July 4, 1950 H. C. R. CARLSON 2,513,916

APPARATUS TO COIL SPRINGS FROM A STRAND OF WIRE

Filed July 16, 1949

FIG. 1

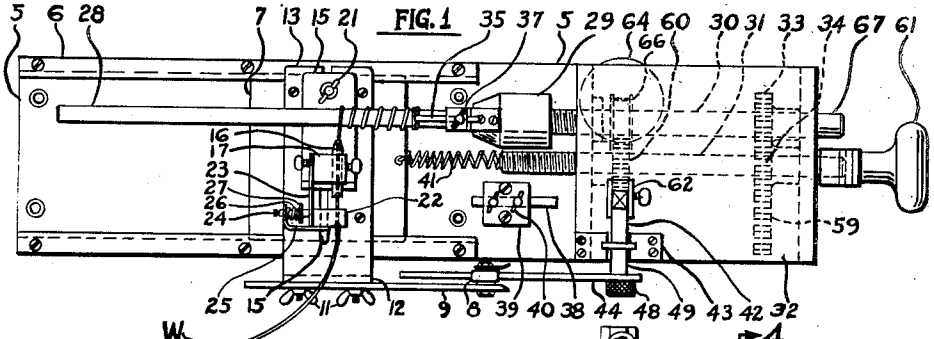



FIG. 2

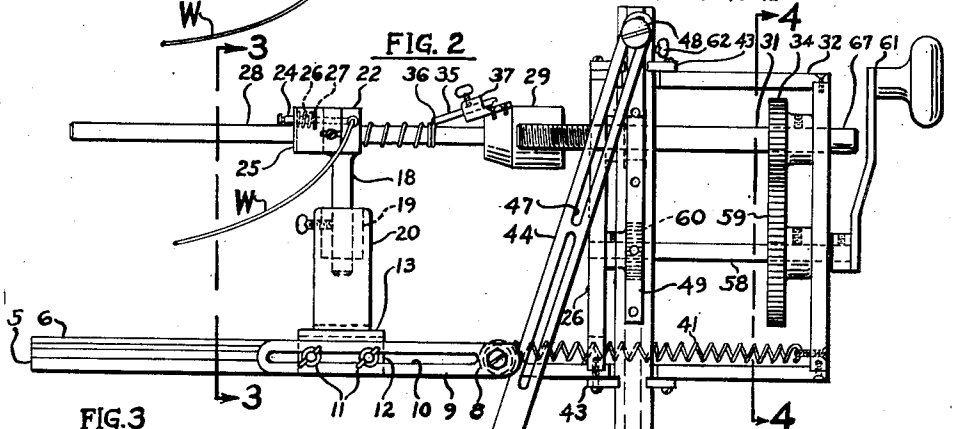



FIG. 3

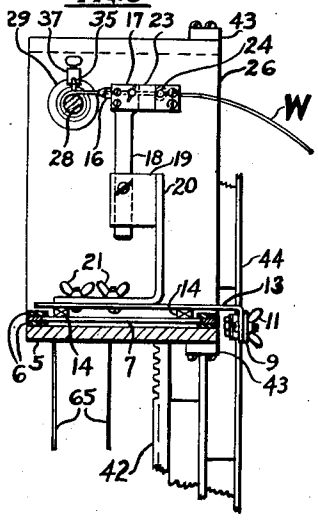
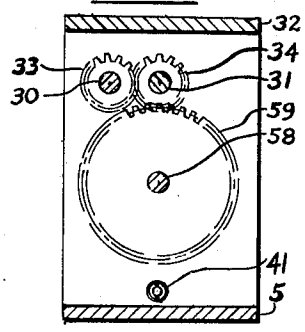



FIG. 4



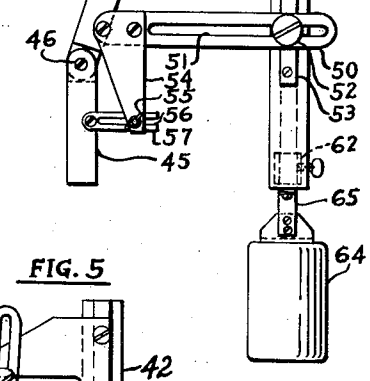
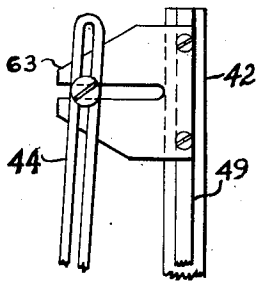




FIG. 5




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## APPARATUS TO COIL SPRINGS FROM A STRAND OF WIRE

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1 Claim. (Cl. 153—67)

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This invention relates to apparatus for coiling springs, and it is an object of the invention to provide an apparatus adjustable to coil different types of coiled springs, such as compression, extension and torsion springs, either left hand or right hand wound as desired.

It is another object of the invention to provide an apparatus of this character adjustable to vary the pitch, length and diameter of the springs and the number of closed coils at the opposite ends of the compression springs coiled thereby.

Other objects and advantages of this invention will be described hereinafter.

The embodiment of the invention comprises a reciprocal carriage yieldingly retained in one extreme position and arranged to support and guide a strand of wire laterally thereof relative to an arbor releasably supported by a coupling member adapted to be releasably mounted on either of a pair of rotary shafts operatively connected to each other to rotate in opposite directions. The coupling member is arranged with a member to retain the lead end of the wire strand on the arbor. The carriage is moved from its position in which it is yieldingly retained by a cam member reciprocating in a plane extending transversely of the path of reciprocation of the carriage. The pair of shafts and the cam member are simultaneously actuated from a drive shaft operatively connected to said pair of shafts and the cam member. The cam member is adjustable to vary the pitch, length and number of closed coils at one end of the spring being coiled. The mounting of the coupling member on a particular shaft of the pair of shafts determines whether the coil is left hand or right hand wound. The coupling member permits the interchanging of arbors of different diameters which will determine the diameter of the spring to be coiled.

In the drawing accompanying and forming a part of this application:

Figure 1 is a top view of the apparatus forming the embodiment of this invention.

Figure 2 is a front elevational view of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2 looking in the direction of the arrows to show the strand of wire being guided to and coiled upon the arbor.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2 looking in the direction of the arrows to show the operative connection between the drive shaft and the pair of shafts.

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Figure 5 is a fragmentary view of the upper end of the cam member showing a modified form of an adjustable connection between a rack bar and cam portion of said member.

The embodiment of the invention as illustrated in the accompanying drawing comprises a base plate 5 to be mounted on a suitable support, such as a work-bench, not shown, and arranged at one end portion with guides 6 at the opposite longitudinal edge sections for slidably supporting a carriage in the form of a plate 7. The carriage 7 is arranged with a cam follower including a roller 8 rotatably mounted on one end of an arm 9 having a slot 10 therein extending from the periphery of the roller to the opposite end of the arm for adjustable engagement of clamping screws 11 mounted in a depending flange 12 of a plate 13 secured to and spaced above the carriage 7 by spacers 14, as shown in Figure 3. The purpose of the cam follower will be described hereinafter. The plate 13 is provided with a slot 15 for the adjustable mounting of a support and guide for a strand of wire *w*.

The support and guide for the strand of wire comprises a tubular coiling point member 16 releasably retained in a head 17 of a post 18 adjustably mounted in a socket 19 at the upper end of a vertical portion of an angle bracket 20 having a horizontal portion adjustably mounted on the plate 13 by clamping screws 21 engaged in said horizontal portion of the angle bracket and the slot 15 in the plate 13, as shown in Figures 1 and 3, whereby the member 16 will have adjustments in vertical and horizontal directions. The feed of the wire *w* through the member 16 is yieldingly restrained by passing the wire before it enters the member 16 through a block 22 supported from the post head 17 by an arm 23 secured to the block and head, as shown in Figures 1 and 3. The wire is yieldingly retained in the block 22 by a plunger 24 slidable in a direction transversely of the wire feed in said block and an angle bracket 25 secured to the block 22. The plunger is yieldingly urged into engagement with the wire by a spring 26 engaged on the plunger and compressed between the bracket 25 and a shoulder 27 on the plunger, as shown in Figures 1 and 2.

The wire *w* is guided by the member 16 to an arbor 28 releasably supported at one end in a coupling member 29 in the form of a drill-chuck removably mounted as by screw threads on one end of either of a pair of shafts 30 and 31 rotatably supported in the end walls of a gear box 32 mounted on the end portion of the base

plate 5 opposite the end portion arranged with the guides 6. The shafts extend in horizontal alinement with each other and parallelly to the base plate, and are operatively connected to each other by meshing gears 33 and 34 secured on the shafts 30 and 31, respectively.

The lead end of the wire *w* is retained in fixed position on the end of the arbor 28 adjacent to the coupling member 29 by a holder in the form of a needle shaped member 35 having a slot 36 for the engagement of the lead end of the wire and releasably supported in a bracket 37 secured on the coupling member 29, as shown in Figures 1 and 2.

The carriage 7 is yieldingly retained in a position to horizontally aline the wire guide member 16 with the wire engaging slot 36 of the holder 35, so that the coiling of the spring on the arbor 28 will commence at the portion of the arbor adjacent to the slot 36. This is accomplished by providing an adjustable stop in the form of a rod 38 adjustable in a bracket 39 secured to the base plate 5 and the rod 38 retained in adjusted position by set screws 40, as shown in Figure 1. The carriage 7 is yieldingly held against the stop 38 by a spring 41 anchored at the opposite ends to the carriage 7 and the end wall of the gear box 32, as shown in Figures 1, 2 and 4.

The movement of the carriage 7 in a direction from the stop 38 against the force of the spring 41 and the simultaneous rotation of the arbor 28 will coil the wire around the arbor.

Movement in a direction from the stop 38 is imparted to the carriage 7 by a vertical reciprocatory cam member comprising a rack bar 42 slidably mounted in guides 43 secured to the top wall of the gear box 32 and the base plate 5 relative to suitable openings in said top wall and base plate. The rack bar is provided with cam sections 44 and 45 in the form of strips of different lengths pivotally connected at adjacent ends to each other, as at 46 in Figure 1, with the section 44 of greater length than the section 45. The opposite end portion of the long cam section 44 is arranged with a slot 47 for the engagement of a clamping screw 48 threaded in an elongated block 49 secured to the back of the rack bar to retain said end of the cam section 44 in adjusted position on the upper end portion of the rack bar. The lower end of the cam section 44 is adjustably connected to the lower end portion of the rack bar by an arm 50 secured at one end to the cam section 44 and having a slot 51 extending inwardly from the opposite end for the engagement of a clamping screw 52 threaded in an elongated block 53 secured to the back of the rack bar and of greater height than the block 49 to have the arm 50 overlap the cam section 44. The short cam section 45 is adjustably connected to the arm 50 by a depending portion 54 secured at one end to the arm 50 and the opposite end arranged with a clamping screw 55 adjustably engaged in a slot 56 in an arm 57 secured to the short cam section 45. By the reciprocation of the rack bar 42 in an upward direction, the cam sections 44 and 45 will engage the roller 8 and move the carriage in a direction from the stop 38 against the spring 41.

The shafts 30 and 31 are rotated in opposite directions and the rack 42 is actuated in an upward direction by a drive shaft 58 rotatably supported by the end walls of the gear box 32 and having secured thereon a gear 59 meshing with the gear 34 on the shaft 31 and a pinion 60 meshing with



the teeth of the rack 42. The drive shaft 58 is rotated in a clockwise direction looking at the right hand end of the apparatus in Figures 1 and 2 and may be actuated by suitable power means which is shown in the present illustration of the invention to be manually transmitted to the drive shaft through a handle 61 releasably mounted on an end of the shaft extending exteriorly of an end wall of the gear box 32.

In the operation of the apparatus, the adjustment of the stop 38 will position the roller 8 a predetermined distance from the long cam section 44 in the lowermost position of the rack bar 42 to form the desired number of closed coils at the lead end of the wire *w* by permitting the arbor 28 to be rotated by the handle 61 without transmitting movement to the carriage 7. The adjustment of the short cam section 45 by the arm 57 will determine the number of closed coils at the rear end of the spring by permitting rotation of the arbor 28 without transmitting movement to the carriage 7 at the end of its forward movement. The horizontal adjustment of the arm 50 will determine the length of the spring. The length of travel of the rack bar 42 is adjustable by stops 62 adjustably mounted on the opposite end portions of the rack bar to abut the top wall of the gear box 32 and the bottom of the base plate 5 which act as fixed abutments and said length of travel of the rack bar will determine the number of coils in the spring. The angular adjustment of the long cam section 44 will determine the pitch of the coils of the spring.

When it is desired to coil springs of very short pitch and to coil extension and torsion springs, the angle of adjustment of the long cam section is very nearly vertical and this adjustment is effected by the use of an arm 63 to adjustably connect the upper ends of the rack bar 42 and long cam section 44, as shown in Figure 5.

When it is desired to form left hand springs, the coupling member 29 is mounted on the shaft 30 with the bracket 37 above the arbor 28 and the guide 16 in horizontal alinement with the upper surface of the arbor, as shown in Figure 2, and to form right hand springs, the coupling member 29 is mounted on the shaft 31 with the bracket 37 below the arbor 28 and the guide 16 in horizontal alinement with the lower surface of the arbor.

The use of the coupling member 29 in the form of a drill-chuck will permit the mounting of arbors of different diameters and the diameter of the arbor will determine the diameter of the spring.

After completing the coiling of a spring which is determined by the lower stop 62 abutting the base plate 5, the formed spring is severed from the wire *w* and the ends of the spring are clipped by wire cutters.

When it is desired to coil springs from wire of large diameter of great stiffness, the handle 61 or other power means is connected to an end portion 67 of the shaft 30 extending exteriorly of the gear box.

To reduce the speed of return of the rack bar 42 to its normal starting position with the upper stop 62 abutting the top wall of the gear box 32, counterweight 64 is connected to the lower end of the rack bar 42 by a strap 65 extended around a pulley 66 loosely mounted on the shaft 30.

Having thus described my invention, I claim:

In apparatus to coil springs from a strand of wire, a reciprocal carriage yieldingly retained in one extreme position, a guide adjustably mounted on the carriage to support and guide the strand of

wire in a direction transversely of the path of reciprocation of the carriage, a pair of rotary shafts extending in a plane parallel to the path of reciprocation of the carriage, meshing gears secured on the pair of shafts to operatively connect the shafts to each other and cause the shafts to rotate in opposite directions, an arbor arranged to be releasably mounted on either shaft of the pair of shafts, a member rotatable with the arbor and arranged to retain the lead end of the wire strand extended from the guide in fixed position on the arbor, a drive shaft extending parallelly of one of the pair of shafts, a gear secured on said drive shaft and meshing with the gear on said parallel shaft of the pair of shafts, a pinion secured on the drive shaft, a rack bar reciprocally mounted in a plane extending transversely of the axes of the shafts and meshing with the pinion on the drive shaft, a cam adjustably connected to the opposite end portions of the rack bar, and a cam follower on the carriage to engage said cam



portion, whereby the carriage is moved a predetermined distance simultaneously with the rotation of the arbor.

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