Feb. 25, 1936. S. KRAKAUER ET AL 2,031,894

APPARATUS FOR TYING COIL SPRINGS TOGETHER

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Fig. 1.

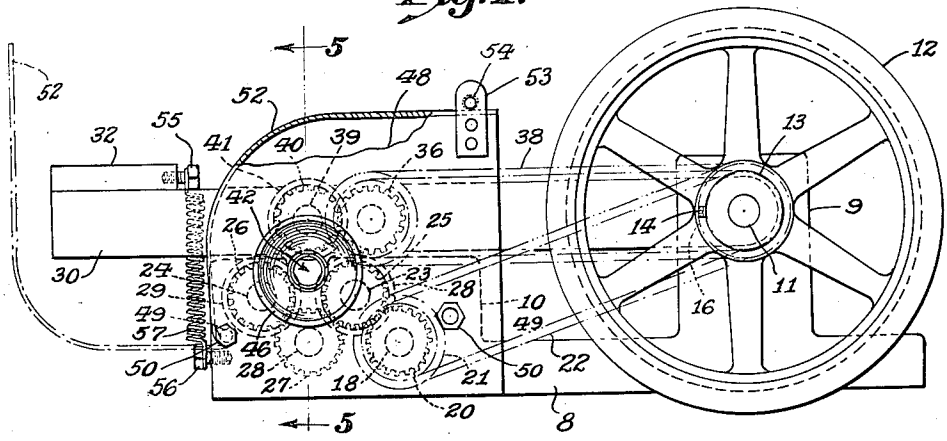
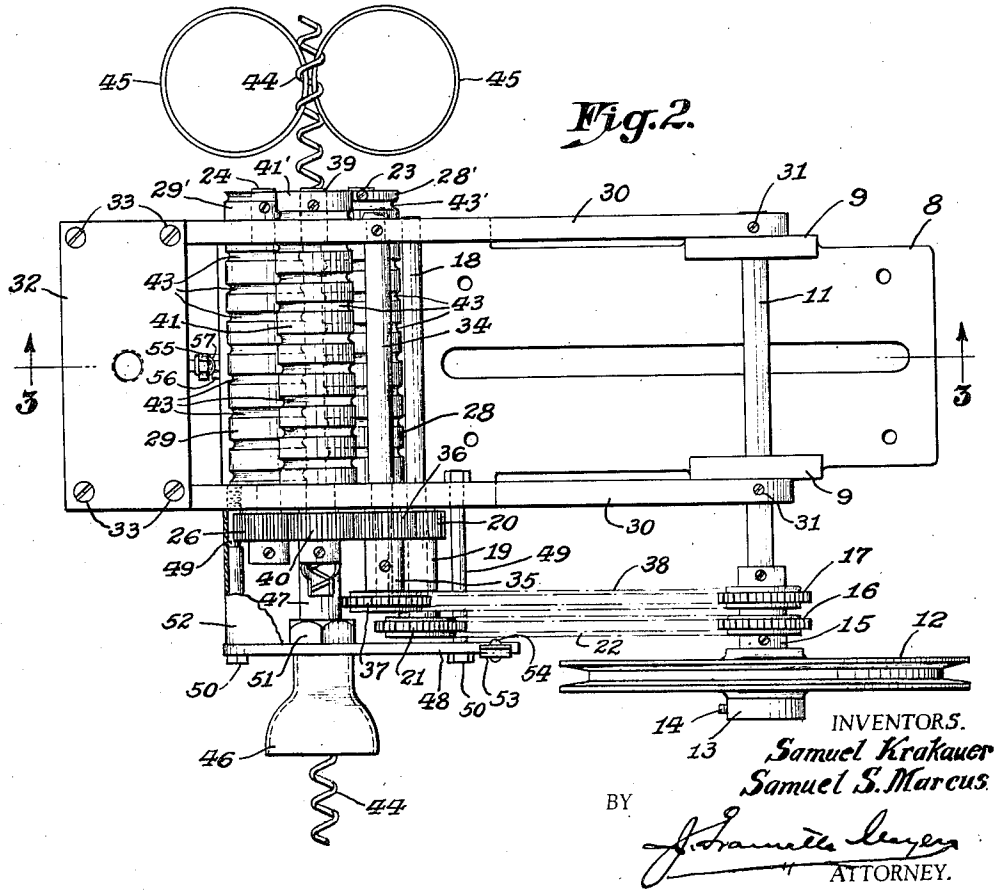


Fig. 2.



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Fig. 3.

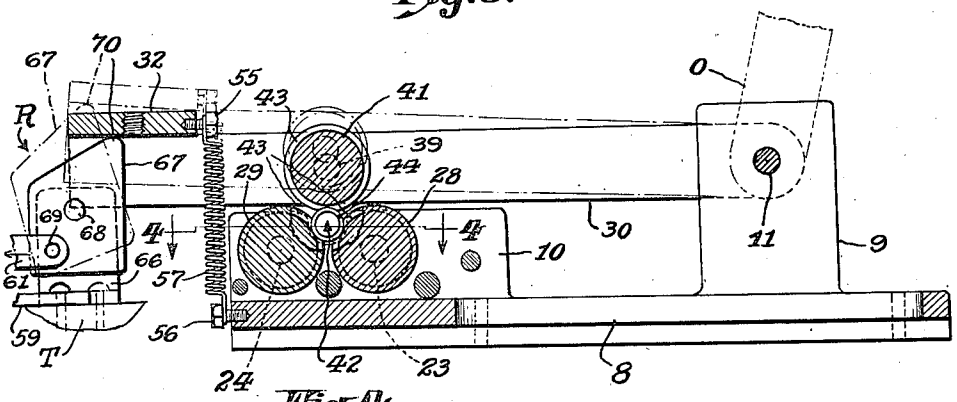


Fig. 4.

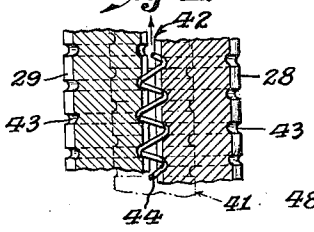


Fig. 6.

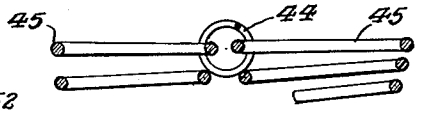


Fig. 5.

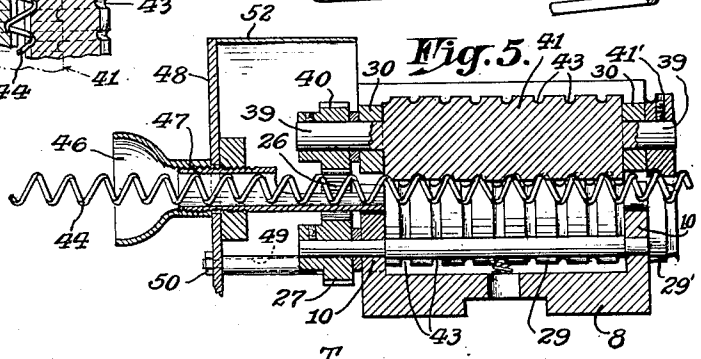


Fig. 8.

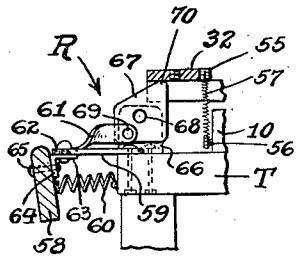
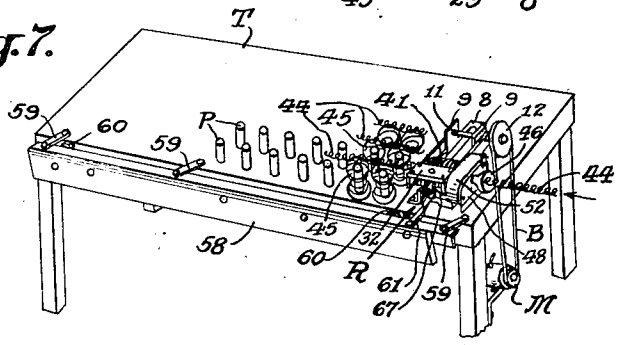


Fig. 7.



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Fig. 9.

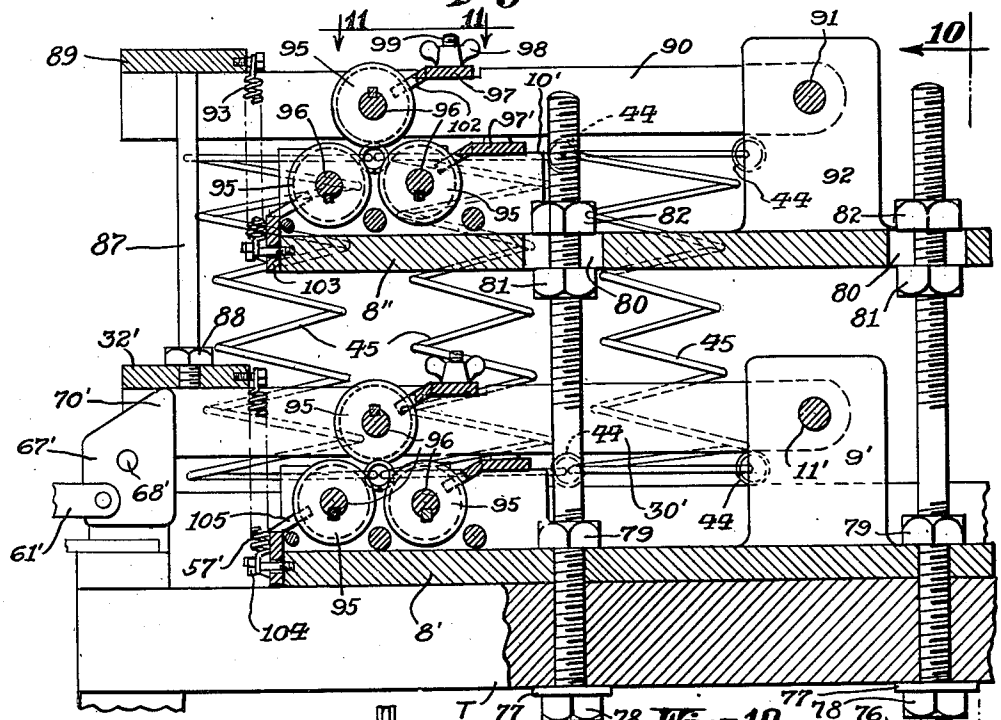


Fig. 11.

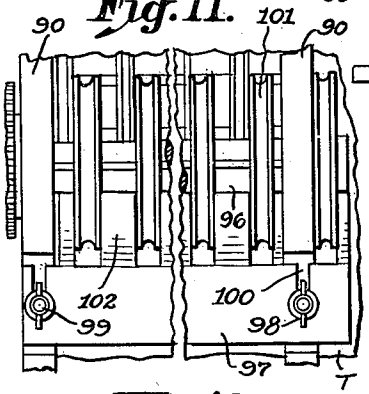


Fig. 10.

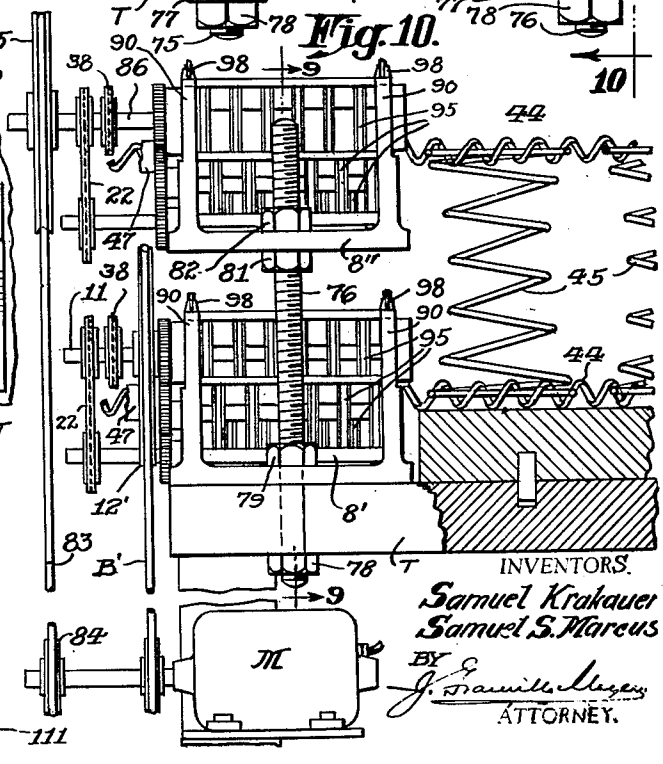
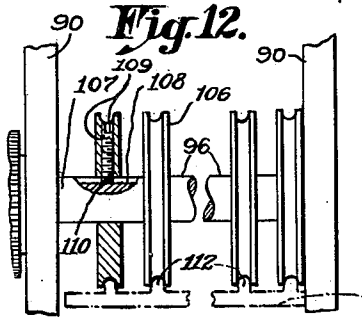


Fig. 12.



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APPARATUS FOR TYING COIL SPRINGS TOGETHER

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Application October 25, 1934, Serial No. 750,002

5 Claims. (Cl. 140—3)

The objects of our present invention stated generally are, first to provide a relatively compact and simple mechanism for feeding a spirally formed wire across alined coiled springs to tie the same together either at their tops or bottoms or both as the spirally formed wire rotates during the feeding movement thereof; second, to provide a continuously operating driving means for feeding or moving the spirally shaped formed wire with a rotating movement and permitting quick and positive stop to the movement of the spirally formed wire without stopping the actuating mechanism which normally feeds the wire; and third, to provide such mechanism constructed and operated in conjunction with the guiding means to facilitate the insertion of the spirally formed wires to be fed or driven thereby without stopping the operation of the mechanism.

The foregoing and other objects and advantages of the invention will become more apparent and will be pointed out during the course of the following detailed description of the accompanying drawings, in which

Fig. 1 is a side elevation of the mechanism for advancing the spiral wire to bind the coil springs together;

Fig. 2 is a plan view of the mechanism shown in Fig. 1 showing two adjacent coil springs being bound together by the advancing spiral wire;

Fig. 3 is a view taken on the line 3—3 of Fig. 2;

Fig. 4 is a view taken on the line 4—4 of Fig. 3;

Fig. 5 is a view taken on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary side elevation of two coil springs bound together by a spiral wire;

Fig. 7 is a perspective view of a table with mechanism embodying my invention mounted thereon;

Fig. 8 is a detailed fragmentary side elevation view of the means for raising and lowering the upper feed roll;

Fig. 9 is a vertical sectional view through a double arrangement of mechanism such as shown in Figs. 1–3 for advancing upper and lower strands of spiral wire to bind respectively the tops and bottoms of the coil springs;

Fig. 10 is a view taken on the line 10—10 of Fig. 9;

Fig. 11 is a fragmentary plan view looking in the direction of the arrows on the line 11—11 of Fig. 9; and

Fig. 12 is a view similar to Fig. 11 showing a further modification in the feed rollers.

Referring to the drawings, the numeral 8 designates a base plate above which are oppositely disposed upstanding ears 9 connected to the plate or formed as a part thereof, and at the other end of the plate upstanding brackets or plates 10. Shaft 11 is mounted through alined openings in the ears 9 and on one end of the shaft is rotatably mounted a pulley 12 held on the shaft by collar 13 which is secured to the shaft by a set screw 14. The pulley 12 is formed with or connected to a sleeve 15 rotatably mounted on the shaft and carrying a pair of sprocket wheels 16 and 17. Mounted between brackets 10 is a shaft 18 on which is rotatably supported a sleeve 19 connected to a gear 20 and a sprocket 21. A sprocket chain 22 is trained around the sprocket 16 and sprocket 21. Also secured between the brackets 10 are a pair of alined shafts 23 and 24, the former provided with a collar carrying a gear 25 and the latter provided with a collar carrying a gear 26. The teeth of the gear 25 mesh with the gear 20 and also mesh with a gear 27 on a shaft 28 mounted between the brackets 10. The teeth of the gear 27 also mesh with the teeth of the gear 26, so that when the sprocket 16 is rotated the sprocket 21 will also be rotated to rotate the gears 20, 23, 27 and 26. The shafts 23 and 24 have connected thereto for rotation therewith, elongated rollers 28 and 29 between the brackets 10 and on the outside of one of the brackets 10 the shafts also have connected thereto portions of rollers similar to 28 and 29 and designated by the numerals 28′ and 29′.

A pair of arms or elongated plates 30 are connected to the shaft 11 by set screws 31. The other ends of the arms 30 are interconnected by plate 32 through which screws 33 engage into the arms 30. A shaft 34 is mounted between the arms 30 and has rotatably mounted on one of its ends a sleeve 35 which is provided with a gear 36 at one end, and a sprocket 37 at its other end. A sprocket chain 38 is trained around the sprocket 17 and the sprocket 37. Also mounted between the arms 30 is a shaft 39 on the outer end of which is keyed a gear 40, the teeth of which mesh with the gear 36. Between the arms 30 on the shaft 39 is a roller 41 similar to the rollers 28 and 29 and positioned thereabove and having on one of its ends a portion of a roller 41′ similar to the portions 28′ and 29′. Obviously the arrangement of the sprockets and gears is such that when the pulley 12 is rotated, all of the rollers 28, 29, 41 and portions 28′, 29′ and 41′ will all be rotated in the same direction.

Between the rollers 28, 29, 41 and the portions bearing corresponding primed numerals, there is an opening or space 42, and each of the rollers is provided with grooves 43 slightly inclined relative to the longitudinal axis of the rollers, the

grooves being relatively arranged as shown in Figs. 2–5 to receive the spirally formed wire 44, so that as the rollers are rotated the wire will be rotated thereby, due to its frictional engagement in the grooves when the rollers are in the full line position of Figs. 3 and 5, and also moved longitudinally of the rollers to be fed across coil springs 45, which may be arranged in alinement on pegs P as shown in Fig. 7. To facilitate inserting or feeding the wires 44 to the opening 42 and to the grooves 43, we provide a funnel-shaped member 46 which has a neck 47 alined with the said opening. The neck of the member 46 extends through an opening in a plate 48 which is secured to one of the brackets 10 as by shouldered bolts 49 and nuts 50. A nut 51 is threaded on neck 47 of the member 46 and bears against one face of the plate 48 while the member 46 on the other side of the plate 48 is provided with a shoulder which abuts the plate. We may hingedly connect a cover 52 on one of the bolts 49 by bending an end of the plate 52 around the bolt. The cover is preferably of a width substantially equal to the distance between the plate 48 and one of the arms 30 and one of the brackets 10, so that the gears are housed under the cover and inside of the plate 48. We may also provide a flat spring 53 on the plate 48 with a projection 54 to hold the cover 52 down in the full line position of Fig. 1 and yet permitting it to be swung to the dot and dash line position of Fig. 1 when it may be desired to lubricate the parts.

As long as the parts are in the full line position of Fig. 3, when a wire 44 is fed through the funnel-shaped member 46, it will be moved longitudinally with a rotating movement when the rollers 28, 29, 41 are rotated. However, it is desirable to stop the longitudinal and rotary movement of the wires 44 when passing the wire from one pair of coil springs to another, so that the operator can be sure that the end of the wire 44 is alined with the top or bottom coils of the springs 45, whereby they will be tied together as illustrated in Figs. 2 and 6. We find that my providing for movement of the roller 40 away from the rollers 28 and 29 that this stopping of the feeding movement of the wire 44 may be accomplished quickly and without stopping operation of the sprockets and ears. To this end, the roller 41 is carried by the arms 30, which as previously mentioned, are pivoted on the shaft 11. As shown in Figs. 1 and 3, the plate 32 connecting the other ends of the arm 30 has tapped therein a screw 55, and the base 8 has tapped therein a similar screw 56, the screws receiving the hooked ends of a coil spring 57 which normally tends to pull the arms 30 and the roller 41 carried thereby downwardly, so that the three rollers are in driving relation to feed the wire 44 therebetween. If the spring 57 is disconnected from either of the screws 55 or 56, the arms 30 may be swung up freely with the shaft 11 serving as an axis of rotation to give clear access to the rollers 28 and 29 and the lower gears. The swung up or open position of the arms 30 is shown in dotted lines in Fig. 3 as designated by the letter O.

Referring to Fig. 7, it will be noted that we have shown a supporting table T on top of which are two rows of the pegs P and at the end of the rows on top of the table is the apparatus just described; Fig. 7 further showing the pulley 12 driven by belt B and motor M. A board 58 is pivotally connected by links 59 to the top of the table and springs 60 are mounted between the board and the front edge of the table normally holding the board away from the table but permitting movement of the board toward the table. Also in Fig. 7, we have designated generally by the letter R, mechanism for raising the arms 30 to lift the roller 41 for the purpose previously described. This mechanism is shown in detail in Fig. 8, wherein the numeral 61 indicates a strip twisted intermediate its end to place the surface of one end in a horizontal plane and the other in a vertical plane, the former end 62 being connected at 63 to an angle plate 64 which is also connected as by screws or bolts 65 to the board 58. An angle bracket 66 is secured to the top of the table beneath the plate 32 and a cam or bell crank 67 is pivotally connected at 68 to the plate 66 and at 69 to the strip 61. The upper end 70 of the member 67 is immediately beneath the plate 32. Obviously, if the operator leans against the board 58 to swing it on links 59 against the action of springs 60 toward the table, the member 67 is rotated on its pivot 68 so that the end 70 raises the plate 32 and consequently the arms 30 to lift the roller 41 to the dot and dash position of Fig. 3. When the operator removes his weight from the board 58, the spring 57 pulls the arms 30 down and the springs 60 push the board 58 out. This action is very quick, as also is the raising of the arms 30. We wish it to be understood that we may use other means than that specifically shown and described in Figs. 7 and 8 for accomplishing the raising and lowering of the arms 30, such for instance, as a foot pedal operating a lever or cam.

In operation, to form a unitary spring structure, a plurality of coil springs are placed on the front row of pegs P, and with the motor M operating to rotate the pulley 12, sprockets 16, 17, 21, 37, and the gears driven thereby, and consequently the rollers 28, 29, 41 and portions 28', 29', 41' in the same direction, one end of the wire 44 is inserted through the funnel-shaped member 46 until it is engaged in the articulated grooves 43, whereby rotation of the rollers will rotate the wire and project it toward the springs. As the end of the wire approaches the first spring, the operator may lean on the board 58 to stop the feeding of the wire by raising the roll 41. He then positions the wire with respect to the spring, releases the board 58 so that the wire is coiled around the spring and projected toward the second spring, at which time he again stops the feeding of the wire and positions the end of the wire with respect to the second spring, and so on, until the entire line of springs have been tied together along their outer edges. This row of springs is then moved back to the second row of pegs, and another row of springs is inserted on the first row of pegs, after which another wire 44 is inserted and fed, to tie the two rows of springs together as shown in Figs. 2 and 6. Between each pair of springs, the operator may stop the feeding to position the end of the wire and the coils, so that they will be accurately tied together. The operation is very rapid and at no time is the rotation of the rollers stopped, so that they are always rotating at a fairly rapid rate, and as they approach each other and all engage the wire 44, the latter is quickly projected and rotated to tie the springs together.

The construction and arrangement of the apparatus above described is such as to bind only tops or bottoms of the springs together without reversing the springs, and its use would necessitate turning the springs over to bind the springs

together at their other ends. This is due to the fact that there is shown in Figs. 1–8 only a single spiral wire feeding mechanism which may be located in alinement either with the bottoms or tops of the springs. We provide, however, a double or tandem arrangement of wire feeding mechanism, as shown in Figs. 9 and 10, wherein the primed numerals designate the same parts designated by unprimed numerals in Figs. 1–8. The base plate 8' of the lower feeding mechanism is secured to the top of the table T by elongated bolts 75 and 76, the lower ends of which receive washers 77 and nuts 78. Nuts 79 are threaded on the bolts 75 and 76 to bear against the top of the base 8', and the bolts extend upwardly through openings 80 in a second base 8'' of feeding mechanism substantially identical with the lower mechanism. Nuts 81 and 82 bear against the opposite faces of the base 8'' to hold the same at a predetermined height above the lower mechanism. As shown in Fig. 10, a second belt 83 similar to the belt B' is driven by a pulley 84 on the shaft of the motor M and is trained around a second pulley 85 similar to the pulley 12 of Figs. 1–7 or 12' of Fig. 10. The pulley 85 is keyed to a shaft 86 similar to the shaft 11' to rotate the feeding discs of the upper feeding mechanism in the identical manner with the lower feeding mechanism. To accomplish the simultaneous separation of the feeding rollers on the upper and lower mechanisms, a bolt 87 is threaded into the plate 32' which is engaged by the end 70' of member 67' and a nut 88 is threaded on the bolt 87 to bear against the top of the plate 32'. The upper end of the bolt 87 is rigidly secured to a plate 89 similar to the plate 32' and which is connected to a lever 90 similar to the lever 30' and pivoted on a shaft 91 similar to the shaft 11' supported by extensions 92 similar to the extensions 9'. A spring 93 is attached at one end to the plate 89 and at its other end to its base 8'' serving the same function as the spring 57 of Figs. 1–8, namely, to hold the lever 90 normally down.

Obviously, the mechanism of Figs. 1–8 may be arranged and connected as shown in Figs. 9 and 10, one above the other to operate in unison, so that tops and bottoms of coil springs arranged on a single row of pegs may be tied together without turning the coil springs over as would be necessary where a single feeding mechanism is used.

Under the construction and arrangement of parts thus far described, particularly with reference to the feed rollers of Figs. 1–8, if spiral wires of different pitches are used then the feed rollers must be interchanged, due to the fact that the feed rollers previously described are unitary structures.

Another modification of the invention resides in providing feeding discs in place of the unitary rollers with means for relatively adjusting the discs to accommodate spiral wires of different pitches.

In Fig. 9 the discs are indicated generally by the numeral 95 and are keyed on their respective shafts 96, corresponding to shafts 23, 24, 39 of Fig. 2. The lever arms 90 have secured therebetween a plate 97 as by means of wing nuts 98 engaging screws 99 disposed through slots 100 (see Fig. 11 in the plate), and each of the discs 95 is provided with a groove 101. The plate 97 is provided with forward extensions or fingers 102 which are disposed between the discs 95 to maintain them in predetermined spaced relation. The width of the fingers 102 determines the distance which the discs are spaced from each other, and, of course, there may be several sets of plates with fingers of different widths to adjust the discs for feeding spiral wires of different pitches. It will be understood that the discs may slide along the shaft on the key 96 when making adjustments. A plate 97' similar to the plate 97 is mounted on top of the sides 10' of the base 8'' and the base 8' to space the rear lower rollers; while a plate 103 is secured to the front of each of the bases 8' and 8'' as by screws 104, and is provided with spacer fingers 105 for the front lower sets of discs.

Another means of adjustably connecting the discs on their respective shafts is shown in Fig. 12, where the discs are designated generally by the numeral 106, and one of the shafts is designated as 107 and is provided with a longitudinal groove 108. Each of the discs 106 under the embodiment of the invention shown in Fig. 12 is provided with a radial screw threaded bore 109 which receives a set screw 110 of sufficient length to engage at its lower end in the groove 108 when the upper flat end is flush with or just below the peripheral grooves in the discs. Obviously by loosening the screws the discs may be moved longitudinally along the shaft and adjusted relative to each other. To facilitate relative positioning of the discs to accommodate spiral wires of different pitches, we may provide guides such as shown in dot and dash lines in Fig. 12, and designated by the numeral 111. Such guides comprise plates having at predetermined intervals projections 112 to engage in the grooves of the discs. When the plate 111 is properly positioned and the grooves of the discs are engaged by the projections 112, the screws 110 are tightened to lock the discs to the shaft for rotation therewith.

We claim:

1. Apparatus for tying coil springs together with a spirally formed wire comprising a table, a plurality of rollers mounted thereon, means to rotate the rollers, said rollers being formed with grooves relatively arranged to receive the spirally formed wire, whereby as the rollers rotate they will move the wire toward the springs to be tied thereby while simultaneously rotating the spirally formed wire, means to move the rollers out of cooperating relation to stop said forward and rotating movement of the wire as desired without stopping rotation of the rollers, and an actuating member for said last means mounted across the front of the table.

2. Apparatus for tying coil springs together with a spirally formed wire comprising a table, a plurality of rollers mounted on said table, means normally holding said rollers near each other, means to rotate the rollers, adjacent arcuate surfaces of the rollers providing a space through which the wire is fed, means to guide insertion of the wire into said space, said rollers being formed with grooves arranged to receive the spirally formed wire whereby as the rollers rotate the wire will be fed therebetween with a longitudinal and rotating movement, means to separate the rollers to stop said longitudinal and rotating movement of the wire, and an actuating member for said last means mounted across the front of the table.

3. Apparatus for tying coil springs together with a spirally formed wire comprising a table, a supporting frame on said table, rollers rotatably supported by said frame, means to rotate said rollers, an auxiliary frame hingedly supported at

one end by said first frame, at least one roller rotatably supported by said auxiliary frame between said one end and its other end and adjacent said first rollers, all of said rollers having grooves arranged thereon to receive the spirally formed wire in the space between the rollers, means to rotate said second roller whereby when all of the rollers are in engagement with the wire and are being rotated the wire will also be rotated and fed forwardly, a spring normally holding said other end of the auxiliary frame down with all of said rollers in wire engaging position, means to move said auxiliary frame relative to said first frame to move said second roller away from said first rollers and away from said wire to stop said rotating and forward movement thereof without stopping rotation of the rollers, and an actuating member for said last means mounted across the front of the table.

4. In apparatus for tying coil springs together with spirally formed wires and including a plurality of driven shafts, discs on said shafts provided with circumferential grooves to receive the spirally formed wires, means adjustably connecting said discs to said shafts and permitting different spacing of the discs relative to each other on said shafts to accommodate spiral wires of different pitches.

5. In apparatus for tying coil springs together with spirally formed wires and including a plurality of driven shafts, a plurality of discs arranged on the shafts and each having a circumferential groove to receive the wires, a spacer for the discs on each shaft comprising, a member having projecting fingers located between the discs to maintain them in predetermined spaced relation, said members being interchangeable to adjust the spacing of the discs to accommodate spiral wires of different pitches.

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