United States Patent

[11] 3,596,339

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[45] Patented **Aug. 3, 1971**

[54] **METHOD AND APPARATUS FOR HANDLING COIL COMPRESSION**
31 Claims, 25 Drawing Figs.

[52] **U.S. Cl.** **29/173,** 29/200, 29/208, 29/211, 29/227
[51] **Int. Cl.** **B23p 13/00,** B23q 7/10, B23b 19/04
[50] **Field of Search** ..... 29/200 D, 429, 211, 227, 200 A, 91.1, 173, 200, 208

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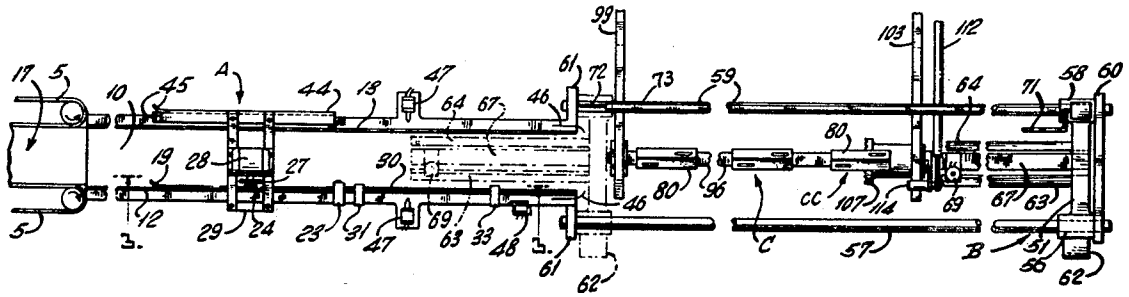
ABSTRACT: A method and apparatus for handling coil compression springs in the manufacture of spring assemblies for use in mattresses, cushions and the like. The apparatus arranges coil springs in a rigidly held oriented position from which they are picked up by a movable magazine. The loaded magazine then scans a plurality of coil snatching heads which withdraw individual oriented coils from the magazine during the magazine movement and present them in operative relationship for a subsequent assembly operation.



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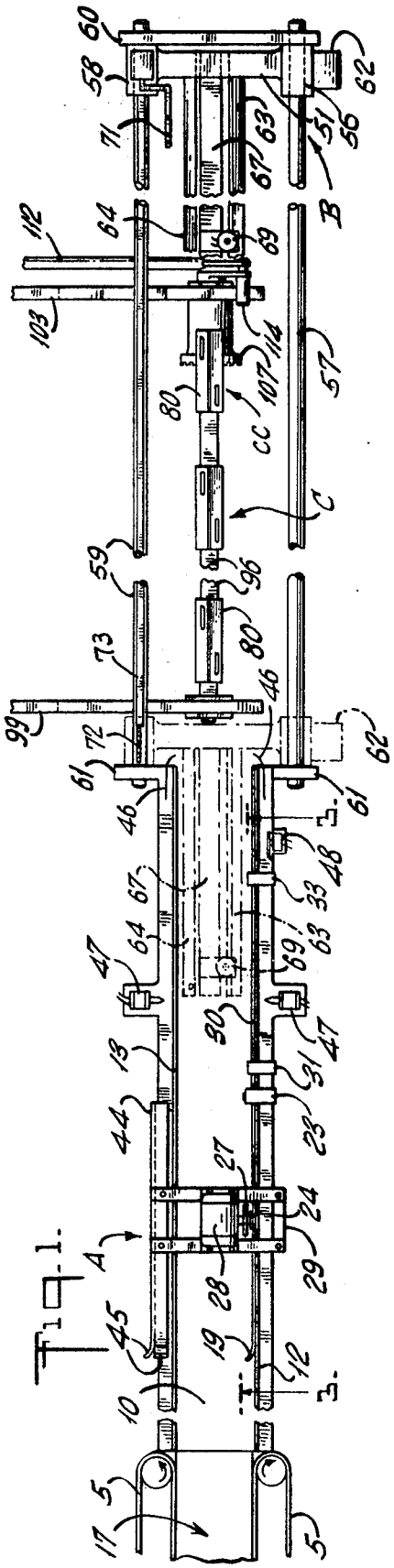

FIG. 1.

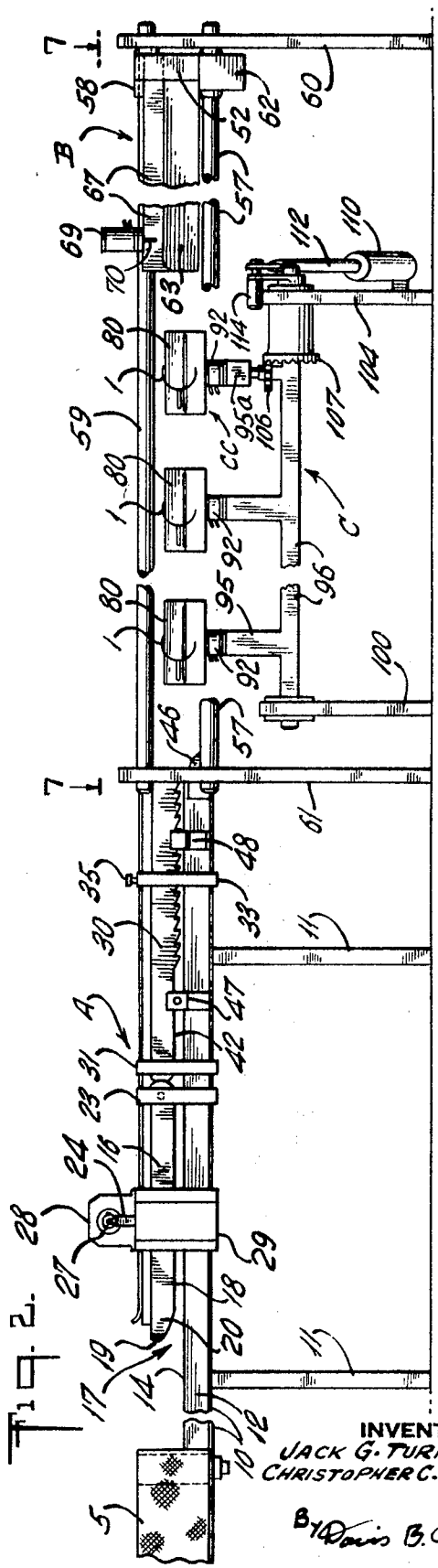

FIG. 2.

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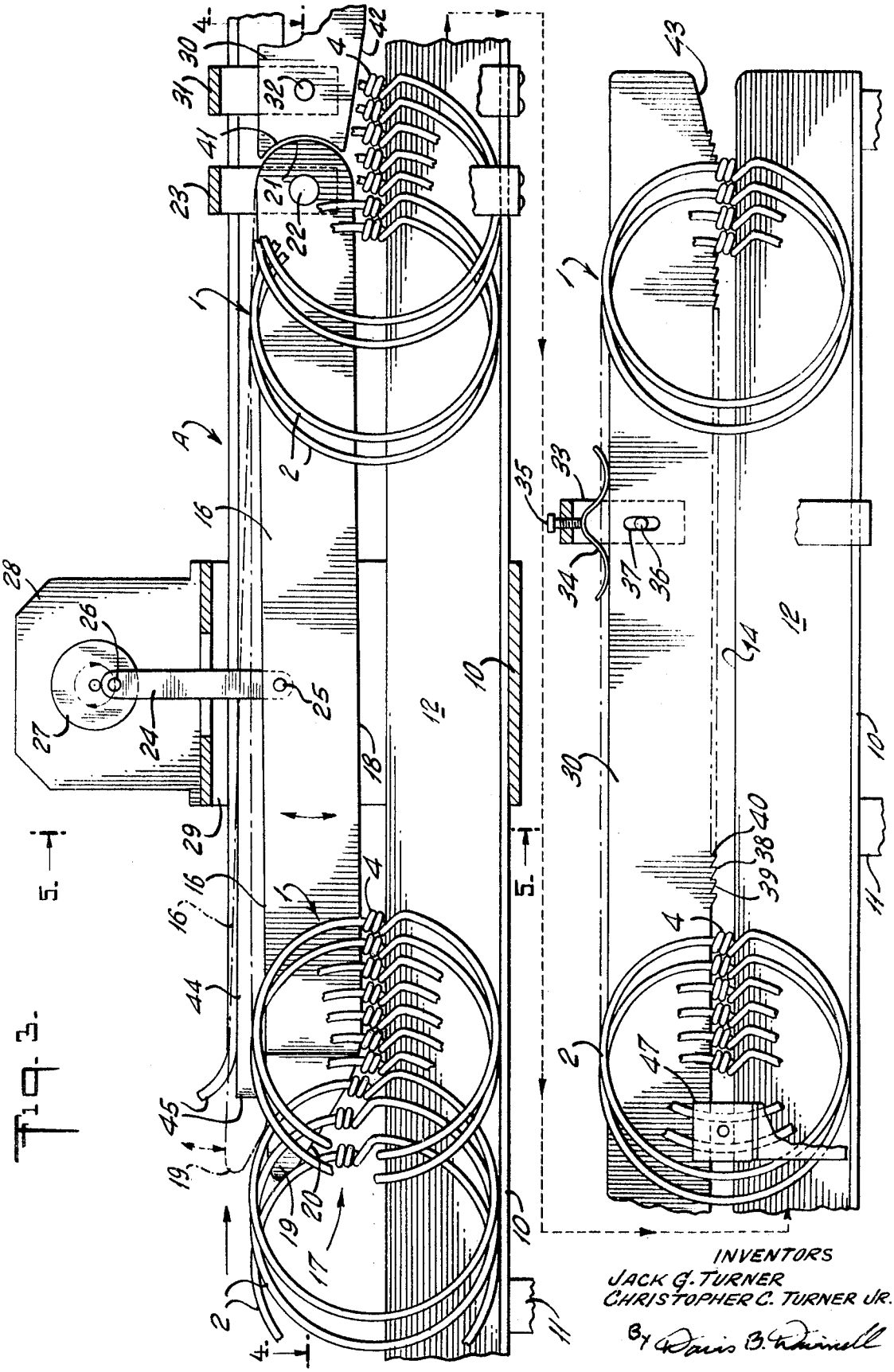

FIG. 3.

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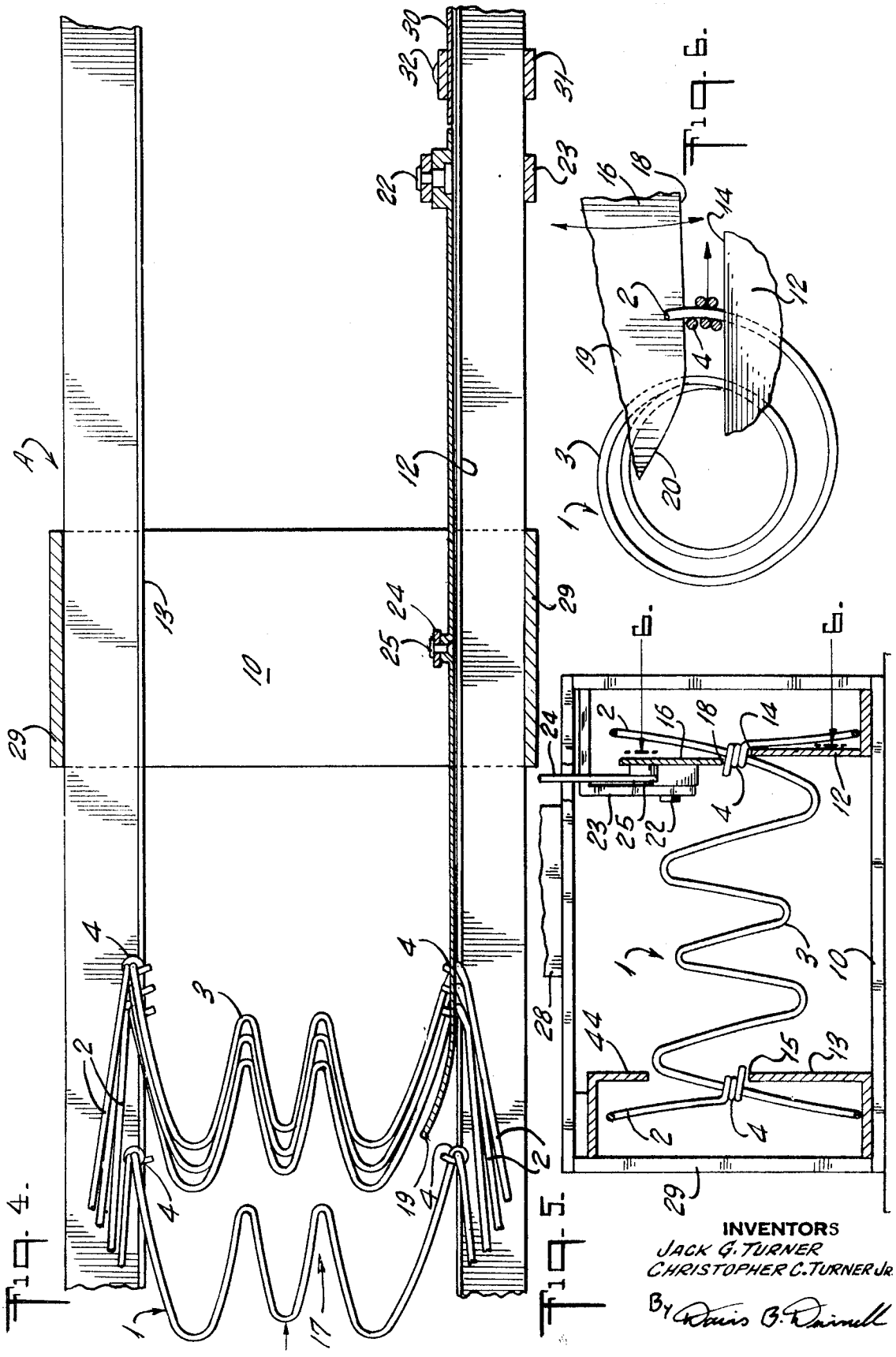
FIG. 4.
FIG. 5.
FIG. 6.
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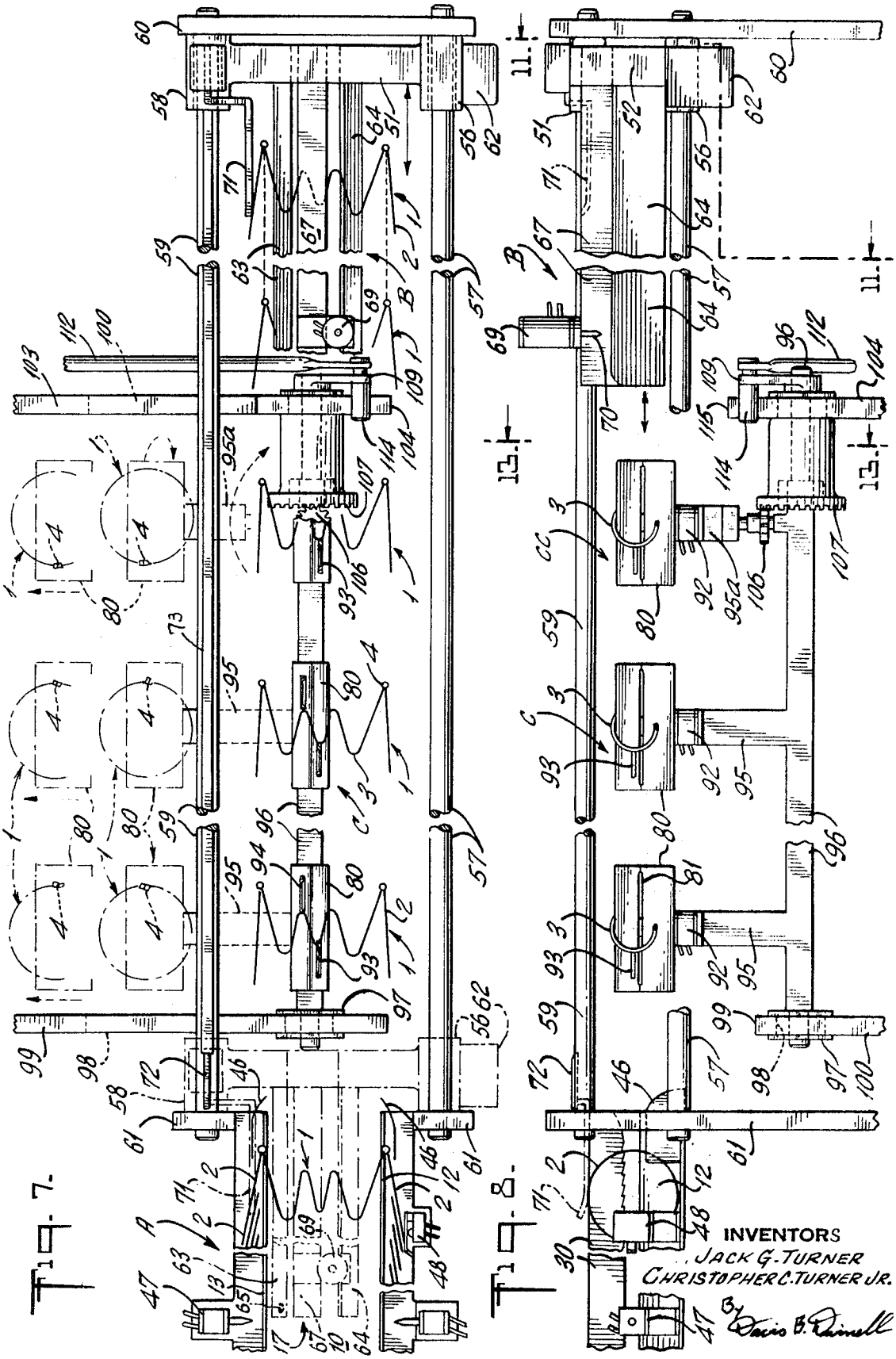

FIG. 7.

FIG. 8.

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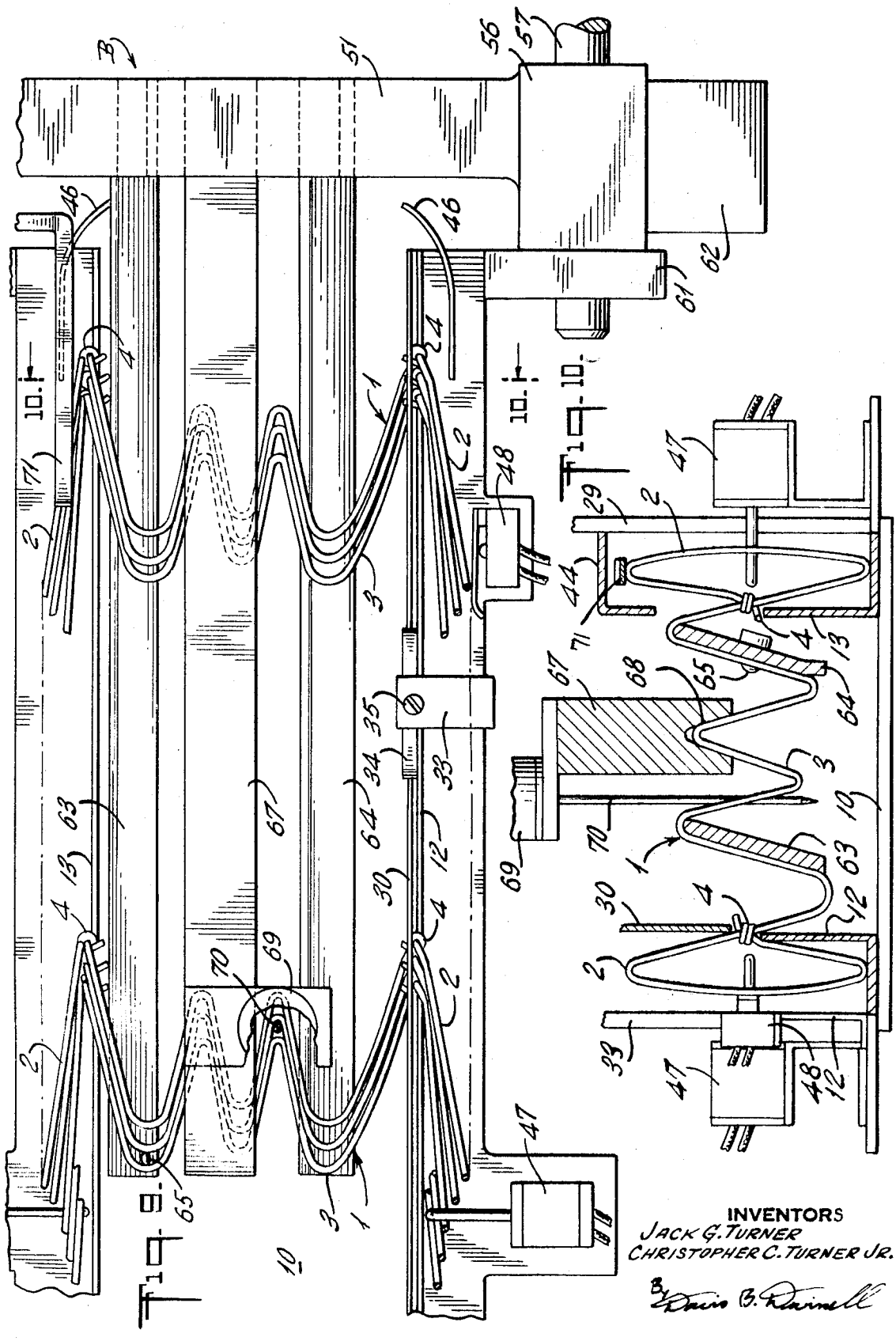

FIG. 9.

FIG. 10.

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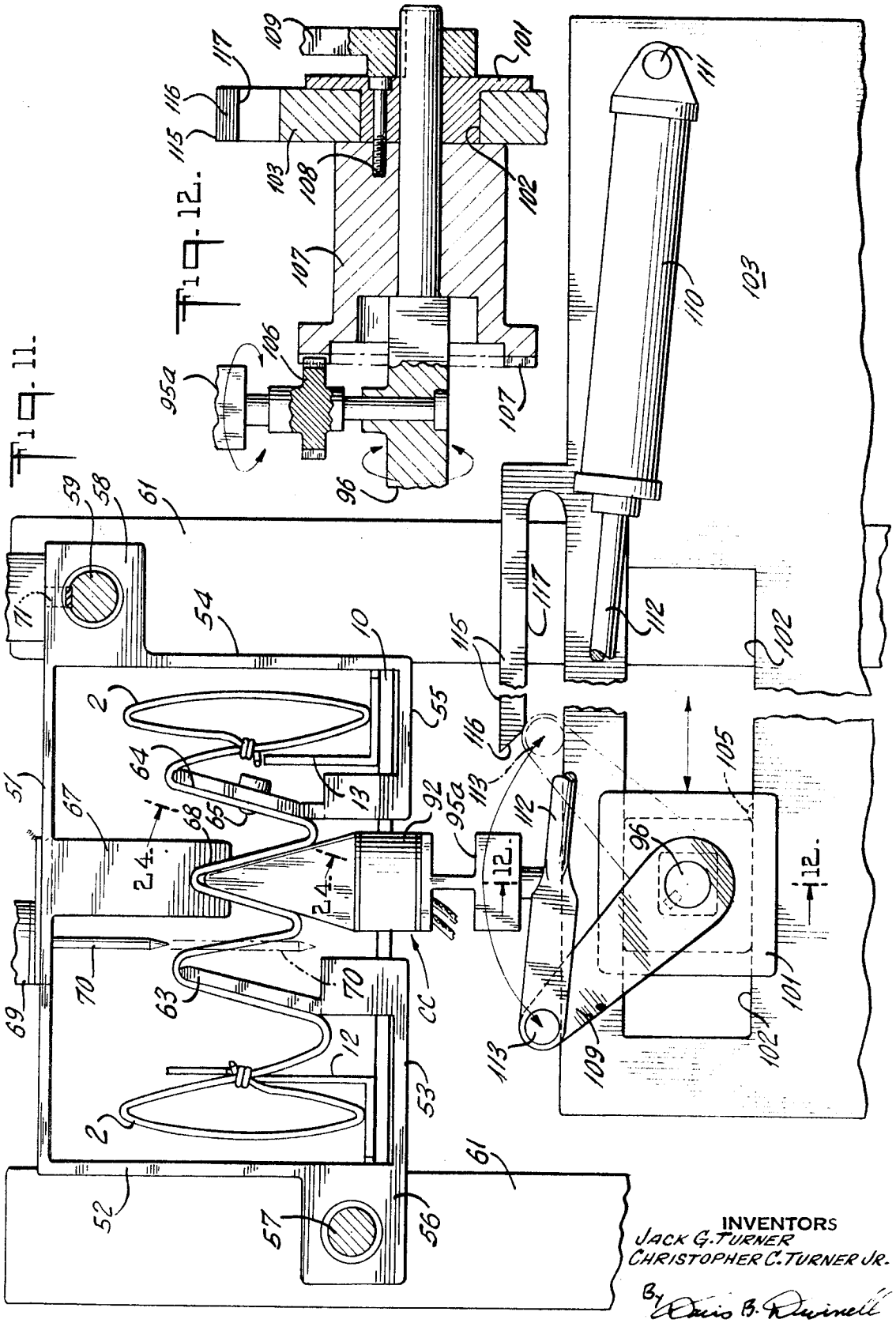

FIG. 11.

FIG. 12.

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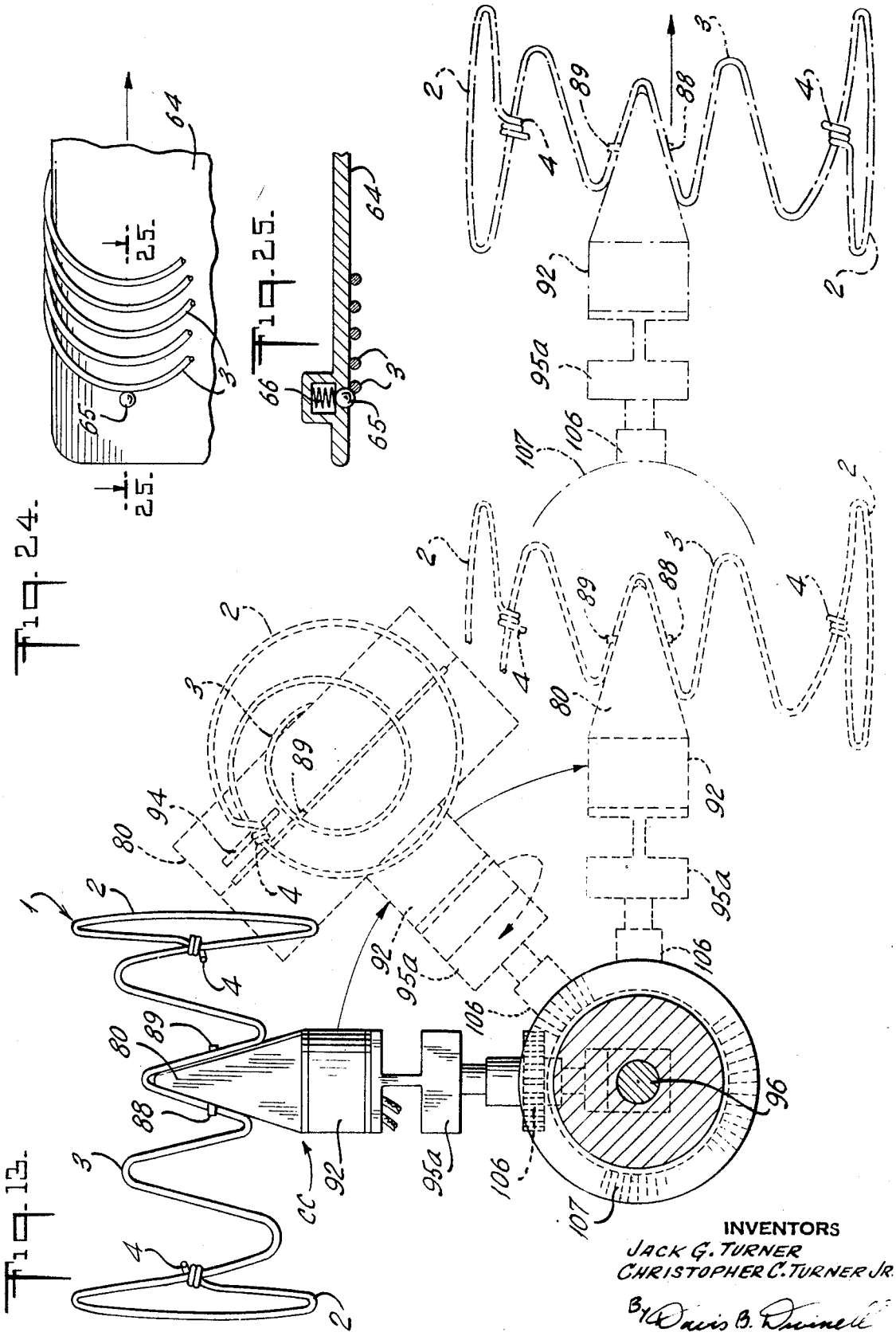
FIG. 24.
FIG. 25.
FIG. 13.
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Fig. 14.

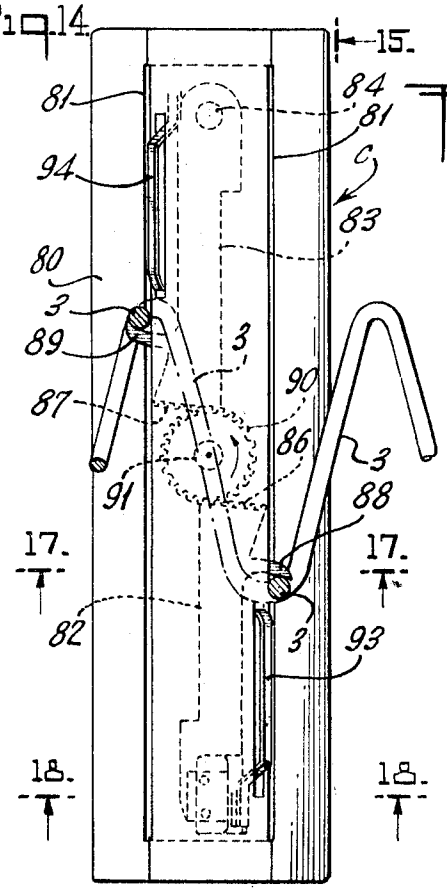


Fig. 15.

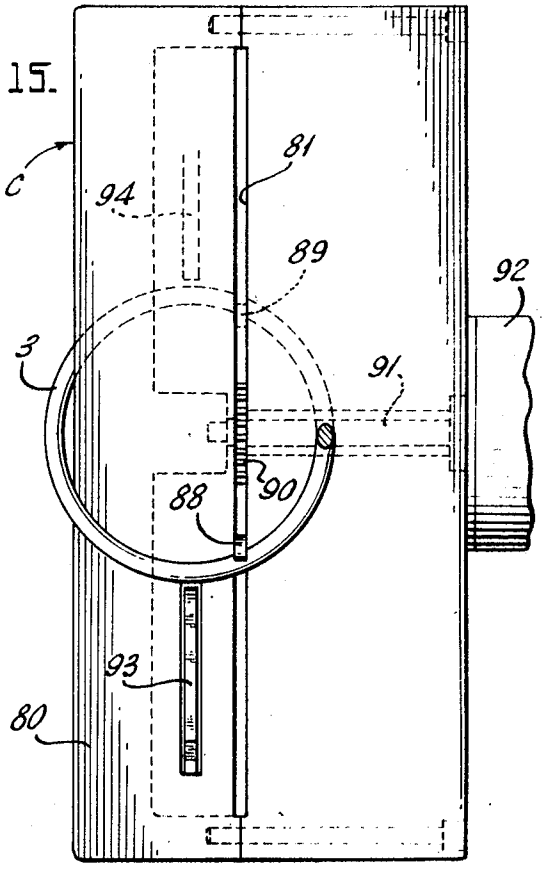


Fig. 16.

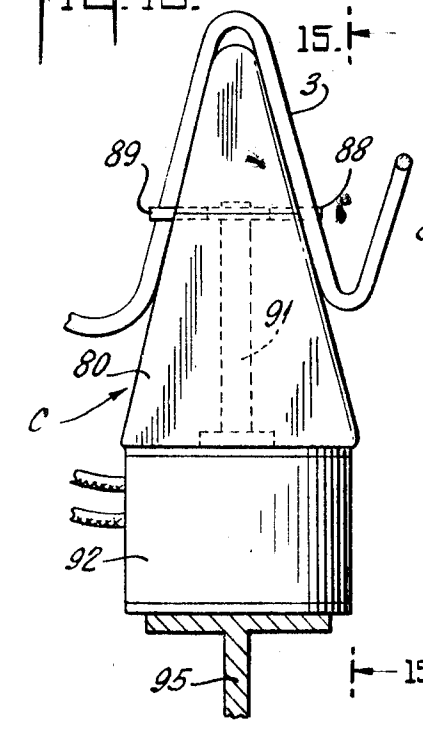


Fig. 17.

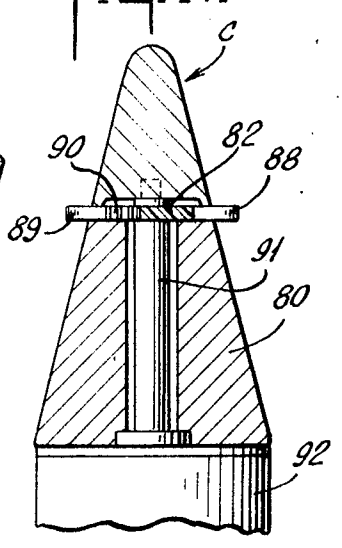
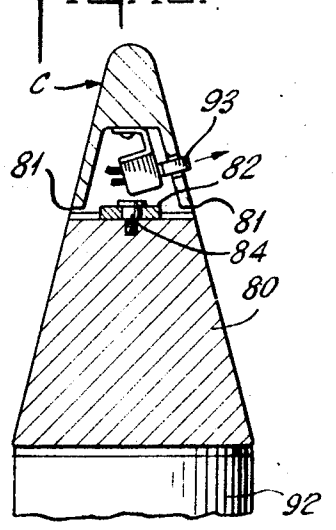


Fig. 18.



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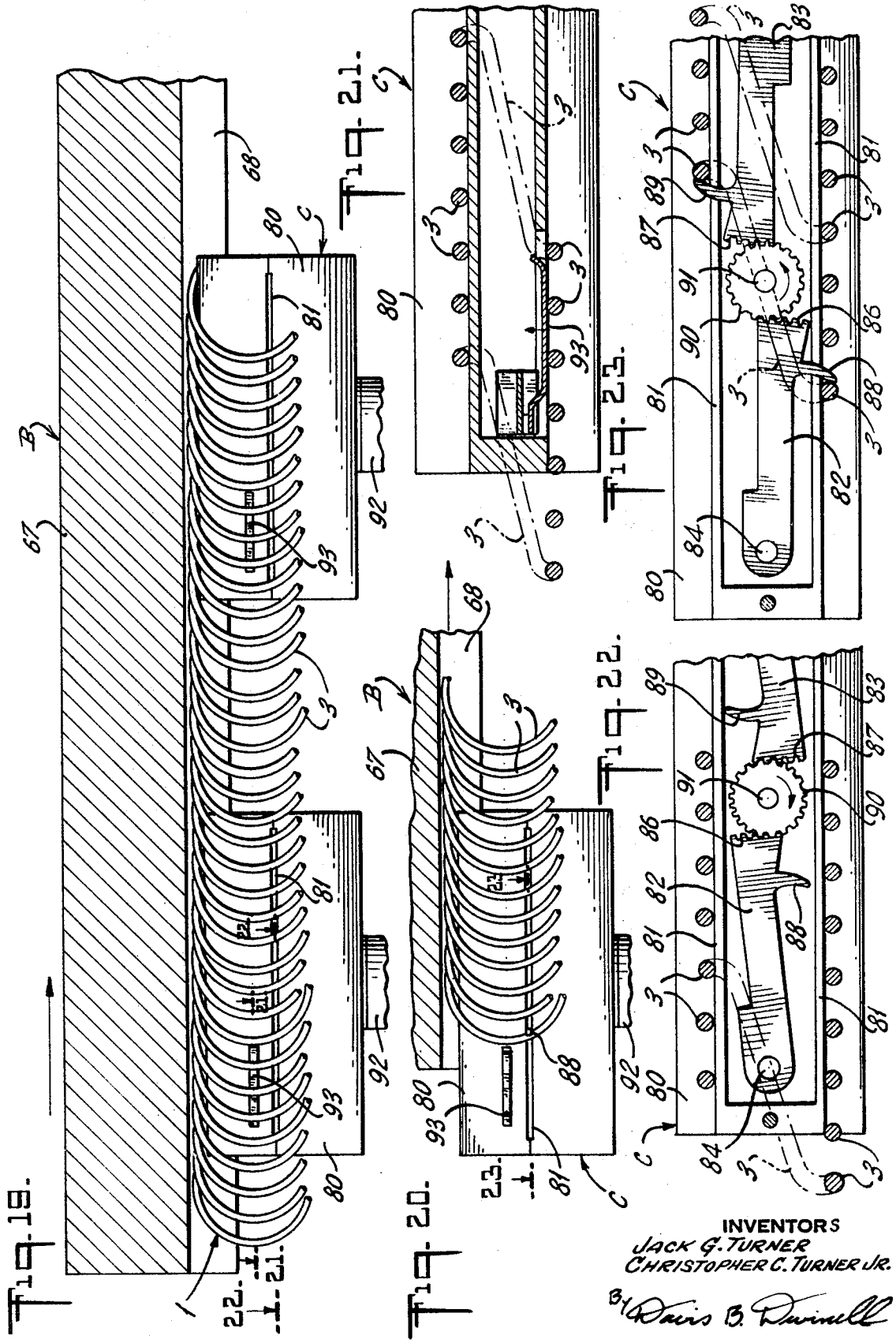

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METHOD AND APPARATUS FOR HANDLING COIL COMPRESSION

This invention is concerned with the handling of coil springs and is particularly directed to a method and apparatus for automatically orienting and individually engaging coil compression springs in the manufacture of spring assemblies.

In automating the manufacture of helical coil compression springs and spring assemblies for use in mattresses, cushions and the like, substantial progress has been made in recent years. The prior art discloses devices for the high speed automated manufacture of helical coil compression springs from wire stock. The prior art also discloses devices for the high speed automated fabrication of spring assemblies wherein a group of individual coil springs are tied together in a unitary assembly. The real bottleneck in the overall operation has, until the advent of the instant invention, been the provision of some suitable means of automatically transferring coil springs from a coil spring manufacturing machine to a machine for fabricating coil spring assemblies. A number of problems present themselves in satisfying the need to eliminate this bottleneck. A coil spring by virtue of its configuration is very difficult to handle mechanically. A satisfactory device for handling coil springs in order to improve over manually fed arrangements, must be capable of operating efficiently under relatively high speed production conditions. Such device must be able to accurately orient coil springs and maintain that orientation throughout the coil spring handling operation. It is essential that each individual coil spring be rigidly engaged and without reliance on hard to maintain critical relationships. In addition the coil spring feeding machine capable of overcoming the above problems must be manufactured economically and in line with cost standards in the coil spring industry.

Attempts have been made at solving the above mentioned problems improving to some degree over manual spring handling arrangements. However, the few attempts that have to date come to light have failed in numerous respects to provide a satisfactory solution to these basic problems.

The method and apparatus disclosed by the instant invention advantageously overcomes all of the above mentioned problems in providing a device that accurately orients coil springs fed either directly from a coil spring manufacturing machine or from accumulated storage. In accordance with the invention a group of coil springs are arranged in overlapping nested relationship and are locked in properly oriented position whereupon the oriented group of springs is separated and displaced by movable magazine which accurately maintains that orientation. The loaded magazine then scans a plurality of snatching heads each of which engages and withdraws an individual coil spring from the moving magazine and rigidly holds it in oriented position. The end spring is rotated through 180° whereupon the snatching heads present the coil springs in operative relationship to a machine for fabricating spring assemblies. The forward travel of the magazine is reversed and the scanning step is repeated. The scanning and spring snatching steps are repeated a predetermined number of times and the magazine is then reloaded causing the cycle to repeat itself as the operation of the device continues.

It is accordingly a principal object of this invention to provide a new method and apparatus for handling coil compression springs.

Another object is to provide a method and apparatus for arranging and orienting coil compression springs in overlapping nested relationship.

A further object is to provide a method and apparatus for separating a group of coil springs in oriented and overlapping nested relationship.

A further object is to provide a method and apparatus for withdrawing coil springs from said group and presenting said springs in operative relationship to a spring assembly fabricating machine.

A still further object is to provide a method and apparatus for effecting said withdrawing by rigidly engaging individual coil compression springs.

Other and more detailed objects will in part be obvious and in part pointed out as the accompanying description of the drawing proceeds.

In that drawing:

FIG. 1 is a top plan view of the apparatus of the invention and for carrying out the method thereof;

FIG. 2 is a side elevation of the invention with parts broken away for clarity;

FIG. 3 is a sectional view taken on line 3–3 of FIG. 1;

FIG. 4 is a sectional view taken on line 4–4 of FIG. 3;

FIG. 5 is a sectional view taken on line 5–5 of FIG. 3;

FIG. 6 is a fragmentary sectional view taken on line 6–6 of FIG. 5;

FIG. 7 is a plan view taken on line 7–7 of FIG. 2;

FIG. 8 is a side elevational view of the coil spring snatching heads and scanning magazine illustrated in FIG. 7;

FIG. 9 is a top plan view of the scanning magazine in loading position with parts broken away for clarity;

FIG. 10 is a sectional view taken on line 10–10 of FIG. 9;

FIG. 11 is a part elevational part sectional view taken on line 11–11 of FIG. 8;

FIG. 12 is a fragmentary sectional view taken on line 12–12 of FIG. 11;

FIG. 13 is a part elevational part sectional view taken on line 13–13 of FIG. 8;

FIG. 14 is a top plan view of a coil spring snatching head;

FIG. 15 is a side elevational view taken on line 15–15 of FIG. 14;

FIG. 16 is an end elevational view taken on line 16–16 of FIG. 14;

FIG. 17 is a vertical sectional view taken on line 17–17 of FIG. 14;

FIG. 18 is a vertical sectional view taken on line 18–18 of FIG. 14;

FIG. 19 is a part elevational part sectional view showing the magazine in scanning position;

FIG. 20 is a view similar to FIG. 19 showing the magazine in an advanced position;

FIG. 21 is a fragmentary sectional view taken on line 21–21 of FIG. 19;

FIG. 22 is a fragmentary sectional view taken on line 22–22 of FIG. 19;

FIG. 23 is a fragmentary sectional view taken on line 23–23 of FIG. 20;

FIG. 24 is a fragmentary sectional view taken on line 24–24 of FIG. 11; and

FIG. 25 is a fragmentary sectional view taken on line 25–25 of FIG. 24.

The apparatus of the invention as seen in FIG. 1 is made up of three basic components. A coil spring orienting mechanism A receives coil springs fed into it by a spring conveyor, arranges the springs in overlapping nested relationship and accurately imparts a specific orientation to the springs. The springs are locked in oriented position by the mechanism A and retained in overlapping nested relationship. A movable scanning magazine B picks up a group of oriented coil springs and separates them from the orienting mechanism A while maintaining the springs in proper oriented nested relationship. The loaded magazine B then scans a series of coil spring snatching heads C which snatch the coil springs individually and withdraws them from the moving magazine B. The snatching heads C rigidly grip the coil springs in oriented position and present them in operative relationship to a subsequent work station.

The particular article with which the method and apparatus of the invention is concerned is a coil compression spring indicated by the numeral 1 and as clearly seen in FIGS. 10, 11 and 12 comprises two substantially circular end loops 2 and an intermediate helical coil 3. The helical coil 3 is joined at either extremity to the end loops 2 by a knot 4 in such a fashion that

an integral spring member is formed with the knots 4 lying along a common axis passing through opposed points on the circumference of the end loops 2. A feeding device made up of a pair of laterally spaced endless conveyor belts 5 is provided for aligning the common axis of the coil springs 1 in parallelism and feeding the spring into the orienting mechanism A.

Considering the orienting mechanism A the same is seen to comprise a longitudinally extending base plate 10 supported by two pairs of upright legs 11. A pair of longitudinally extending lower members forming sideplates 12 and 13 each having an upper edge 14 and 15 respectively is mounted at either side of the base plate 10. A movable upper side plate 16 is mounted above the lower sideplate 12 and toward the open entrance end 17 of the mechanism A as seen in FIGS. 1 and 2. The upper plate 16 is spaced laterally inwardly with respect to the lower plate 12, see FIG. 5, and has a lower edge 18 vertically spaced with respect to the plate edge 14. The entrance end of the upper plate 16 is curved laterally inwardly at 19 and is provided with an upwardly inclined lower edge 20 forming a continuation of the edge 18. The opposite end of upper plate 16 has a semicircular form 21 and is pivotally supported at 22 by a bracket 23 connected to the base plate 10. An arm 24 has its lower end pivotally connected at 25 to an intermediate point on the upper plate 16. The upper end of the arm 24 is eccentrically pivotally connected at 26 to a drive disc 27. The disc 27 is driven by an electric motor 28 secured to a bracket 29 which is in turn supported by the base plate 10.

A stationary upper side plate 30 is mounted in vertically spaced relationship above the lower sideplate 12 in longitudinal alignment with the upper side plate 16. The end of sideplate 30 adjacent the sideplate 16 is pivotally supported at 31 by a bracket 32 mounted on base plate 10. A second bracket 33 supported by base plate 10 is located at an intermediate point along the length of side plate 30. The bracket 33 incorporates a downwardly facing leaf spring 34 which is urged against the upper edge of the sideplate 30 by an adjusting screw 35. A pin 36 on bracket 33 extends into a vertically elongated slot 37 in the plate 30. The lower edge of sideplate 30 is provided with a plurality of teeth 38 having an inclined face 39 facing the entrance end 17 of the mechanism A and a vertical face 40 facing the opposite or exit end of the mechanism A. The end of stationary plate 30 adjacent the movable plate 16 is concavely curved at 41 to mate with the semicircular plate end 21 and the lower edge is inclined upwardly at 42 and devoid of teeth to join the curved end 41. At the opposite end of stationary plate 30 the lower edge is also inclined upwardly at 43 and is devoid of teeth.

A longitudinally extending upper angle member 44 secured to bracket 29 is positioned above lower sideplate 13 in opposition to upper sideplates 16 and 30. At the entrance end of the angle member 44 the horizontal and vertical legs thereof are flared outwardly as indicated at 45. A pair of opposed inwardly curved flexible guide fingers 46 are mounted on the base plate 10 at the exit end of the mechanism A outside the lower sideplates 12 and 13 and overlapping the ends of the same. A pair opposed of solenoid actuated locking pins 47 are located intermediate the ends of the upper sideplate 30 and arranged to project into the gap between the upper and lower side plates on either side of the mechanism A. A microswitch 48 is positioned on the plate 10 outside the lower sideplate 12 adjacent the exit end of the mechanism A. It should be pointed out here that suitable means (not shown) can be provided for adjusting the vertical height of the sideplates 12, 13, 16 and 30 in order to accommodate manufacturing variations between different lots of springs.

The operation of the mechanism A is as follows: Coil springs with their common axis aligned in substantial parallelism and with their knots leading are fed into entrance end 17 of the mechanism A with their end loops 2 located outside the lower sideplates 12 and 13. The feeding may be carried out by hand or by the spring conveyor belts 5 receiving springs either directly from a coil spring making machine or from suitable storage racks. As the coil springs 1 move along the base plate they are arranged in overlapping nested relationship and the respective end loops 2 are guided under the upper angle member 44 by the flared ends 45 and outside the upper side plate 16 by the inwardly curved end 19. At this point the knots 4 are urged under the upper sideplate 16 by the inclined edge portion 19. The coil spring knots 4 then move into the longitudinal gap formed between the lower edge 18 of upper sideplate 16 and the upper edge 14 of the lower side plate 12. The reciprocating motion imparted to the upper sideplate 16 by the motor 28 through the drive disc 27 and arm 24 forces the knots 4 down against the edge 14. The coil springs 1 are thus accurately oriented with their knots 4 lying in a single horizontal plane. Upon reaching the end 21 of the reciprocating upper sideplate 16, the knots 4 are forced under the upper sideplate 30 by the inclined edge 42. As the coil springs 1 move along the edge 14 the teeth 38 on the lower edge of upper sideplate 30 are resiliently urged against the knots 4 by the spring 34. The resulting restraining force exerted on the coil springs 1 is controlled by the adjusting screw 35. The leading coil spring 1 upon approaching the exit end of the mechanism A, contacts the microswitch 48 closing an electrical circuit to the locking pin solenoid 47 causing the locking pins to eject and lock the advancing springs in stationary position. Actuation of the microswitch 48 also deactivates the motor 28 and the feed conveyor belts 5.

Considering next the construction of the movable magazine B the same is seen in FIG. 11 to comprise a rectangular frame 50 having an upper laterally extending arm 51. A vertical leg 52 extends downwardly from the end of arm 51 adjacent the lower sideplate 12 and is spaced outwardly therefrom. A foot 53 extends inwardly from the lower end of the leg 52. Another leg 54 extends downwardly from the other end of arm 51 adjacent the lower sideplate 13 and is spaced outwardly therefrom. A foot 55 extends inwardly from the lower end of the leg 52.

A journal 56 provided at the lower end of leg 52 rides along a longitudinally extending lower rod 57. A journal 58 provided at the upper end of leg 54 rides along an upper rod 59. The rods 57 and 59 are connected at their far ends to an upstanding end plate 60 and are connected to the mechanism A by a pair of upright members 61. A reversible electric motor 62 is connected to the journal 56 and incorporates a suitable drive mechanism for driving the magazine B back and forth along the rods 57 and 59. A longitudinally extending angle plate 63 is connected at one end to the inner end of the foot 53. Another angle plate 64 is connected at one end to the inner end of the foot 55. An inwardly facing ball detent 65 resiliently supported by a spring 66, clearly shown in FIGS. 24 and 25, is mounted in the angle plate 64 adjacent either end thereof. Such ball detents may be located along the length of the angle plate 64 at spaced intervals if desired. A longitudinally extending center arm 67 is attached at its far end to the arm 51 and depends therebelow. The bottom surface of the arm 67 is formed with an inverted V-shape groove 68 as seen in vertical cross section in FIG. 10. A vertically oriented solenoid 69 is mounted on the free end of the arm 51 for actuating an elongated downwardly extending locking pin 70. The solenoid 69 is activated by a resilient microswitch finger 71 mounted on the journal 58 extending angularly inwardly into the path of the coil springs 1 as seen in FIG. 7. An electrical conductor 72 is embedded in the end portion of the rod 59 adjacent the upright member 61 for energizing the microswitch finger 71. A nonconducting strip 73 is embedded in the rod 59 throughout the major portion of its length.

The operation of the magazine B is as follows: The empty magazine B is driven along the rods 57 and 59 toward the spring orienting mechanism A by the motor 62. As clearly seen in FIG. 9, the magazine angle plates 63 and 64 and the arm 67 are thrust into the oriented coil springs 1 which are locked against rearward movement by the locking pin solenoids 47 in the exit and portion of the mechanism A. As seen in FIG. 10, the angle side plates embrace the outer turns of the

intermediate helical coil 3 from below and the V-shape groove 68 embraces the center turn of the intermediate coil 3 from above. As the magazine journals 56 and 58 approach the upright members 61 the resilient microswitch finger 71 is activated by the conductor 72 and is then deflected by contacting the first coil spring 1 at the exit end of the orienting mechanism A. The deflected microswitch finger 71 reverses the drive motor 62 and activates the solenoid 69 causing the pin 70 to eject and lock a group of oriented coil springs 1 on the magazine B. As the loaded magazine B reverses its travel along the rods 57 and 59 the angle plates 63, 64 and center arm 67 withdraw from the orienting mechanism A, the journal 59 moves off of the conductor 72 opening the electrical circuit to the solenoid 69. A holding circuit associated with the solenoid 69 momentarily delays retraction of the locking pin 70 until the group of coil springs 1 carried by the magazine B are conveyed between the guide fingers 46 and separated from the mechanism A. At the same instant the end of the carriage B leaves the mechanism A the end loops 2 of the moving group of springs 1 clear the microswitch 48 opening the circuit to the locking pin solenoids 47 causing retraction of the same so that a new supply of oriented coil springs can be fed under the upper side plate 30. The loaded magazine B then continues along the rods 57 and 59 performing the scanning operation described hereinafter.

Considering next the coil spring snatching heads C, which may be of any suitable number and are adjustably spaced depending on the size and construction of the coil spring assembly being fabricated, each head is seen to comprise a coil spring supporting block 80 having side surfaces forming an inverted V-shape configuration as viewed in vertical cross section in FIGS. 16 and 17 and 18. A longitudinally extending outwardly opening slot 81 is centrally located in the block 80. A pair of longitudinally opposed elongated cams 82 and 83 are horizontally disposed within a cavity in the block 80. The cam 82 is pivotally supported at 84 its far end and the cam 83 is pivotally supported at 85 at its far end. The near end of the cam 82 has a gear segment 86 and the near end of the cam 83 has a gear segment 87. The cam 82 has an outwardly extending curved locking tooth 88 adjacent its gear segment end 86 and the cam 83 has an outwardly curved locking tooth 89 adjacent its gear segment end 87. As seen in FIGS. 22 and 23 the locking teeth 88 and 89 are arranged to extend out of slot 81 at either side of the block 80. A drive gear 90 is centrally disposed within the slot 81 so as to drivingly engage the cam gear segments 86 and 87. A vertically extending drive shaft 91 connects the gear 90 to a rotary solenoid 92 secured to the bottom of the block 80. A pair of longitudinally microswitch extending arms 93 and 94 for independent actuation of the rotary solenoid 92 are mounted in the upper portion of the block 80 and protrude from the opposite outer side surfaces of the block 80 above the slot 81. The microswitch arm 93 is located in the end of the block 80 adjacent the cam 82 and extends to a point closely adjacent the locking tooth 88. The microswitch 94 is located in the other end of the end of the block 80 adjacent the cam 83 and extends to a point closely adjacent the locking tooth 89.

Each of the solenoids 92 is mounted on an arm 95 which is in turn connected to a rotatable and laterally movable longitudinally extending shaft 96. The near end of the shaft 96 adjacent the orienting mechanism A is rotatably supported in a double flanged bushing 97 which is nonrotatably mounted in and laterally movable along, an elongated slot 98 in a laterally extending arm 99 supported by a vertical leg 100. The far end of the shaft 96 is rotatably supported in a single flanged bushing 101 which is nonrotatably mounted in, and laterally movable along, an elongated slot 102 in a laterally extending arm 103 parallel to the arm 99 and supported by a vertical leg 104. As clearly seen in FIG. 11 a resiliently supported ball detent 105 is mounted in the slot 102 for releasably holding the bushing 101 at the inner end of the slot 102.

In the fabrication of coil spring assemblies it is necessary to have the end row of coil springs oriented at 180 degrees to the rest of the springs as seen in FIG. 7, accordingly means are provided for rotating the last snatching head designated CC through 180° . The solenoid 92 of snatching head CC is mounted on a rotatable arm 95*a* having a gear 106 affixed thereto. A ring gear 107 in engagement with the arm gear 106 is mounted on the end portion of shaft 96 inwardly of the arm 103 and is fixed to the bushing 101 by a screw 108 as clearly seen in FIG. 12. A lever arm 109 is keyed to the far end of the shaft 96 outwardly of the arm 103. A pneumatically operated cylinder 110 is pivotally connected to the free end of the arm 103 at 111 and has a piston rod 112 pivotally connected to the remote end of lever arm 109 at 113. A cam follower 114 is attached to the pivot connection 113. A cam track 115 is mounted on the upper edge of arm 103 and is formed with an inclined entrance cam follower surface 116 which merges into a horizontal laterally extending cam follower surface 117.

The operation of the spring snatching heads C and the head CC taken in conjunction with spring orienting mechanism A and the magazine B is as follows: As the loaded magazine B leaves the coil spring orienting mechanism A the microswitch arms 94 are deactivated by suitable circuitry and the scanning of the snatching heads commences. As seen in FIG. 11 the turn of the intermediate helical coil 3 supported by the groove 68 in carriage arm 67 rides over the outer surfaces of the snatching head block 80. Looking at FIGS. 19 and 21 it can be seen that the springs 1 contact the microswitch arms 93 opening the circuit to the rotatary solenoids 92 thereby deactivating the same causing the gear 90 to retract the teeth 88 and 89, through a spring biased connection, within the slot 81 to the position illustrated in FIG. 22 allowing the springs to pass over the heads. As the last coil spring 1 in the magazine B clears the microswitch arm 93 on the first snatching head traversed as seen in FIG. 20, the circuit to the solenoid 92 closes activating the same causing the teeth 88 and 89 to be projected outwardly through the slot 81 into locking engagement with adjacent portions of the supported turn of the end spring helical coil 3 as seen in FIGS. 14, 15 and 23. The continuously moving magazine B moves away from the first head C leaving the last spring 1 rigidly locked on the block 80 with end loops 2 free and the knots 4 still in properly oriented relationship. As the magazine B scans each of the snatching heads C and the end head CC, the respective end coil springs 1 are locked on the blocks 80, as described above, and withdrawn from the free end of the magazine. Upon reaching the end plate 60 the carriage motor 62 is shut off leaving a row of similarly oriented springs rigidly locked on the snatching heads C including the end head CC. It should be noted here that the ball detents 65 on the ends of the angle plate 64 prevent any of the remaining springs 1 from being dragged off of the end of the magazine with the end locked spring. It should also be noted that the distance between the end of the microswitch arm 93 and the tooth 88 and similarly the distance between the end of the microswitch 94 and the tooth 89 is equal to the minimum spacing attainable between adjacent coil springs. This minimum spring spacing is achieved when the knots 4 are in abutting relationship and as seen in FIG. 9 is approximately three times the cross sectional diameter of the wire from which the spring is formed. Any greater spacing of the coil springs 1 that may occur, however, has no effect on the proper operation of the snatching heads.

In the next step of the operation of the coil spring snatching heads C and the end head CC, the pneumatic cylinder 110 is activated to retract the piston rod 112 swinging the lever arm 109 through 90 degrees over to the position shown in dot dash lines in FIG. 11 bringing the cam follower 114 into engagement with the inclined cam surface 116 on the cam track 115. The lever arm 109 in turn rotates the shaft 96 swinging the snatching heads through 90° down to a horizontal position as indicated in dot dash lines in FIG. 7. As the head CC is rotated by the shaft 96, engagement of the gear 106 with the nonrotating ring gear 107 causes the head CC to be rotated by the arm 95*a* about its axis through 180 degrees as illustrated in FIG. 13. This rotational movement places the coil springs 1 in

properly oriented relationship for reception by a spring assembly fabricating machine with the knots 4 on the end spring rotated through 180 degrees relative to the knots on the rest of the springs. Continued retraction of the piston rod 112 pulls the cam follower 114 under the cam surface 117 causing the bushing 101 to override the ball detent 105 whereupon the shaft 96 is pulled to ends of the slots 100 and 102 and the snatched springs inserted in the spring assembly fabricating machine. At the end of its retraction stroke the pneumatic cylinder is reversed simultaneously with the releasing, through suitable electrical circuitry, of the coil springs 1 from the snatching heads C and head CC. Advancement of the piston rod 112 pushes the bushing 101 back over the ball detent 105 and restores the lever arm 109 and the snatching heads to their original upright position. The motor 62 then reverses and drives the partially loaded magazine B back towards the spring orienting mechanism A. During this reverse travel the head scanning operation is repeated and springs snatched from the supported end of the magazine B in the same manner so described in conjunction with the forward movement of the magazine with exception that the microswitch arms 93 are deactivated when the springs contact the microswitch arms 94. Also the ball detent 65 mounted in the supported end of the angle plate 64 assures withdrawal of the end spring alone.

The forward and reverse scanning movements of the magazine continue, the number of which depending on the number of springs held on the magazine relative to the number of snatching heads. After the predetermined number of scanning passes, the magazine B returns to the orienting mechanism B and the angle plates 63 and 64 and the center arm 67 are again thrust into the oriented springs held in the mechanism A to pick up another group of springs. It should be noted that in the event a few springs remain on the carriage when the new thrust is made, the end loops 2 of these springs will override the flanges 46 and the remaining springs be pushed back to the rear end of the magazine B by the locked springs in the mechanism A. The microswitch finger 71 will be accordingly deflected so that when the journal 58 contacts the conductor 72 the solenoid 69 will be activated locking another oriented group of coil springs 1 onto the magazine 5 by the locking pin 70. It can thus be seen that the thrust of the magazine B is effected in the same manner regardless of the presence of springs remaining on the carriage.

Having described my invention what we claim to be new and novel and seek to protect by Letters Patent is:

1. The method of handling coil compression springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops, said end loop coil extremity connections of said respective springs disposed along a common axis passing through opposed points on the circumference of said end loops comprising the steps of orienting said common axes in a single plane, separating a group of said oriented springs, withdrawing individual coil springs from said group and maintaining said orientation of said common axes in said single plane.

2. The method as in claim 1 and rotating the longitudinal axis of one of said withdrawn coil springs through 180°.

3. The method as in claim 1 and moving said withdrawn individual coil springs away from said group.

4. The method as in claim 1 and effecting said withdrawing by rigidly engaging said individual coil springs.

5. The method of handling coil compression springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops, said end loop coil extremity connections of said respective springs disposed along a common axis passing through opposed points on the circumference of said end loops comprising the steps of aligning said common axes in substantial parallelism, arranging said coil springs in nested overlapping relationship, orienting said longitudinal axis in a single plane and sequentially individually engaging said intermediate coils of said respective coil springs.

6. The method as in claim 5 and rigidly engaging said individual coil springs by applying a force couple to said intermediate coils of said individual coil springs.

7. The method as in claim 5 and withdrawing said individually engaged coil spring.

8. The method of handling coil compression springs made up of two opposed substantially circular end loops, and intermediate helical coil connected at either extremity to said end loops, said end loop coil extremity connections of said respective springs disposed along a common axis passing through opposed points on the circumference of said end loops comprising the steps of aligning said common axes in substantial parallelism, arranging said coil springs in nested overlapping relationship orienting said common axis in a single plane and locking said coil springs in oriented nested position.

9. The method as in claim 8 and separating a fixed group of said oriented coil springs.

10. The method as in claim 9 and withdrawing individual coil springs from said group.

11. The method of handling coil compression springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops, said end loop coil extremity connections of said respective springs disposed along a common axis passing through opposed points on the circumference of said end loops comprising the steps of orienting said common axes in a single plane and engaging said coil springs sequentially individually through the application of a force couple to the said respective springs.

12. The method as in claim 11 and applying said force couple to spaced points on said helical coil of said individual springs.

13. The method as in claim 11 and effecting said individual engagement in response to the presence of said coil springs.

14. In apparatus for handling coil compression springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops, said end loop coil extremity connections of said respective springs disposed along a common axis passing through opposed points on the circumference of said end loops comprising means for orienting said common axes in a single plane, a movable carriage for conveying said oriented coil springs in a group and coil spring snatching means for withdrawing individual coil springs from said group.

15. Apparatus as in claim 14 and including drive means for conveying said carriage along a path over said snatching means to effect said withdrawing of said individual coil springs.

16. Apparatus as in claim 14 and including means for moving said snatching means out of the path of said movable carriage.

17. In apparatus for handling coil compression springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops comprising a coil spring orienting mechanism including an elongated vertically disposed lower member, an elongated vertically disposed upper member vertically spaced from said lower member and means for conveying said coil springs along said lower and upper members with said end loop coil extremity connections at one end of said coil springs confined in the vertical space between said lower and upper members.

18. In apparatus as in claim 17 and including means for imparting vertical reciprocating motion to said upper member.

19. In apparatus as in claim 17 and including means for locking said oriented coil springs in fixed position.

20. In apparatus as in claim 17 and including means for separating a group of said oriented coil springs.

21. In coil spring handling apparatus, a coil spring snatching head including a coil spring engaging block having side surfaces forming an inverted V-shape configuration as viewed in vertical cross section, a cavity formed in said block, coil spring locking means mounted within said cavity and actuating means operatively connected to said block for projecting said

locking means out of said cavity so as to rigidly lock a coil spring in engagement with said block.

22. In apparatus as in claim 21 said locking means comprising a pair of teeth adapted to project from said block side surfaces.

23. In apparatus as in claim 21 said actuating means including a microswitch mounted in said block cavity.

24. In apparatus as in claim 21 and including means for moving said snatching heads.

25. Apparatus for feeding coil springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops comprising a member for engaging said spring within said helical coil and means operatively connected to said member for gripping the turns of said helical coil at spaced points to grip said turns of said helical coil against said member.

26. Apparatus as in claim 25 said gripping mans including pair of teeth adapted to project from said member and exert a force couple on said helical coil turns.

27. Apparatus for feeding coil springs from a nested group, said respective springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops comprising a member for engaging said respective springs within said helical coil, means for displacing said nested group of springs relative to said member and means operatively connected to said member for withdrawing an individual spring from said nested group.

28. Apparatus as in claim 27, and said withdrawing means including a pair of teeth for gripping the turns of said helical coil at spaced points.

29. The method of handling coil springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops comprising the steps of inserting a spring engaging member within the turns of said helical coil and engaging said turns of said helical coil at spaced points and exerting a force couple on said helical coil.

30. The method of feeding coil springs from a nested group, said respective springs made up of two opposed substantially circular end loops, an intermediate helical coil connected at either extremity to said end loops comprising the steps of inserting a spring engaging member within the turns of said helical coils, displacing said nested group of springs relative to said member and withdrawing a succession of individual springs from said nested group in a direction of said displacement.

31. The method as in claim 30, and effecting said withdrawing by gripping said turns of said helical coil at spaced points.