Jan. 30, 1940. F. L. COOK 2,188,705

MACHINE FOR FORMING END LOOPS ON HELICAL SPRINGS

Filed Jan. 20, 1939 4 Sheets-Sheet 1

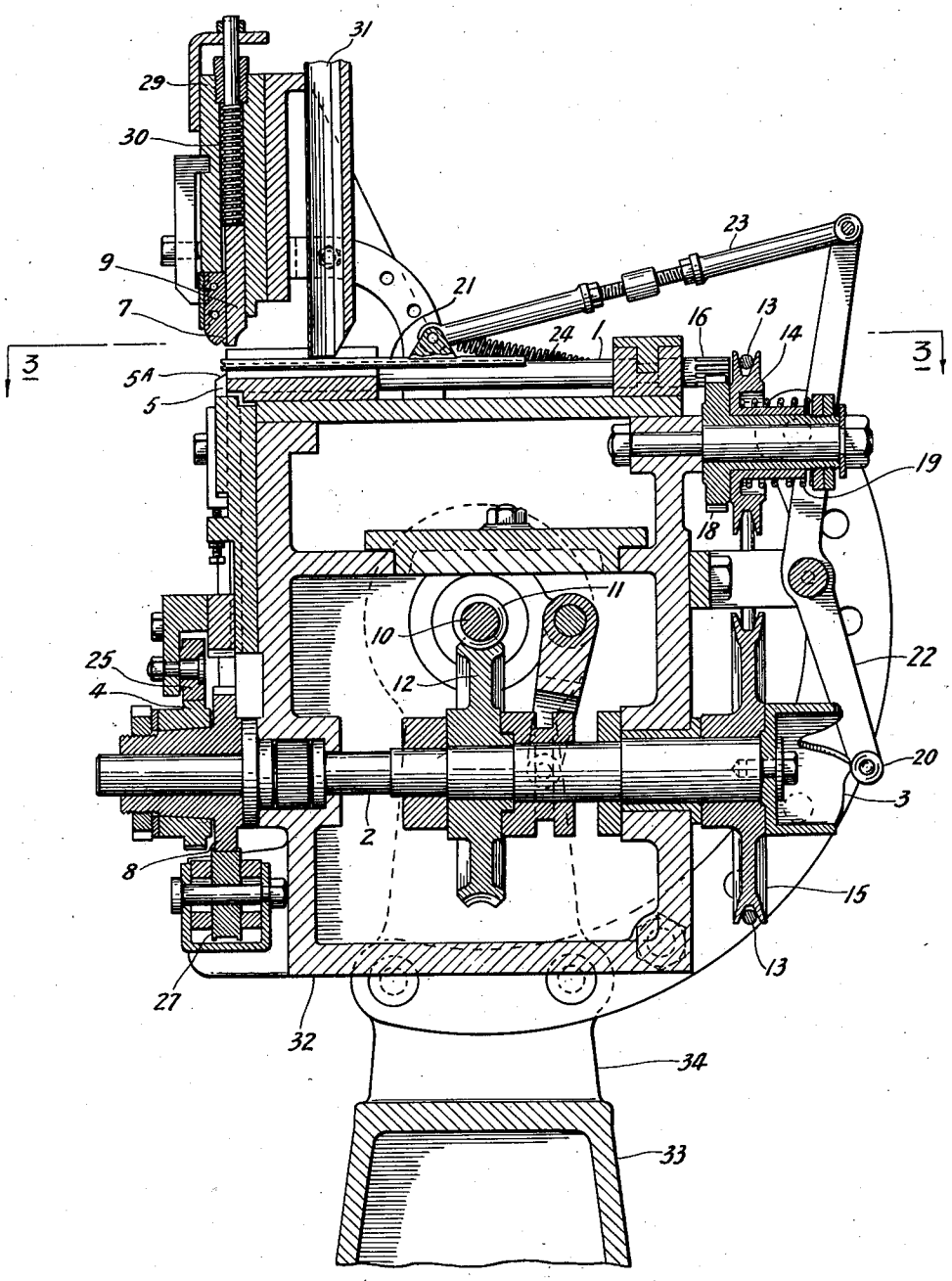


FIG. 1.

Frederick Leonard Cook
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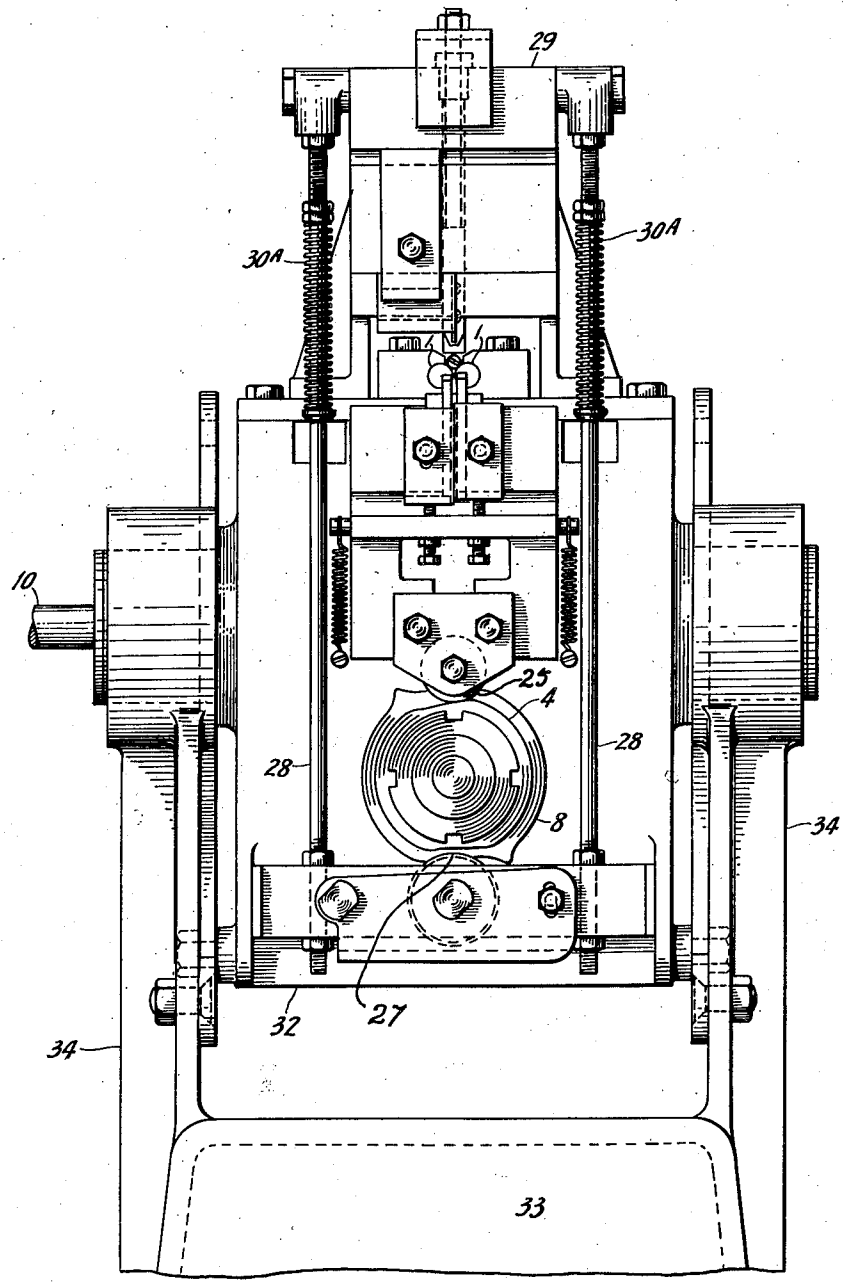


FIG. 2.

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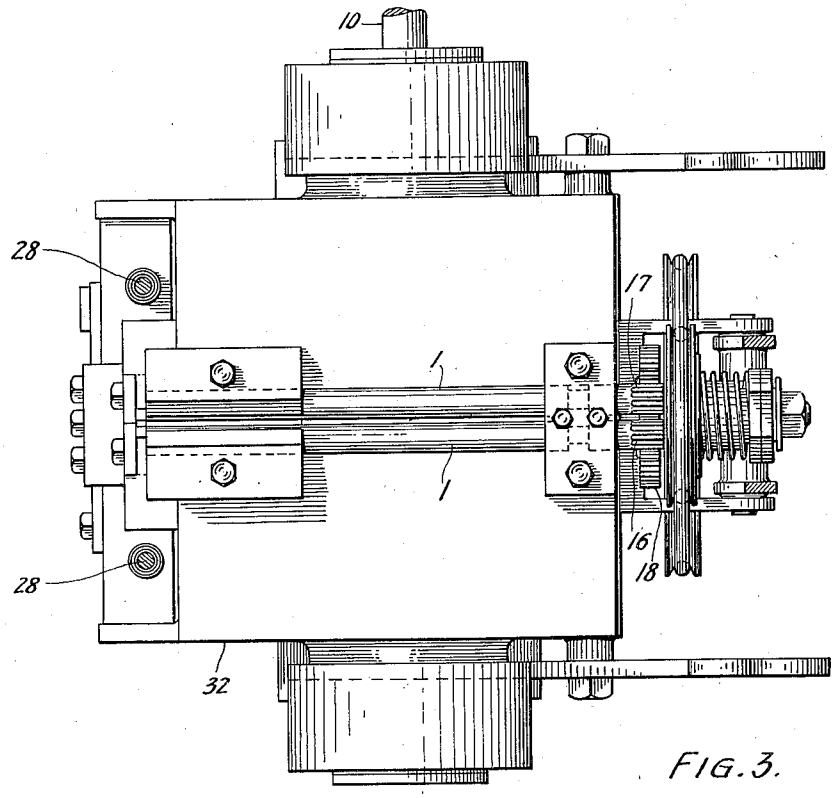


FIG. 3.

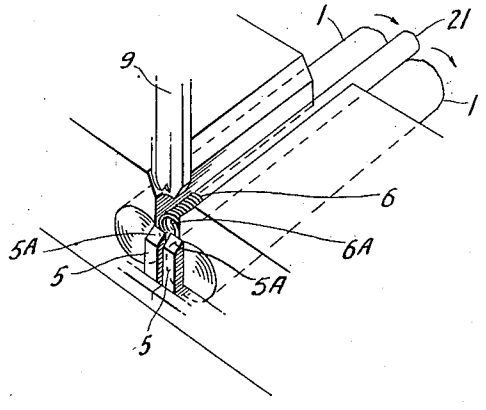


FIG. 4.

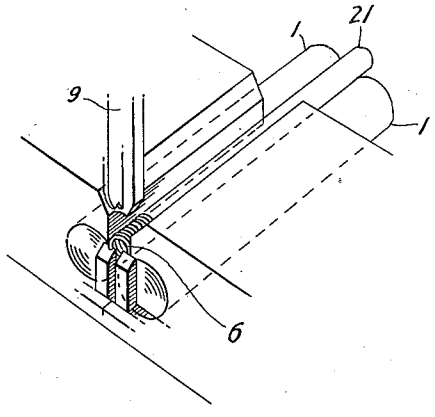


FIG. 5.

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MACHINE FOR FORMING END LOOPS ON HELICAL SPRINGS

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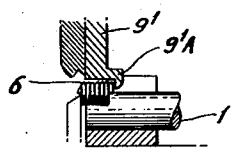
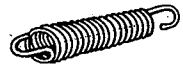


FIG. 8.

FIG. 6.

FIG. 7.



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Patented Jan. 30, 1940

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UNITED STATES PATENT OFFICE

2,188,705

MACHINE FOR FORMING END LOOPS ON HELICAL SPRINGS

Frederick Leonard Cook, Brighton, Victoria, Australia

Application January 20, 1939, Serial No. 251,888
In Australia October 25, 1938

2 Claims. (Cl. 140—103)

This invention relates to improvements in machines for bending the end convolutions of helically coiled springs to form loops for anchoring the springs or connecting them to movable parts of mechanism.

This invention has for its object the provision of mechanism for automatically placing the helical springs in the correct position to be gripped and held securely during the operation of the loop-forming means and for finally ejecting the looped springs.

I attain this object by the mechanism illustrated in the accompanying drawings, in which:

Figure 1 is a vertical longitudinal section through a machine according to this invention;

Figure 2 is a front elevation thereof;

Figure 3 is a sectional plan at 3—3 of Figure 1 with parts such as 21, 23, 24 and 31 of Figure 1 omitted;

Figure 4 is a perspective detail view showing the spring being rotated towards the loop-forming position;

Figure 5 is a detail perspective view corresponding to Figure 4 but showing the spring in the loop-forming position;

Figure 6 is a view corresponding to the upper portion of Figure 1 but showing the machine tipped up into an inclined position;

Figure 7 is a view of a spring with a loop formed on each end.

Figure 8 is a somewhat diagrammatic view showing a modified form of gripping plunger engaging a spring.

According to the construction shown more especially in Figures 1 to 5:

Two parallel cylindrical rollers 1 are rotatable, as hereinafter described, in the same direction, which may be either clockwise or counterclockwise. Each spring 6, in turn, lies in the valley between the upper portions of these rollers and is rotated by frictional engagement with the rollers to bring it into the correct peripheral position for loop-forming. A driven shaft 2 carries a series of cams one of which, 3, operates a pusher rod 21 to move the spring forward while another, 4, raises, at the appropriate moment, a stop member 5 which is engaged by the free end 6A of the wire of the helical spring 6 owing to these forward and turning movements imparted to the spring. This stop member thus terminates the movements of the spring so as to locate it in the correct position for the loop-forming operation.

The member 5 is also shaped so as to co-act with a knife-edged member 7 in forming the loop when the upper portion of the outer convolution of the spring is bent out subsequently. A third cam 8 operates a gripping plunger 9 drawing it down to hold the spring firmly in position when the end of the wire has engaged the stop member. A further movement of this third cam then pulls down the knife-edged loop-former 7 so that it passes down between the outer convolution and second convolution of the spring and bends the upper portion of the outer convolution outwards and then bends it downwards against the co-acting lower loop-former, consisting of an inclined face 5A on the outer portion of the stop member 5, so as to form the loop.

When the loop-formers have operated, the gripping plunger then moves away from the spring and the latter is then discharged from the machine by a further movement of the pusher rod. The springs are again fed to the machine to form the loops at their other ends. These cam actions thus actuate the various operative members in timed relationship. They are described more fully hereinafter.

The driving shaft 10 of the motor carries a worm 11 engaging a worm wheel 12 on the driven shaft 2 which carries the cams abovementioned. The rollers 1 are close together. They are driven from the shaft 2 by a belt 13, pulleys 14 and 15, and toothed gear wheels 16, 17 and 18. The pulley 14 frictionally engages the gear wheel 18 under the pressure of a spring 19. This permits the drive to slip when a spring is pressed down and held by the gripping plunger 9 or if a jam occurs. The cam 3 actuates the pusher rod 21 by engaging a roller 20 and thus moving a pivoted lever 22 and adjustable link rod 23, against the pull of a pair of springs 24. The pusher rod feeds the springs towards the loop-formers 7 and 5A, but to prevent jamming of the spring before it reaches its correct final position the final forward movement of the spring is preferably effected otherwise, as hereinafter described.

The other end of the shaft 2 carries a pair of disc-like members 4, 8 with peripheral cam surfaces. One of these, 4, engages an upper roller 25 associated with the stop member and at the appropriate moment raises the roller and the stop member. The stop member may be integral with or associated with the lower loop-former and may be bifurcated or may be formed in two parts positioned side by side as shown in Figure 4. The other disc cam, 8, engages a lower roller 27 which is connected by pull rods 28 (Fig. 2) to a cross-head 29 which carries the plunger 9 that grips the upper portion of the spring at the appropriate moment. The cross-head carries the

gripping plunger 9 and the upper loop-former 7. The plunger 9 is slidable in relation to the cross-head against the action of a spring 30, so that the pull rods and cross-head can continue their movement after the gripping plunger has engaged the spring 6 which is about to be looped. This further movement carries down the loop-former 7 and forces out the upper portion of the outer convolution of the spring as above-described to press it down against the lower former formed by the inclined face of the stop member 5. The cross-head is provided with return springs 30A positioned around the pull rods 28.

The knife-edged former is curved away from its knife edge, so as to form a shaped surface which presses the upper portion of the outer convolution of the spring more and more outwardly and downwardly as this loop-former is moved downwards. When this loop-former rises again, the loop usually rises somewhat owing to the springiness of the material. For this reason the loop-formers are normally designed to press the loop down through more than 90° so that when the loop is released it will return to a position about 90° from that which it occupied originally before bending.

The springs may be fed to the spring-rotating means, comprising the pair of rotating rollers 1, through a chute 31 to which the springs are supplied manually, or other primary feeding means operated manually or automatically may be provided. The diameter of each of the rollers 1 will normally be substantially greater than the diameter of the springs upon which the loops are being formed.

The frame 32 supporting the operative mechanism may be adjustably supported in a cradle 33 with bracket arms 34, so that the rollers 1 can be set horizontally, or at any desired inclination to the horizontal less than the maximum angle of repose for the springs upon a stationary surface. Alternatively, the machine may be permanently set in any one of those positions. When the frame is inclined the forward feeding of the springs is assisted by gravity.

Figure 6 shows the machine set in the inclined position and in dotted lines shows the pusher rod mechanism retracted into and locked in an inoperative position, the feeding of the spring to the loop-forming means being effected in the latter case by the inclined rotating rollers alone.

The pusher rod 21 normally functions also as a gate to admit the springs one by one from a feed chute 31 to the valley or channel formed by and between the spring-rotating rollers, but if the pusher rod is omitted or not utilized, any known means is provided to regulate this admission of the springs.

In Figure 8 a modified construction 9^1 of gripping plunger is shown. This has a tail-piece 9^1A which holds the rear end of a spring positively against any backward pressure that may be exerted by the loop-formers.

When a loop has been formed on one end of a spring, the latter may be reversed by hand or in other known manner and again be fed to the machine to form a loop on the other end. The loops may be shaped as shown in Figure 7, for example.

The pusher rod may be provided with a swivel tip 21A as indicated in Figure 6, so as to facilitate the rotation of the spring when it is being pushed forward by the pusher rod. The swivel tip may be slotted at 21B to accommodate a loop which has been formed on the adjacent end of the spring. If the final forward movement is effected by a non-rotating pusher rod or the like it is necessary for the pushing member to engage the spring more lightly than the frictional engagement of the spring with rollers 1.

Owing to the inclinability of the frame of the machine it is obvious that the more gravity can be relied upon to feed the springs to stop 5 the less important becomes the function of the pusher rod or other equivalent substitute therefor. Conversely, the less gravity is relied upon the more important becomes the function of such pusher rod. The importance of this pusher rod, therefore, largely depends upon the angle at which the machine operates.

I claim:

1. The combination in a machine for forming end-loops on helical springs, of power-driven intermittently rotatable rollers, and a feed channel formed by and between said rollers, said rollers being adapted to simultaneously rotate and guide said springs while the latter are passing along said feed channel, with stop means adapted to arrest the longitudinal and rotational movements of the spring in a predetermined position of the spring, means adapted to grip the spring and retain it in this predetermined position, means adapted to engage the end convolution of the spring and bend it to form a loop, means adapted to eject said spring, and mechanism actuating all said means automatically.

2. In a machine for forming end loops on helical springs as claimed in claim 1, sliding loop-forming means, and sliding gripping means adapted to grip each spring during the loop-forming operation, said sliding gripping means being resiliently mounted on a portion of said sliding loop-forming means.

FREDERICK LEONARD COOK.