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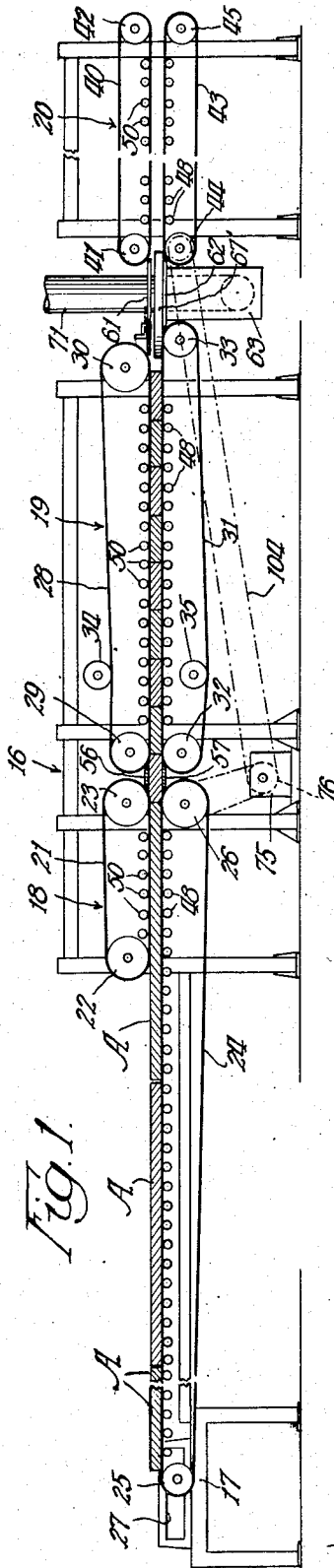
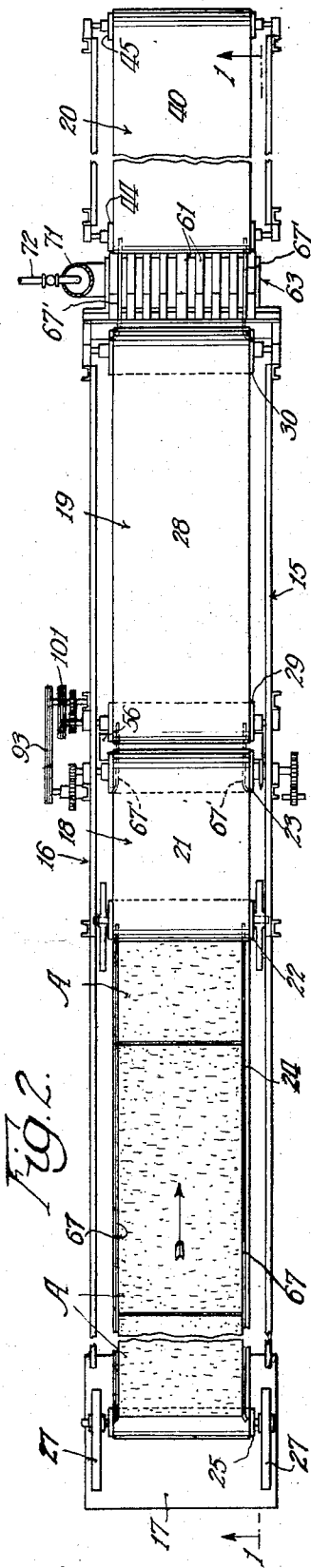
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2,303,087

APPARATUS FOR COMPRESSING CREPED WADDING

Filed Dec. 24, 1938

7 Sheets-Sheet 1



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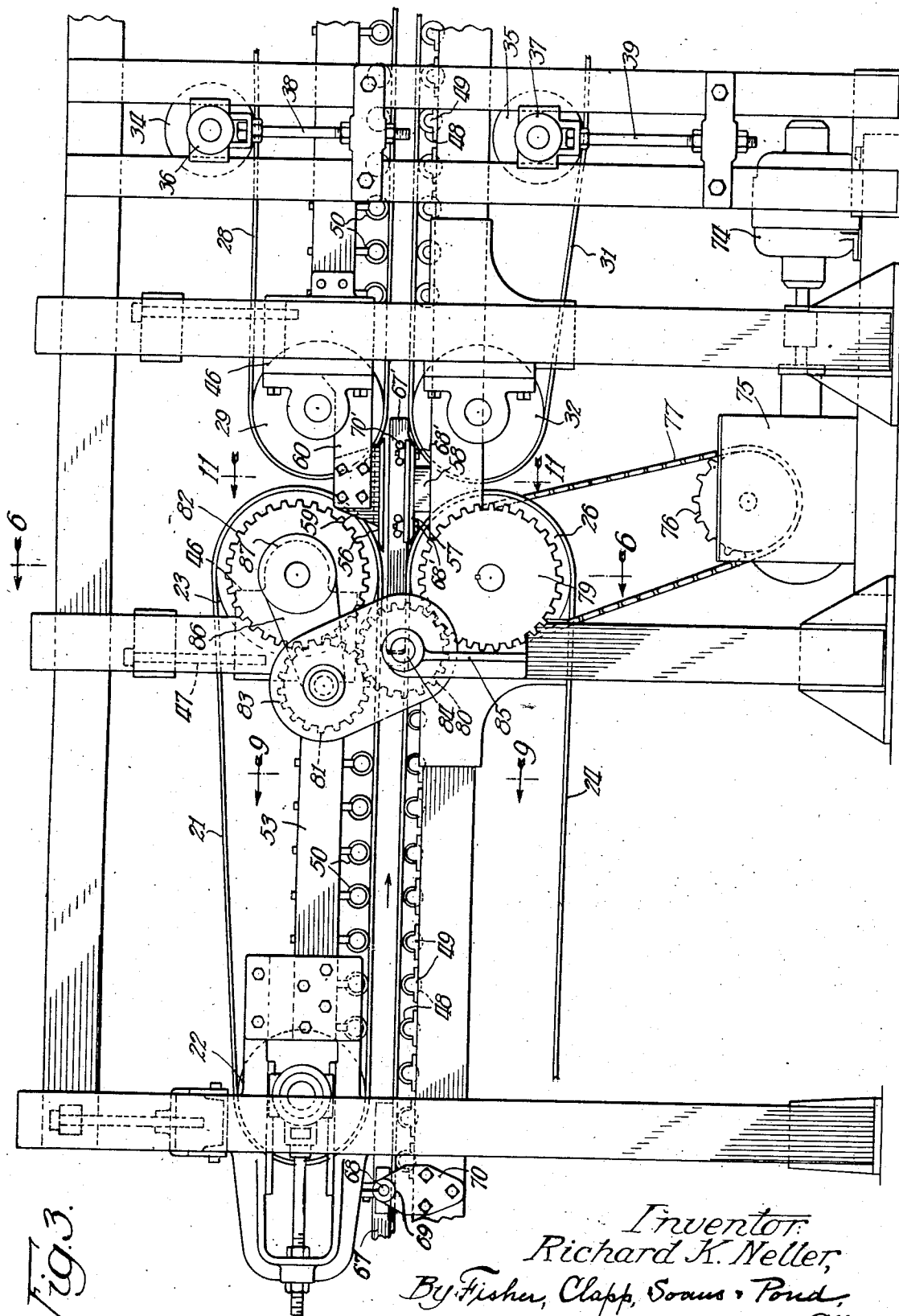
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7 Sheets-Sheet 2



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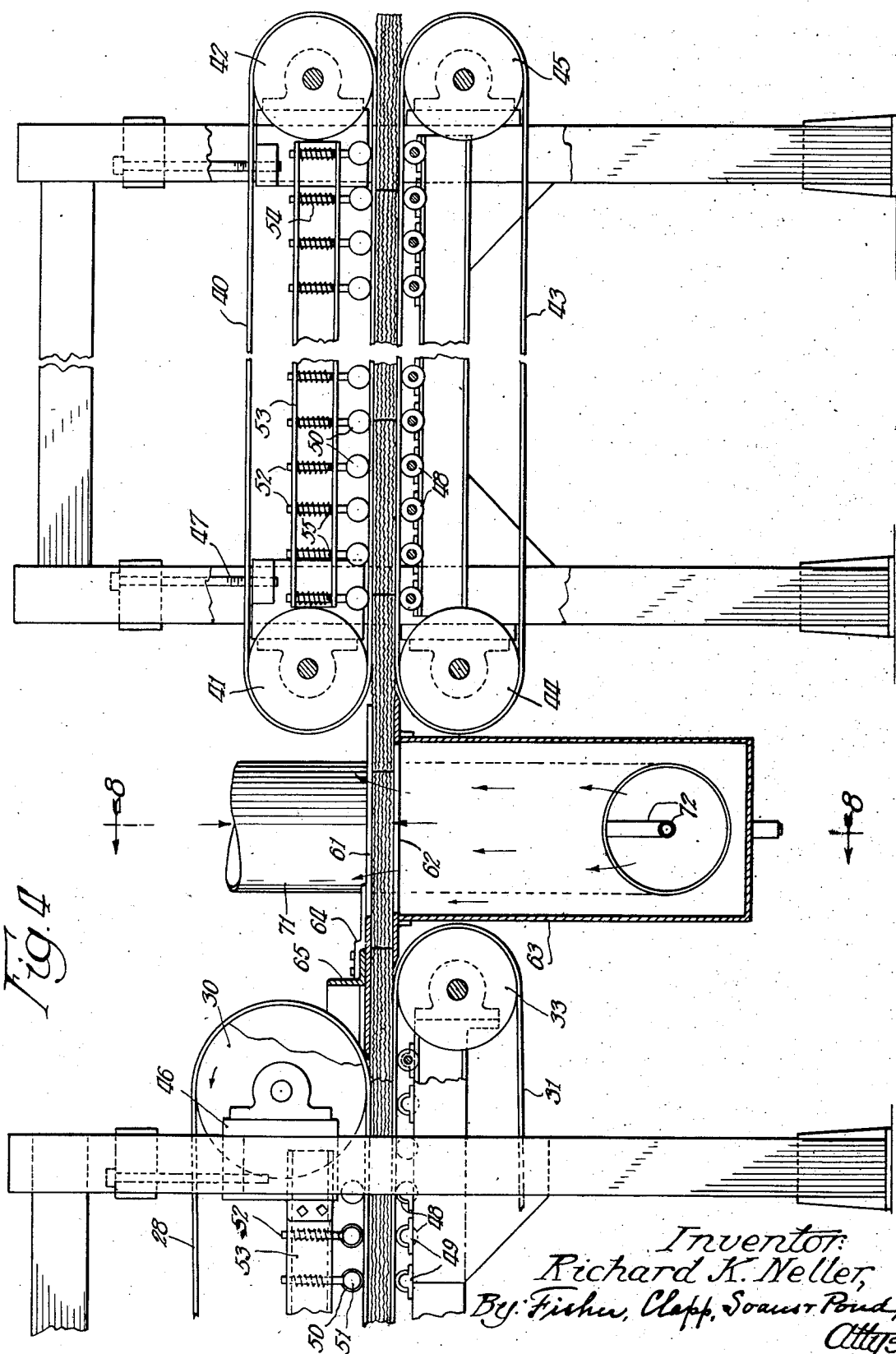
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7 Sheets-Sheet 4

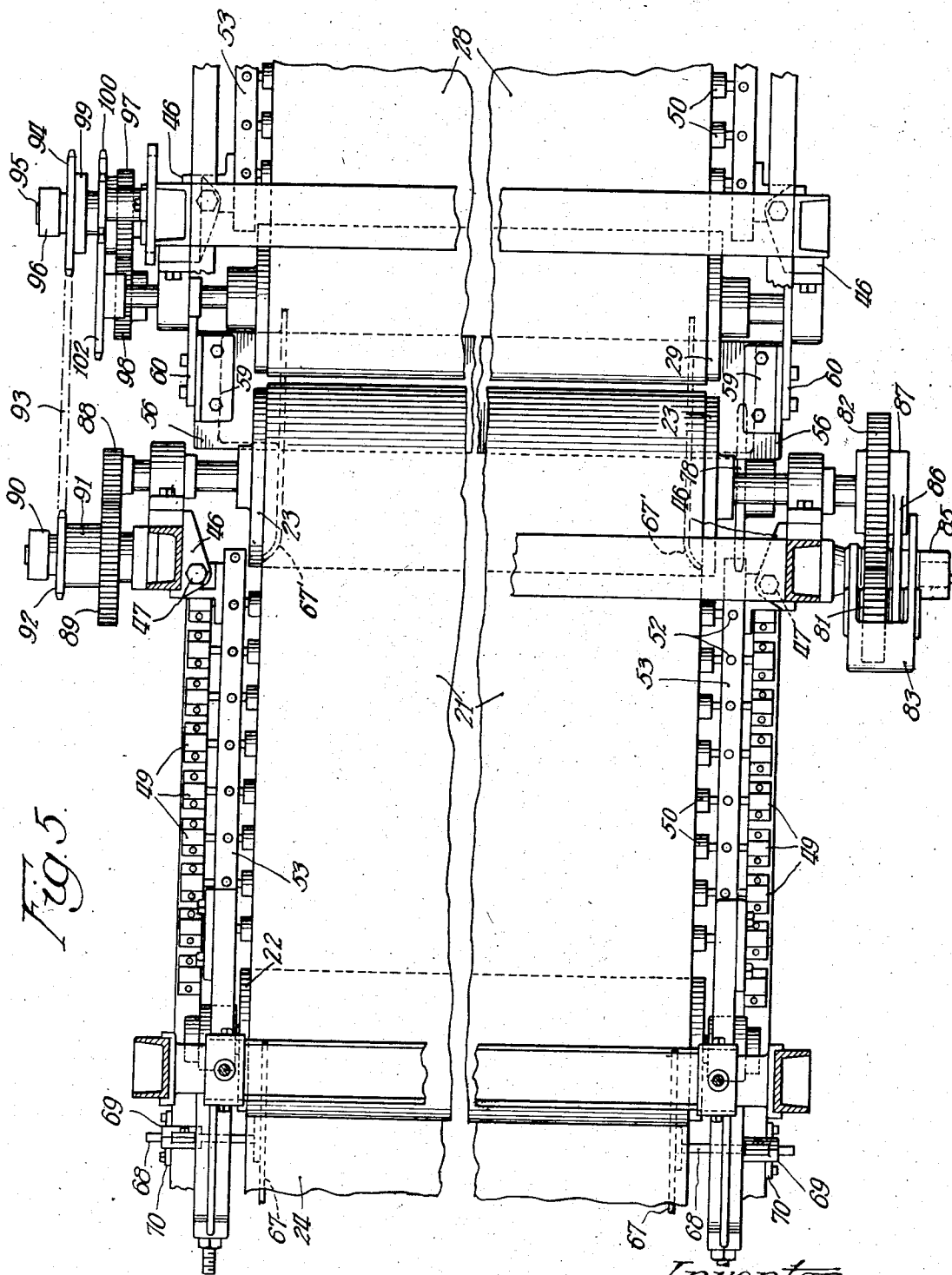


Fig. 5.

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7 Sheets-Sheet 5

Fig. 6.

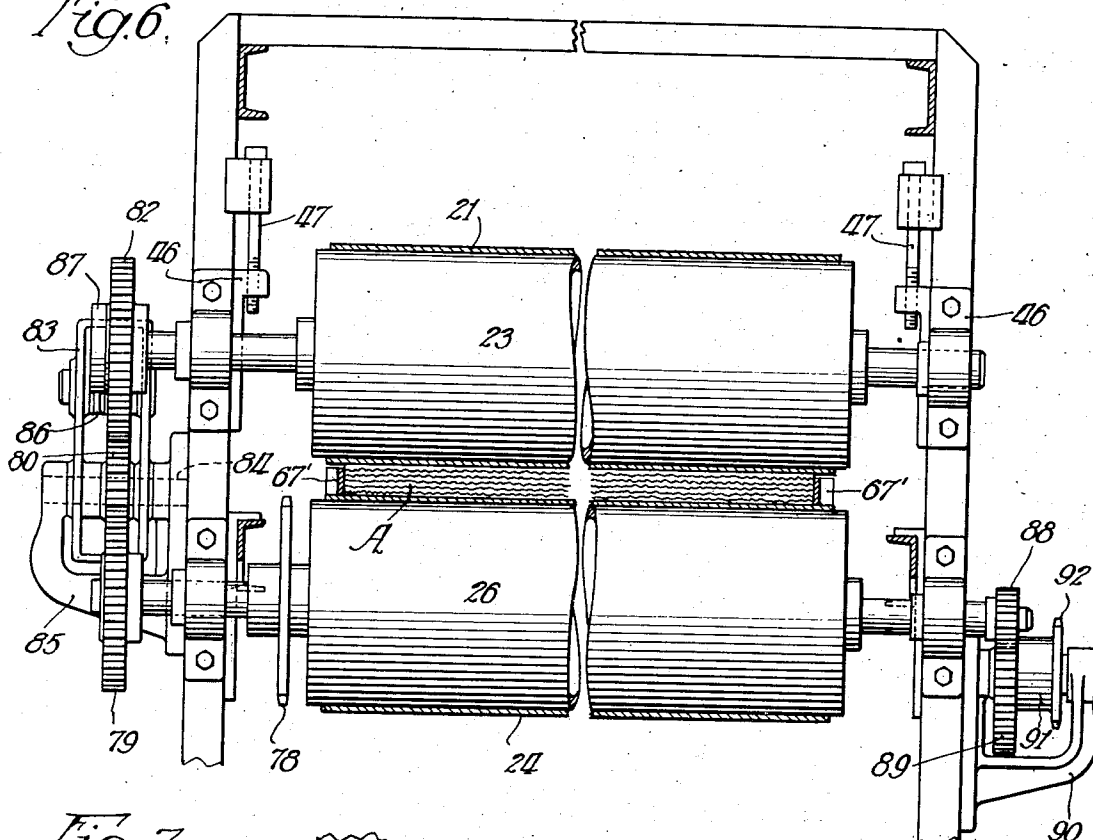
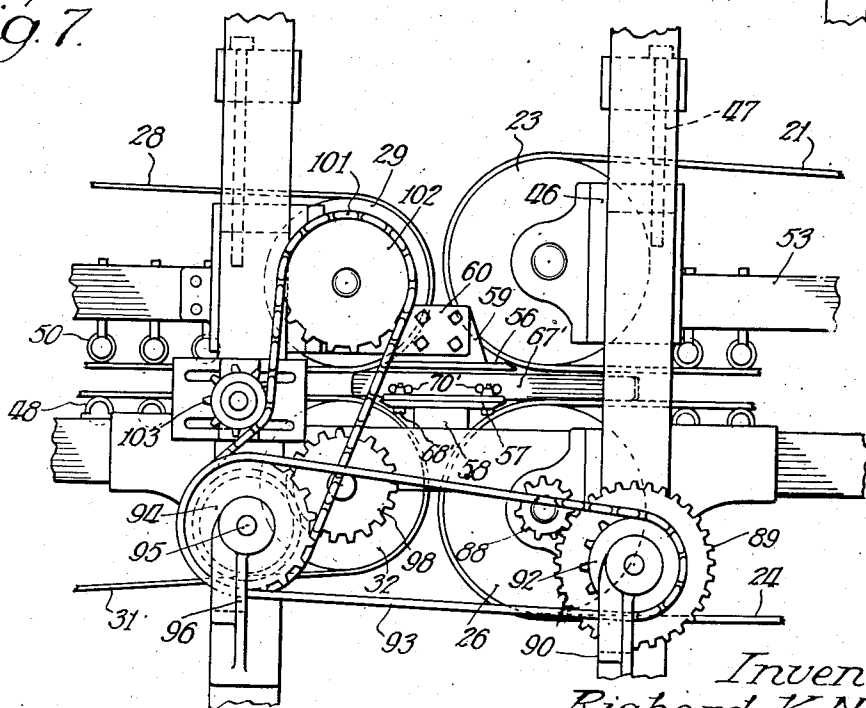


Fig. 7.



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Fig. 9.

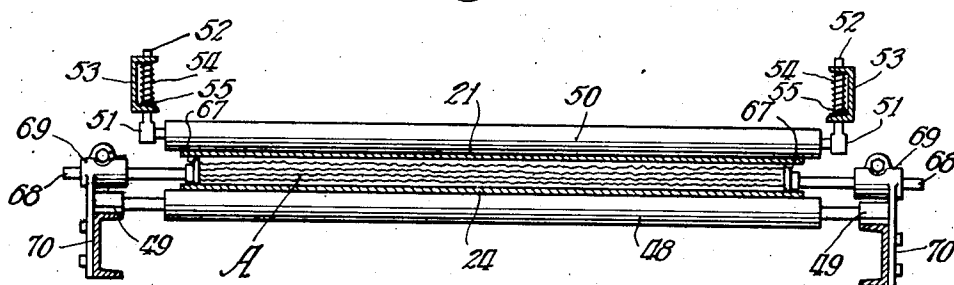
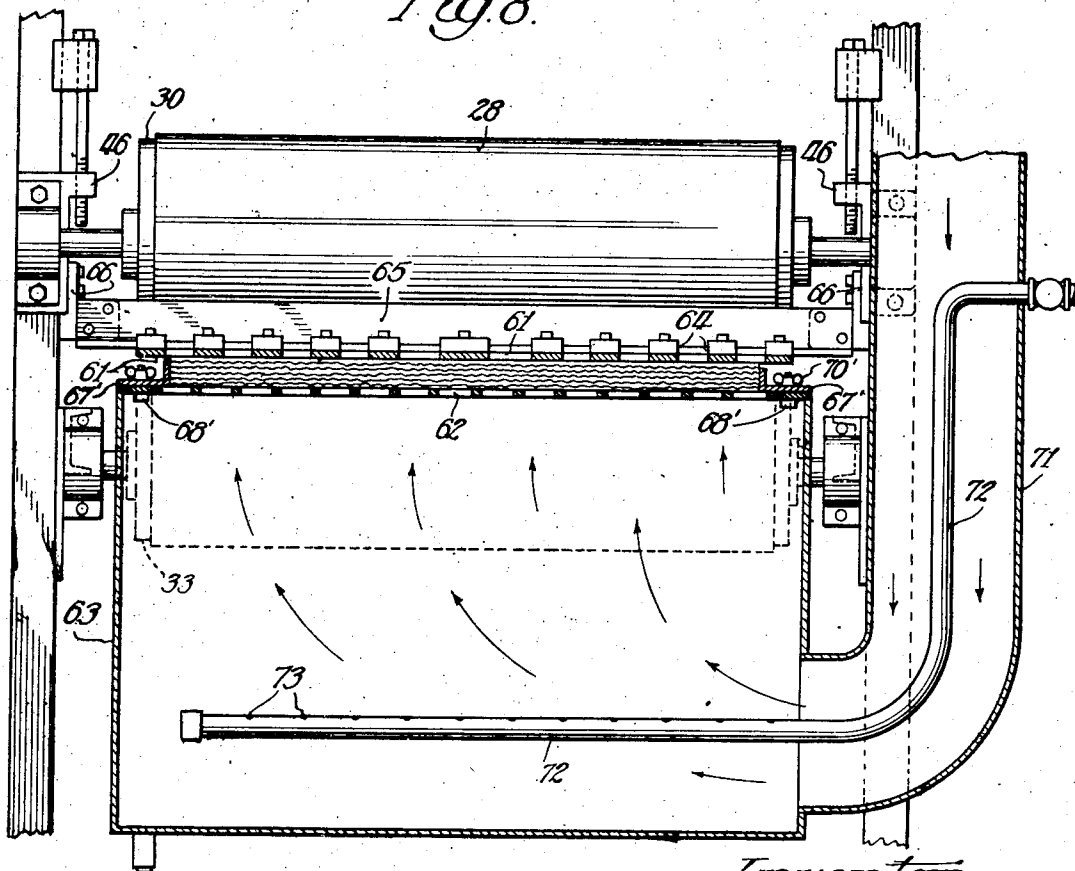


Fig. 8.



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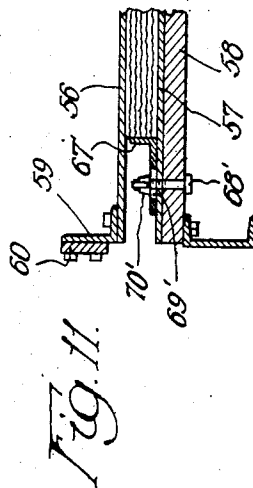
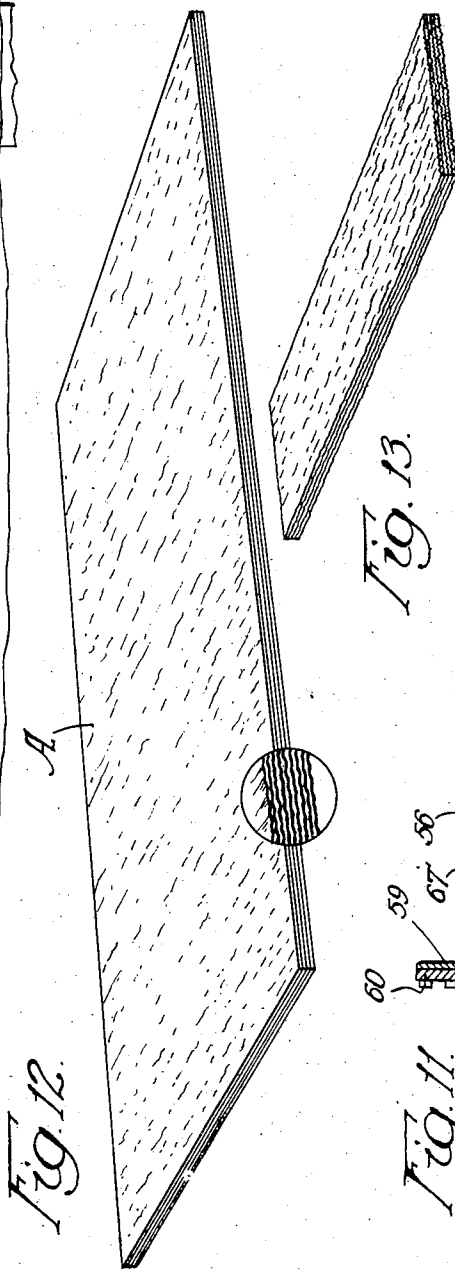
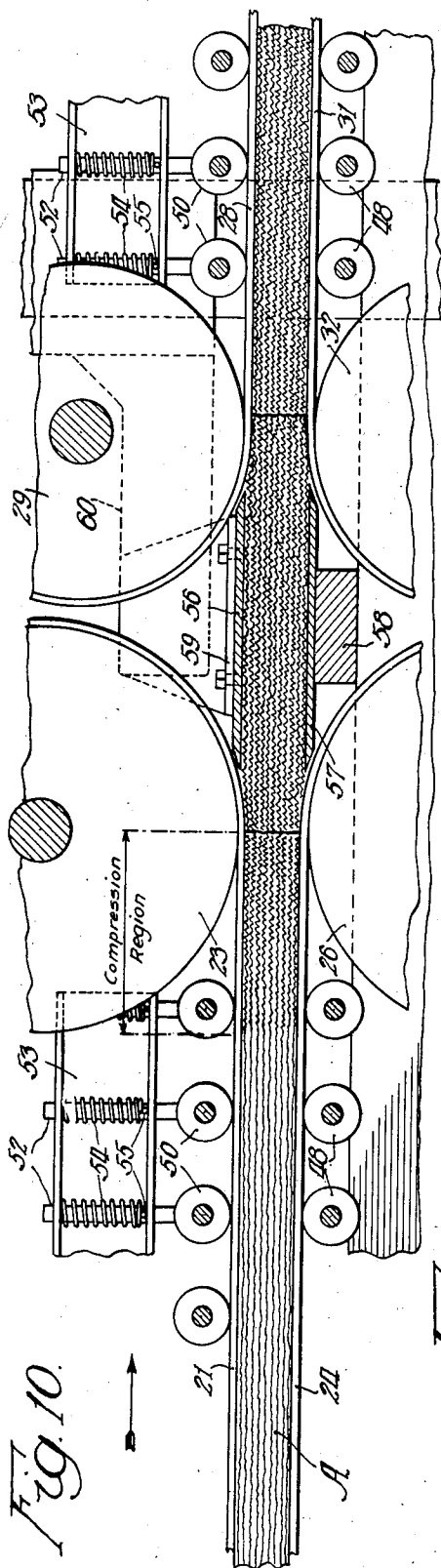


Fig. 13.

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UNITED STATES PATENT OFFICE

2,303,087

APPARATUS FOR COMPRESSING CREPED
WADDING

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poration of Wisconsin

Application December 24, 1938, Serial No. 247,561

8 Claims. (Cl. 154—1)

This invention relates to an apparatus for compressing pads or bats, comprising superposed sheets or plies of creped wadding, endwise or in a direction substantially perpendicular to the crep-
ing therein, for the purpose of converting a high
bulk and low density article temporarily into a
low bulk and high density product of substan-
tially the same width and thickness for storage
and for shipment, which latter product may be
restored at any time by longitudinal expansion
thereof to a low density high bulk condition so
as to render it suitable for use.

In an application filed by Charles A. Fourness and John B. Catlin on December 7, 1936, Serial No. 114,590, and owned by the assignee of the present invention, there is disclosed an apparatus for effecting the compression of pads or bats of creped wadding in the manner above described, consisting of a press so constructed as to define a rectangular chamber of substantially the same dimensions as the bat, or pile of superposed bats, to be compressed, and a plunger or ram slidable in said chamber.

The general object of the present invention is to provide an improved apparatus for compressing the bats, and especially bats of considerable length, operating on a different principle, and by which any number of bats can be successively and continuously compressed in a continuous operation of the machine.

The present invention is based on the principle of a plurality of conveyor sections disposed end to end and operating at different speeds, the first section, into which the uncompressed bats are fed operating at a high speed, and the succeeding section or sections operating at a much lower speed, so that the bats undergo endwise compression as they travel through the sections. In the preferred embodiment of the invention herein illustrated and hereinafter described in detail I employ a first or feed conveyor operating at a high speed which may be around 100 feet per minute, and which I term the fast conveyor, a second conveyor operating preferably at from one-sixth to one-tenth of the speed of the first or fast conveyor, and which I term the slow conveyor, and a third conveyor operating at approximately the same speed as the second section, which I term the magazine section. Between the first and second sections the wadding travels between a pair of transfer plates, and between the second and third sections the compressed bats also travel between a pair of transfer plates that are preferably apertured for the passage of damp air supplied by

an air blower and moistener to check or prevent re-expansion of the compressed bats as they emerge from the magazine section. The transfer plates guide the bats from the delivery end of one conveyor into the receiving end of the next conveyor, and prevent buckling at the gaps. Means are provided for adjusting the vertical spacing of the upper and lower belts of each conveyor, so that bats of varying thicknesses may be handled.

In the accompanying drawings I have illustrated an apparatus embodying the invention which in actual practice has been found to give highly satisfactory results, and referring to the drawings—

Fig. 1 is a diagrammatic longitudinal section on line 1—1 of Fig. 2 of the general assembly.

Fig. 2 is a top plan view of the same.

Fig. 3 is an enlarged side elevation of the central portion of the assembly in which the compression of the wadding and its transfer to the slow moving conveyor takes place.

Fig. 4 is an enlarged side elevation, partially in vertical longitudinal section, of the delivery end of the apparatus, showing also a moistening device.

Fig. 5 is a top plan view partly in horizontal section of the portion of the apparatus shown in Fig. 3.

Fig. 6 is a vertical transverse section, taken on the line 6—6 of Fig. 3.

Fig. 7 is a rear elevation of the drive mechanism for driving the slow conveyor from the fast conveyor.

Fig. 8 is a vertical transverse section through the moistener, taken on the line 8—8 of Fig. 4.

Fig. 9 is a vertical transverse section, taken on line 9—9 of Fig. 3, showing upper spring-pressed rollers acting on the bottom lap of the upper conveyor belt, and the supporting rollers of the top lap of the lower conveyor belt, and also showing lateral guides for the wadding passing between the upper and lower conveyor belts.

Fig. 10 is an enlarged longitudinal vertical section through the compression zone.

Fig. 11 is a sectional detail taken on line 11—11 of Fig. 3.

Fig. 12 is a perspective view of an uncompressed sheet of wadding as it is fed into the fast conveyor.

Fig. 13 is a perspective view of a compressed unit of wadding as it travels into and through the slow conveyor.

Referring to the drawings, 15 and 16 designate as entireties front and rear parallel longitudinal

side frames, conveniently formed of longitudinal and upright channels riveted or bolted together at their intersections. At their front ends the side frames are united by a horizontal platform 17. On and between these side frames are mounted three longitudinally aligned conveyors, designated as entireties in Figs. 1 and 2 by 18, 19 and 20. The foremost conveyor 18, which is the fast conveyor, consists of an upper endless belt 21 trained over drum pulleys 22 and 23, and a lower endless belt 24 trained over drum pulleys 25 and 26. To properly tension the belt 24 the bearings of pulley 25 are mounted in horizontal slideways 27 supported on the platform 17. It will be observed that the lower belt 24 is much longer than the upper belt 21. This extended portion of belt 24 provides a long moving feed table on which the uncompressed pads or bats of creped wadding, indicated by A, can be deposited, guided, inspected and prepared for compression, so that they will enter the compressor in good condition, the rectangular pads being laid in end to end contact with each other, as indicated.

The intermediate slow conveyor 19, located just beyond and in alignment with the fast conveyor 18, consists of an upper endless belt 28 trained over drum pulleys 29 and 30, and a lower endless belt 31 trained over drum pulleys 32 and 33. Belt tightener pulleys 34 and 35 (Fig. 3), having bearings 36 and 37 slidable on and between a pair of the frame uprights and adjustable by screws 38 and 39, maintain the belts 28 and 31 properly tensioned.

The rear or magazine conveyor 20, located just beyond and in alignment with the slow conveyor 19, consists of an upper endless belt 40 trained over drum pulleys 41 and 42, and a lower endless belt 43 trained over drum pulleys 44 and 45.

As best shown in Figs. 3, 5 and 6, the pulleys of the upper belts of the three conveyors are vertically adjustable, so as to permit the machine to handle pads of varying thicknesses. Each pad or bat consists of a number of superposed sheets or plies, which, in practice, may be from fifteen to ninety plies, such pads running from one-half inch to three inches in thickness. The pintles of the drum spindles are journaled in bearings mounted on shoes 46 that slidably engage the frame uprights, and these shoes are suspended and adjusted up and down by screws 47.

To cause the pad contacting limbs of the belts of the conveyors to remain in frictional contact throughout with the pads it is essential to maintain them perfectly flat, and this is effected by a group of closely adjacent fixed rollers 48 transversely underlying and supporting the upper limb of the lower belt and journaled in bearings 49 mounted on horizontal bars of the side frames, and by a similar group of spring pressed rollers 50 that bear on the lower limb of the upper belt. As best shown in Figs. 4, 9 and 10, the end pintles of rollers 50 are journaled in bearings 51 formed on the lower ends of rods 52 that extend through holes in the flanges of channel bars 53, which channel bars 53, are, in turn, attached at their ends to the vertically adjustable shoes 46 so as to partake of the up and down adjustments and movements of the upper belt and its pulleys. Coil springs 54 at their upper ends footed on the top flange of bar 53 and at their lower ends on pins 55 in the rods 52 urge the rollers 50 downward.

Between the discharge end of the fast conveyor 18 and the receiving end of the slow conveyor 19 are a pair of flat, vertically spaced upper and lower transfer plates 56 and 57 bridging the gap

between said conveyor ends. The distance between these plates is slightly larger than the distance between the pad engaging limbs of the fast and slow conveyor belts to avoid excessive friction. The lower plate 57 is supported on a fixed cross bar 58 of the frame (Figs. 10 and 11), and the upper plate 56 is connected at each end by an angle bracket 59 to an arm 60 on one of the vertically adjustable shoes 46, so as to partake of the up and down adjustments of the upper belt and its pulleys.

Referring to Figs. 4 and 8, between the discharge end of the slow conveyor 19 and the receiving end of the magazine conveyor 20 are a pair of generally similar upper and lower transfer plates 61 and 62. Both of these plates are longitudinally slotted, forming grids, as clearly shown in Fig. 8. The lower fixed plate 62 forms the top wall of an underlying water tank 63, later described, while the upper plate 61 is, by means of cleats 64, attached to and supported by an angle cross bar 65 that is attached at its ends by brackets 66 to the vertically adjustable shoes 46.

Suitable guides for the side edges of the pads to prevent any edgewise displacement of the latter while traveling through the apparatus are provided as follows.

On the feed section, up to the point where the uncompressed bats pass under the top belt 21 of the fast conveyor, the guides take the form of bars 67 (Figs. 2, 5 and 9) mounted on the inner ends of rods 68 adjustably mounted in clamps 69 on the upper ends of supporting brackets 70 attached to the outer sides of longitudinal channels of the side frames. For guiding the bats as they travel through the compression zone and from one conveyor section to the next between the transfer plates I preferably employ a pair of aluminum angles 67' (Figs. 2, 3, 5, 6, 7, 8, and 11) adjustably secured on and crosswise of the ends of the lower transfer plates by bolts passed through the lower transfer plate and through slots 69' (Fig. 11) in the horizontal limbs of the angles and tightened by wing nuts 70'. The guides 67 and 67' are thus adjustable to different widths of bats. The height of the vertical limb of the angle is about two-thirds the thickness of the wadding, and the receiving ends of the angles are flared outwardly, as best shown in Fig. 5.

Referring to Figs. 1, 2, 4 and 8, a moistener for the compressed pads, as herein shown, may take the form of the water tank 63, into the lower portion of one end of which leads a pipe 71 connected to a blower or other source of air above atmospheric pressure. Also entering the lower portion of the tank 63 through the pipe 71 is a steam pipe 72, the horizontal limb of which has apertures 73 through which the steam enters the body of water to warm the rising air current flowing through the transfer plates 62 and 61 and the compressed pad between them. The purpose of this moistener or dampener is to prevent partial re-expansion of the compressed pads before they can be baled or packed. I have found that both the so-called "white" pads—which are pads that have not been treated, and the so-called "black" pads—which are pads that have been treated with asphalt or other thermo-plastic material as set forth in a pending application of Charles A. Fourness, Cellulose product, Serial No. 99,520, filed September 5, 1936, now U. S. Letters Patent No. 2,170,655, dated August 22, 1939, owned by the assignee of the present invention, are quite elastic or springy, and when the compressive pressure is released they tend to re-expand to a cer-

tain extent before they can be baled or packed. This is especially true of the untreated "white" pads. The moistening of the pads as they pass from the slow conveyor to the magazine conveyor effectively prevents this. In lieu of the equipment above described for supplying warm moist air, an air conditioning machine furnishing a supply of warm moist air through a pipe leading into an empty chamber beneath the slotted transfer plates may be used.

Any suitable or approved drive may be employed for operating the conveyors at the desired speed ratio. A drive herein shown comprises the following. An electric motor 74 (Fig. 3), through a speed reducer indicated at 75 drives a sprocket 76, and the latter through a chain 77 drives a sprocket 78 (Fig. 6) fast on one end spindle of drum 26. Fast on the same end spindle is a gear 79 that, through intermediate gears 80 and 81, drives a gear 82 fast on an end spindle of drum 23. To accommodate this gear transmission to vertical adjustments of drum 23, the intermediate gears 80 and 81 are journaled in a yoke 83 that is pivoted at 84 in a bracket 85 secured to one of the channel uprights of the side frame. A link 86 connects the stub shaft of gear 81 with a collar 87 loose on the end spindle of drum 23.

On the other end spindle of drum 26 is a pinion 88 that drives a gear 89 journaled in a bracket 90 mounted on one of the channel uprights of the rear side frame. Fast with the hub 91 of gear 89 is a sprocket wheel 92 that, through a chain 93, drives a sprocket 94 fast on a short shaft 95 journaled in a bracket 96 mounted on another channel upright of the rear side frame. Fast on shaft 95 is a gear 97 (Fig. 5) that drives a gear 98 having the same number of teeth fast on the rear end spindle of drum 32. Secured to sprocket 94 by a hub 99 (Fig. 5) is a sprocket wheel 100, that, through a chain 101, drives a sprocket 102 having the same number of teeth fast on the end spindle of drum 29. The ratio of pinion 88 to gear 89 and of sprocket 92 to sprocket 94 determines the relative speeds of the fast and slow conveyors. The sprocket chain 101 is long enough to accommodate the highest position of the upper conveyor 19, and slack in the chain, in a lower position, is taken up by an adjustable compensating idler sprocket 103 (Fig. 7).

In Fig. 1 I indicate a sprocket chain drive 104 from the shaft of speed reducer sprocket 76 to the lower drum 44 of the magazine conveyor 20; and, since the transmission from the lower to the upper member of this conveyor to accommodate the vertical adjustments of the upper member may be the same as that already described in connection with the fast conveyor 18, I have not duplicated such transmission in the drawings.

In the operation of the apparatus the multiply pads or bats are supplied to the compressor in any convenient form, usually in rolls, and each pad or bat may have a length of four hundred feet or more. The long extension of the lower belt of the high speed conveyor permits the pads to be superimposed, inspected, and otherwise prepared for compression. The drawings, however, show the conveyors adjusted to handle one inch thick pads made up of thirty-ply which are not superimposed upon each other, but are individually compressed. The pads are fed in continuously, being already cut to the proper length. The forward end of one pad is butted against the rear end of the preceding pad to secure continuous operation.

When the apparatus is first started in opera-

tion, the foremost pad, as it emerges from the delivery end of the fast conveyor passes between the transfer plates into the nip of the slow conveyor, by which its further travel is greatly slowed down, so that compression of the first pad takes place between the transfer plates. While the first compressed pad is still in the zone of the transfer plates, the compression of the following pad begins, and its compression, and that of all the succeeding pads, takes place gradually and uniformly in the discharge end portion of the fast conveyor, as is indicated in Fig. 10. The rearward thrust of the compressed wadding between and beyond the transfer plates is great enough in this region to overcome the friction between the fast belts and the wadding, so that compression of each succeeding pad actually occurs before it enters the zone of the transfer plates, the pad contacting surfaces of the fast (feed) conveyor compressing and maintaining the material fed under top and bottom compression for a substantial distance prior to the crowding or axial compression of said material. To prevent excessive scuffing of the wadding surface because of the slippage of the belts on the wadding in this compressing region, and to permit a bulk increase during compression, the belt pressure is relieved by slightly raising the pulley 23. The ordinary bulk control, however, is obtained by raising or lowering the entire upper belt of the fast section. These features I have found quite important in obtaining satisfactory operation.

The transfer plates 56, 57 serve to guide the compressed pad as it passes from the fast conveyor to the slow conveyor and prevent it from buckling due to the longitudinal force of compression. As above stated, to avoid excessive friction the plates are spaced slightly farther apart than the pad contacting belts of the fast and slow conveyors.

The compressed pad travels through the slow conveyor section and into the magazine section without further compression. To avoid any jamming of the pads in the transfer plates between the slow conveyor and magazine section, the belts of the magazine section are caused to travel from three to five percent faster than belts of the slow conveyor.

With the present method of packaging the compressed product in boxes, it is necessary to maintain the wadding in its compressed state for a long enough period to permit placing it in the boxes. This is accomplished mainly by the dampener located between the slow conveyor section and the magazine section, which produces a degree of relaxation in the compressed wadding sufficient to permit packing it without the use of a restraining wrapper, although the magazine section of the conveyor supplements the relaxation effect, especially in the case of the untreated "white" pads.

The speed ratio of the fast and slow conveyors may, by the use of suitable gearing, be varied within very considerable limits. Ordinarily the ratio is about six to one, so that the compressed pads emerging from the apparatus have been condensed to about one-sixth of their original length. It is, however, entirely practical to effect a compression of ten to one or even more. In apparatus now in use, the fast conveyor section operates at about 100 feet per minute, but this speed may be considerably increased.

The slight moistening of the wadding by the dampener has no detrimental effect on the wadding whatsoever. I have found that products

opened and expanded several months after being finished show no loss of bulk or expansion properties. The purpose of this moistener or dampener is to retard the re-expansion of the compressed pads so they can be handled for inspection and packing without becoming too long for the finished package.

The apparatus herein shown and described possesses not only the advantage over the old plunger type of wadding compressor referred to in the preamble of this specification of greater speed and capacity resulting from continuous operation, but it also makes possible an increase in thickness per ply in both the compressed and expanded materials. In the old type of baler or compressor a pad having an average thickness of one inch possessed exactly the same thickness after baling or compressing. In this new type of continuous compression, owing to the spring-pressed top walls of the passageways through which the pads move, it has been found possible to feed a one inch thick uncompressed pad into the machine and take a one and one-quarter inch thick compressed pad out at the other end. This has two principal advantages. First, it reduces the thickness limitations of the material entering the compressor, thus making it possible to run the creped wadding manufacturing machines faster and to accept more of the material produced thereby in the finished product, and second, it makes possible a greater bulk and further reduction in the initial density after expanding.

I have also found that it is possible to compress a bat of white wadding by apparatus such as that herein disclosed without using a marker between the various layers. Crepe wadding may be compared in its action to the well known "zipper." When plies are once separated the bond cannot be again made by simply laying and pressing the surfaces together. They must be knit together as they are when wadding is accumulated on a reel, ply by ply. In the case of black wadding the tackiness of the asphalt causes enough adhesion to make a marker desirable, although not essential.

Variations and modifications in the structural details may be resorted to within the scope of the invention as defined in the following claims.

I claim:

1. In apparatus for effecting endwise compression of flat creped wadding pads to convert the same from high bulk and low density to low bulk and high density, the combination of a feed conveyor, and a second conveyor disposed beyond and in alinement with said feed conveyor and moving at a substantially slower speed than said feed conveyor and receiving the pads from the latter, both of said conveyors including independent flat traveling surfaces in pressure contact throughout with the top and bottom surfaces of the pads, the traveling surfaces of said feed conveyor compressing and maintaining the material fed under top and bottom compression for a substantial distance prior to the crowding or axial compression of said material due to endwise contact thereof with the slower moving material ahead of it, whereby the endwise compression of each pad takes place gradually and uniformly during the passage of the pad through the final portion of said feed conveyor.

2. In apparatus for effecting endwise compression of flat creped wadding pads to convert the same from high bulk and low density to low bulk

and high density, the combination of a feed conveyor, and a second conveyor disposed beyond and in alinement with said feed conveyor and moving at a substantially slower speed than said feed conveyor and receiving the pads from the latter, each of said conveyors consisting of upper and lower endless belts between the adjacent laps of which the pads travel in friction contact with said laps, the pad contacting laps of said feed conveyor compressing and maintaining the material fed under top and bottom compression for a substantial distance prior to the crowding or axial compression of said material due to endwise contact thereof with the slower moving material ahead of it, whereby the endwise compression of each pad takes place gradually and uniformly during the passage of the pad through the final portion of said feed conveyor.

3. In combination with the apparatus defined in claim 2, parallel upper and lower transfer plates between which the endwise compressed pads travel from the discharge end of the feed conveyor to the receiving end of the second conveyor, said transfer plates serving to prevent buckling of the pads while passing from the feed conveyor into the second conveyor.

4. In combination with the apparatus defined in claim 2, parallel upper and lower transfer plates between which the endwise compressed pads travel from the discharge end of the feed conveyor to the receiving end of the second conveyor, said transfer plates serving to prevent buckling of the pads while passing from the feed conveyor into the second conveyor; the distance between said transfer plates being slightly greater than the distance between the pad engaging laps of the conveyors to avoid excessive friction.

5. In combination with the apparatus defined in claim 2, a magazine conveyor structurally similar to, and disposed beyond and in alinement with, the second conveyor and receiving the compressed pads from said second conveyor, said magazine conveyor serving to give the compressed material time to lose its tendency to re-expand before its final discharge from the apparatus.

6. In combination with the apparatus defined in claim 2, a magazine conveyor structurally similar to, and disposed beyond and in alinement with, the second conveyor and receiving the compressed pads from said second conveyor, said magazine conveyor traveling at a slightly greater speed than said second conveyor and serving to give the compressed material time to lose its tendency to re-expand before its final discharge from the apparatus.

7. In combination with the apparatus defined in claim 2, a magazine conveyor structurally similar to, and disposed beyond and in alinement with, the second conveyor and receiving the compressed pads from said second conveyor, and a pad dampener located between said second conveyor and said magazine conveyor.

8. In combination with the apparatus defined in claim 2, a magazine conveyor structurally similar to, and disposed beyond and in alinement with, the second conveyor and receiving the compressed pads from said second conveyor, apertured upper and lower transfer plates between said second conveyor and said magazine conveyor, and means for directing a flow of warm moist air across said transfer plates.

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