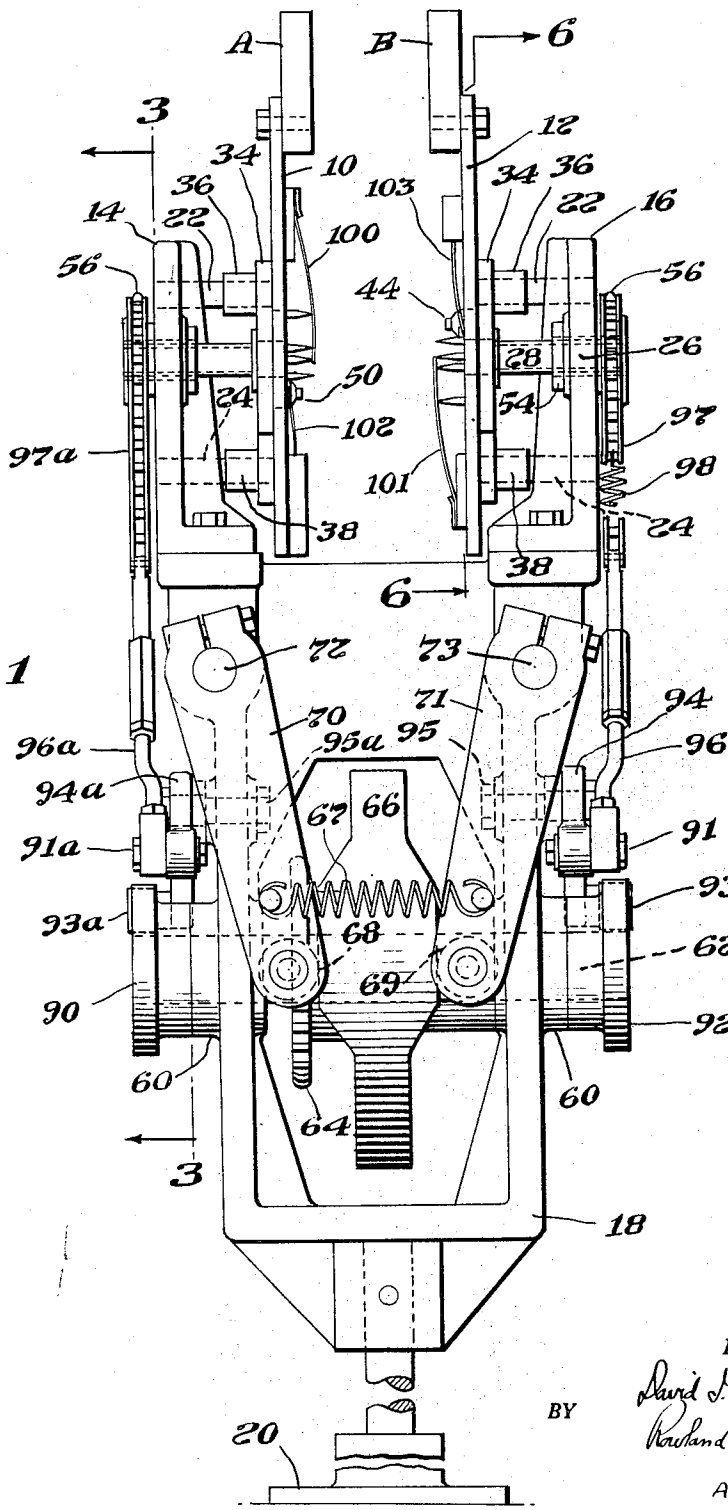
June 15, 1954 D. I. LEVINE 2,681,085

APPARATUS FOR CHANGING THE CONFIGURATION OF THE END CONVOLUTIONS OF SPRING COILS FOR CUSHIONS, MATTRESSES, AND THE LIKE

Filed July 13, 1949 4 Sheets-Sheet 1



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Fig. 2

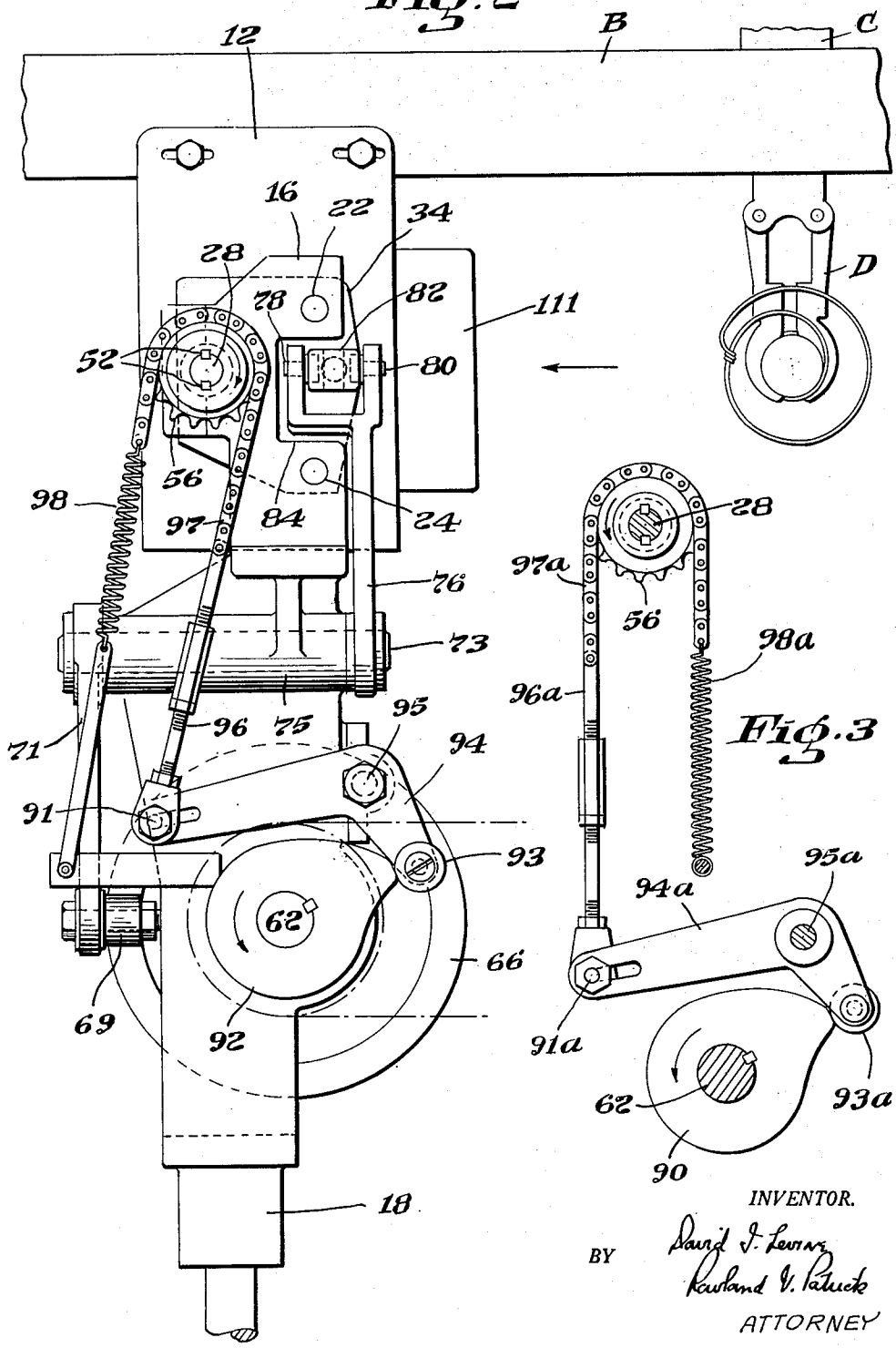


Fig. 3

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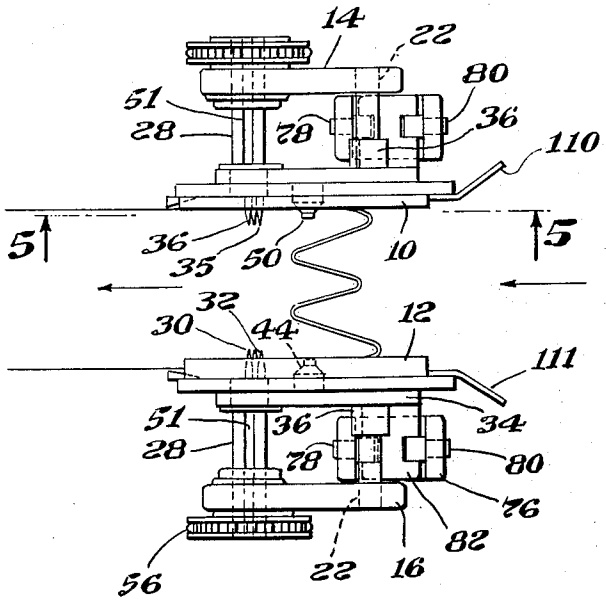
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Fig. 4



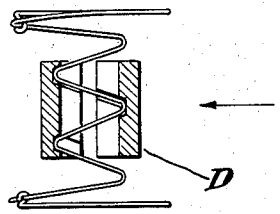
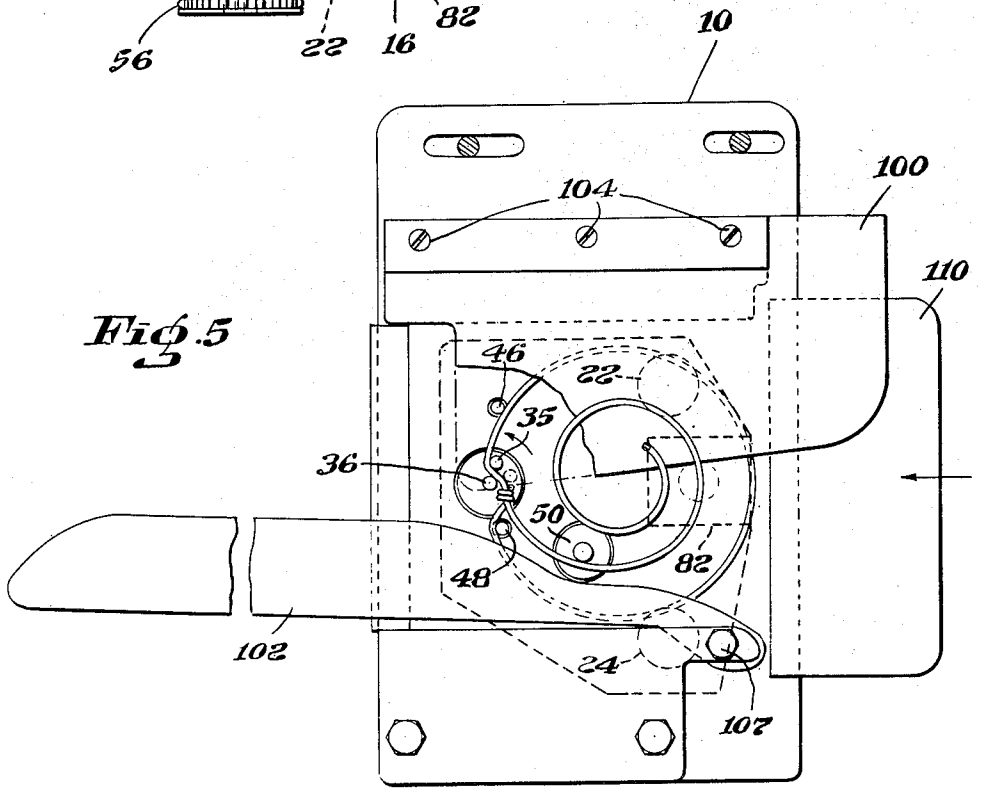


Fig. 5



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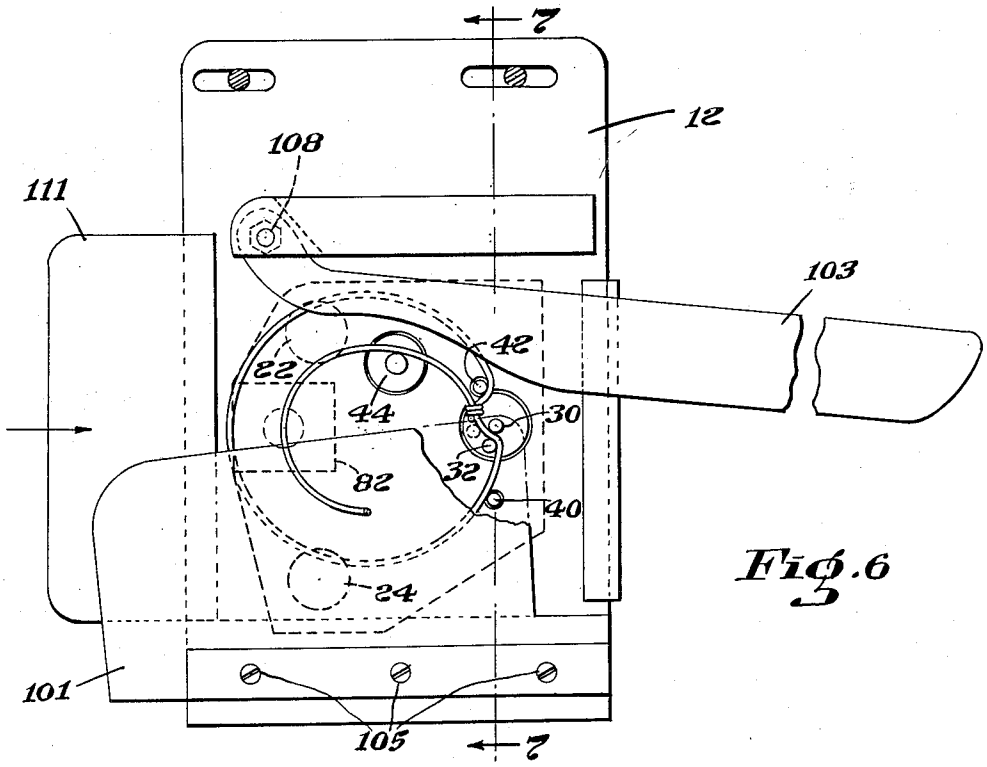


Fig. 6

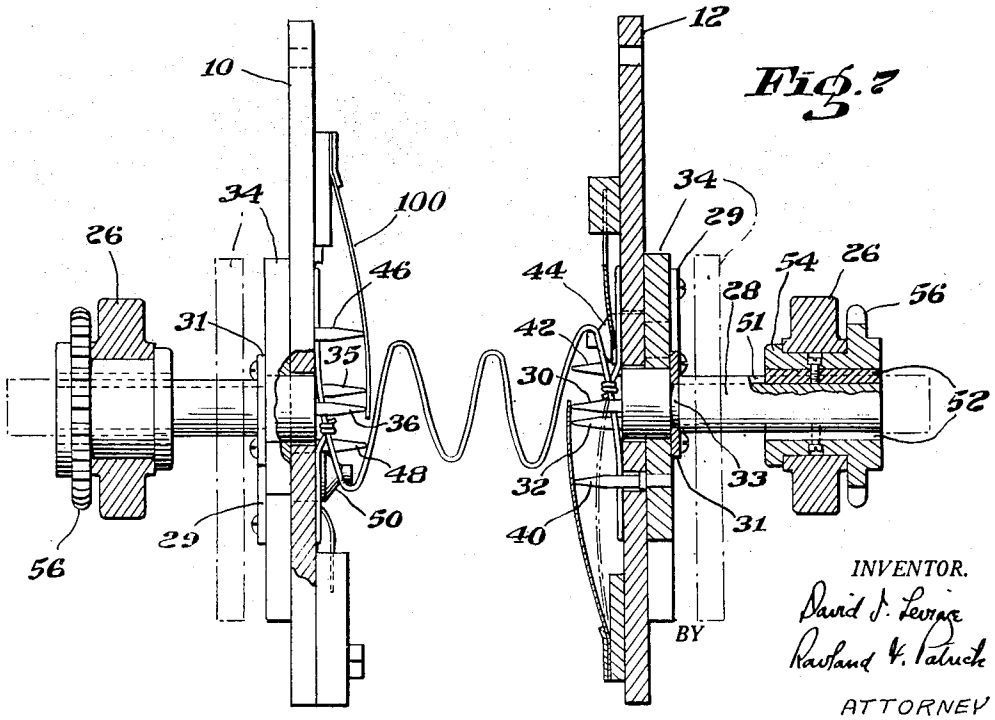


Fig. 7

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Patented June 15, 1954 2,681,085

UNITED STATES PATENT OFFICE

2,681,085

APPARATUS FOR CHANGING THE CONFIGURATION OF THE END CONVOLUTIONS OF SPRING COILS FOR CUSHIONS, MATTRESSES, AND THE LIKE

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Application July 13, 1949, Serial No. 104,542

5 Claims. (Cl. 140—105)

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This invention relates to apparatus for forming coil springs of the type utilized in the manufacture of mattresses and cushions, and, in particular, is concerned with apparatus for performing, as a last step in a coil spring forming operation, a bending operation to change the configuration of the end convolutions of the coil from a spiral configuration, as it comes from the conventional coil-forming machine, to more nearly circular configuration.

The apparatus is thus adapted, in an automatic operation, to form a coil of the type described and claimed in my co-pending application Serial No. 34,937, filed June 24, 1948 now Patent No. 2,641,758, issued June 9, 1953.

Coil-forming machines are universally used by spring manufacturers to form coils. These machines are generally of the type shown in Patents Nos. 1,681,728 or 1,851,540 and form successive lengths of wire coiled springs which are knotted at each end to form closed end convolutions. The mechanical operation results, however, in the inherent formation of end convolutions which are each of non-uniform radius, as shown in Fig. 16 of Patent No. 1,851,540.

My aforesaid co-pending application describes a hand tool for bending the end convolutions so that they will have a uniform radius throughout substantially their entire extents except adjacent the knots. It is the purpose of the present invention to provide an attachment for conventional coil-forming machines so that this operation is performed automatically as a last stage in the coil-forming operation.

To this end, the attachment of this invention includes operating parts which are driven off the main drive shaft of the coil-forming machine and in timed relation thereto, so that as a coil is at the last station of the conventional machine, a preceding coil is at the supplemental attachment station and being subjected to the end convolution configuration changing operation. The spring of changed end convolution configuration is ejected from the attachment as the next spring formed by the machine is fed to the attachment station.

The attachment with incorporated mechanism, together with its relation to conventional parts of a coil spring forming machine is illustrated in the accompanying drawings wherein:

Fig. 1 is an end elevation of the attachment;

Fig. 2 is a side elevation thereof;

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a plan view of certain parts of the

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device showing the relation of stations of the apparatus;

Fig. 5 is an enlarged cross-sectional detail taken along the line 5—5 of Fig. 4;

Fig. 6 is an enlarged cross-sectional detail taken along the lines 6—6 of Fig. 1; and

Fig. 7 is an end view partly in elevation, and partly in cross-section taken along the lines 7—7 of Fig. 6.

A and B represent two parallel beams of a conventional coil-forming machine which support, for reciprocal travel, a carriage C (Fig. 2) from which is suspended a coil grab D utilized to pick up a coil at one station and transfer it to the next where the jaws of the grab D are opened to release the coil, the carriage then returning to pick up the next coil. All this is well-known structure and operation.

My novel attachment includes two parallel stationary plates 10 and 12 which are suspended from and extend downwardly from the beams A and B respectively. The springs are adapted to be moved by the grab D between holder plates 10 and 12 by the motion which is the usual ejecting motion of the conventional machine.

Flanking the plates 10 and 12, as shown in Fig. 1, are two upstanding reinforced angle frames 14 and 16, each of which is bolted to the top of an arm of a bifurcated frame 18 supported on a pedestal 20.

Each angle frame 14 and 16 has extending inwardly therefrom and fixed relative thereto an upper and lower dowel 22 and 24, respectively, and accommodates a split ring bearing 26 to form a journal for the outer end of a shaft 28.

Fixedly secured to the inner end of the right-hand shaft 28 are two pins 30 and 32; and to the inner end of the left-hand shaft 28, two pins 35 and 36.

As shown more clearly in Fig. 7, the shafts 28 also have fixed thereto plates 34 held for reciprocal motion therewith by screw-held split locking elements 29 and 31 which surround shafts 28 and extend into annular recesses 33 in said shafts. The plates 34 have upper and lower bosses 36 and 38 respectively, which receive the dowels 22 and 24 and therefore act to guide the plates 34 in their reciprocal motion with the shafts 28.

The right-hand plate 34 is provided with a lower guide pin 40, an upper guide pin 42, and a conical snubbing element 44. Each of these is fixed to plate 34 and extends through a proper aperture provided therefor in the stationary plate 12.

The opposite left-hand reciprocating plate 34 similarly has two pins and a conical snubbing element 43, 48 and 50, respectively, except that their position is reversed and the apertures in the plate 10 are placed correspondingly. The outer ends of the shafts 28 are carried in the bearings 26 for both rotating and reciprocating motion relative to the angle frames 14 and 16. For this purpose, as shown in Fig. 7, the shafts have key ways 51 containing keys 52 locking the shafts 28 against relative rotation with respect to bushings 54. Bushings 54 include sprockets 56, the bushings 54 being held in the bearings 26.

Further parts of the machine comprise operating mechanism for (1) reciprocating the shafts 28 and plates 34 with their mounted pins or projections 30, 32, 35, 36, 40, 42, 46, 48 and snubbing elements 44 and 50 from positions withdrawn outwardly from the inner surfaces of plates 10 and 12 as indicated by the dot-and-dash line positions of the plates 34 and shafts 28 in Fig. 7, to the full line positions shown in Fig. 7, and (2) for oscillating the shafts 28, all in timed relation with the operation of the remainder of the machine.

For accomplishing the first operation, the bifurcated frame 18 is provided with bearings 60 in which are journaled a shaft 62 driven through a sprocket 64 off the main drive shaft (not shown) of the coil-forming machine, as indicated by the dot-and-dash sprocket chain line in Fig. 2. The shaft 62 carries, centrally thereof, a double-acting cam 66 against which bear, under the influence of spring 67, cam rollers 68 and 69 carried at the lower ends, respectively, of rocker arms 70 and 71, each of which is clamped at its upper end to a shaft 72 and 73 respectively. The shaft 72 is journaled in a bearing 74 in the left-hand arm of the bifurcated frame 18, while the shaft 73 is journaled in a bearing 75 in the right-hand upstanding arm of bifurcated frame 18.

The forward end of each shaft 72 and 73 carries a rocker arm 76 which is bifurcated at its upper end and pivotally and slidably connected by studs 78 and 80 to a block 82 (Fig. 4) extending outwardly from the face of the respective plates 34, the angle frames 14 and 16 being recessed at 84 to accommodate the bifurcated arms 76.

As will be seen, therefore, the motion of the rocker arms 70 and 71 through the action of cam 66 will be transmitted in the form of oscillation of rocker shafts 72 and 73 in reverse directions to reciprocate the plates 34 outwardly through the interposition of connections 76, 78 and 80 with the plates 34 being guided by the bosses 36 and 38 moving along the stationary dowels 22 and 24.

The operation (2) of oscillating the shafts 28 is performed also in timed relation off the shaft 62 through identical cams 90 and 92 on opposite ends of shaft 62.

On the right-hand side of the machine, as shown in Fig. 2, a cam roller 93 is carried on the end of a bell crank lever 94, pivotally mounted by a stud 95 on the frame 18. The other end of the bell crank lever 94 is pivotally connected at 97 to a turnbuckle connecting rod 96 with a sprocket chain 97 which passes over the sprocket wheel 56 and is anchored at its other end through a spring 98 to the frame 18.

At the left-hand side of the machine the arrangement is similar, with the important exception that the sprocket chain 97*a* is passed over the left-hand sprocket 56 in the opposite direction, as shown in Fig. 3, and the spring 98*a* is anchored at a different point on frame 18. Other of the reference numbers have the *a* added to distinguish from the corresponding right-hand parts.

The cams 90 and 92, being identical and set for identical action with respect to the cycle of shaft 62, impart opposite and equal oscillations of the shafts 56 in each cycle of the machine.

As shown in the figures, the parts are in the full line position when the cam rollers 68, 69, 93 and 93*a* are all on the high points of the cams with the plates 34 at the limit of their inward movement and the shafts 28 are at the limit of their operating movement.

As the shaft 62 continues its rotation in counter-clockwise direction as shown in Fig. 2, the springs 98 and 98*a* will operate to rotate the right-hand shaft 28 in counter-clockwise direction (Fig. 2) and the left-hand shaft in a clockwise direction (Fig. 3) to move the pin 32 from its full line position in Fig. 6 to its dotted line position and the pin 35 from its full line position in Fig. 5 to the dotted line position in Fig. 5. Upon completion of this motion of the pins with the shafts 28, the cam rollers 68 and 69 go off their high point on the cam 66 and the plates 34 are retracted away from the stationary plates 10 and 12 under the influence of spring 67.

As shown in Fig. 1 there are also provided four resilent wing guides 100, 101, 102 and 103, all affixed to the plates 10 and 12. The guides 100 and 101 are of substantially identical shape and contour but the guide 100 extends downwardly over the pins on the left-hand side as shown in Fig. 1, whereas the guide 101 extends upwardly over the pins on the left-hand side as indicated in Fig. 6. Both are at the entering end of the station and may be attached to the plates 10 and 12 by the screws 104 and 105 respectively.

The wing guides 102 and 103 extend toward the discharge end of the station. On the left-hand side the guide 102 is anchored to the plate 10 at its forward end by a bolt 107 as shown in Fig. 5; whereas the wing guide 103 is suspended from the bolt 108 in similar fashion as shown in Fig. 6.

As shown in Fig. 1 the wing guides 102 and 103 clear the pins.

Accordingly, as a coil spring is moved to the station by the gripper D with the pins in retracted position, the upper end convolution of the coil passes between plate 10 and wing guide 100 and the lower edge of the guide 100 forms a guide for positioning the coil with respect to its axis with the knot located at the edge of the wing guide 100 as shown in Fig. 5; whereas, on the right-hand side the guide 101 has an upper surface which positions the knot at the other end of the coil therealong.

Meanwhile, the bottom portion of the end convolution at the left-hand side passes between the guide 102 and the plate 10, and the upper part of the end convolution at the right-hand side passes between the guide 103 and the plate 12.

The guides 100, 101, 102 and 103, therefore, act to position the end convolutions circumferentially in proper position so that the retracted pins on each side, when they are actuated towards each other will enter the coil springs with the pins properly positioned with respect to the end convolutions.

Also provided affixed to plates 10 and 12 are two stationary converging entrance guides 110 and 111.

The apparatus thus provides automatic means for performing a bending operation to change

the configuration of the end convolutions of a spring coil at a supplemental station for conventional coil-forming machines.

The grippers D eject a spring from the last station of a conventional machine with the end configurations, guided by the wing guides 100 and 101 engaging the knots, to a suitable position of advance at rest at the supplemental station, held by the resilience of the coil itself and of the wing guides; the grippers are retracted and withdrawn; whereupon the cam 66 in proper timed relation, by driving in plates 34, inserts the pins 30, 32, 40, 42 and conical snubbing element 44, as shown in Figs. 6 and 7, pin 32 at the moment having the dotted line position of Fig. 6. Simultaneously on the left-hand side of the machine the pins 35, 36, 46, 48 and conical snubbing element 50 are moved inwardly, the pin 35 at that moment having the dotted line position shown in Fig. 5.

Immediately this movement has been completed, the cams 90 and 92 operate to rotate the shafts 28 in opposite directions with the pin 32 moving from its dotted line position to its full line position as shown in Fig. 6, and the pin 35 moving from its dotted line position to its full line position as shown in Fig. 5. These rotations bend the end convolutions to the configuration shown in Figs. 5 and 6. The springs 98 and 98a thereupon return the shafts 28 to their original positions of rotation, whereupon the spring 67 returns the shafts 28 to retracted position, thus completing the cycle and readying the parts for the positioning of the next spring by the gripper D.

While any means may be provided for discharging the spring from the supplemental station, in practice it has been found that the coil held by the gripper D as it goes to the supplemental station will eject the previous coil therefrom.

I claim:

1. Apparatus for changing the configuration of an end convolution of a coil spring comprising a frame, a holder mounted on the frame for holding an end of said spring, a plurality of coil engaging projections slidably mounted on the frame for movement axially of the spring at an end thereof while the spring is in said holder to and from an inoperative position behind the spring engaging face of said holder and an operative position in which they engage an end convolution of the spring laterally and hold it as it is bent, a coil engaging pin eccentrically mounted on a rotatable member on the frame adjacent at least one of said projections for reciprocal movement axially of the spring to and from an inoperative position in which the pin is withdrawn behind the spring engaging face of said holder and an operative position in which the pin is disposed at a side of a portion of an end convolution of said spring opposite said adjacent projection, said rotatable member being rotatable about an axis parallel to the axis of said spring when in operative position, means for moving said projection and said rotatable member to and from operative position, and means for rotating said rotatable member to move said pin transversely to the axis of the spring when in operative position to bend a portion of said end convolution.

2. Apparatus for changing the configuration of an end convolution of a coil spring comprising a frame, a pair of opposed parallel holders mounted on said frame including a plurality of coil engaging guide members for directing opposite ends of said spring against the opposing faces of said holders, conveyor means for advancing said spring in a direction transverse to its axis along said guide members to held position between said holders with the opposing end convolutions thereof in contact with the faces of the respective holders, a plurality of coil engaging projections slidably mounted on the frame for movement axially of the spring at each end thereof while the spring is in said holders to and from an inoperative position in which the projections are withdrawn behind the spring engaging faces of said holders and an operative position in which they engage the end convolutions of the spring laterally and hold them as they are bent, a coil engaging pin eccentrically mounted on a rotatable member on the frame adjacent at least one of said projections at each end of the spring for reciprocal movement axially of the spring to and from an inoperative position in which the pins are withdrawn behind the spring engaging faces of the holders and an operative position in which the pins are disposed at a side of a portion of each end convolution of the spring opposite the side on which the adjacent projection is disposed, each rotatable member being rotatable about an axis parallel to the axis of the spring when in operative position, means for moving said projections and said rotatable members to and from operative position, and means for rotating said rotatable members to move said pins transversely of the axis of the spring when in operative position to bend a portion of said end convolutions.

3. Apparatus as defined in claim 2 including cam means for actuating said rotating means and said means for moving the projections and support members to and from operative position in timed relation with said conveyor means.

4. Apparatus for changing the configuration of an end convolution of a coil spring comprising a frame, a holder mounted on the frame including a plurality of coil engaging members for holding an end of said spring in contact with a face of said holder, a plurality of coil engaging projections mounted on a carrier for sliding movement on said frame, said projections moving axially of the spring through the holder to and from an inoperative position behind the spring engaging face of the holder and an operative position in which they engage the end convolution of the spring laterally and hold it as it is bent, a rotatable shaft mounted on the frame for reciprocal movement through said holder axially of the spring, a plurality of adjacent coil engaging pins mounted at the end of the shaft in alignment therewith, at least one of the pins being eccentric with respect to the shaft, said shaft being reciprocable to and from an inoperative position in which the pins are behind the spring engaging face of the holder and an operative position in which the pins are disposed at each side of a portion of the end convolution of the spring, means for moving said carrier and said shaft to and from operative position, and means for rotating said shaft when in operative position to move said eccentrically mounted pin transversely of the axis of the spring and bend a portion of said end convolution.

5. Apparatus for changing the configuration of an end convolution of a coil spring comprising a frame, a holder mounted on the frame including a plurality of coil engaging members for holding an end convolution of the spring in contact with a face of the holder, a plurality of coil engaging projections mounted on a carrier for sliding

movement on said frame, said projections moving axially of the spring through the holder to and from an inoperative position behind the spring engaging face of the holder and an operative position in which they engage the end convolution of the spring laterally and hold it as it is bent, a rotatable shaft mounted on the frame linked with the carrier for reciprocal movement simultaneously therewith through said holder axially of the spring, a coil engaging pin extending from the center of the end of the shaft in alignment therewith, a second coil engaging pin adjacent the first extending from the end of said shaft eccentrically thereof and parallel thereto, said shaft being reciprocable with said carrier to and from an inoperative position in which the pins are behind the spring engaging face of the holder and an operative position in which the pins are disposed at each side of a portion of the end convolution of said spring, means for moving said carrier and said shaft simultaneously to and

from operative position, and means for rotating said shaft when in operative position to move said eccentrically mounted pin transversely of the axis of the spring and bend a portion of said end convolution.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
566,379	Deck	Aug. 25, 1896
1,192,631	Hick	July 25, 1916
1,192,655	Lyons	July 25, 1916
1,326,031	Cunningham	Dec. 23, 1919
1,353,346	Kitselman	Sept. 21, 1920
1,682,949	Ziler	Sept. 4, 1928
1,821,894	Otaka	Sept. 1, 1931
1,851,540	Gail	Mar. 29, 1932
1,860,582	Kirchner	May 31, 1932
1,867,128	Wunderlich	July 12, 1932
2,059,117	King	Oct. 27, 1936
2,351,659	Bronstien	June 20, 1944