March 31, 1970 C. O. KIRCHNER 3,503,115

HELICAL FEEDING MECHANISM FOR SPRING ASSEMBLY MACHINE

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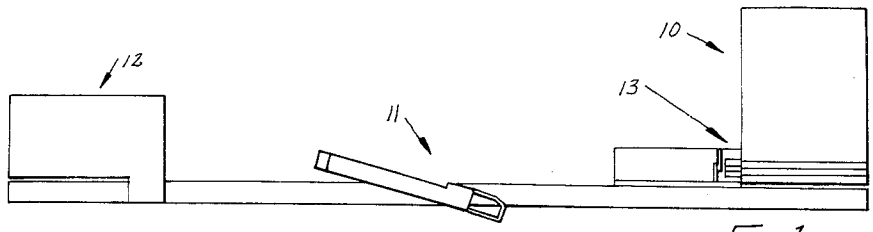


FIG. 1

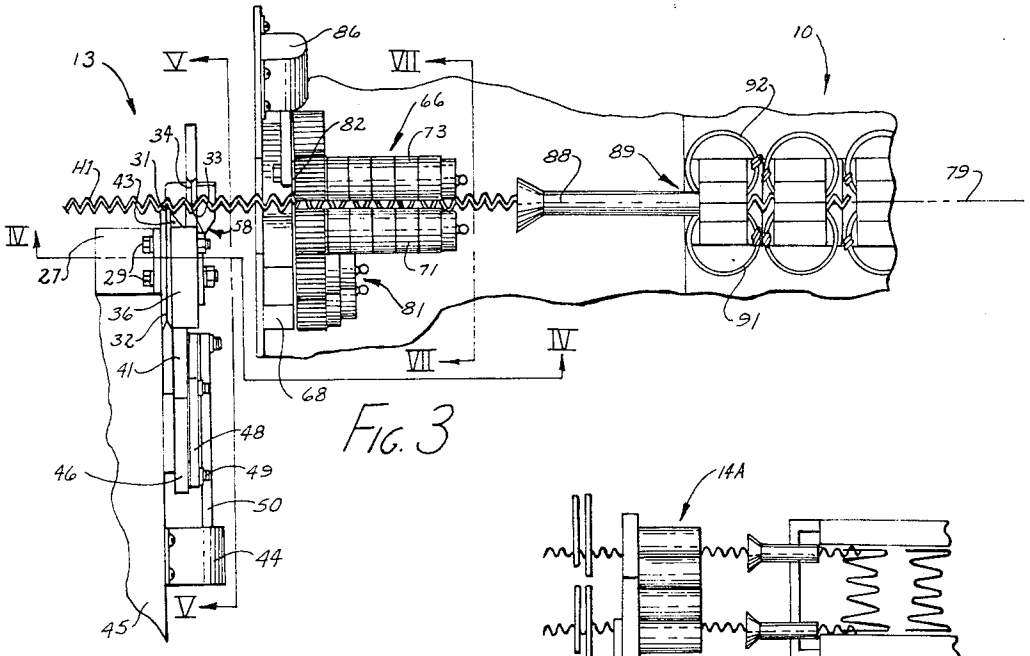


FIG. 3

FIG. 8

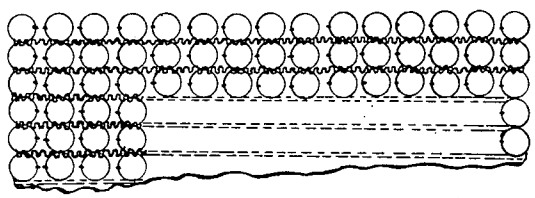


FIG. 2

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FIG. 5

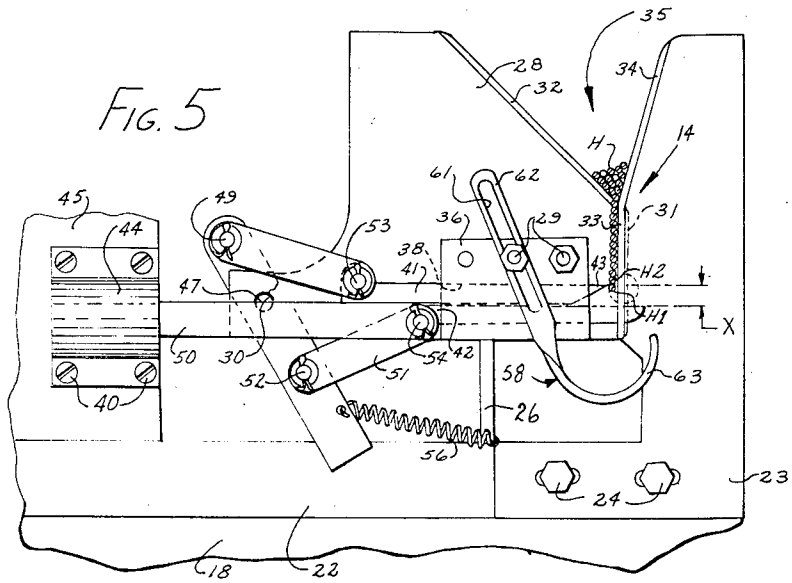
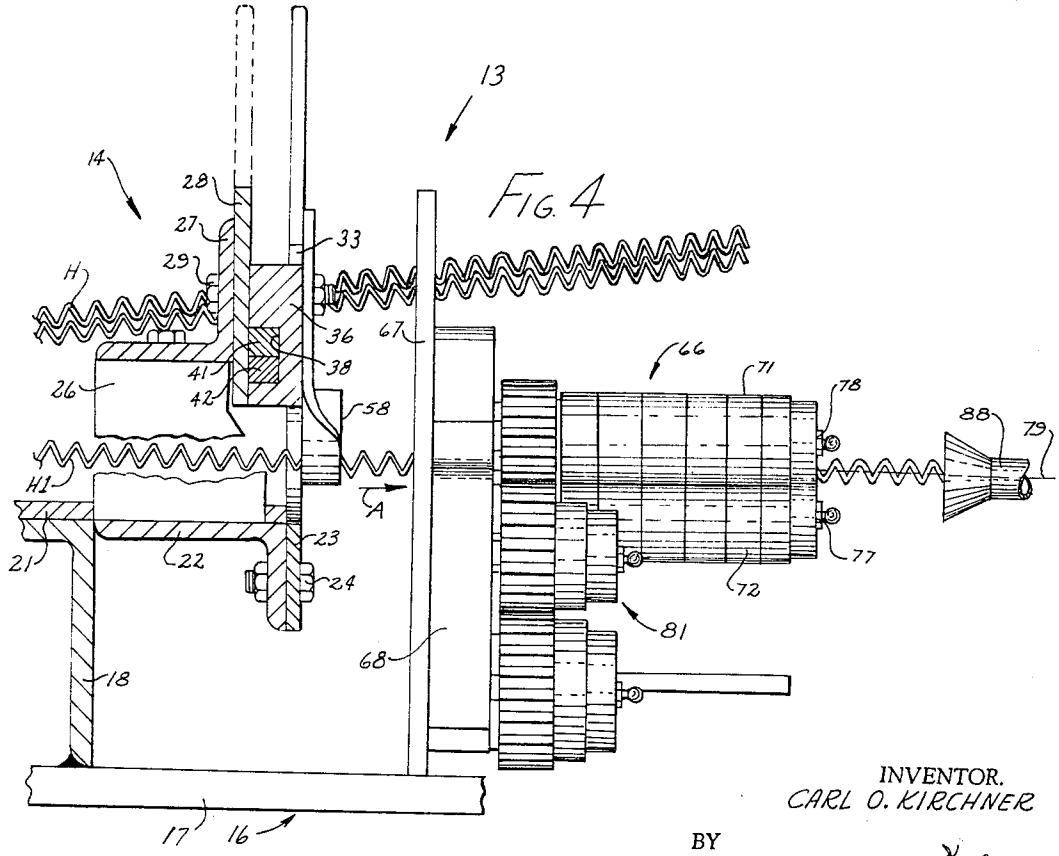


FIG. 4



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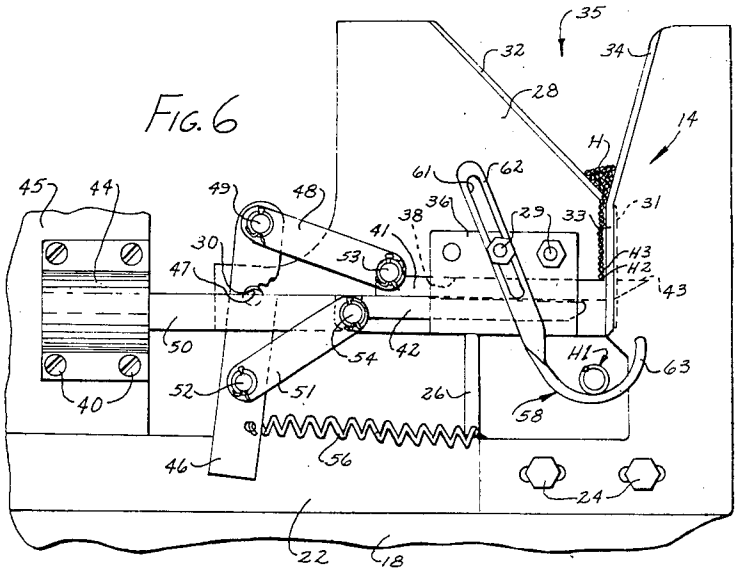
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HELICAL FEEDING MECHANISM FOR SPRING ASSEMBLY MACHINE

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FIG. 6



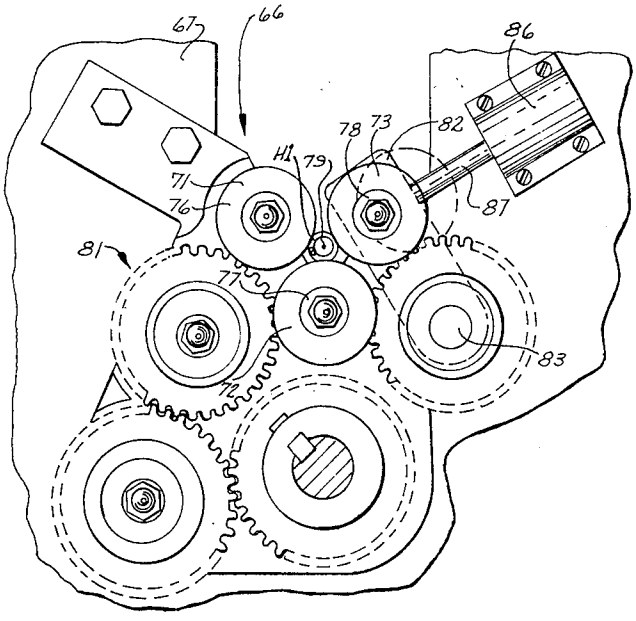


FIG. 7

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United States Patent Office 3,503,115 Patented Mar. 31, 1970

3,503,115

HELICAL FEEDING MECHANISM FOR SPRING ASSEMBLY MACHINE

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Filed June 12, 1967, Ser. No. 645,341
Int. Cl. B23p 19/04; B23g 7/10
U.S. Cl. 29—208 4 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus including a plurality of feed rolls and mechanism for supporting and feeding one helical tie wire at a time into engagement with the terminal convolutions of two adjacent rows of coil springs. The feeding mechanism includes cylinder means located on one axial side of the rolls coaxial with the feedline of the helical tie wire, and spaced edge means on the other side of said rolls extending transversely of the feedline and arranged to move the helical tie wires from a supply thereof into a single row whereby finger means can select and discharge one helical tie wire at a time from said row.

FIELD OF THE INVENTION

This application relates in general to a spring assembly machine and, more particularly, to a mechanism for advancing the helical tie wires, one at a time, into engagement with a plurality of coil springs for the purpose of forming a spring assembly.

DESCRIPTION OF THE PRIOR ART

Many machines have been developed and are in use for arranging and interconnecting coil springs by means of helical tie wires (often called "helicals") to form a unitized spring assembly of such coil springs, after which the assembly is then covered with padding and/or sheet material or the like, for example, to provide innerspring cushions, mattresses and the like. In the many years during which the development of more effective machinery has been constantly advanced, one problem has consistently avoided satisfactory solution. Specifically, there has been a definite need for an apparatus, which can automatically select one helical from a plurality of such helicals placed substantially at random within a hopper or the like for holding the helicals, and then feed the selected helical into engagement with coil springs. Presently, the helicals must be carefully prearranged so that they can be mechanically fed, one at a time, into engagement with the coil springs, or they must be handfed.

In order to solve the problem, it was first necessary to recognize that the problem actually had two separate parts, namely, (1) providing a mechanism for selecting one helical at a time from a group and moving it into the feeding position, and (2) arranging a group of the helicals so that just one of the helicals at a time can be so selected. Moreover, such selecting mechanism also appeared to necessitate a modification of the helical-advancing rolls so that the selected helical could be moved into a position of engagement by such rolls without affecting adversely the feeding capabilities of the rolls.

Accordingly, a primary object of the invention has been the provision of a helical-feeding apparatus including mechanism for first arranging a plurality of helicals in predetermined positions with respect to each other and thereafter selecting one of the helicals from such plurality while, at the same time, moving at least one of a plurality of cooperating feed rolls out of its normal feeding position so that the selected helical can drop into the zone between the feed rolls for engagement and

prompt advancement thereby into the spring assembly machine.

A further object of this invention is the provision of an apparatus, as aforesaid, which will supply helicals for interlacing advancement along the feedline as quickly and as accurately as any previous means or method available, including a handfed operation, and which can be automatically coordinated with the operation of the entire spring assembly machine.

Other objects and purposes of the invention will become apparent to persons familiar with this type of equipment upon reading the following descriptive material and examining the accompanying drawings, in which:

FIGURE 1 is a plan view of a portion of a spring assembly machine including the apparatus of the invention.

FIGURE 2 is a fragment of a plan view of a spring assembly produced by said machine.

FIGURE 3 is an enlarged fragment of FIGURE 1 showing the apparatus of the invention.

FIGURE 4 is a sectional view substantially as taken along the line IV—IV in FIGURE 3.

FIGURE 5 is a sectional view taken along the line V—V in FIGURE 3.

FIGURE 6 is a sectional view similar to that appearing in FIGURE 5 with parts thereof in different positions of operation.

FIGURE 7 is a sectional view taken along the line VII—VII in FIGURE 3.

FIGURE 8 is a schematic front view of the helical-feeding mechanism and the spring assembler.

For convenience in description, the terms "upper," "lower" and words of similar import will have reference to the apparatus of the invention and parts of the assembly machine associated therewith as appearing in FIGURES 4, 5 and 6. The terms "leading" and "trailing" will have reference to the rightward and leftward ends, respectively, of a helical and parts of the apparatus associated therewith as appearing in FIGURE 4. The terms "inner," "outer" and derivatives thereof will have reference to directions toward and away from, respectively, the geometric center of said machine and parts of said apparatus associated therewith. The terms "front," "rear" and words of similar import will have reference to the left and right sides, respectively, of the structure and parts of the machine associated therewith as appearing in FIGURES 5 and 6.

SUMMARY OF THE INVENTION

The objects and purposes of the invention, including those set forth above, have been met by providing an apparatus including a feed mechanism having a cylindrical member for guiding a helical into engagement with the terminal convolutions of two rows of adjacent coil springs. A plurality of rolls, here three, define a helical-engaging zone, and one of the rolls is movable into and out of the helical-engaging position so that a helical can be dropped into the said zone. The apparatus also includes a sorting and selecting mechanism having a pair of spaced edges arranged to receive helicals therebetween and thereafter guide them into a row which is preferably substantially vertical. A pair of reciprocable fingers are disposed near the lower end of said row to support the helicals and select the lowermost one of the helicals in said row and discharge it into said zone between said rolls. The feed mechanism then advances the helical into engagement with the coil springs in the usual manner.

DETAILED DESCRIPTION

Referring now to FIGURE 1, a spring assembly machine **10** is schematically illustrated in combination with a device **11** for advancing coil springs from a forming machine **12** to said assembly machine **10**. Parts of the

device **11** are disclosed in the copending application Ser. No. 656,109 of Carl Kirchner and John King filed on July 26, 1967 and assigned to the assignee of this application.

The assembly machine **10** includes a helical selecting and feeding apparatus **12** having helical-feeding mechanism **14** which is supported by the frame structure **16** (FIGURE 4) upon the base of the machine. The frame structure **16** comprises a bed plate **17** having an upright frame member **18** affixed to its upper surface by any convenient means, such as welding. A plate **21** is secured to the upper flange of the structural member **18** so that it is disposed above and parallel to the bed plate **17** and the right end (FIGURE 4) of the plate **21** overhangs the structural member **18**.

An L-shaped frame member **22** (FIGURE 4) is secured to the right end of the plate **21** and supports an upright guide plate **23** by the bolts **24**. A bracket **26** is supported upon and extends upwardly from the upper surface of the frame member **22**. An L-shaped frame member **27** is secured to the upper surface of the bracket **26** and supports a guide plate **28** secured thereto by bolts **29** (FIGURE 5). The guide **28** is parallel with and spaced from the guide plate **23**. The front end (FIGURE 5) of the guide plate **28** is provided with an opening **30**. The parallel guide plates **23** and **28**, which comprise positioning means for the helicals, are preferably provided with an adjustable spacing therebetween which is preferably equal to one and one-half times the pitch of the helicals H, which are aligned therebetween as illustrated in FIGURE 3.

The guide plate **23** has a first edge **31** which is, in this particular embodiment, vertical as illustrated in FIGURE 5. The plate **23** has a second edge **32** which is preferably an upward extension of the edge **31** and is inclined frontwardly with respect to the vertical. The guide plate **28** has a vertical guiding edge **33**, parallel with the edge **31** on the plate **23**, and an upper guiding edge **34** which extends from the edge **33** and is inclined rearwardly with respect to the vertical.

The guide edges **32** and **34** define a downwardly converging hopper **35** for the helicals H. The guide edges **31** and **33** are preferably overlapped by an amount approximately equal to the inside diameter of a helical H. Thus, when each helical reaches the lower end of the hopper **35**, and the guide edges **32** and **34** cause it to move between the edges **31** and **33**, the helicals H line up in a vertical row between said edges **31** and **33**, one on top of the other. The helicals H are received into the hopper **35** by the guide edges **32** and **34** so that the leading ends thereof project rightwardly from the guide plates **23** and **28**.

A guide block **36** is secured to the guide plate **28** along the righthand side thereof by any conventional means, such as the bolts **29** which secure the plate **28** to the frame member **27**. The guide block **36** has a slot **38** in the surface thereof which bears against the right-hand side of the plate **28**. The slot **38** extends the full length of the block **36** as illustrated in dotted lines in FIGURE 5.

Dispensing means including a pair of upper and lower fingers **41** and **42**, respectively, are slideably disposed within the slot **38** and extend outwardly from both ends of the block **36**, as illustrated in FIGURE 5. The rear end **43** of the finger **41** is provided with a pointed end **43**, and both fingers are constructed so that they can project across the gap between the vertical edges **31** and **33** to support a row of helicals H disposed between the edges **31** and **33**. In this embodiment, the pointed end **43** on the finger **41** is spaced above the flat upper surface of the finger **42** by a predesignated distance X, which is slightly greater than the radius of the helical. Thus, the point will, when moved rightwardly, project between the two lowermost helicals, as illustrated in FIGURE 6.

A lever **46** is pivotally secured to the guide plate **28** by a pin **47** extending through the opening **30**. A link **48** is pivotally secured to the upper end of the lever **46** by a pin **49**, and a link **51** is pivotally secured to the lever **46** at a point below the pivot pin **47** by a pin **52**. The rear ends of the links **48** and **51** are pivotally secured to the front ends of the fingers **41** and **42** by pins **53** and **54**, respectively. A spring **56** is connected to and held under tension between the lower end of the lever **46** and the lower portion of the guide plate **23**.

A solenoid **44** is secured to a frame member **45** (FIGURES 3, 5 and 6) by plurality of bolts **40** so that said solenoid is axially aligned lengthwise with the lower finger **42**. The solenoid armature **50**, which is also aligned with the lower finger **42**, is fastened thereto by a pin **54** and is reciprocated by the solenoid **44**.

A hook-shaped receiver **58** is secured, in this particular embodiment, to the block **36** by one of the bolts **29**, which extends through a slot **61** in the shank **62** thereof, whereby to permit adjustment thereof with respect to said block **36**. The hook portion **63** of the receiver **58** is positioned below the row of helicals normally supported by the finger **42**.

The helical-driving device **66** is supported by a frame member **67** secured to the said plate **17** by any conventional means, such as welding. The helical-driving device **66** is preferably positioned under the overhanging, leading ends of the helicals contained on the hopper **35**. The helical-driving device **66** comprises a bearing structure **68** upon which a plurality of rolls **71**, **72** and **73** are rotatably supported by the shafts **76**, **77** and **78**, respectively. The rolls **71**, **72** and **73** are grouped around, and preferably equidistant from, the extended axis of the helical feedline or axis **79** (FIGURES 3, 4 and 7), which is the axis of the helical H supported by the receiver **58** in its normal position. The rolls **71**, **72** and **73** are all driven clockwise (FIGURE 7) by an appropriate gear train **81** connected to the shafts **76**, **77** and **78**. The roll **73** is mounted on a lever **82** pivotally secured to the shaft **83** supporting one of the gears in the gear train **81**. A solenoid **86** is secured to the frame member **67** and has an armature **87** attached to the lever **82** to pivot the roll **73**, attached thereto, into and out of its driving position.

The descriptive material set forth hereinabove discloses a helical-feeding mechanism **14** for tying together the lower end convolutions of two rows of coil springs. However, a similar feeding mechanism **14A** (FIGURE 8) can be used for effecting the engagement of a helical with the upper end convolutions of said coil springs. This mechanism includes upper helical guide plates, three driving rolls and a guide tube.

OPERATION

Although the operation of the apparatus embodying the invention has been indicated somewhat above, said operation will be described in detail hereinbelow for a further understanding of the invention.

A plurality of helicals H are loosely placed within the hopper **35**, as illustrated in FIGURES 4, 5 and 6, so that the leading ends of the helicals extend beyond the right side of the guide plates and overhang the driving device **66**. The operator may then actuate a switch (not shown) which energizes the solenoid **86** to retract the roll **73** into its dotted line position illustrated in FIGURE 7. At about the same time, the solenoid **44** is actuated to move the lower finger **42** frontwardly from the FIGURE 5 position to the FIGURE 6 position. Since the link **48** connected to the finger **41** is on the opposite side of the pivot pin **47** from the link **51** connected to finger **42**, the finger **41** moves rearwardly as the finger **42** moves frontwardly. Thus, the pointed end **43** of the finger **41** (FIGURE 5) is moved between the lowermost helical H and the next adjacent helical H2 in the row of helicals, so that when the finger **42** is moved to its FIGURE 6 position, the lowermost helical H1 is free to fall under the pull of gravity onto the hook-shaped receiver **58** and thereby become aligned with the feedline **79** for subsequent movement into the tube **88**. The remaining helicals H in said row thereof are supported on the upper surface of the finger **41** as illustrated in FIGURE 6.

After a selected period of time, the solenoids **44** and **86** are de-energized whereupon the roll **73** is moved back to the solid line position illustrated in FIGURE 7, and the fingers **41** and **42** are returned to their FIGURE 5 positions. The rolls **71**, **72** and **73**, which now embrace the helical **H1** therebetween, are rotated by the gear train **81** (and driving means not shown). The pressure of said rolls on the helical **H1** will rotate same and, due to the structure thereof, will propel it rightwardly, as indicated by the arrow A in FIGURE 4, along the feedline **79** through the tube **88** and into the jaws **89** of the spring assembly machine **10**. The helical encircles adjacent parts of the terminal convolutions of said coil springs **91** and **92** to form a unitized spring assembly as illustrated in FIGURE 2.

When the solenoid **44** is de-energized, the tension spring **56** returns the lever arm **46** from the FIGURE 6 position to the FIGURE 5 position resulting in a corresponding return of the fingers **41** and **42** to the position also illustrated in FIGURE 5. As a result, the next adjacent helical **H2** moves downwardly under the pull of gravity so that it is supported on the finger **42** as illustrated in FIGURE 5. Thus, the operation of selecting but one helical to be projected into the tubular guide member **88** and jaws **89** can be repeated as long as there is a supply of helicals between the guide edges **31** and **33**.

Although a particular preferred embodiment of the invention has been disclosed above for illustrative purposes, it will be understood that variations or modifications thereof, which lie within the scope of the appended claims, are fully contemplated.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a machine for interconnecting a helical with the terminal convolutions of a plurality of coil springs arranged in two rows, said machine including jaw means for holding said terminal convolutions adjacent a helical feed axis, the combination comprising:

plural roll means axially parallel with and grouped around said feed axis, said roll means defining a helical-receiving zone therebetween, one of said roll means being movable transaxially with respect to the other rolls;

positioning means for holding a plurality of helicals, at least some of said helicals being arranged in a row substantially parallel with said feed axis;

dispensing means located between said positioning means and said feed axis and adapted to dispense the one of said helicals at an end of said row transaxially into said helical-receiving zone;

first actuating means for moving said one roll means; and

second actuating means for rotating said roll means after said one helical has been moved into said helical-receiving zone and said one roll means has moved into engagement with said one helical, whereby said one helical is advanced along said feedline and into engagement with said terminal convolutions.

2. A machine according to claim **1**, wherein said dispensing means comprises:

first finger means for supporting said row of helicals in substantially vertical alignment;

second finger means insertable between said one helical and the next helical adjacent thereto;

linkage means connected to said first and second finger means for moving said first finger means out of said supporting position after said second finger means has moved between said one helical and said next helical, whereby said one helical drops into said zone.

3. A machine according to claim **1**, wherein said positioning means comprises a pair of substantially parallel, guide plates having a first pair of spaced and vertical guide edges extending transversely of said feed axis and having a second pair of guide edges converging downwardly toward and connecting respectively with the upper ends of said first guide edges whereby a plurality of helicals are moved by gravity into a substantially vertical row of helicals supported upon said dispensing means.

4. In a machine for interconnecting a helical with the terminal convolutions of a plurality of coil springs to form a spring assembly, said machine having jaw means for holding two rows of coil springs with their terminal convolutions in adjacent positions along a helical feed axis, the combination comprising:

guide means axially aligned with said feed axis for directing a helical into engagement with said adjacent convolutions;

plural, axially parallel roll means parallel with and grouped around the feed axis to define a helical-receiving zone through which said axis extends, one of said roll means being movable transaxially with respect to the other roll means out of helical-engaging position;

storage means for supporting a plurality of helicals substantially parallel with and spaced laterally from said feed axis, one end of each of said helicals being overlapped axially with said roll means, at least some of said helicals being arranged in an upright row for movement into said zone when said one roll means is moved out of said helical-engaging position;

first finger means for supporting said row of helicals;

second finger means insertable between the first and second helicals at the lower end of said row;

linkage means connected to said first and second finger means for moving said first finger means out of supporting position after said second finger means is inserted between said first and second helicals, whereby said first helical can drop into said zone;

support means adjacent said first and second finger means limiting downward movement of said first helical when same is released from support by said first finger means; and

means for rotating said roll means after said one roll means is moved into said helical-engaging position, whereby a said helical is advanced through said guide means along said feed axis and into engagement with said terminal convolutions of said coil springs.

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U.S. Cl. X.R.

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