, it is obvious that there is provided a plurality of traveling tines, as the tines carried by rotors 13 or 75. The mechanically obtaind wood fibers are a heterogeneous mass. They are not of uniform mass or dimension. When these fibers are tossed in the air either by the said tines or by the grinders 67 of Fig. 8, they are thrown unequal distances and directions. By having them tossed at relatively high speed, the difference in the mass and size of individual fibers causes them to travel unevenly. As they fall or as they are thrown upwardly, the appearance within the housing is much like that of a snowstorm. By providing individual fibers, and which are being air separated, they form a mat which is well intertwined and is very self-sustaining. As the mat 40 is being formed on the relatively traveling conveyor, such as 41 of Fig. 1, its upper surface is at a small longitudinal angle to the conveyor. In other words, the mat 40 slopes gradually upwardly from its initial end as it approaches the scraper rotor 46. If the angle is too steep, then the fibers tend to roll down an incline and a mat is ruined because the fibers in a ball cannot be intertwined and intermatted with the other fibers in the mat. It has been discovered that if the fibers are not thrown at a high rate of speed, so that advantage can be taken of their difference in mass and difference in dimensions, a good uniform mat is not produced. Thus, the process of forming the mat by tossing the heterogeneous fibers violently in combination with the relatively moving mat supporting means is also a part of the invention.

Other features of the invention have been described in the foreging specification and are inherent in the appended claims.

Obviously, changes may be made in the forms, dimensions, and arrangement of the parts of the invention without departing from the principle thereof, the above setting forth only preferred forms of embodiment.

We claim:

1. A mat forming device comprising a housing; a plurality of traveling tines disposed at an upper end portion of said housing; feeding means for delivering fibrous material into the path of said tines to unmat said fibrous material and toss the same in a direction toward the other end of the housing; a relatively traveling mat supporting member disposed below said tines and constituting a bottom for said housing; and a plurality of deflector plates providing a plurality of spaced apart passageways therebetween and disposed in relatively close proximity to said tines and distributing fibers crosswise of the housing to form a mat of substantial uniform thickness, crosswise considered, said plates extending longitudinally of the housing.

2. A mat forming device comprising a housing; a plurality of traveling tines disposed at an upper end portion of said housing; feeding means for delivering fibrous material into the path of said tines to unmat said fibrous material and toss the same in a direction toward the other end of the housing; a relatively traveling mat supporting member disposed below said tines and constituting a bottom for said housing; and a plurality of deflector plates disposed in relatively close proximity to said tines and distributing fibers crosswise of the housing to form a mat of substantial uniform thickness, crosswise considered, said deflector plates being relatively thin members and extending longitudinally of the housing and having an arcuate edge surface portion which substantially follows the path of travel of the fibers at that location.

3. A mat forming device for forming a mat of mechanically obtained heterogeneous wood fibers comprising an elongated housing of substantial heighth; a driven drum disposed at an upper end portion thereof; a plurality of tines projecting from said drum and adapted to toss fibers in the air at relatively high speeds so that their differences in mass and weight will cause them to move different distances and directions; a plate member disposed in close proximity to the peripheral path of the tines projecting from said drum, said plate member extending from said housing and converging toward said drum to provide a gradually diminishing passageway for wood fibers up to the location where the fibers are tossed by said tines; feeding means for delivering wood fibers into said passageway and into the path of travel of said tines; and a traveling conveyor disposed below said tines at a substantial distance to allow wood fibers to fall, after air separation, on said conveyor and form a mat of wood fibers thereon.

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