June 6, 1950 C. G. JOA 2,510,229

BAT FORMING MACHINE AND METHOD

Filed April 19, 1948 3 Sheets-Sheet 1

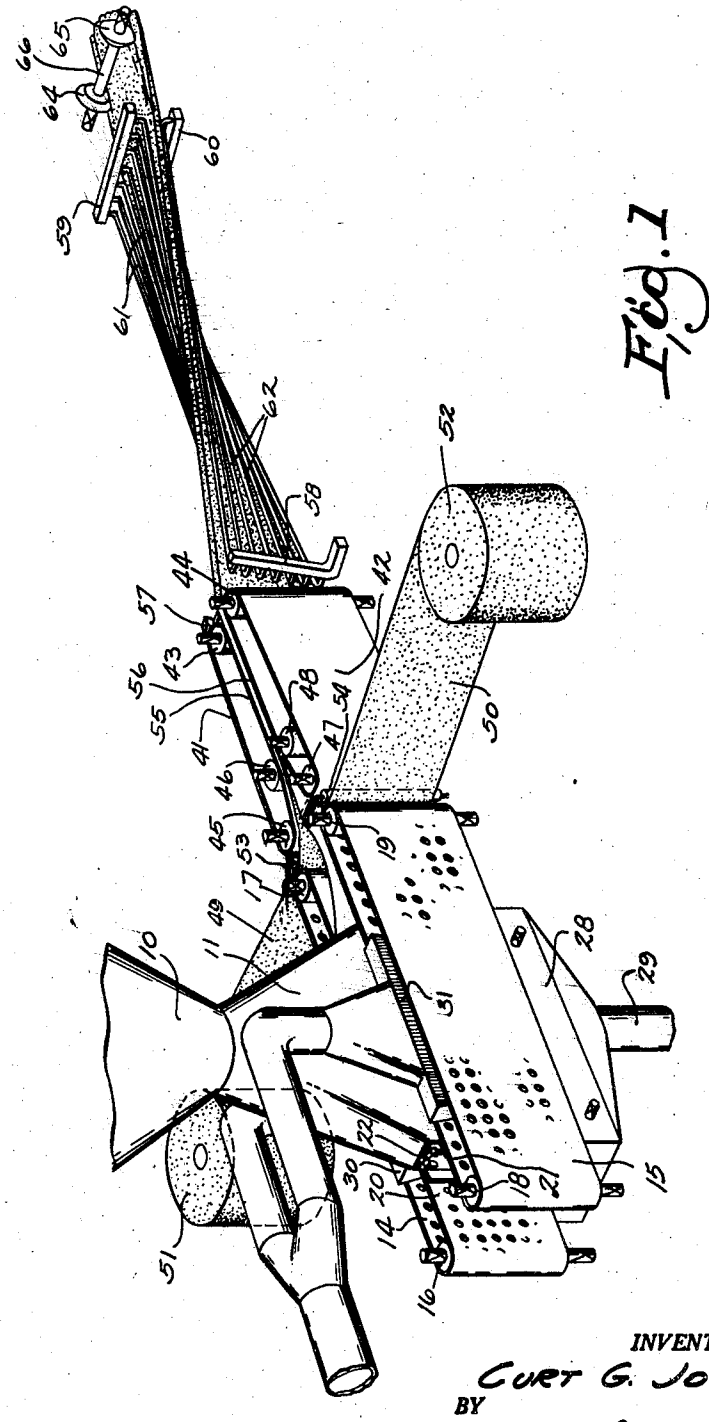


Fig. 1

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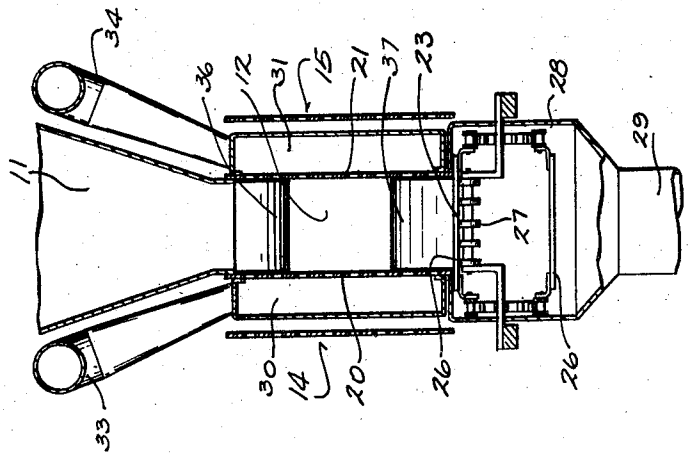


Fig. 3

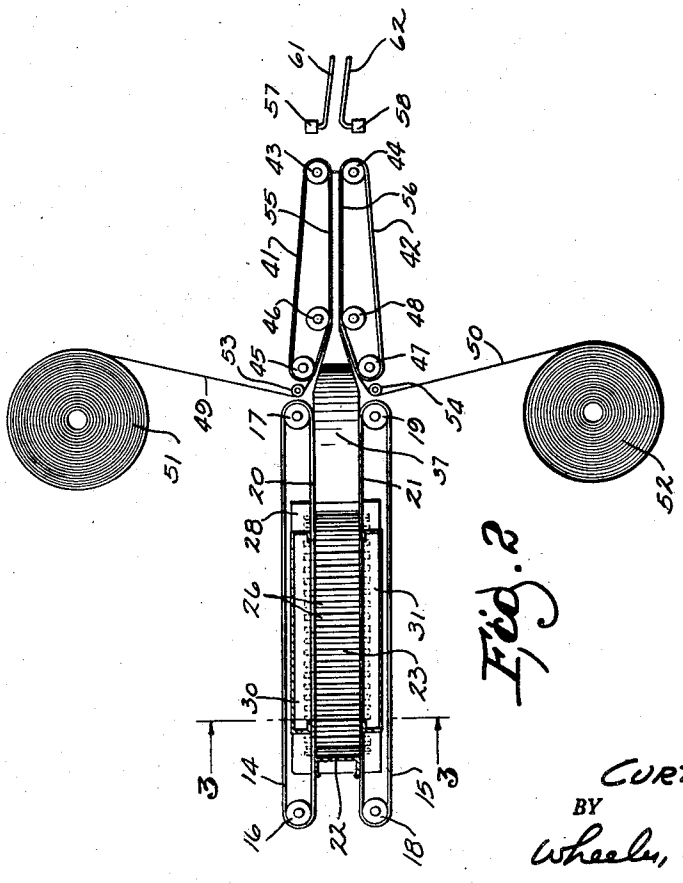


Fig. 2

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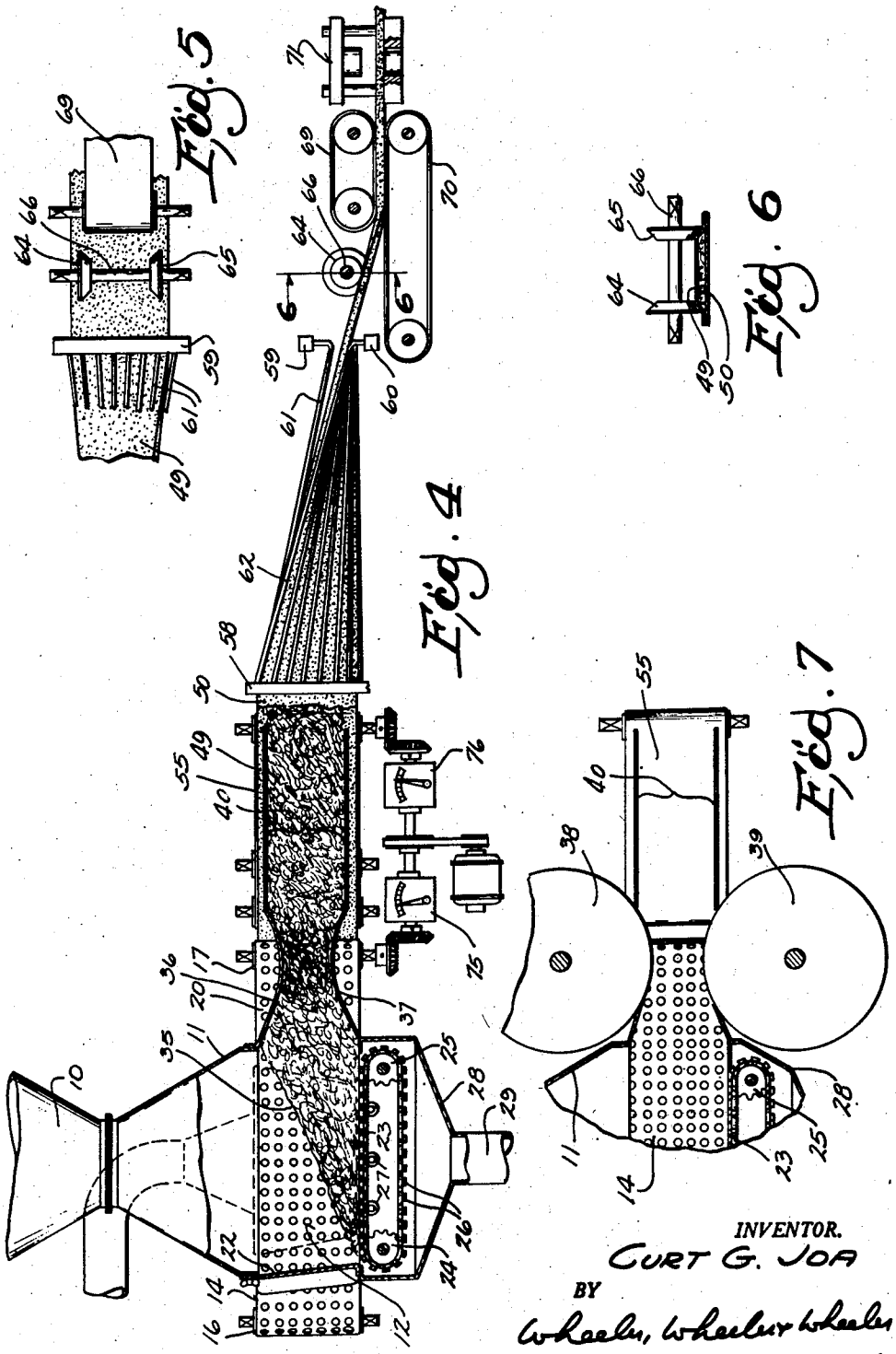


Fig. 4

Fig. 5

Fig. 6

Fig. 7

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BAT FORMING MACHINE AND METHOD

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Application April 19, 1948, Serial No. 21,793

22 Claims. (Cl. 154—29)

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This invention relates to a method and apparatus for the continuous on-edge assembly of a bat of wood fiber or the like. The present invention represents an improvement on the device disclosed in Curt G. Joa Patent 2,282,477 of May 12, 1942.

It is a primary object of the invention to provide better control of the density of the bats and to improve and simplify the apparatus involved and to provide a method whereby a bat can be constructed at lower cost than has heretofore been possible. These objectives are best achieved, in our experience, by assembling the bat on edge in a vertical plane and thereafter turning it to a horizontal position for delivery. It may later be die-cut into pads, as for assembling in sanitary napkins.

It is a further important object of the invention to minimize the amount of air circulation required in an apparatus of this character and to minimize the amount of wood fiber or cellucotton which must be re-circulated in the course of the practice of the method.

Other objects of the invention will be apparent from the following disclosure and with reference to the accompanying drawings, wherein:

Fig. 1 is a diagrammatic view in perspective illustrating an embodiment of the invention.

Fig. 2 is a view partially in horizontal section and partially in plan through the apparatus shown in Fig. 1.

Fig. 3 is a view taken in cross-section on the line indicated at 3—3 in Fig. 2.

Fig. 4 is a view partially in longitudinal section and partially in side elevation of the apparatus shown in Fig. 1.

Fig. 5 is a fragmentary detailed view in plan of a portion of the device shown in Fig. 4.

Fig. 6 is a view taken in transverse section on the line 6—6 of Fig. 4 and illustrating in section the fragmentary portion of the apparatus illustrated in Fig. 5.

Fig. 7 is a view fragmentarily illustrating in longitudinal vertical section a modified embodiment of a portion of the invention.

As was explained in the above identified Joa Patent 2,282,477, commercial cellucotton or wood fiber is ordinarily supplied in an elongated and rather dense web which is commonly shredded, pulverized, or disintegrated to make up the loose pulp fiber material from which the bat of the present invention is to be formed.

From whatever source the loose fiber is derived, it is pneumatically conveyed to a conventional cyclone separator of which only the hopper

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portion 10 is here illustrated. The hopper portion 10 of the cyclone separator discharges the pulp fiber into a flattened funnel 11 which forms a top closure for a fiber depositing chamber having moving walls as will hereinafter be explained.

As diagrammatically illustrated in Fig. 1, a pair of foraminous belts 15 and 16 operate over spaced pulleys at 16, 17, and 18, 19. The adjacent runs 20, 21 of the two belts operate in the same direction and are spaced to comprise the opposite side walls of the flat, elongated chamber in which the pulp fiber is deposited.

The space between the two belts is closed at the rear by a flanged back plate 22.

The bottom of the pulp-depositing chamber comprises a slatted conveyor 23 comprising a pair of spaced chains operating over sprockets 24, 25, and connected by the cross slats 26 (see Fig. 4). Between the sprockets the chains are desirably supported in some manner, as by the idler rollers 27. This entire conveyor system is conveniently enclosed in a vacuum chest at 28 connected by pipe 29 with an evacuator.

Other vacuum chests at 30, 31, are disposed between the runs of the foraminous lateral belts 15, 16 and are respectively connected with an evacuating air-blower or pump by pipes 33, 34, these being disposed at each side of the funnel 11. This completes a chamber 12 substantially rectangular cross-section and of elongated form as clearly appears by comparison of Figs. 2 and 3. As the fiber is separated in the cyclone and delivered through the funnel 11 into the top of this chamber, the fiber accumulates on the moving conveyor 23 between the correspondingly operated side belts 15, 16, and gradually increases in height as the belts move through the chamber, the result being that the top surface of the deposited fiber in the chamber tends to remain continuously at the angle indicated at 35 in Fig. 4. In other words, the full depth of the fiber to the top of the chamber is reached just as the fiber deposited therein is leaving the chamber area beneath the funnel 11.

As the fiber leaves the chamber, it is desirably compacted edgewise in the bat. This is desirably done either by stationary polished convex upper and lower throat plates 36, 37, as indicated in Fig. 4, or by means of correspondingly formed rolls 38, 39, as diagrammatically illustrated in Fig. 7.

Whatever the means employed, the throat reaches its maximum constriction in a vertical plane, while the paper or pulp fiber is still confined between the runs 20, 21 of the belts 14, 15.

By the time the vertically compressed bat reaches the point where the belts 14, 15 begin to diverge about the pulleys 17, 19, the deposited fiber is permitted to expand by passing the most constricted point of the throat. It continues to expand vertically and edgewise to any extent required by the elasticity of the fibers. This point will be reached while the bat is slightly narrower than the original vertical or edgewise dimension of the bat as initially deposited, the ultimate width of the bat being indicated by the bracket 40 in Fig. 4.

The take-away belts 41, 42, Fig. 2, operate over the driving pulleys 43, 44, and the idler pulleys 45, 46, 47, 48. Webs of tissue paper are supplied at 49 and 50, from the respective supply rolls 51, 52. These webs are guided over the idlers 53, 54, to enter between the idler rollers 45, 47, over which the belts 41, 42, operate. In effect, the tissue webs 49, 50, constitute constantly moving liners for the inner runs 55, 56, of the take-away belts 41, 42, but the webs are laminated to the bat and leave therewith.

It will be observed from Fig. 2 that the idler pulleys 46, 48, are slightly farther apart than the drive pulleys 43, 44, whereby the runs 55, 56 of the belts 41, 42, are progressively approaching more closely to each other. This gives the bat a compression in its transverse or thinnest dimension, following the compression it has previously received in its edgewise dimension in passing through the throat above described.

The vertical width of the webs 49, 50, is preferably slightly greater than that of the bat of fiber and may approximate the width of the fiber bat as initially deposited and prior to its edgewise compression (Fig. 4).

As the compressed bat, now laminated between the tissue webs 49, 50, leaves the constricting rollers 43, 44, about which the belts 41, 42, operate, the bat enters a twisting device which turns it from its initial vertical edgewise position to a horizontal position in the course of its continued movement. The twisting device comprises a pair of laterally spaced upright supports 57, 58, and a pair of transverse and vertically spaced supports 59, 60. First and second guide means initially vertically connected with the supports 57, 58, turn to horizontal for connection with the respective supports 59, 60, the turning movement being gradual and substantial parallelism being maintained between the guide means in the course of their change of position. While the guide means may take any desired form, I prefer to use parallel bars 61, 62, offset at their respective ends for connection with the respective supports and elsewhere parallel with corresponding opposing bars.

It will be remembered that the webs of tissue at 49, 50, are slightly wider than the intervening web of pulp fiber. In order to prevent any shifting thereof before the webs enter the die which blanks the napkin pads, I desirably employ the oppositely beveled rolls 64, 65, on transverse shaft 66.

So far as the present invention is concerned, the composite web is now complete and it makes no difference what ultimate use is made thereof. It may, for example, be passed through the feeding conveyors 69, 70, to the cut-off dies 71, diagrammatically shown in Fig. 4.

It will have been observed that the fiber comprising the bat of the present invention, is not delivered under pneumatic pressure to the apparatus but falls by gravity from the hopper 10 of

the separating cyclone. It is found through practical experience with the apparatus that the fibers deposited in the bat include practically all of the fibers pneumatically delivered to the cyclone, there being practically no return fiber picked up in the various vacuum chests which facilitate distribution of the fiber in the movable-walled chamber.

The belts 14, 15, which provide the lateral side walls of the chamber and the conveyor belt 23, which provides the bottom thereof, are moved at like speeds and the speed of operation thereof is approximately twice the speed at which the take-away belt functions. These speeds are subject to simultaneous or relatively variable control by means of suitable rate-changing transmissions diagrammatically illustrated at 75, 76, in Fig. 4. Assuming that the fiber is being delivered from the cyclone hopper 10 at a substantially constant rate, the density of the web of fiber can be varied by slowing down both sets of belts while maintaining their relative speeds. If the belts are both slowed down, the density of the resulting fiber web will be increased while if the belts are simultaneously accelerated a less dense web will be created. The amount of control that can be exercised over the density of the web by regulating the speeds of the belt is very exact, although the range is relatively small. If the belts are operated too slowly, the pulp is not taken away and the chamber will ultimately plug up. If the belts are accelerated too much, the chamber will not completely fill with the fiber and the web will be only partially filled at one side. Thus, where greater variations in density are required, these can be accomplished only by altering the amount of pulp delivered pneumatically into the cyclone separator and then adjusting the speed of the two belts accordingly. However, after approximate adjustments in the density of the web are made by controlling the quantity of pulp fed into the pulverizer and therefrom into hopper 10, the final adjustment in density is made by proper adjustment of the speed of the vacuum belts and the take-away belts respectively.

While the method of operation has already been described incident to the description of the apparatus, it will be briefly summarized as follows:

Continuously delivered fiber is constantly built up into a bat by edgewise delivery of the fiber into a confined space which, in practice, is preferably elongated vertically and in one horizontal direction and has very little thickness in the opposite horizontal direction. The bat formed by constant delivery of fiber edgewise into this elongated but thin space is constantly being removed from such space in the direction of its horizontal elongation and, in the course of its removal, is constricted edgewise in the plane of its thinnest dimension.

After the bat is constricted edgewise, it is permitted to expand edgewise to the full extent of the elasticity of its component fiber and is then introduced between two plies of tissue and is compressed transversely while being carried away at a reduced rate so that the arriving bat material is compressed longitudinally as well as in the edgewise and thickness directions.

Following compression or densification of the laminated bat comprising fiber and superposed webs of tissue, the resulting web is turned from its vertical edgewise position to a horizontal position in the course of its continued movement and is ultimately delivered as a complete product in

such latter position. In the course of such delivery, the outer plies of tissue are preferably marginally forced together outside of the marginal edges of the intervening web of fiber.

The movable walls and bottom of the chamber in which the fibrous material is confined during its initial deposit are preferably foraminous and subject to vacuum. The continued escape of air facilitates the dense deposit of the pump between such moving walls and bottom. The bat gradually increases in its edgewise dimension until it reaches the full height permitted by the chamber. It is after this that the edgewise compression occurs.

I claim:

1. A method of continuous manufacture of a wide, thin bat which comprises the continuous addition in an edgewise direction of increments to a continuously moving bat, and the withdrawal of the bat in a direction with respect to which said edgewise direction is transverse.

2. The method of claim 1 followed by the further step of edgewise compression of the bat.

3. A method of continuous manufacture of a wide, thin bat, such method consisting in the continuous addition in an edgewise direction of increments of fiber to fiber previously deposited, the continuous withdrawal of a web of bat material as such web reaches a desired width, the direction of withdrawal being in a direction to which the addition of fiber increments is transverse, and the edgewise and thickness compression of the bat in the course of such withdrawal.

4. A method of continuously building up an elongated thin and wide web of bat material, which method consists in confining bat material and delivering additional bat material edgewise into engagement with the web material already confined whereby to add successive increments edgewise thereto, progressively withdrawing the completed bat as the increments material added thereto reach a predetermined bat width, the direction of withdrawal being in a direction to which the addition of fiber increments is transverse, and compressing the material edgewise, laterally and longitudinally in the course of its withdrawal.

5. The method recited in claim 4 in which the edewise dimension of the progressively deposited bat material is vertical and the successive increments of bat material are added thereto by gravity.

6. The combination set forth in claim 4 in which the bat material is subjected to edgewise compression and thereafter released from said edgewise compression and allowed to expand edgewise prior to its compression otherwise.

7. A method of continuous manufacture of an elongated wide, thin bat of fibrous material which method comprises the progressive edgewise and vertical delivery of fibrous material upon other previously deposited fibrous material to comprise a web, the continuous withdrawal laterally of said vertical delivery of the web thus formed, and the subsequent twisting of the web in the course of its advance to deliver it in a horizontal rather than a vertical position.

8. The method recited in claim 7 in combination with the further steps of separately compressing the bat in two dimensions successively in the course of its advance.

9. The method of forming an elongated, wide, thin bat, which method comprises the continuous withdrawal of air from an elongated, thin space, the delivery edgewise into such space of fibrous material and entrained air, the material being deposited on material previously delivered into said space and the air being withdrawn from such space, and the withdrawal of a bat continuously from such space at substantially the rate at which increments of fibrous material are added thereto.

10. The method recited in claim 9 in further combination with the step of edgewise compression of the bat in the course of its withdrawal from such space, and the further step of releasing the bat from said edgewise compression and permitting the fibrous material to expand in accordance with the elasticity of its fibrous components and thereafter compressing it in another dimension in the course of its continued advance.

11. A method of making a wide, thin bat continuously, such method consisting in the continuous edgewise deposit of fibrous material into a thin, elongated space upon material previously deposited in said space, the continuous withdrawal of a web of bat material from such space at the rates of deposit of increments of fibrous materials therein, the edgewise compression of the bat material in the course of its advance, the release of said edgewise compression to permit the expansion of such material, and the subsequent compression of the bat material in the direction of its thickness in the course of its continued withdrawal.

12. The method recited in claim 11 in which the last-mentioned step of compression in the direction of its thickness is carried on at a rate of withdrawal which is approximately only half the rate of original withdrawal of the web from the space first mentioned, whereby to compress the bat longitudinally.

13. The method of continuous manufacture of a bat of substantial width and greatly reduced thickness which method consists in the progressive withdrawal of a web of bat material from a vertically wide and laterally narrow confined space while continuously depositing edgewise vertically into such space increments of fibrous material for addition to the bat being built therein, progressively confining the web of bat material edgewise as it leaves such space, thereafter releasing such edgewise confinement and permitting such material to expand to the extent required by the elasticity of its fibrous component, laminating such material between webs of tissue of greater width than the compressed web, and compressing the multiple web in the direction of its minimum thickness while reducing its speed of advance whereby to densify the web, and turning the web from a vertical edgewise position to a horizontal position.

14. Apparatus for continuous bat manufacture comprising a bat forming a chamber having a discharge end and three foraminous walls, vacuum chest means for withdrawing air through said walls, a constricted throat at the discharge end of said chamber, and means for withdrawing a bat through said throat.

15. The device of claim 14 in which said walls comprise conveyors movable toward said throat.

16. Apparatus of the character described comprising the combination of a bat forming chamber comprising for its opposite walls a pair of moving belts having opposing parallel runs on edge, and a hopper arranged for the delivery of fibrous material vertically between said belt runs.

17. The device of claim 16 in further combination with a vertically constricted throat between said belt runs at the delivery end of said chamber toward which said belts operate.

18. The device of claim 17 in further combination with transversely converging belts beyond said throat arranged to receive the material issuing from said throat and to effect transverse compression thereof.

19. Apparatus of the character described comprising a pair of spaced belts having correspondingly operating runs, a feeder opening between the edges of said runs for delivering fibrous material edgewise between said belts and a conveyor opposite said feeder opening correspondingly operative with the belt runs, of upper and lower constricting throat means disposed between said belts in the path of the material issuing from said chamber for compressing the material while such material is still confined between said belts, a second pair of belts beyond said throat means and arranged to receive the material issuing therefrom, said second pair of belts having progressively approaching run portions whereby to exert a lateral pressure upon the material which has been compressed vertically by said throat means.

20. The combination recited in claim 19 in further combination with means for delivering tissue plies between the belts last mentioned at each face of the material to be compressed therebetween.

21. The combination set forth in claim 19 in further combination with a set of parallel twisting guides having vertical portions to receive the material from between said second pair of belts and horizontal portions arranged to deliver the material for discharge.

22. A device of the character described comprising a chamber having a movable bottom conveyor and spaced movable side conveyor walls, a feeding funnel elongated in the direction of the space between said conveyor walls, a vertically constricting throat comprising upper and lower throat means leading from said walls, and a twisting discharge device comprising a set of guides having vertical portions adapted to receive the web and horizontal portions for the discharge thereof, whereby the web is twisted from vertical to horizontal position in the course of delivery.

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