July 15, 1952 B. F. DOCKERY 2,603,246

MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

Filed Nov. 19, 1948 9 Sheets-Sheet 1

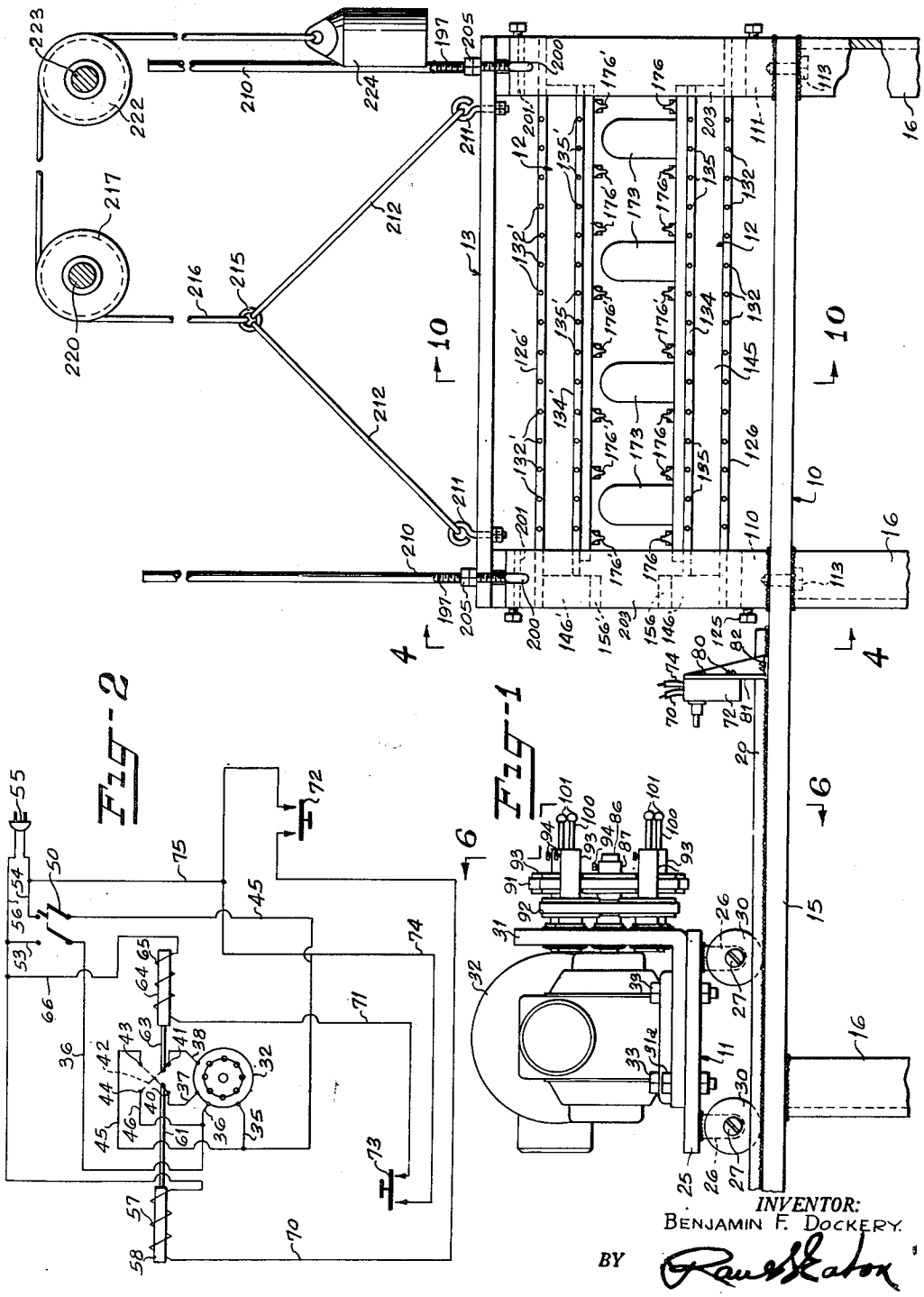


Fig-2

Fig-1

INVENTOR:
BENJAMIN F. DOCKERY.

BY Raus Katon

ATTORNEY

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MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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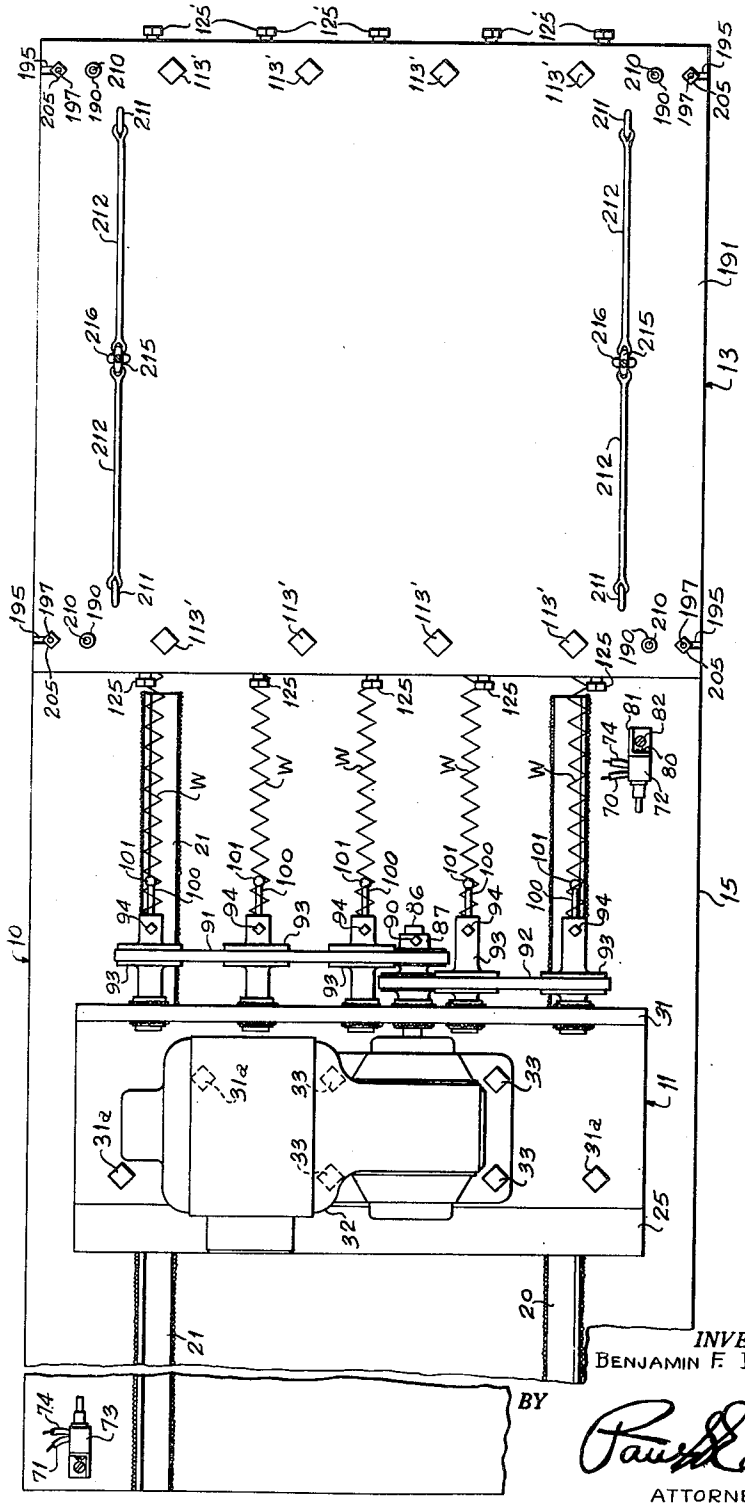


Fig-3

INVENTOR:
BENJAMIN F. DOCKERY.

BY

ATTORNEY

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MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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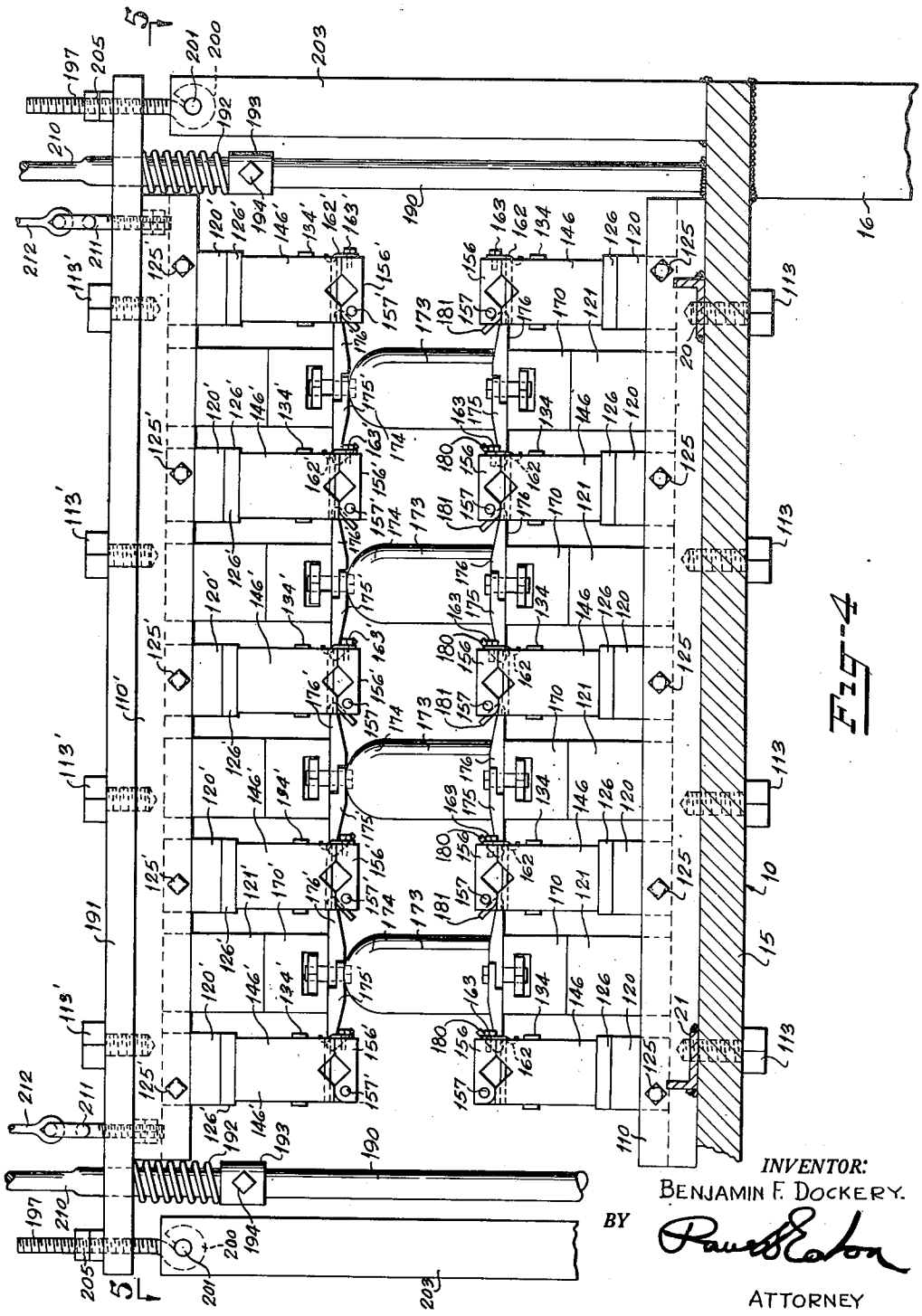


Fig-4

INVENTOR:
BENJAMIN F. DOCKERY.
BY
ATTORNEY

July 15, 1952

B. F. DOCKERY

MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

2,603,246

Filed Nov. 19, 1948

9 Sheets-Sheet 4

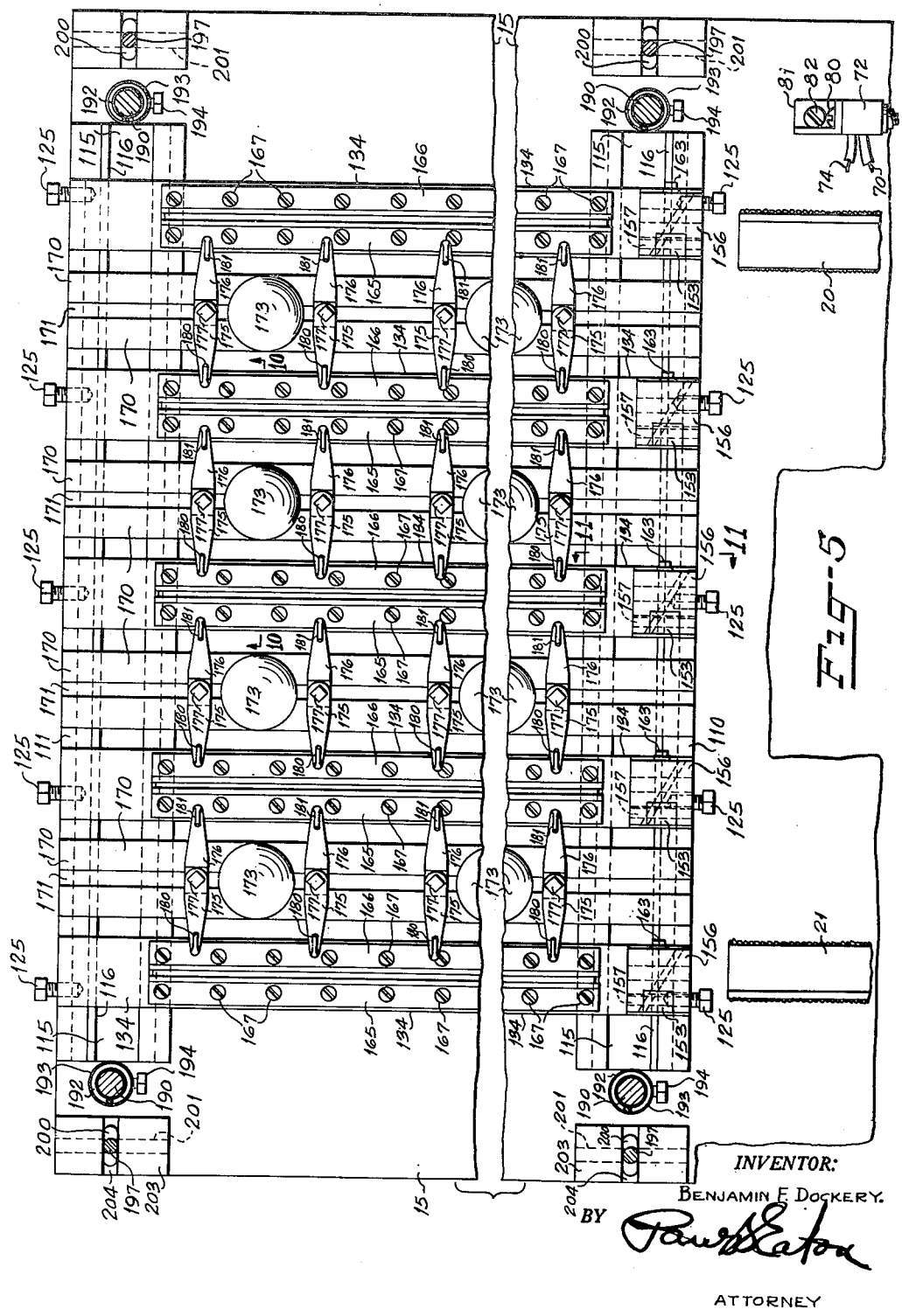


Fig-5

INVENTOR:

BENJAMIN F. DOCKERY.

BY

ATTORNEY

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MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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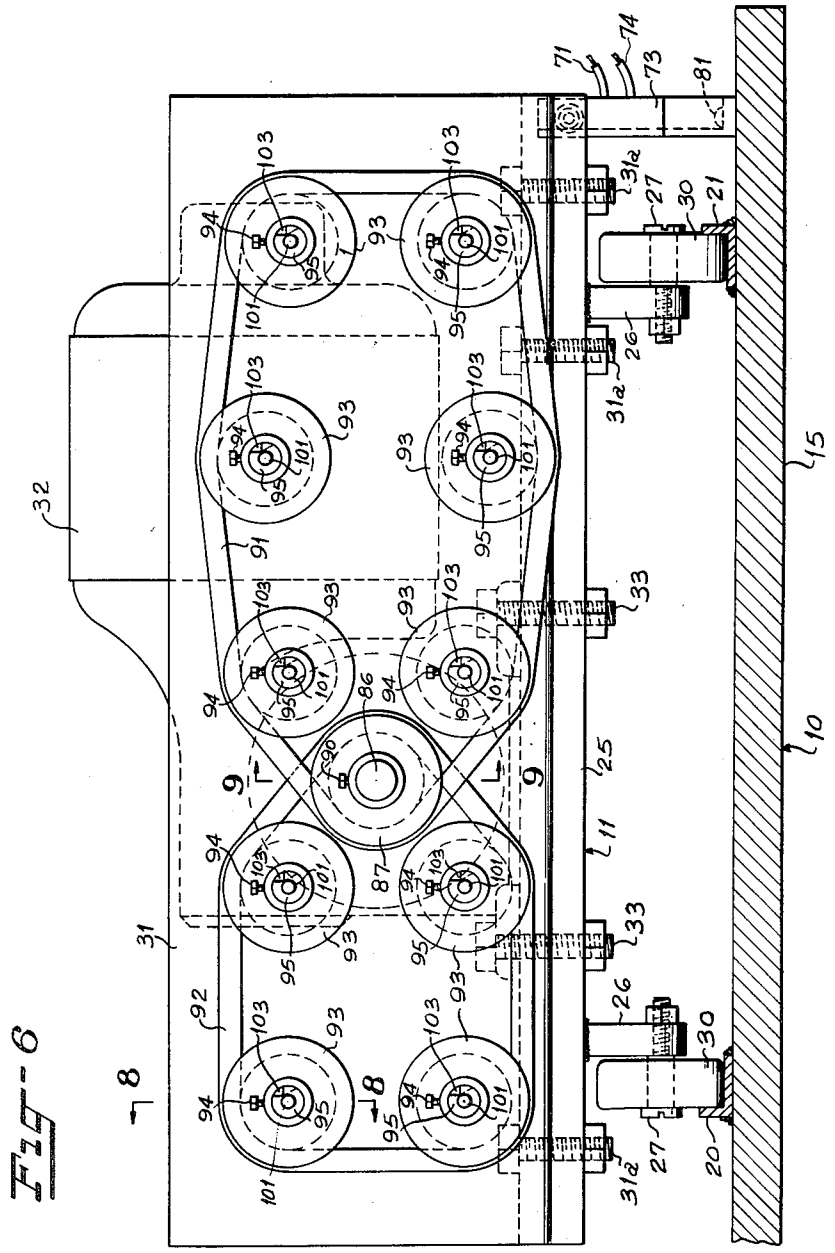


Fig-6

INVENTOR:
BENJAMIN F. DOCKERY.

BY

ATTORNEY

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MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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Fig-7

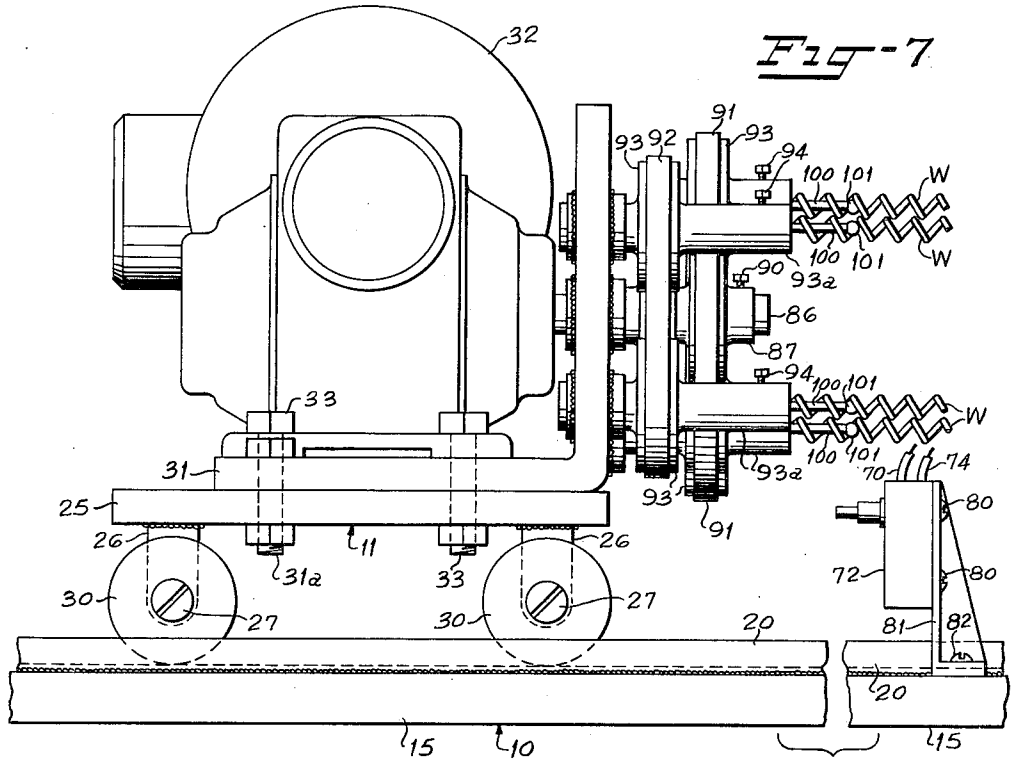


Fig-8

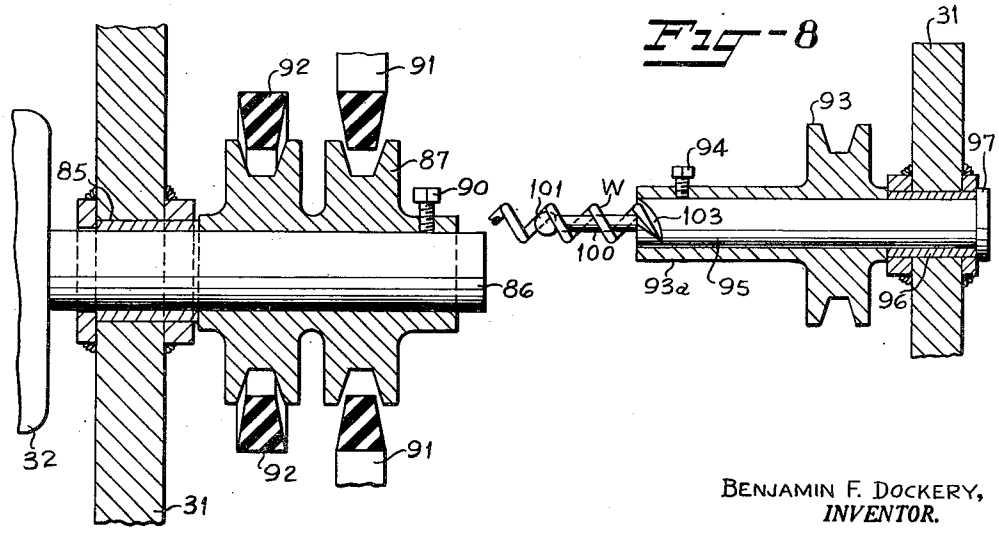


Fig-9

BENJAMIN F. DOCKERY,
INVENTOR.

BY

ATTORNEY

July 15, 1952 B. F. DOCKERY 2,603,246

MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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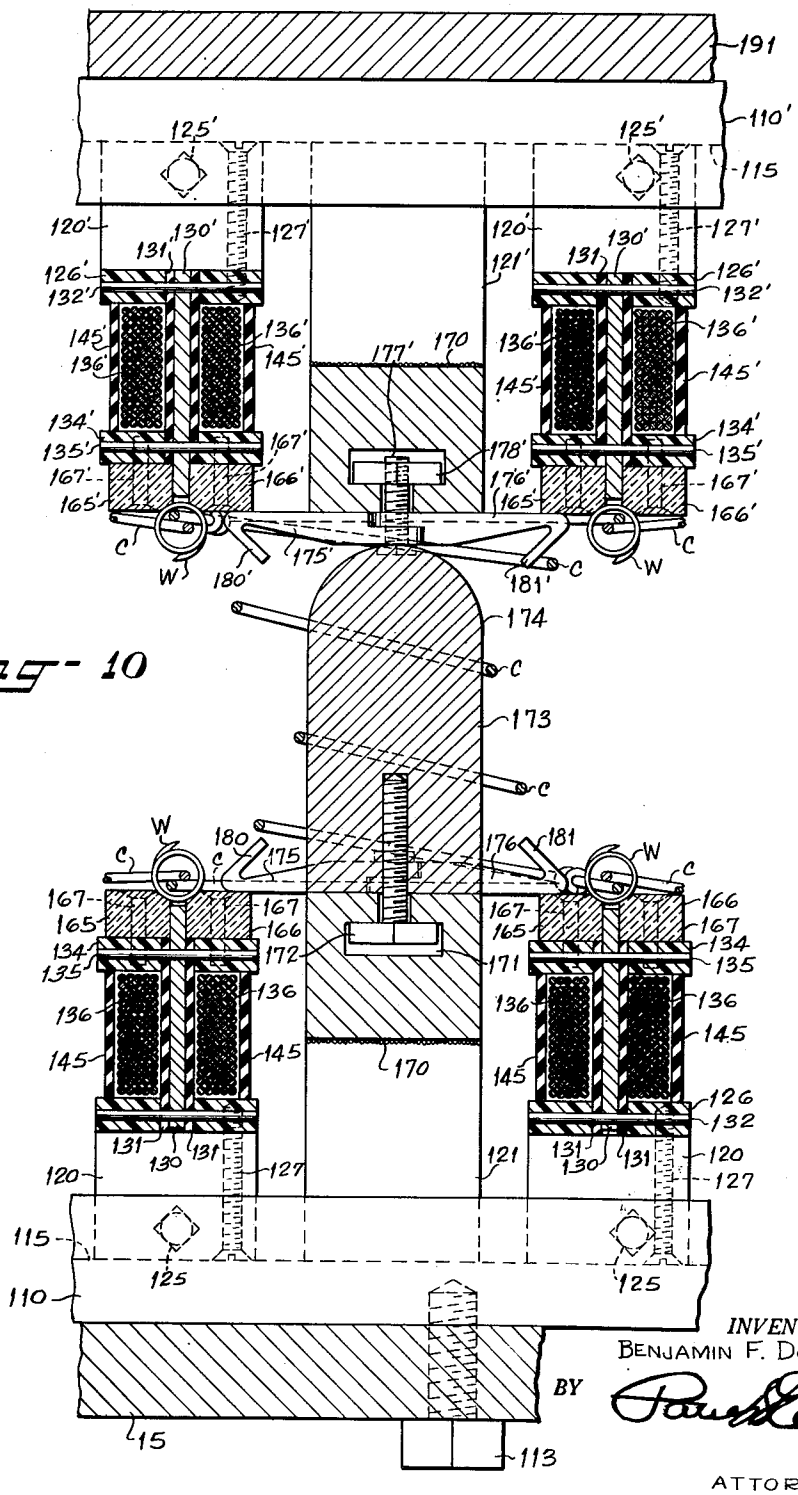


Fig- 10

INVENTOR:
BENJAMIN F. DOCKERY.

BY

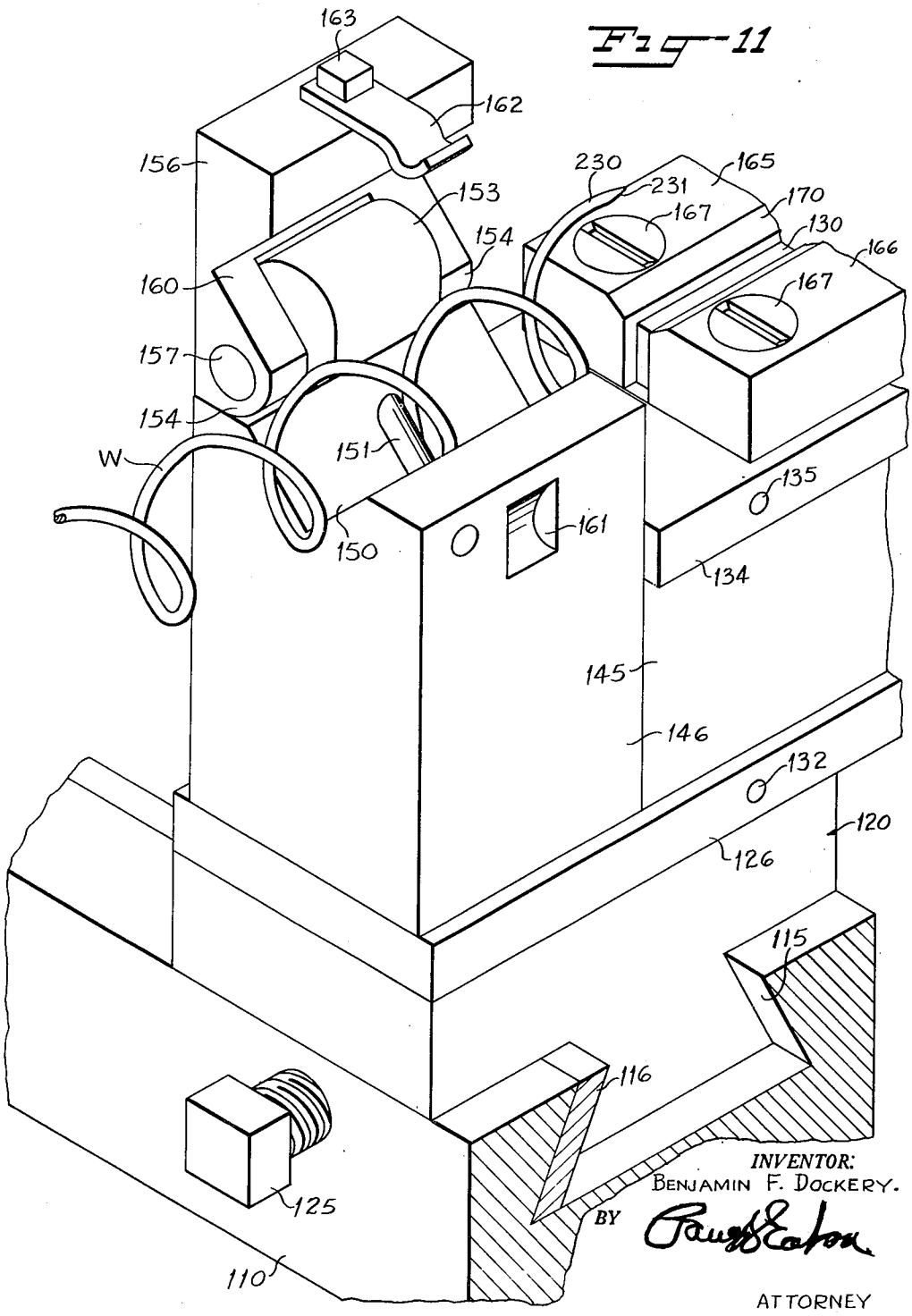
ATTORNEY

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MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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Fig 11



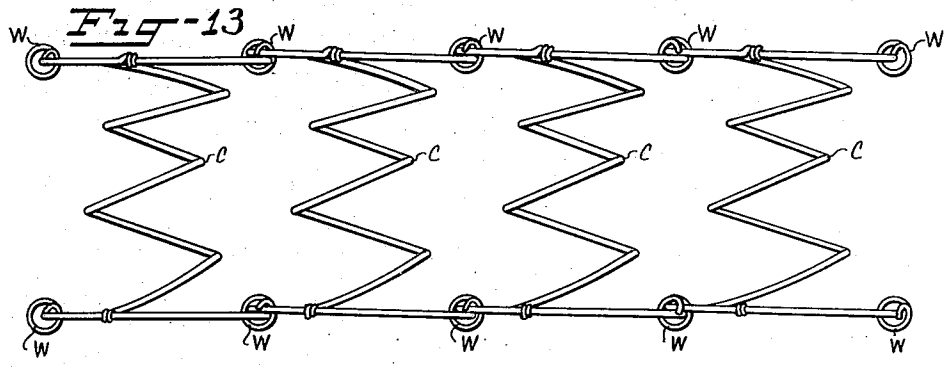
INVENTOR:
BENJAMIN F. DOCKERY.
BY
ATTORNEY

July 15, 1952 B. F. DOCKERY 2,603,246

MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

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Fig-13



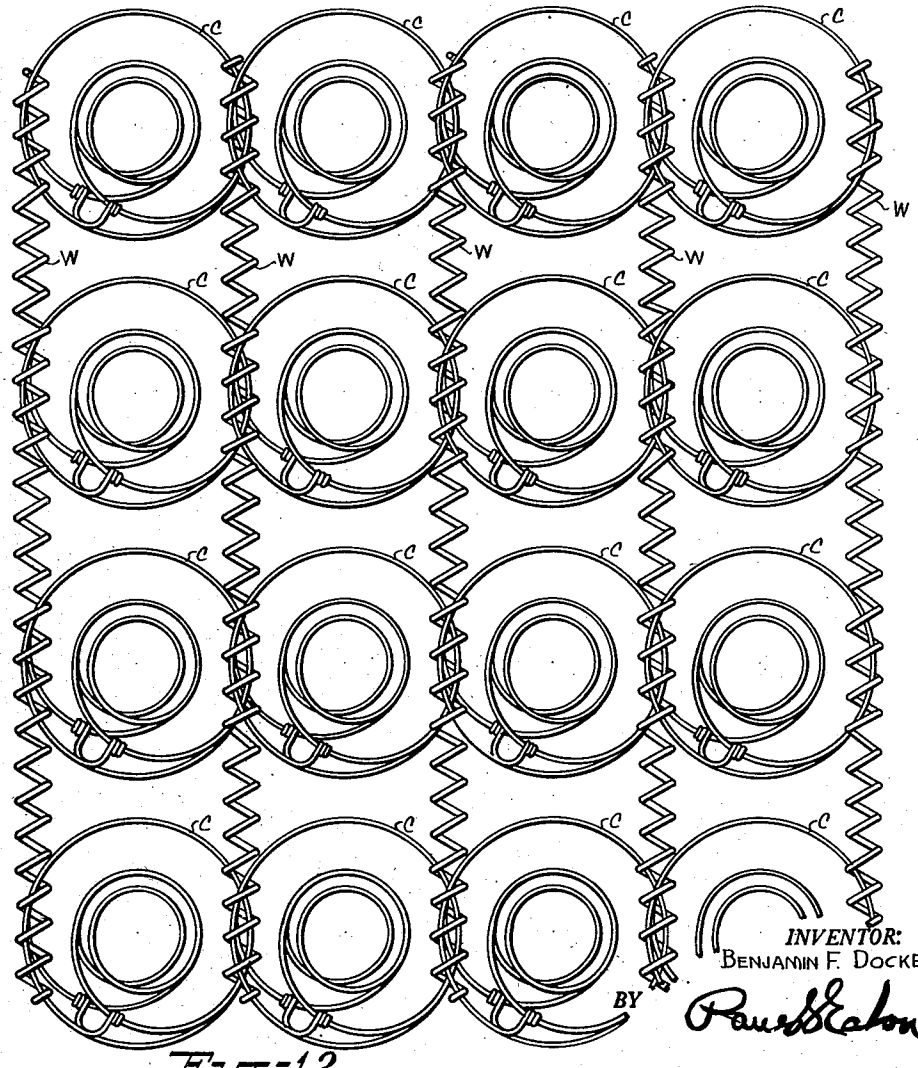


Fig-12

INVENTOR:
BENJAMIN F. DOCKERY.

BY Paul & Eaton

ATTORNEY

Patented July 15, 1952

2,603,246

UNITED STATES PATENT OFFICE

2,603,246

MAGNETIC HOLDING AND GUIDE MEANS FOR SPRING ASSEMBLY MACHINES

Benjamin F. Dockery, High Point, N. C.

Application November 19, 1948, Serial No. 61,047

2 Claims. (Cl. 140—92.9)

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This invention relates to apparatus for assembling coiled spring units such as are used in bed springs, furniture springs, automobile cushion springs, and the like.

Coiled spring units such as are used in bed springs, upholstered furniture and the like, generally comprise a plurality of coiled springs disposed on a vertical axis, which are arranged in spaced longitudinal and transverse rows, the longitudinal rows of coiled springs being disposed immediately adjacent or overlapping each other, while the transverse rows of coiled springs are spaced apart from each other and a plurality of coiled wires extend longitudinally from one transverse row of the coiled springs to the next transverse row of coiled springs and so on. As the coiled wires pass from one transverse row of coiled springs to the next, they are spirally wound about the overlapping portions of the uppermost and lowermost coils of the coiled springs in such a manner as to bind the coiled springs together, and to thus form a coiled spring unit.

Heretofore, there have been various methods used for assembling these coiled spring units, among which has been that method of placing the coiled springs on pegs or vertical standards and to provide an electric motor having a spindle to which one end of a coiled wire is attached and the other end of the coiled wire being fed manually into engagement with each of the coiled springs past which the coiled wire is moved, this being repeated for each longitudinal row of coiled springs. This has required considerable time and specially trained, very experienced labor in order to insure a reasonably fast rate of production as well as to keep the expense of assembling the coiled spring units to a minimum.

It is therefore an object of this invention to provide apparatus broadly embodying means for automatically feeding the coiled wires to both the upper and lower ends of the coiled springs simultaneously and in such a manner as to tie them together and wherein all of the coiled wires may be attached to all of the longitudinal rows of coiled springs simultaneously.

It is another object of this invention to provide apparatus for assembling coiled spring units comprising a platform on which a plurality of vertically disposed pegs are adjustably mounted and each of which is adapted to receive a coiled spring, the pegs being arranged in longitudinal rows and between each row of which there is a longitudinally extending grooved member, the grooved member having a magnetized member extending longitudinally thereof and from the

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upper surface of which the sides of the groove are beveled outwardly and to further provide a plurality of driven spindles being disposed on a horizontal axis. A suitable guiding member is disposed in alinement with the feed end of the longitudinal extending grooved member, whereby each of the upstanding pegs may have a coiled spring placed over the same, the proximate edges of the coiled springs lapping over each other above the grooved member in such a manner that a coiled wire may be placed on the guiding member at one end thereof and the other end of the coiled wire may be attached to the corresponding spindle, there being a spindle for each coiled wire. These spindles are adapted to receive the trailing ends of the coiled wires in such a manner that upon rotation of the spindles the coiled wires will be fed onto the grooved member and will be held in proper alinement by the beveled walls of the grooved member and, due to the magnetic attraction of the magnetized member extending longitudinally of the grooved member, the coiled wire will adhere to the grooved member and thus the coiled wire will be fed around the coils at the bottoms of the coiled springs which will assemble the springs in proper spaced relation to each other thus forming an assembled coil spring unit.

It is another object of this invention to provide automatic means associated with the coiled spring assembling apparatus whereby upon the coiled wires being installed on the coiled springs as heretofore described, the driving means and its associated spindles, which is mounted on a wheeled carriage, will be drawn towards the platform as the coiled wires are fed around the bottom coils of the coiled springs. Now, as the coiled wires are finally fed entirely into the apparatus, the wheeled carriage on which an electric motor is mounted will engage a switch to thus automatically reverse rotation of the motor and to release the coiled wires from the associated spindles, after which the wheeled carriage is manually moved away from the platform of the apparatus for a repeat operation.

It is another object of this invention to provide an upper plate having an identical guiding means for the coiled wires to that of the platform and having other adjustable means to assist in properly locating the upper ends of the coiled springs, the upper plate being vertically movable for loading the coiled springs on the base and whereby the coiled wires may also be attached to the uppermost coils of the coiled springs simultaneously with the coiled wires being assembled to

the lowermost of the coils of the coiled springs in the manner described, thereby automatically completing the assembly of a coiled spring unit preparatory for its being upholstered in the usual manner.

Some of the objects of the invention having been stated other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

Figure 1 is a side elevation of the coiled spring unit assembling apparatus with parts being broken away and omitting the component parts of the coiled spring unit;

Figure 2 is an electrical wiring diagram showing the various electrically responsive parts schematically;

Figure 3 is a top plan view of the structure shown in Figure 1;

Figure 4 is an enlarged elevation with parts in section and is taken substantially along the line 4—4 in Figure 1;

Figure 5 is a top plan view of the structure shown in Figure 4 and is taken substantially along the line 5—5 in Figure 4, but omitting the vertically movable upper plate and the various parts secured thereto;

Figure 6 is an enlarged elevation of the spindle and motor carriage and showing a portion of the table top in cross section and is taken substantially along the line 6—6 in Figure 1;

Figure 7 is an enlarged elevation of the left-hand portion of Figure 1 and showing portions of the coiled wires mounted on the spindles of the motor carriage;

Figure 8 is an enlarged vertical sectional view taken substantially along the line 8—8 in Figure 6;

Figure 9 is an enlarged vertical sectional view taken along the line 9—9 in Figure 6;

Figure 10 is a greatly enlarged vertical sectional view taken substantially along the line 10—10 in Figure 1 and showing one of the stations at which the coiled springs are mounted for assembly to the coiled wires;

Figure 11 is an enlarged isometric view with parts in section and with other parts being broken away and is taken substantially along the line 11—11 in Figure 5;

Figure 12 is a top plan view of an assembled coiled spring unit;

Figure 13 is an elevation of the assembled coiled spring unit looking down on the upper end of Figure 12.

Referring more specifically to the drawings, this invention comprises a table 10, a motor carriage 11, a spring assembling platform 12, and a vertically movable upper platform 13. Referring to Figure 1 it may be observed that the table 10 comprises a horizontally disposed plate 15 which is supported on suitable legs 16, which are secured to the horizontally disposed plate 15 by any suitable means such as welding. Suitable angle bar trackways 20 and 21 are welded to the top surface of the plate 15 for guiding the motor carriage 11 to be presently described.

The motor carriage 11 (Figures 1, 3, 6, 7, 8 and 9) comprises a horizontally disposed rectangular plate 25 having ears 26 welded to the lower surface adjacent each corner thereof and projecting downwardly therefrom. Each of the ears 26 has a shoulder bolt 27 secured therein and on which a suitable roller or wheel 30 is rotatably mounted. These wheels 30 are adapted to ride in the trackways 20 and 21 when the motor carriage 11 is caused to move back and forth relative to the spring assembling platform 12 in the manner to be later described.

The rectangular plate 25 has an angle plate 31 secured thereon, as by bolts 31a. This angle plate 31 has a suitable electric gear reduction reversible motor 32 secured thereon, by any suitable means such as bolts 33, which slidably penetrate the horizontal leg of the angle plate 31 and also penetrate the rectangular plate 25 thus securing the motor 32 and the angle plate 31 to the rectangular plate 25. The electric motor 32 has electric wires 35, 36, 37 and 38 extending therefrom and by referring to Figure 2 the motor is shown symbolically as being a reversing motor, single phase.

The electric wires 37 and 38 extend to contact points 40 and 41, respectively (Figure 2), which are adapted to be intermittently engaged by a switch closing contact bar 42. The switch closing bar 42 is pivoted intermediate its ends and the opposite end of the same from that which engages the contact points 40 and 41 intermittently engages contact points 43 and 44, respectively, from which electric wires 45 and 46, respectively, extend to a manually operated double pole master switch 50 the other side of which is adapted to contact electric wires 53 and 54. The wire 46 is connected to the electric wire 36 adjacent the electric motor 32 (Figure 2).

The electric wire 54 extends to one side of a male plug 55 which is adapted to be plugged into a suitable source of electric energy, not shown, and this male plug 55 has an electric wire 56 extending from the other side thereof to one side of a solenoid coil 57. The electric wire 53 extending from the switch 50, is connected to the electric wire 56 extending from the male plug 55 to the solenoid coil 57. The solenoid coil 57 surrounds a plunger 58 having a rod 61 extending from one end thereof and being pivotally connected adjacent the lower end of the contact arm 42 in Figure 2. Also pivotally connected adjacent the lower end of the contact arm 42 is one end of a rod 63, the opposite end of which is connected to a plunger 64 surrounded by a solenoid coil 65. One end of the solenoid coil 65 has an electric wire 66 extending therefrom and being connected intermediate the ends of the electric wire 56.

The solenoid coils 57 and 65 have electric wires 70 and 71, respectively, extending therefrom to one side or micro-switches 72 and 73, respectively. The other sides of the micro-switches 72 and 73 are connected to opposite ends of an electric wire 74 and an electric wire 75 is connected intermediate the ends of electric wire 74, the other end of the wire 75 being connected to wire 54 extending from the male plug to the master switch 50.

Obviously, the reversing mechanism for the electric motor 30 and the switch 50 may be disposed remotely from the table 10 and for that reason and for purposes of clarity, these parts have been omitted from the drawings with the exception of the schematic wiring diagram shown in Figure 2. The micro-switches 72 and 73 are also shown in Figures 1, 3, 5 and 6. Each of the micro-switches 72 and 73 is secured as by screws 80 to an upright bracket 81 secured as by a screw 82 adjacent opposite ends of the trackways 20 and 21 and to the horizontally disposed plate 15. The purpose of the switches 72 and 73 is to automatically reverse the rotation of the electric motor at each end of the range of

travel of the carriage for purposes to be later described.

The vertical leg of the angle plate 31 has a suitable bearing member 85 (Figure 9) fixedly mounted therein and the electric motor 32 has a shaft 86 extending from the same which is rotatably mounted in the bearing member 85.

The shaft 86 extends beyond the vertical leg of the angle plate 31 and has a double grooved V-pulley 87 secured thereon as by a set screw 90. The pulley 87 has V-belts 91 and 92 mounted thereon which extend in opposite directions and each of which engages a plurality of spaced V-pulleys 93 which are disposed in two substantially parallel rows, one above the other (Figure 6), to thus impart rotation to each of the pulleys 93 in a like direction to that in which the motor shaft 86 may be rotating.

Referring to Figure 8 there may be observed one of the V-pulleys 93 and this pulley 93 has an elongated hub portion 93*a* and is secured, as by a set screw 94, on a spindle 95 which is rotatably mounted in a bearing portion 96 secured in the vertical leg of the angle plate 31. The shaft 95 has a headed portion 97 at its right-hand end in Figure 8 and this headed portion as well as the pulley 93 on the shaft 95 prevent endwise movement of the shaft 95. It will be noted that the grooved pulleys 93 to the left of the motor shaft 86 in Figure 5 are disposed in alinement with each other for engagement by the V-belt 92 and the pulleys 93 disposed at the right-hand side of the shaft 86 are disposed in alinement with each other for engagement by the V-belt 91.

Referring to Figures 6 and 8 it may be observed that each of the spindles 95 has a restricted portion 100 integral therewith which is ball pointed as at 101 and which is adapted to receive the trailing end of the coiled wire indicated at W. It will be noted that the spindle 95 has an axial groove 103 cut therein which is also cut on an angle or spirally relative to the axis of the spindle 95 and which is adapted to receive the trailing end of the coiled wire W whereby, upon rotation being transmitted to the spindle 95 in such a manner as to cause the upper side of the shaft to move away from the observer in Figure 8, the coiled wire W will be caused to rotate in a like manner.

Spring assembling platform

Before the electric motor 32 is started, as will be more fully described in the method of operation, the end of each of the coiled wires W is to be mounted in one of the spindles or shafts 95 in the manner heretofore described and the other of leading ends of the coiled wires W extend to the upper and lower platforms 13 and 12, respectively, connected to the same in a manner to be later described.

The spring assembling platform 12 comprises a pair of transverse spaced dove-tailed guide members 110 and 111 which are secured as by screws 113 (Figure 1) to the horizontally disposed plate 15 of the table 10. Both of the dove-tailed guide members 110 and 111 are identical and by referring to Figure 11, it may be observed that the dove-tailed guide member 110 has a dove-tailed groove 115 extending longitudinally thereof and in which a gib 116 is mounted and this dove-tailed groove 115 in each of the transverse dove-tailed guide members 110 and 111 is adapted to receive the male dove-tailed portions of a plurality of support blocks 120, these support blocks 120 being spaced

alternately apart from each other and between each of which is a similar block 121 (Figures 4 and 11).

Each of the transverse dove-tailed guide members 110 and 111 has a plurality of set screws 125 threadably penetrating the outer walls of the dove-tailed groove 115, the heads of which are disposed on the remote sides of the dove-tailed guide blocks 110 and 111 in Figure 1. The proximate ends of these set screws 125 are adapted to engage the gibs 116 (Figure 11) disposed in the dove-tailed groove 115 in the guide members 110 and 111 in such a manner as to clampingly secure the male dove-tailed portions of the blocks 120 and 121 in a desired adjusted position with respect to each other.

It is obvious that when so desired, the set screws 125 may be loosened slightly to thereby permit lateral adjustment of the blocks 120 and 121 with respect to each other. Each of the blocks 120, mounted in the transverse guide bar 110, has a corresponding block 120 mounted in the guide bar 111 and mounted on each of these blocks 120, as by screws 127, and spanning the distance therebetween, is a lower insulation bar 126 (Figure 7). The insulation bar 126 has the lowermost portion of a longitudinally extending soft iron core bar 130 embedded therein which is surrounded by a suitable insulation material 131 (Figure 10).

The soft iron core member 130 is preferably rectangular in cross section and is secured to the insulation bar 126 by suitable insulation pins 132. The soft iron core bar 130 and its insulation 131 extends upwardly and slidably penetrates an upper insulation bar 134. The insulation material 131 terminates at the top surface of the upper insulation bar 134; however, the soft iron core bar 130 projects a substantial distance upwardly above the top surface of the insulation bar 134. Suitable spaced insulation pins 135 are pressed through the insulation bar 134 and the upper portion of the core bar 130 to thus secure the core bar 130 to the insulation bar 134.

The insulation material 131 completely surrounds the opposite ends and both sides of the vertically disposed soft iron core bar 130 and a suitable magnetic coil 136 is wound about the same. Electric wires 137 and 140 extend from opposite sides of the magnetic coil 136 and are connected to lead wires 141 and 142 extending from a suitable source of electrical energy, not shown, thus forming an electro-magnet in which the core bar 130 is magnetized. A suitable insulation material 145 surrounds the magnetic coil 136 thus completing the structure of the electro-magnet.

It will be noted in Figures 4, 5 and 11 that the insulation bar 134 terminates a substantial distance short of the end of the insulation bar 126 adjacent the feed end of the apparatus and a guide block 146, of a suitable non-magnetizable material such as aluminum, is secured, by suitable means such as screws 147, to the insulation bar 126 and the block 120 mounted in the transverse guide bar 110.

The block 146 has a longitudinally extending V-groove 150 therein and the block 146 has a horizontally disposed pin 151 secured therein, as by a pressed fit, and which is disposed at an angle relative to the axis of the V-groove 150 and passes across the V-groove 150. The angle at which the pin 151 passes across the V-groove 150 conforms substantially to the lead of the

coils in the coiled wire W and the V-groove 150 conforms to the exterior diameter of the coiled wire W. The guide block 146 has an upwardly projecting portion 153 integral therewith which is straddled by downwardly projecting ears 154 of a guide block cap 156. The guide block cap 156 is pivotally secured, as at 157, to the upwardly projecting portion 153 of the guide block 146.

The guide block cap 156 has a V-groove 160 therein which cooperates with the V-groove 150 in the guide block 146 to form a square opening between the members 146 and 156 and through which the coiled wire W passes to the coiled springs, to be presently described. The guide block 146 has a cavity 161 therein (Figure 11) which is adapted to receive the free end of a leaf spring member 162 secured, as by a screw 163, to the guide block cap 156 when it is in closed position.

Engaging opposite sides of that portion of the longitudinally extending soft iron core 130 which projects above the insulation bar 134, are non-magnetizable guide bars 165 and 166 which are preferably of porcelain or glass and are secured, as by screws 167, to the upper insulation bar 134. The proximate upper edges of the longitudinally extending guide bars 165 and 166 are beveled as at 170 and, as the coiled wire W is fed through the apparatus in a manner to be later described, it is adapted to engage the beveled surfaces 170 as the magnetized soft iron core 130 tends to draw the coiled wire W towards the same to thus assist in retaining the coiled wire W between the guide bars 165 and 166 as it moves longitudinally thereof.

Referring to Figures 4 and 10, it may be observed that the blocks 121 disposed between the blocks 120 are of a substantially greater height than the blocks 120 and each of the blocks 121 mounted in the guide bar 110 has a corresponding block 121 mounted in the guide bar 111. Welded to the block 121 in the guide bar 110 at one end, and to the block 121 in the guide bar 111, at its other end, is a longitudinally extending bar 170 which has a T-slot 171 extending from one end to the other thereof. The T-slot 171 is adapted to loosely receive the head portions of a plurality of T-bolts generally designated by the reference character 172. These T-bolts 172 extend upwardly and each of them are threadably embedded in an individual peg or standard 173 to thus adjustably secure each of the standards 173 to the longitudinally extending bar 170. Each of the pegs 173 is hemispherical as at 174 at its upper end for ease of reception of a conventional cushion coiled spring designated at C.

To assist in properly locating the coiled spring C on the peg 173, each of the pegs 173 has a pair of adjustable pilot bars 175 and 176 mounted at each side thereof and being adjustably secured, as by a bolt 177, to the longitudinally extending bar 170, there being a square or rectangular nut 178 disposed within the T-slot 171 to threadably receive the lower end of the bolt 177. It will be noted that a portion of the pilot bar 175 overlaps a portion of the pilot bar 176 and this overlapping portion is slidably penetrated by the screw 177 so as to not only permit adjustment of the pilot bars longitudinally of the bar 170 but to also permit the bars 175 and 176 to be pivotally adjusted on a horizontal plane relative to each other.

The remote ends of the pilot bars 175 and 176 are bent upwardly and inwardly at an angle as at 180 and 181 respectively, and these portions 180 and 181 serve as guiding cams to further assist in guiding the lowermost coil of the coiled spring C into proper position on the pilot bars 175 and 176. Obviously, the inwardly projecting portions 180 and 181 may be of a separate piece of material from the pilot bars 175 and 176, respectively, and may be welded to or secured integral with the pilot bars 175 and 176 by any desirable means.

Welded to the horizontally disposed plate 15 and disposed adjacent opposite ends of the transverse dove-tailed guide bars 110 and 111, are vertically disposed the guide posts 190 which project upwardly and slidably penetrate a horizontally disposed rectangular plate 191 which comprises a part of the vertically movable top platform 13. Suitable compression springs 192 surround the intermediate portion of the vertically disposed guide post 190 and assist in supporting the weight of the horizontally disposed plate 191 and associated parts, the plate 191 resting on the upper end of the springs 192. The lower end of each of the springs 192 is supported on an adjustable collar 193 secured, as by a set screw 194, on each of the posts 190.

The horizontally disposed plate 191 has a slot 195 adjacent each corner thereof, and each of the slots 195 is slidably penetrated by a clamping screws 197. Each of the clamping screws 197 has an eye portion 200 integral therewith which is slidably penetrated by a pin 201 secured, as by a pressed fit, in the upper end of a vertically disposed standard 203, there being one of these vertically disposed standards 203 adjacent each corner of the horizontally disposed plate 15 and being welded thereto at their lower ends. The upper ends of the vertically disposed standards 203 are grooved as at 204 to slidably receive the eye portion 200 of each of the adjustment screws 197. The adjustment screws 197 each have a pair of lock nuts 205 threadably mounted thereon which are adapted to engage the upper surface of the plate 191, when it is in the position shown in Figure 4, to thus clampingly secure the plate 191 against the upper ends of the compression springs 192.

The horizontally disposed plate 191 has transverse dove-tailed guide bars 110' and 111' secured thereto, as by screws 113', and the parts associated with these dove-tailed guide bars 110' and 111' are identical to the parts associated with the guide bars 110 and 111, heretofore described as being secured to the horizontally disposed plate 15 of the table 10, and therefore parts associated with the dove-tailed guide bars 110' and 111' which are identical to those associated with the dove-tailed guide bars 110 and 111 will bear the same reference characters with the prime notation added. There is, however, an exception in the case of the parts being identical, in that those parts associated with the vertically movable platform 13 do not include any pegs identical to the pegs 173 secured to the longitudinally extending bar 170.

It will be noted in Figures 1 and 4 that each of the guide posts 190 has a restricted upwardly extending portion 210 integral therewith to thereby minimize resistance to vertical movement of the vertically movable top platform 13 on the upper portions 210 of the guide post 190.

To assist in supporting the weight of the vertically movable top platform 13 the horizontally disposed plate 191 has eye bolts 211 secured thereto and extending upwardly therefrom. Each

of these eye bolts 211 has a bar or cable 212 connected thereto and these bars or cables 212 extend upwardly and inwardly at an angle and are connected to a suitable metallic ring 215, there being two of these metallic rings shown in the drawings. Referring to Figure 1, it may be observed that the metallic ring 215 has one end of a cable 216 connected to the same which extends upwardly and passes over an idler pulley 127 rotatably mounted on a shaft 220 which may be secured in any desired manner to the framework of the building in which the apparatus is to be used and the cable 216 passes over a similar pulley 222 which is also rotatably mounted on a shaft 223 mounted in the same manner as the shaft 220. The cable 216 then extends downwardly and is connected at its other end to a suitable weight 224 and it is thus seen that the weight 224 will serve to equalize the weight of the parts associated with the vertically movable top platform 13.

Attention is called to the fact that in order to facilitate ease of operation of this apparatus, the leading ends of the coiled wires W in this instance, are bent outwardly at a slightly different arc than the other coils of the wire W, as at 230, and are also beveled at their leading ends as at 231 to thus assist in leading the coiled wire W around the coils of the coiled spring C and this function will be more clearly disclosed in the method of operation.

Method of operation

Preparatory to assembling the coil springs C and the coiled wires W, the electrically magnetized soft iron core bars 130 of the spring assembly platform 12 and the electrically magnetized soft iron core bars 130' of the vertically movable platform 13, are adjusted laterally an equal distance each side of the pegs 173 (Figure 10) and a distance apart from each other whereby their center to center distance is slightly less than the mean diameter of the endmost coils on the coiled springs C. The pegs 173 are adjusted longitudinally of the bars 170 any desired distance apart from each other and the pilot bars 175 and 176 are also adjusted longitudinally of each of the bars 170 relative to each of the pegs 173 to where their remote ends will conform to the curvature of the endmost coils of the coiled springs C.

The pilot bars 175' and 176' are adjusted longitudinally of the bar 170' of the vertically movable platform 13 so that they are disposed in the same vertical plane as the pilot bars 175 and 176 of the spring assembling platform 11.

By the weight of an operator being applied to the plate 191 of the vertically moveable platform 13, the plate 191 is forced downwardly against the compression springs 192 (Figure 4) thus permitting the bolts 197 to be swung outwardly on their axes and out of engagement with the slots 195 in the plate 191. The plate 191 is then relieved of the operator's weight and the operator may raise the entire vertically movable platform 13 upwardly, the weight of the platform 13 being overcome by the counter balancing effect of the weight 224 (Figure 1). It might be stated that the plate 191 moves off of the main portion of the guide portion 190 as the vertically movable platform 13 is moved upwardly manually, and is guided by the restricted portions 210, thus relieving frictional resistance to vertical movement of the plate 191 on the guide posts.

While the vertically movable platform 13 is in a raised position; that is, the plate 191 is disposed adjacent the uppermost ends of the restricted portions 210 of the guide post 190, a coiled spring C is placed over each of the pegs 173 in the manner shown in Figure 10, the pilot bars 175 and 176 serving by frictional contact to retain the lowermost coil of the coiled spring C in proper alinement on the longitudinally extending guide bars 165 and 166.

The vertically movable platform 13 is in a raised position; that is, the plate 191 is disposed adjacent the uppermost ends of the restricted portions 210 of the guide post 190, a coiled spring C is placed over each of the pegs 173 in the manner shown in Figure 10, the pilot bars 175 and 176 serving by frictional contact to retain the lowermost coil of the coiled spring C in proper alinement on the longitudinally extending guide bars 165 and 166.

The vertically movable platform 13 is then moved downwardly to the position shown in Figures 1, 4 and 10 and, upon the plate 191 engaging the upper ends of the compression springs 192, the operator again applies his weight to the plate 191 to thus force the same downwardly against springs 192 and to permit the bolts 197 to again be moved into the slots 195 at opposite sides of the plate 191 to thus lock the plate in this position. It might be stated that as the vertically movable platform 13 moves downwardly the uppermost coils of the coiled springs C are positioned on the pilot bars 175' and 176', in the manner heretofore described, and the coiled springs C are placed under compression to insure that the lower and upper ends of the coiled springs C will be properly seated on the longitudinally extending bars 170 and 170', respectively, and the guide bars 165 and 166 and 165' and 166', respectively. For example; the coiled springs C have a normal free length of 4 inches and when the lower and upper platforms 12 and 13 are in the position shown in Figure 4, the coiled springs C are compressed to approximately 3 inches in overall length.

The motor carriage 11 is then moved manually as far to the left as is possible in Figure 3; that is, until the plate 25 engages the plunger of the microswitch 73 and, assuming that the male plug 55 (Figure 2) has been plugged into a suitable source of electrical energy, not shown, the current will flow through the wires 54, 75, and 74 to one side of the microswitch 73. The current continues through the switch 73, through the electric wire 71 to the solenoid coil 65, through the wires 66 and 56 to the other side of the male plug 55. This will complete a circuit to the solenoid coil 65 thus causing the solenoid plunger 64 to move from left to right in Figure 2 and to thus complete a circuit between the wires 38 and 46 to the electric motor 32 which will cause the electric motor 32 to rotate in one direction when the switch 50 is closed, as will be later described.

Now, with the motor carriage 11 in the position heretofore described, the trailing ends of coiled wires W of the desired length are placed on each of the spindles 95 in the manner heretofore stated (Figure 8) and the leading ends of the coiled wires W are placed in the guide blocks 146 and 146' in the manner to be presently described.

The cover members 156 and 156' are then moved about their axis 157 and 157', respectively, to permit access to the V-grooves 150 and 150' in the guide blocks 146 and 146', respectively, so

the coiled wires W may be placed over the transverse pins 151 and 151' in the guide blocks 146 and 146', respectively. The cap members 156 are then closed and their leaf spring members 162 will engage the cavities 161 in the blocks 146 to lock them in closed position.

Now, assuming that the electric wires 141 and 142 and 141' and 142' are connected to a suitable source of electrical energy, the current will flow through the wires 137 and 140 and 137' and 140', to each of the magnetic coils 136 and 136', respectively, to thus electrically magnetize each of the soft iron core bars 130 and 130', respectively. The electric switch 50 (Figure 2) is then closed and current will flow from the male plug 55 through the electric wire 54, through the switch 50, through the electric wires 45 and 35 to the electric motor 32. Current will also flow from the motor 32 through the wire 36, through the switch 50, through the wires 53 and 56 to the other side of the male plug 55 thus completing an electrical circuit to the motor 32. Current will also flow from wire 36 through wire 46, contact bar 42, and wire 38 to the motor 32. This will cause rotation of the motor shaft 86 in a counterclockwise direction in Figure 6 thus causing like rotation to be transmitted to the pulleys 93 and the associated spindles 95 which will, in turn, transmit rotation to the coiled wires W.

Obviously, upon rotation of the coiled wires W (Figure 11) the transverse pin 151 of the spring assembling platform 12 and the transverse pins 151' of the vertically movable platform 13 will cause the coiled wires to move inwardly towards the guide bars 165 and 166 and 165' and 166' to thus cause the coiled wires W to move longitudinally between the guide bars 165 and 166. As the coiled wires W move longitudinally between the bars 165 and 166, although they do not engage the proximate edges of the soft iron core bars 130 and 130', they are attracted to the soft iron core bars 130 and 130' which serve to retain the coiled wires W in the groove formed by the longitudinally extending bars 165 and 166 at the spring assembling platform 12 and the groove formed by the longitudinally extending bars 165' and 166' of the vertically movable platform 13.

Now, as these coiled wires W rotate on their axes and move longitudinally of the soft iron core bars 130, the leading ends of the coiled wires W, being bent outwardly slightly relative to the rest of the coils, and being beveled as shown in Figure 11, will guide the coil around the overlapping portions of the endmost coils of the coiled springs C, thus assembling the coiled springs C and the coiled wires W into a coiled spring unit such as that shown in Figures 12 and 13.

It is manifest that, as the coiled wires W feed past the coiled springs C, they pull the motor carriage 11 after them. It will be noted that when the motor carriage 11 moves from left to right in Figures 1 and 2, the horzontally disposed plate 25 engages the plunger of the microswitch 72 and, instantaneously, the current will flow from the male plug 55 through the wires 54, 75 and 74 to one side of the microswitch 72 (Figure 2). The current then flows through the wire 70, the solenoid coil 57, and the wire 56 to the other side of the male plug 55. This will complete a circuit to the solenoid coil 57 thus causing the plunger 58 to move from right to left in Figure 2 and to thus cause the contact bar 42 to move in a clockwise direction in Figure 2 and to thus break the circuit between the wires 46 and 38 and to complete a circuit between the wires 45 and 37 to reverse rotation of the shaft 86 of the motor 32. Upon reverse rotation of the shaft 95; that is, the lower portion of the shaft 95 moving away from the observer in Figure 8, the trailing ends of the wires W will be released from the shaft 95 and this will also prevent the motor carriage 11 from being pulled too far to the right in Figures 1 and 2. After the motor shaft 86 has reversed rotation, the switch 50 (Figure 2) is again opened to stop rotation of the shaft 86 of the electric motor 32 after which the motor carriage 11 is moved manually to the left in Figures 1 and 2 until the plate 25 of the motor carriage 11 again engages the plunger of the microswitch 73 preparatory to a repeat operation.

The vertically movable platform 13 is then raised, in the manner heretofore described, and the completed spring unit as shown in Figures 12 and 13 is then removed from the spring assembling platform 12.

It is thus seen that I have provided a coiled spring assembling machine wherein any desired number of coiled springs may be assembled simultaneously automatically, resulting in an unprecedented saving in cost of manufacturing springs of this type.

In the drawings and specifications there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. An improvement in an apparatus for assembling coiled springs into coiled spring units in which there is provided a lower platform having a plurality of spaced longitudinally extending rows of spaced vertically disposed pegs mounted thereon, said apparatus also having guiding means located at one end of the platform and substantially half-way between the rows of pegs for directing coiled wires between the rows of pegs and said apparatus also having driving means for transmitting rotation to each of the coiled wires, said improvement comprising a longitudinally extending electro-magnet disposed between adjacent longitudinally extending rows of vertically disposed pegs, each of said electromagnets having a core projecting upwardly therefrom, a pair of longitudinally extending non-magnetizable members disposed adjacent the opposite sides of each of the cores, the proximate upper edges of the longitudinally extending non-magnetizable members being beveled, said guiding means being located at one end of the electro-magnets for directing a coiled wire onto each of the electro-magnets, whereby upon a coiled spring being placed on each of the vertically disposed pegs the proximate edges of the lowermost coils thereof may lap over each other above the electro-magnets and whereby each of the coiled wires will thus wind itself about the overlapping portions of the coiled springs to thus tie the coiled springs together and the coiled wires being retained against the beveled edges of the non-magnetizable members by magnetic attraction of said cores.

2. An improvement in an apparatus for forming coiled spring units, such as are used in bed springs and automobile cushion springs and the like and in which the coiled spring units are

formed of rows of coiled springs extending in spaced side by side relation to each other and the uppermost and lowermost coils of which are bound together by coiled wires, said apparatus having an upper and a lower platform each provided with longitudinally extending support bars disposed in spaced relation to each other and also having a plurality of spaced upstanding pegs secured to the longitudinally extending support bars on the lower platform, and said apparatus also having rotary driving means, said improvement comprising a plurality of longitudinally extending alternately and laterally spaced electro-magnets secured on each of the platforms and being disposed in the same vertical plane, each of said electro-magnets having a longitudinally extending core projecting therefrom and non-magnetizable longitudinally extending guide bars secured to the upper and lower proximate surfaces of the electro-magnets and disposed each side of the projecting portions of the cores, a source of electrical energy, an electrical connection between the source of electrical energy and the electro-magnets, whereby one of the coiled springs may be placed on each of the upstanding pegs with its endmost coils engaging the guide bars disposed adjacent each side of the longitudinally extending support bars and overlapping the endmost coils of the coiled spring

in the next adjacent row, and whereby said coiled wires may be connected to the rotary driving means for transmitting rotation to the same as they are fed to and around the overlapping portions of the adjacent coiled springs to thus tie the coiled springs together and are held in engagement with the guide bars by attraction of the electro-magnets.

BENJAMIN F. DOCKERY.

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