April 12, 1938. W. E. WUNDERLICH 2,114,008

SPRING PACKING MACHINE

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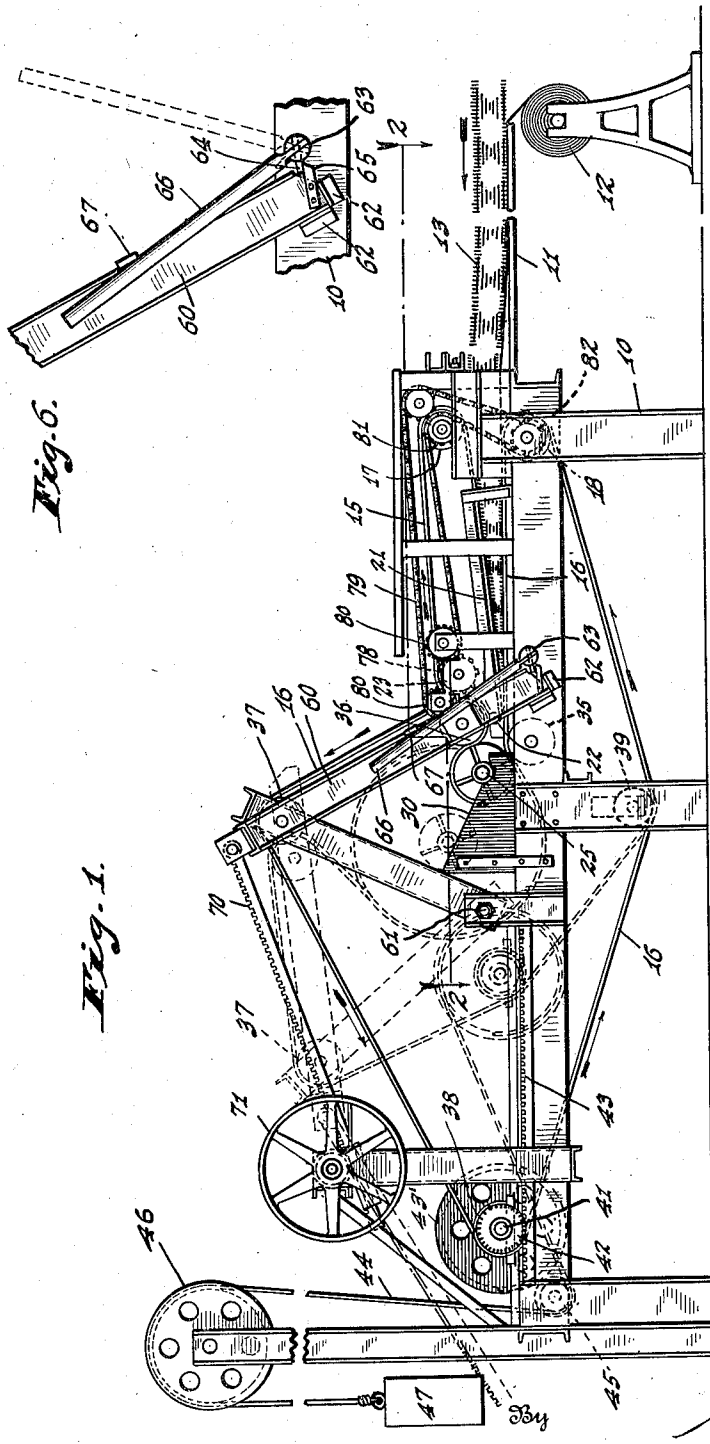

Fig. 1.

Fig. 6.

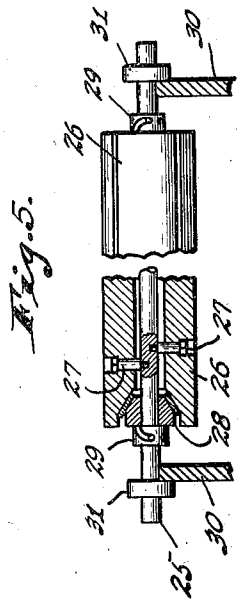

Fig. 5.

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Fig. 2.

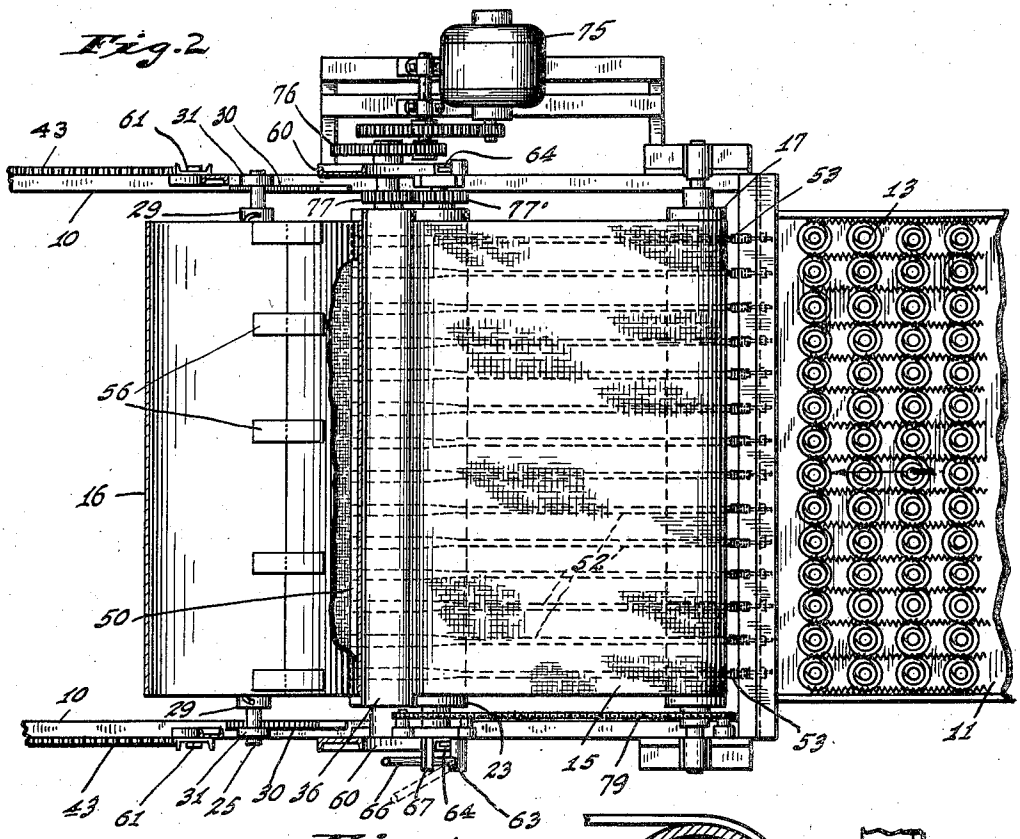

Fig. 4.

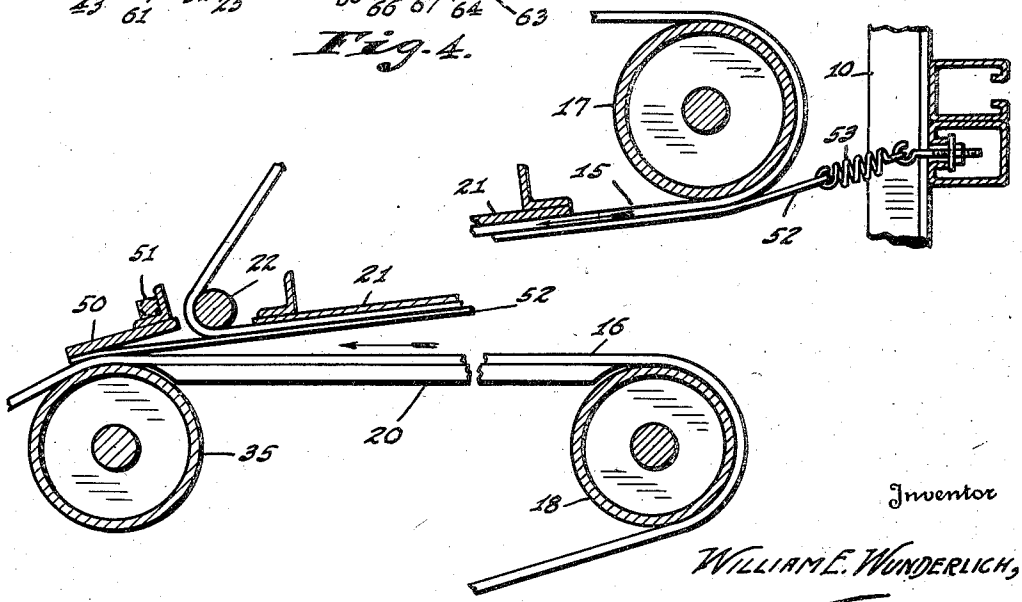

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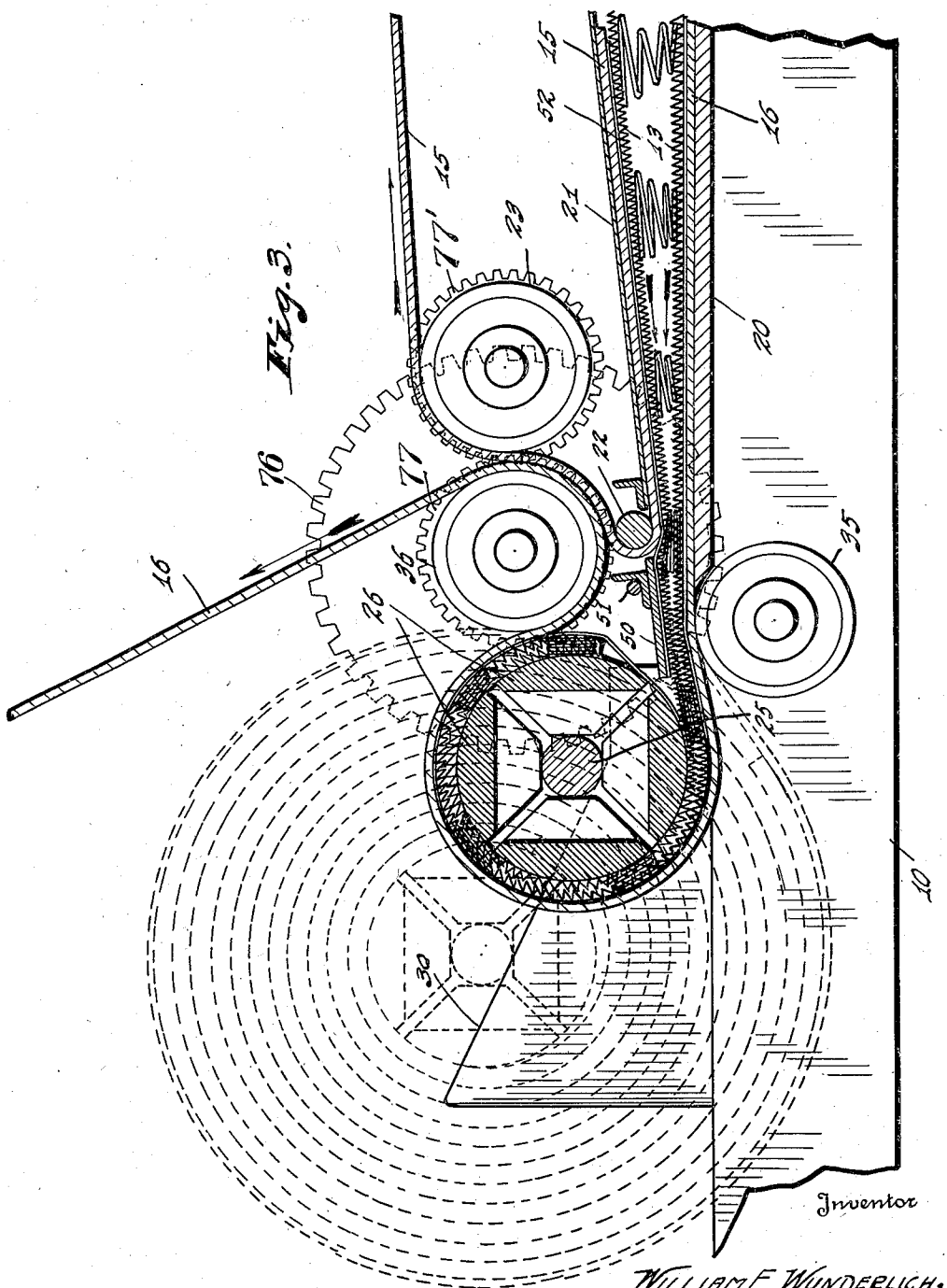
Fig. 3.



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UNITED STATES PATENT OFFICE

2,114,008

SPRING-PACKING MACHINE

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Application October 5, 1933, Serial No. 692,352

4 Claims. (Cl. 100—1)

My invention is concerned with the packaging of spring-assemblies of the type used in mattresses and upholstery. Each of such assemblies consists of a series of rows of vertical-axis, open-wound coil springs, usually of hour-glass shape, which are tied together by means of horizontally disposed helical springs of small diameter that extend longitudinally of the spring-assembly. Obviously, such assemblies occupy a great amount of space in comparison with their weight; and the problem of shipping and storing them is therefore of considerable importance.

It is the object of my invention to package such spring-assemblies in compressed form and thus to reduce shipping and storage charges. A further object of my invention is to place a plurality of spring-assemblies in a compact package in such a way that the assemblies may be removed one at a time while leaving the other assemblies in the package in compressed state. A still further object of my invention is to produce a machine which will perform the operation of packaging the spring-assemblies in the manner I intend.

In carrying out my objects, I compress the spring-assemblies and wrap them successively about a collapsible arbor, a continuous strip of wrapping paper being wrapped about the arbor with the springs. When the package has been built up to the desired diameter, the end of the wrapping-paper strip is secured to the body of the package as through the use of glued tape.

The machine for producing the packages comprises a pair of endless belts which have respectively two stretches that move in the same direction and approach each other in the direction of belt-movement. The paper and spring-assemblies are fed into the machine between these two belt-stretches so that the vertical springs of the spring-assemblies are compressed as the spring-assemblies progress. The lower of the two endless belts passes around the arbor, which is disposed to receive the compressed spring-assemblies as they emerge from the point of closest approach of the two belts. Yielding means are provided for maintaining the proper tension on the lower belt as the package expands in diameter.

The accompanying drawings illustrate my invention: Fig. 1 is a side elevation of the wrapping machine; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1 showing the spring-compressing belts and a complete package of springs; Fig. 3 is a vertical section through the spring-winding portion of the machine showing in full lines a package which has just been started and in dotted lines a package substantially completed; Fig. 4 is a vertical section through the two spring-compressing portions of the endless belts; Fig. 5 is an axial section through the collapsible arbor about which the package is formed; and Fig. 6 is a detailed view showing in side elevation the means employed for holding in operative position that portion of the machine which is raised to permit removal of a finished package.

The machine illustrated in the drawings comprises a frame 10 from one end of which there projects a horizontal feed-table 11. Near the outer end of and below the feed-table 11 I mount a roll of wrapping paper 12 which, in the operation of the machine, is fed longitudinally along the upper surface of the table 11 and into the wrapping mechanism. The spring-assemblies 13 are placed successively upon the paper moving across the feed-table and are carried into the machine by paper-movement.

As the spring-assemblies enter the machine they are received between two endless belts 15 and 16 which, at the receiving end of the machine, pass respectively around vertically spaced rollers 17 and 18. The rollers 17 and 18 are located a sufficient distance apart so that the spring-assemblies enter between the belts without any substantial compression. At and immediately beyond the roller 18, the lower belt 16 is substantially horizontal and is supported upon a plate 20. The stretch of the belt 15 immediately above the horizontal stretch of the belt 16, however, slopes downwardly in the direction of belt movement so that the spring-assemblies will be compressed as they are fed between the belts. To support the operative stretch of the belt 15 against the pressure exerted by the spring-assemblies, I provide a stationary plate 21 which is supported from the frame 10 of the machine and which engages the upper surface of the operative stretch of the belt 15.

At its inner end, the belt 15 passes around a small roller 22, upwardly and outwardly over another roller 23, and then returns to the roller 17. The roller 22 is spaced above the table or plate 20 at such a distance that the spring-assemblies at a point beneath the roller 22 will be substantially completely compressed. Immediately upon emerging from this substantially complete compression, the spring-assemblies pass into the wrapping mechanism.

As previously indicated, the spring-assemblies

are wrapped about a collapsible arbor. This arbor, which is shown in detail in Figs. 3 and 5, comprises a central horizontal shaft upon which are mounted radially movable shoes 26. These shoes are held in position on the shaft 25 by means of studs 27 which project radially outwardly from the shaft and are provided with heads received in counterbores in the shoes 26. The heads of the studs 27 limit outward movement of the shoes.

To hold the shoes 26 in their outer position with the collapsible arbor at its maximum diameter, I employ conical expanders 28 which are located at opposite ends of the arbor and axially movable on the shaft 25. Collars 29 having helical slots that receive pins on the shaft 25 are used to move the expanders 28 inwardly to hold the shoes 26 in expanded position against the heads of the studs 27. The arbor is shown in Fig. 5 in expanded condition, the expanders 28 being held inwardly by the collars 29, each of which has been rotated to bring into the outer end of its helical slot the associated pin on the shaft 25.

The arbor, which is in expanded condition throughout the wrapping operation, is supported in the machine on two plates 30 which are mounted upon the frame 10 of the machine and upon which the ends of the shaft 25 rest. Axial movement of the arbor relative to the plates 30 is limited by collars 31 on the shaft 25.

The lower belt 16, after leaving the plate 20, passes over a roller 35 and thence around the arbor. After leaving the arbor, the belt 16 passes around a roller 36 which is located close to the roll 22 in order that the belt 16 may embrace as much as possible of the circumference of the arbor. From the roll 36, the belt 16 passes in a generally upward direction over a roll 37, and thence rearwardly and downwardly around a tension-maintaining roll 38. From the roll 38, the belt 16 returns to the roll 18 at the receiving end of the machine, preferably passing beneath an idle roll 39 in doing so.

The roll 38 is rotatably mounted upon a shaft 41 that extends transversely of the machine and has secured to it near its ends pinions 42 which mesh with horizontal racks 43 on the frame 10 of the machine. On one end of the shaft 41 there is rigidly mounted a sheave 43′ to which is secured one end of a cable 44. The cable 44 passes beneath an idle sheave 45 mounted on the frame 10 of the machine below the level of the racks 43, and thence upwardly around an overhead sheave 46, the end of the cable 44 being secured to a weight 47. The parts are so arranged that the tension produced in the cable 44 by the weight 47 tends to rotate the shaft 41 and with it the pinions 42 in a counterclockwise direction (Fig. 1) so as to tend to cause the pinions 42 to roll on the racks 43 toward the rear of the machine. Thus, the desired tension is maintained in the belt 16.

For the purpose of maintaining the spring-assemblies under compression as they pass from beneath the roll 22 into association with the arbor, I provide a rocking pressure-bar 50 (Figs. 3 and 4) which is pivotally mounted, as at 51, adjacent the roll 22. To the free edge of the pressure-bar 50 I secure a plurality of metal strips 52 which extend upwardly and outwardly in spaced relation in contact with the lower surface of the belt 15. At their outer ends, the strips 52 are attached to tension springs 53 which are in turn secured to the frame 10 of the machine. The strips 52 are so spaced that they bear against the upper ends of the vertical springs in the spring-assemblies and so that the helical springs of the spring-assemblies will engage the belt 15 between the strips 52.

As is obvious, the tension maintained on the strips 52 by the spring 53 tends to swing the pressure-bar 50 in a counterclockwise direction toward the belt 16 to maintain the springs in compressed state as they pass from beneath the roller 22 into association with the arbor.

For a short distance inwardly from the ends closest to the rolls 35 and 36, the upper surfaces of the plates 30, upon which the shaft 25 rests, are horizontal; but beyond this horizontal portion they slope upwardly in a direction approximately perpendicular to the plane containing the axes of the rolls 35 and 36. At the beginning of the package-wrapping operation, the arbor rests upon these horizontal portions of the upper surfaces of the plates 30; but as the package grows in diameter as successive springs are wrapped, the arbor is forced upwardly along the upper surfaces of the plates 30, as indicated in dotted lines in Fig. 3.

When a packaging operation is to be started, the strip of paper from the roll 12 is drawn across the feed-table 11 and into the machine. This operation is performed by hand until the end of the paper strip is pinched between the arbor and the belt 16, whereupon further paper-feed will be automatically effected. As the paper feeds through the machine, spring-assemblies are successively placed upon it as it passes across the feed table 11. These spring-assemblies enter between the belts 15 and 16, and are compressed as these belts approach each other, the maximum degree of compression occurring at the roll 22. The spring-assemblies are maintained in compressed position by the action of the pressure-bar 50 until they become pinched between the belt 16 and the arbor. As the operation of feeding successive spring-assemblies progresses, the package grows in diameter; and when the desired number of spring-assemblies are wrapped, the strip of paper is severed and its free end secured to the body of the package as by means of strips of glued tape 56 (Fig. 2). Of course, the paper is severed far enough back of the last spring to provide a complete outer turn of paper on the package. During the wrapping operation, tension is maintained on the belt 16 by the operation of the weight 47, as previously set forth; so that the spring-assemblies are maintained tightly compressed in the package.

To facilitate removal of the finished package from the machine, I mount the rolls 36 and 37 upon a swinging sub-frame 60 which is pivotally connected on a horizontal axis as at 61 to the main frame 10 of the machine. To hold the sub-frame in operative position during wrapping of the package I seat its free end in contact with suitable abutments 62 on the main frame 10 and hold it in such position by the latch mechanism illustrated in Fig. 6. This latch mechanism comprises a rockable shaft 63 which carries a projection 64 positioned to engage from above an abutment 65 on the sub-frame 60. The shaft 63 is rocked under the control of an operating handle 66 which is retained in locked position by being received beneath a keeper 67 on the sub-frame 60.

To facilitate raising of the sub-frame 60, I may pivotally connect to it near its upper end a rack 70 which extends rearwardly of the ma-

chine into meshing engagement with a pinion which is mounted upon the frame 10 and rotatable with a hand wheel 71. By removing the operating handle 66 from engagement with the keeper 67 and swinging it to the dotted-line position shown in Fig. 6, the sub-frame 60 is released and can be raised by rotation of the hand wheel 71. The sub-frame is shown in raised position in dotted-lines in Fig. 1.

With the sub-frame elevated, the finished package may be readily removed from the machine. After this has been done, the collars 29 are rotated on the shaft 25 from the position illustrated in Fig. 5, whereby the co-action of their helical slots with the pins in the shaft permits them and the expanders 28 to move outwardly to effect collapse of the arbor about which the package has been wound, and the arbor is then removed, expanded, and returned to the machine.

Any desired means may be employed for driving the belts 15 and 16. In the drawings, I have illustrated an electric motor 75 which, through suitable gearing, drives a gear 76 that is rigid with the roll 36. Preferably, the rolls 23 and 36 are of equal diameter and are operatively interconnected by means of equal-diameter pinions 77 and 77'. In addition to driving the belts through the rolls 36 and 23, I find it advantageous to apply driving effort to them at other points. To this end, I provide rigid with the roll 23 a driving-sprocket 78 for a power-transmitting chain 79. The chain 79 is held in engagement with the sprocket 78 by means of idler sprockets 80, and passes around sprockets 81 and 82 rigid respectively with the rolls 17 and 18 at the receiving end of the machine.

With my machine, I am enabled to form twelve spring-assemblies, each measuring 52 inches by 73 inches by 4¾ inches, into a package 52 inches long and 20 to 21 inches in diameter and to save the cost and weight of crating. Further, the spring-assemblies can be removed from the package one at a time leaving the remaining assemblies in compact compressed state.

I claim as my invention:

1. In a machine for packaging spring assemblies, an arbor, a belt encircling said arbor, means for compressing spring assemblies fed to said arbor in association with said belt, a pivotally mounted pressure bar disposed between said compressing means and said arbor and adapted to engage compressed spring assemblies fed to said arbor from said compressing means, and yielding means co-operating with said pressure bar for maintaining the spring assemblies compressed.

2. In a machine for packaging spring assemblies, an arbor about which said assemblies are to be wound, a feeding and supporting belt for the spring assemblies, said feeding and supporting belt having a generally horizontal feeding stretch extending toward said arbor and thence partially encircling the arbor with its upper face directed inwardly, means for maintaining tension in said feeding and supporting belt, and means for progressively compressing spring assemblies fed to said arbor on the horizontal stretch of said feeding and supporting belt, said means comprising a second belt having a stretch disposed above the horizontal stretch of said feeding and supporting belt and inclined downwardly toward said arbor, the inclined stretch of said second belt being substantially plane and being the only stretch thereof engaging spring assemblies supported on said feeding and supporting belt.

3. In a machine for packaging spring assemblies, an arbor about which said assemblies are to be wound, a feeding and supporting belt for the spring assemblies, said feeding and supporting belt having a generally horizontal feeding stretch extending toward said arbor and thence partially encircling the arbor with its upper face directed inwardly, means for maintaining tension in said feeding and supporting belt, means for progressively compressing spring assemblies fed to said arbor on the horizontal stretch of said feeding and supporting belt, said means comprising a roller disposed adjacent said arbor at a short distance above the horizontal stretch of said feeding and supporting belt, a second roller disposed remote from said arbor and at a greater distance than said first roller above the horizontal stretch of said feeding and supporting belt, a second belt engaging said two rollers and partially encircling the first named roller, and means engaging that stretch of said second belt extending between said rollers for maintaining it substantially plane.

4. In a machine for packaging spring assemblies, an arbor, a belt encircling said arbor, means for compressing spring assemblies fed to said arbor in association with said belt, a movably mounted pressure bar disposed between said compressing means and said arbor and adapted to engage compressed spring assemblies fed to said arbor from said compressing means, and yielding means co-operating with said pressure bar for maintaining the spring assemblies compressed.

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