

Jan. 13, 1942.

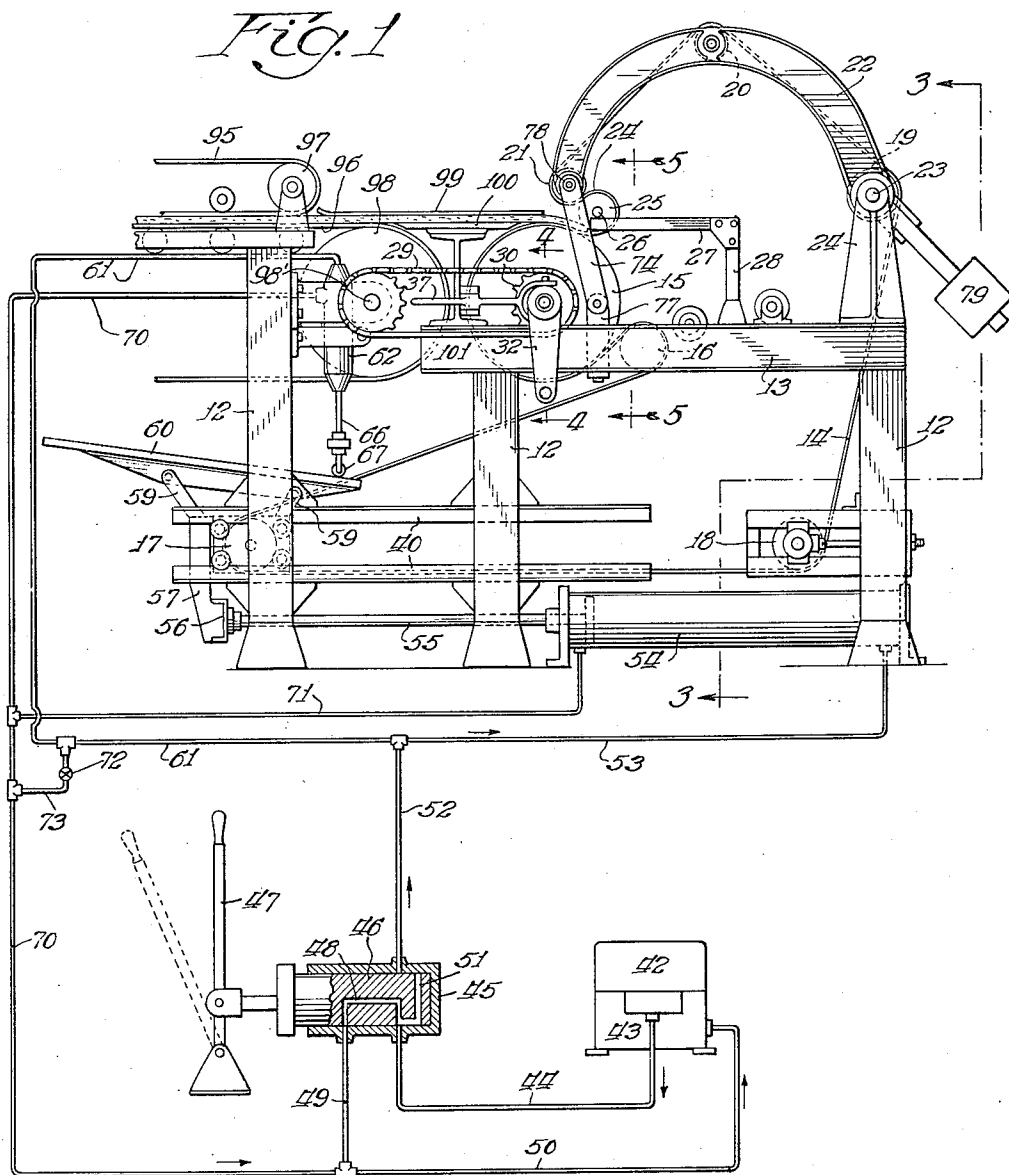
C. A. FOURNESS ET AL

2,270,043

COMPRESSED WADDING ROLL

Filed Feb. 13, 1939

5 Sheets-Sheet 1



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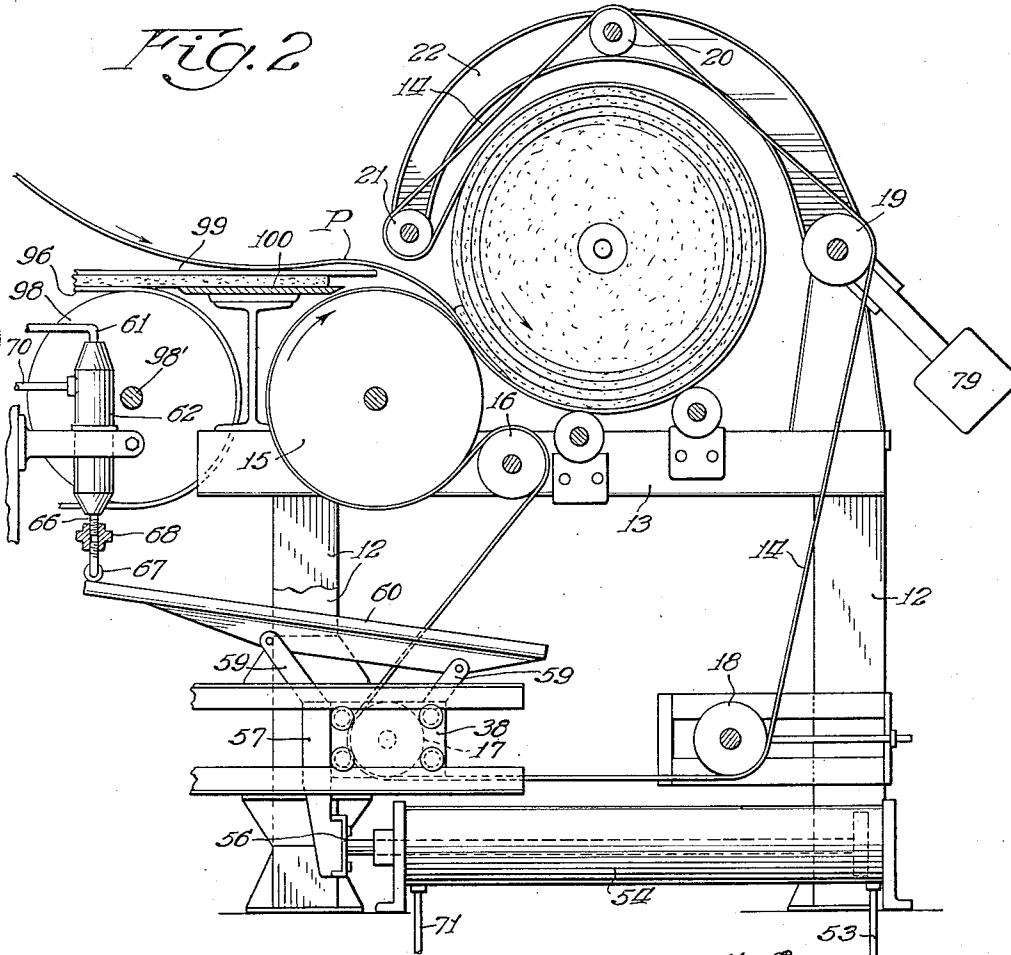
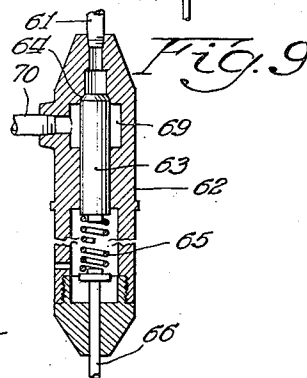
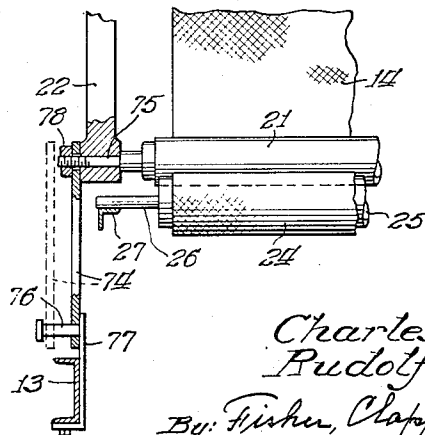


Fig. 5



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Fig. 7

Fig. 3

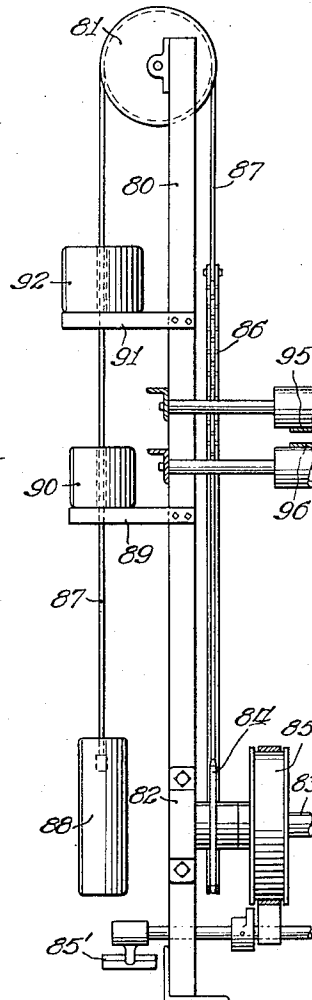
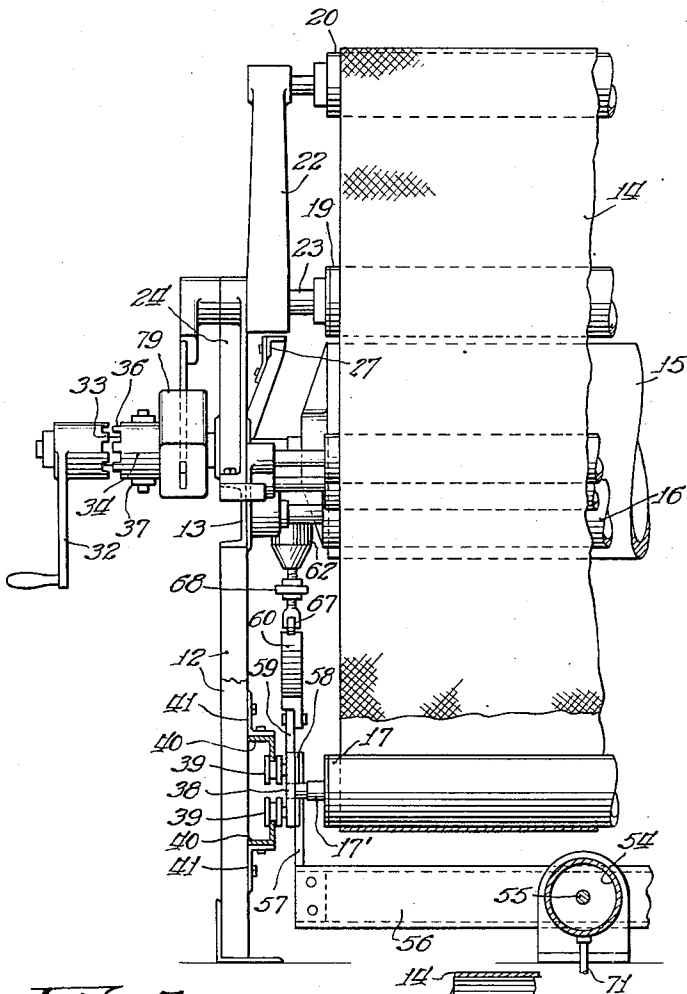
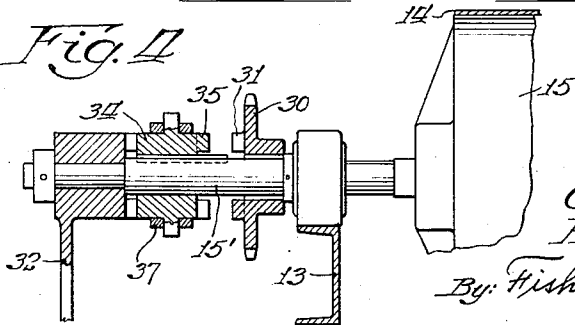


Fig. 4



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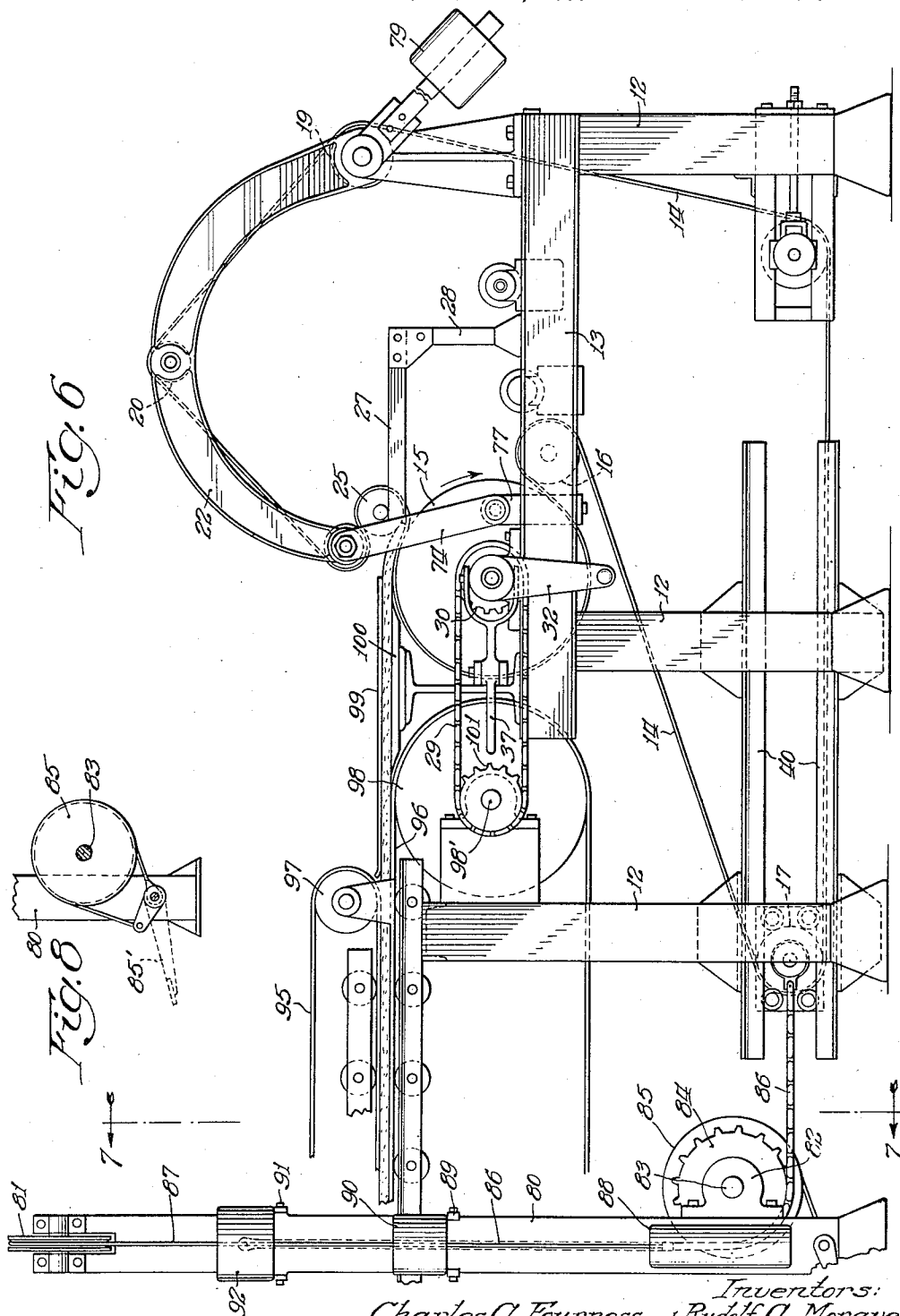
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5 Sheets-Sheet 4



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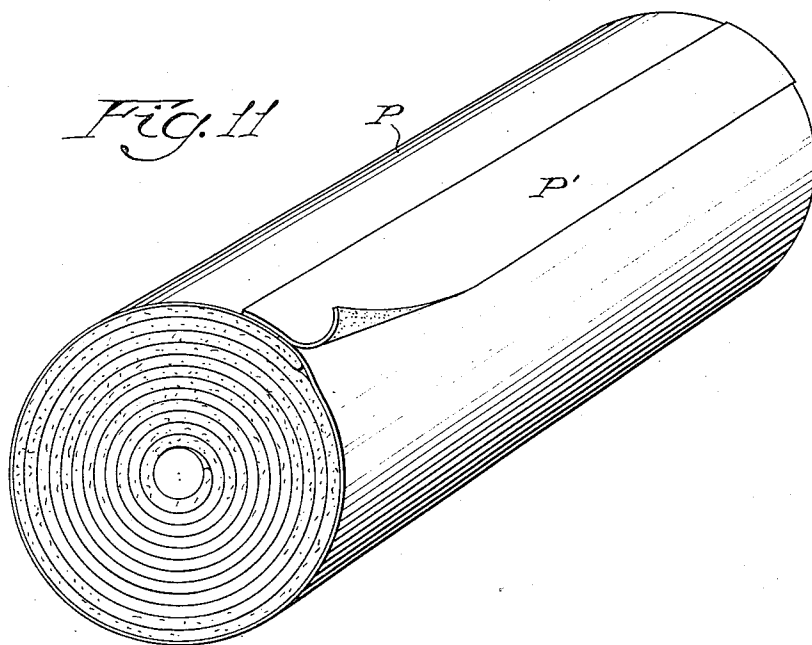
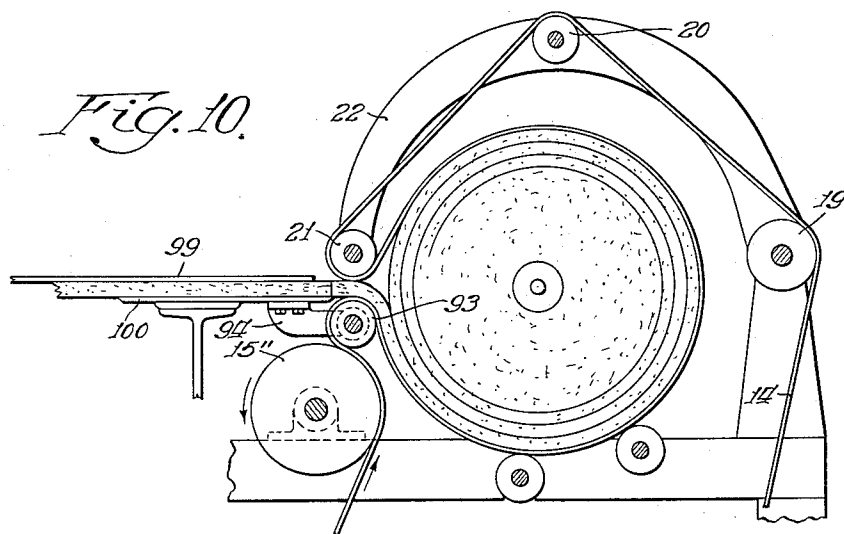
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,270,043

COMPRESSED WADDING ROLL

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Application February 13, 1939, Serial No. 256,242

1 Claim. (Cl. 206—59)

It has heretofore been known, by Letters Patent No. 1,959,418, granted May 22, 1934, to the assignee of the present application on an application filed by Charles A. Fourness, one of the applicants herein, to wind sheets of soft padding-like material, such as uncompressed creped wadding, into the form of a roll, the advance end of the sheet being entered between a cylindrical core member and a moving endless belt which is drivingly engaged with the successive coils of the sheet until the entire sheet has been wound on the core into the form of a cylindrical roll.

In the manufacture of cellulosic insulating material it has heretofore been the practice to superpose a plurality of thin sheets of creped, cellulosic tissue to form a low density pad or bat of the desired thickness, then compress the bat longitudinally in a direction substantially perpendicular to the creping in the superposed sheets while maintaining the thickness substantially uniform during the compressing operation, to form a high density intermediate product of greatly reduced bulk which may be conveniently and economically stored and shipped, and then restoring the compressed bat to substantially its original high bulk and low density condition by stretching when the same is to be used.

Several ways of effecting this compression have been employed. According to an application of Charles A. Fourness and John B. Catlin, Serial No. 341,262, filed June 19, 1940, owned by the assignee of the present invention, the bat is compressed endwise by a baling press comprising a closed chamber of substantially the length and height of the uncompressed bat or pile of bats in which the latter is laid and a plunger reciprocable in said chamber. According to an application of Richard K. Neller, Serial No. 247,561, filed December 24, 1938, owned by the assignee of the present invention, the compression is effected by causing the uncompressed bat to travel first between a pair (upper and lower) of endless belt conveyors moving at a relatively high speed, and thence into and through another similar pair of conveyors traveling at only a fraction of the speed of the first pair. The difference in speed of the two pairs of conveyors causes the bat to be compressed in the direction of its length without any substantial alteration in its thickness.

The product of both of these bat compressing methods is a flat dense sheet or slab, which, on account of the natural elasticity of the material, tends to partially re-expand when released from the compressor, and hence requires to be packed and shipped to its place of use in a suitable box

of such dimensions as to prevent such re-expansion.

Now, the roll form of the product of compression, such as is shown in the case of an uncompressed pad or bat in Figures 3 and 4 of the aforesaid Fourness Patent No. 1,959,418, is a much more convenient and economical form for handling, storage and shipment than the flat form, especially in the case of compressed pads or bats of considerable length. But a difficulty has, prior to the present invention, been found in producing the compressed and condensed product in a roll form, owing to the tendency of the material to re-expand while it is being wound on itself into a roll. We have found that this difficulty may be overcome by employing, in a machine embodying the basic principle of the aforesaid Fourness patent, a means for maintaining the stock on the roll, as the latter is built up during the winding operation, under a constant compression radially of the roll. We have also found that the best results are obtained by gradually increasing this compression as the roll increases in size so as to exert uniform circumferential pressure per unit area.

The object of this invention has been to produce, as a new article of manufacture, a roll of endwise compressed creped wadding or the like as defined in the sub-joined claim in which the density of the wadding which is wound into the roll form is preserved in the roll itself.

To facilitate a clear understanding of the invention, and one means for producing the same, we have illustrated in the accompanying drawings a practical and approved apparatus for winding and bonding the roll against re-expanding, in which drawings—

Fig. 1 is a side elevation showing the parts in the positions assumed at the beginning of the roll winding operation; the operating valve of the hydraulic pressure-applying mechanism appearing partly in longitudinal section.

Fig. 2 is a partial view of Fig. 1 on a larger scale and partly in vertical section showing the parts in the positions assumed at the end of the roll winding operation, including the introduction of the wrapper.

Fig. 3 is an end elevation viewed on the line 3—3 of Fig. 1 broken off on the rear side of the machine.

Fig. 4 is a longitudinal section through a clutch, taken on the line 4—4 of Fig. 1.

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 1.

Fig. 6 is a side elevation of the machine

equipped with a weight operated pressure-applying mechanism.

Fig. 7 is an elevation of the weight operated pressure-applying mechanism viewed on line 7—7 of Fig. 6.

Fig. 8 is a detail of a pedal operated brake associated with the weight operated pressure-applying mechanism.

Fig. 9 is a vertical section of the pressure regulating valve.

Fig. 10 is a vertical section of a slightly modified cradle winder.

Fig. 11 is a perspective view of the completed roll.

Referring to the drawings, the supporting structure of the winder consists of parallel side frames each comprising angle iron uprights 12 and channel-bar longitudinals 13 bolted or riveted at their intersections. An endless canvas cradle belt 14 is guided over pulley rolls 15, 16, 17 and 18 on the frame and thence over pulley rolls 19, 20 and 21 that are journaled in and between a pair of approximately semi-circular arms 22 that are pivotally mounted at 23 on a pair of upright frames. The pivot of roll 19 is axially coincident with the pivot 23 of the arms 22, as shown in Fig. 3. Between the rolls 21 and 15 a loop 24 of the belt partly encircles a cylindrical core 25 that may be a floating member, although, to insure the winding of a perfectly round wadding roll, and avoid an oblong form of roll, the ends of the core 25 carry pintles 26 that are slidably supported on horizontal rails 27 mounted on posts 28 stepped on the upper longitudinals 13 of the side frames. These rails 27 also serve as side plates or guards to keep the wadding roll from working out of the belt loop in a sidewise direction.

The roll 15 is the driving pulley of the belt, and a drive for this roll, which may be both a power and a manual drive, consists of a power driven sprocket chain 29 trained over a sprocket wheel 30 (Figs. 1, 3 and 4) loose on the spindle 15' of pulley 15 and formed with a clutch face 31, a hand crank 32 loose on the outer end of spindle 15', and formed with a clutch face 33 on its hub, a slidable clutch block 34 splined on spindle 15' formed on one end with a clutch face 35 (Fig. 4) for engagement with the sprocket clutch face 31 and its other end with a clutch face 36 (Fig. 3) for engagement with the crank clutch face 33, and a shifting lever 37 for the clutch block 34.

Referring to Figs. 1 and 3, the spindles 17' of the tension pulley 17 are each journaled in a plate 38 that carries on its outer side upper and lower pairs of grooved rollers 39 riding on horizontal angle bar tracks 40 supported on the side frames by brackets 41. The pulley 17 can thus travel inwardly under the pull of the loop of the belt engaged thereby as the diameter of the roll increases during the winding operation.

The spindles of pulley 18 are also mounted for adjustment lengthwise of the machine by substantially the same means as the spindles of pulley 17, as is indicated in Figs. 1 and 2; but this is merely a belt tightener feature to secure adequate tension on the belt when starting up to insure driving of the belt by pulley 15.

Describing next the preferred means for maintaining a gradually increasing tension on the belt 14 as the wadding is wound into a roll so as to compress the coils of the roll, and referring to Figs. 1 and 2 which illustrate this means partly diagrammatically, 42 designates an oil pump, the

intake side of which communicates with an oil reservoir 43. From the discharge side of the pump a pipe line 44 leads to the casing 45 of a distributing valve 46 which may be ported as shown in Fig. 1. The valve 46 is shifted by a hand lever 47. Before starting up, the distributing valve and its lever will be in the neutral position shown in full lines, and if the pump is operating the oil will merely flow back to the reservoir through duct 48 of the valve, and return lines 49 and 50. After about one wrap of wadding has been wound around the core 25, the operator shifts the lever 47 to the dotted line operating position, which puts the valve in the pressure position, in which return line 49 is cut off, and duct 51 of the valve is brought into register with a line 52 that communicates with a line 53 leading into the outer or rear end of a motor cylinder 54. The plunger stem 55 of the motor carries on its free end a cross bar 56 (Figs. 1 and 3), to each end of which is attached an upstanding arm 57, on which is mounted a plate 58 (Fig. 3) attached to the rear side of plate 38. One of the plates 38 carries a pair of upwardly divergent arms 59 that are attached to and support a cam 60 having a length substantially equal to the stroke of the plunger of the motor cylinder 54. More oil is pumped to the cylinder 54 than the cylinder can take, and the remainder backs up through a line 61, continuous with the line 53, into the upper end of a pressure regulating valve 62, which is shown in vertical section in Fig. 9, and is a known commercial article. This valve includes a plunger valve 63 pressed onto its seat 64 by a thrust spring 65, the lower end of the spring being seated on the upper end of a stem 66, which carries on its lower end a roller 67 that rides on the cam 60. To adjust the initial pressure of the spring 65 the valve stem 66 may be made in two sections the adjacent ends of which are oppositely threaded, as shown in Fig. 1, and are engaged by a nut 68, by turning which the stem may be lengthened or shortened. In the valve casing just below the valve seat 64 is a chamber 69, and tapping this chamber is a low pressure return line 70 connected at its other end to the line 50, and, through the latter to the oil reservoir 43. To prevent a vacuum on the plunger-stem side of the plunger of the motor cylinder 54, a line 71 leads from the inner or front end of the cylinder to, and communicates with, the return line 70. Thus, the lines 70, 71 and 50 are at all times low pressure lines.

As the winding of the roll proceeds, the tension roll 17, the cam 60 and the piston of the motor cylinder travel toward the right, viewing Fig. 1; and the pressure regulating valve 62, under the increasing thrust of its spring 65 on plunger valve 63 caused by cam 60, increasingly throttles the flow of oil into the low pressure chamber 69, and this increases the pressure of the oil resisting the backward travel of the motor piston, and this, in turn increases the tension of the belt and the compression of the roll by the belt.

It may here be remarked that the pump 42 is a constant volume type; that is, it delivers a substantially constant volume of oil at all pressures. The pump is also so designed that the maximum oil pressure on the system is limited by a regulator in the pump itself. Thus, even though the pressure regulating valve should be completely closed by the cam, the hydraulic pressure on the system is limited to the maximum pump pressure.

When the sheet of wadding has been fully wound into a roll, as shown in Fig. 2, the power drive of the belt is arrested by shifting the clutch 34 outwardly into engagement with the hub of the crank 32, a sheet P of stout paper is fed in 5 and passed around the roll of compressed wadding by turning the crank, and a second short sheet or strip P' coated with paste on its upper side is then fed in to fasten together the ends of the main sheet P, producing the completed roll of 10 compressed wadding shown in Fig. 11.

After the wadding roll has reached full size and been wrapped as above described, the lever 47 is shifted to the neutral position shown in full lines in Fig. 1. The only hydraulic pressure 15 then on the piston is that due to the oil locked in lines 61, 53 and 52. In order to reduce this pressure to zero it is necessary to open one of these lines to the return side of the pump. This may be done by opening a normally closed valve 20 72 in a line 73 connecting line 61 to line 70.

During the winding of the roll the free ends of the arms 22 are locked down by a pair of links 74 (Fig. 5) that are connected at their upper ends to the arms 22 by pivot pins 75, and at their lower ends are slidably mounted on headed studs 76 25 mounted in brackets 77 attached to the upper longitudinals 13 of the side frames, the outer end of the pins 75 being threaded to receive nuts 78. The wound and wrapped roll is removed from the winder by removing the nuts 78, shifting the links 74 clear of the pins 75, as shown by dotted lines in Fig. 5, and then swinging the arms 22 back, 30 this action being aided by a counterbalance weight 79. The arms 22 are then returned to and locked in the normal working position shown, a new core shaft 25 is put in, the valve 72 is closed, another sheet of wadding is presented to the winder, the control lever 47 is moved to the operating position, the piston of the motor cylinder 54 is forced back to starting position, which 40 carries the tension roll 17 and cam 60 back to starting position (Fig. 1), the power drive is applied by shifting clutch 34 into driven engagement with sprocket 30, and a new cycle is started. 45

In Figs. 6, 7 and 8 we show a weight system substituted for the hydraulic system above described for tensioning the belt and compressing the wadding roll as it is being wound. A vertical post 80 at one side of the machine has journaled 50 on its upper end a pulley 81, and on its lower portion is a bearing bracket 82 in which is journaled a shaft 83. Keyed on shaft 83 is a sprocket wheel 84 and a Prony brake drum 85. A sprocket chain 86 is attached at its lower end to the carriage of the tension roll 17, and passes thence over sprocket 84, and thence upwardly on the rear side of post 80. To the upper end of the chain 86 is attached a cord 87 that passes over pulley 81, thence downwardly on the front side 60 of post 80, and supports at its lower end a weight 88. Attached to the post 80 is a lower pair of horizontal arms 89 that support a weight 90, and an upper pair of horizontal arms 91 of greater spread that support a weight 92. The cord 87 passes freely through central vertical holes in the weights 90 and 92. The weight 88 is sufficiently narrow to pass between the arms 89, and the weight 90 is sufficiently narrow to pass 65 between the arms 91. To produce equal pulls on both ends of the tension roll 17, this weight system is duplicated on the other side of the machine.

As the roll of wadding builds up, the belt is at first tensioned by the weights 88 alone. As soon 75

as weights 88 pick up weights 90 the belt is tensioned by the combined weight of weights 88 and 90; and as soon as weights 90 pick up weights 92 the belt is tensioned by the combined weight of all three pairs of weights. A more gradual and more nearly uniform increase in the belt tension and consequent pressure on the roll as it is wound obviously could be obtained by using a greater number of individual weights in the manner described.

When the roll has been fully wound, the weights are temporarily held in elevated position by applying the brake 85 by pressure on the brake pedal 85' (Figs. 7 and 8), the roll is wrapped, the arms 22 are thrown back, the roll is removed, the arms are returned to operating position and connected to the links 74, and a new core shaft is put in, all as above described in connection with the hydraulic system. The weights are then eased down by manipulating the pedal brake, which restores the tension roll 17 to the starting position shown in Fig. 6, and this completes the cycle.

This weight system for compressing the wadding roll during winding, while not as uniform and perfect as the hydraulic system, gives satisfactory results, especially in the case of the so-called "black" wadding (wadding impregnated with asphalt and used mostly for insulation), since this black wadding can be wound up under a light constant tension, it even being unnecessary to use a cumulative weight system, where the wadding has been deadened by moist air blown through it as shown and described in the aforesaid Neller application. The so-called "white" wadding (unimpregnated) used largely in the manufacture of sanitary pads is more lively, even when dampened by moist air, and for its subsequent reexpansion and conversion to sanitary pads requires a very uniform product. For this the hydraulic tension system best provides the necessary flexible means of control.

By either of the above described means for tensioning the roll-winding belt the roll is tightly wound, the convolutions being pressed on each other radially of the roll; and the cover P, when applied, maintains the roll against unwinding and against expansion of the material of the roll.

In rolling compressed white wadding the belt must be kept under considerable tension to prevent re-expansion of the wadding roll. This tends to squeeze the core and wadding rearwardly and wedge the latter in the gap between the roll 21 and the belt driving roll 15. A modification designed to correct this tendency is illustrated in Fig. 10, wherein the belt driving pulley roll 15" rotates in the reverse direction, the roll 16 is omitted, and a small roll 93 journaled in brackets 94 is inserted between the belt rolls 21 and 15". The rolls 21 and 93, which form in part the means for directing the advance end of the sheet into the winder, are narrowly spaced so that the opposed portions of the belt engaged therewith provide a gap or passageway at the throat of the winder for the sheet of a width about equal to the thickness of the sheet. This effectively prevents any wedging or jamming of the incipient roll in the feed throat of the winder.

As stated before, the roll winding apparatus of this invention has been designed more particularly as an adjunct of the wadding compressor forming the subject matter of the Neller application, Serial No. 247,561, being connected on to the discharge end of the Neller wadding com-

pressor, so that the compressing of the wadding and the winding of the compressed product into the form of a roll ready for storage or shipment may form one continuous operation. Accordingly, in Figs. 1, 2 and 6 we have fragmentarily illustrated the discharge end of the slow conveyor of the Neller compressor through which the compressed wadding pads or sheets travel. 95 and 96 designate the upper and lower belts of the slow conveyor trained over rear end drum pulleys 97 and 98 respectively. From the discharge end of the slow conveyor the compressed wadding travels between flat, stationary upper and lower transfer plates 99 and 100 through the throat of the winder where it is caught in the nip of the winder belt and core and wound on the latter, as shown in Fig. 1. The shaft 98' of the drum pulley 98 is power driven through its belt 96, and fast on this shaft is a sprocket wheel 101 that, through the chain 29, transmits power to the winder.

When the wadding is being rolled up, the winder belt is operated at a speed slightly faster than that of the slow conveyor of the compressor. This eliminates any tendency of the wadding to buckle and jam at the point where it enters between the transfer plates 99, 100, since its tendency to re-expand is partly counter-balanced by the increased speed of the winder; and the extension of the upper transfer plate 99 to the throat of the winder also contributes to check the re-expanding tendency.

The practical and economic advantages of this product and the apparatus for producing it are marked. Substantial savings in shipping costs over soft wound rolls such as are produced by the Fourness Patent No. 1,959,418, are realized. Baled flat compressed wadding, such as is produced by the machine of the Fourness and Catlin application, Serial No. 114,590, is not suitable for use in the manufacture of sanitary napkins

because the individual bats are much too short for handling in sanitary napkin making machines. Perhaps the greatest advantage of the roll product and the apparatus for producing it lies in the fact both the roll product and the apparatus make possible the production of compressed wadding in lengths of nine feet or more. Packaging white wadding of such lengths in roll form makes it practicable for use in sanitary napkin machines wherein the short pads for individual napkins are cut successively from a continuous length of wadding stock, and packaging impregnated insulating wadding of such lengths in roll form instead of bales spells a considerable saving to the consumer, since it makes it possible for him to cut off from the roll the exact length of insulation needed.

Changes in the structural details herein shown and described may be made without departing from the operative principle or sacrificing any of the advantages of the invention. Hence, we reserve all such variations, modifications, and mechanical equivalents as fall within the spirit and purview of the claim.

We claim:

As a new article of manufacture, a strip of compressed cellulose wadding wound upon itself in the form of a roll, said wadding comprising a plurality of superposed plies of thin creped tissue wherein the creping corrugations extend transversely of the strip, are pressed together in a direction lengthwise of the strip and are under pressure exerted in said direction, the material being sufficiently resilient so that said creping corrugations tend to separate and the strip tends to expand longitudinally, and means encircling the wound roll for holding said pressure and preventing said expansion.

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