Nov. 14, 1933. P. S. THOMAS 1,935,137

STOP MECHANISM FOR SPRING WINDING MACHINES

Filed June 23, 1930 2 Sheets-Sheet 1

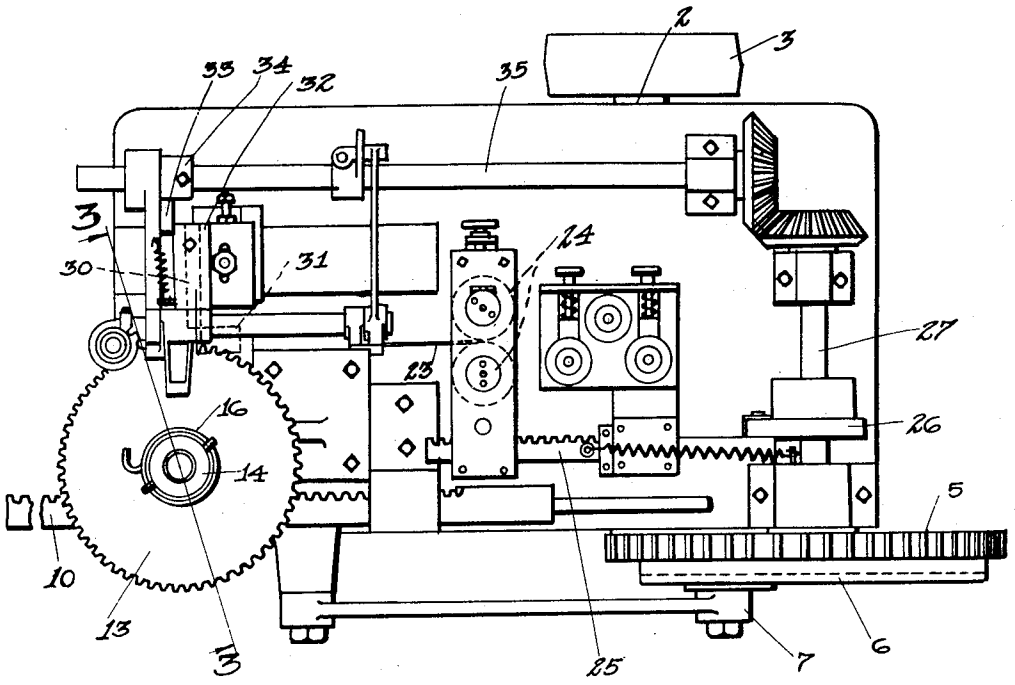


Fig. 1.

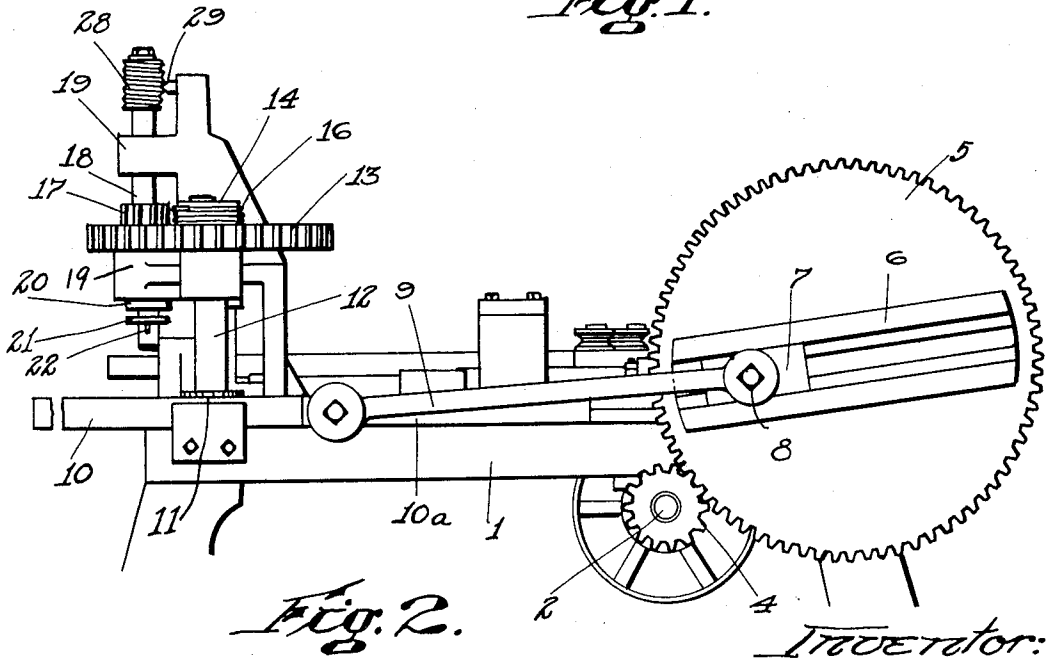


Fig. 2.

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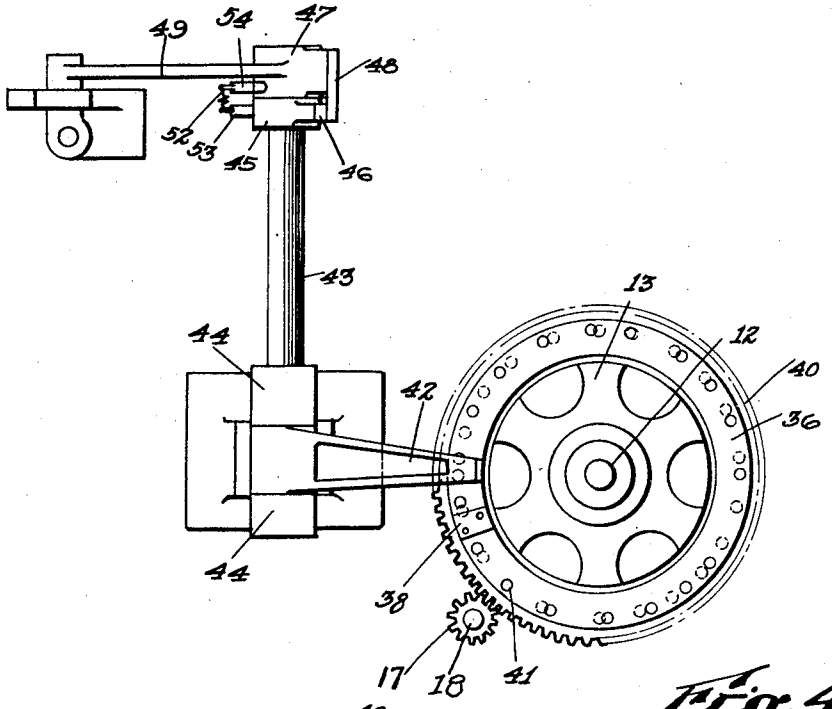


Fig. 4.

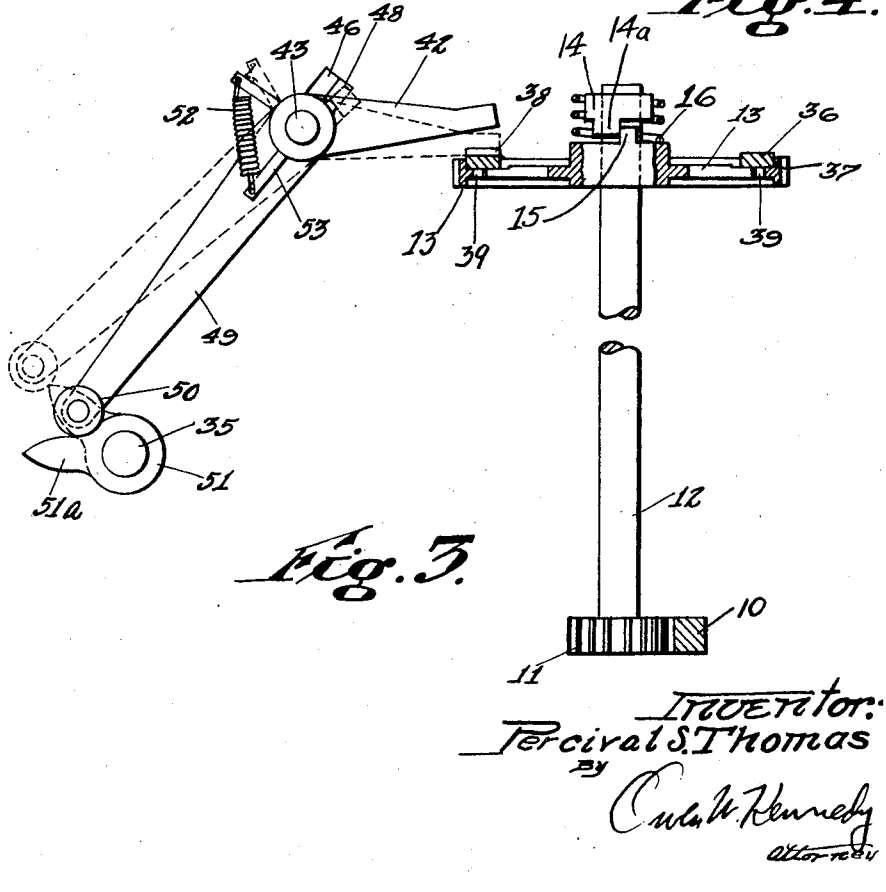


Fig. 3.

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UNITED STATES PATENT OFFICE

1,935,137

STOP MECHANISM FOR SPRING WINDING MACHINES

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Application June 23, 1930. Serial No. 463,084

6 Claims. (Cl. 192—149)

The present invention relates to spring winding machines of the type that are adapted to produce wire springs from a continuous length of wire by means of a rotating arbor operating in conjunction with wire feeding and severing devices.

In Patent No. 1,045,900, issued December 3, 1912, to Frank H. Sleeper, there is shown and described an automatic spring winding machine characterized by the provision of a rotatably driven winding arbor adapted for longitudinal movement, simultaneously with its rotative movement, in order to cause wire stock fed thereto to be wound into springs. In the operation of a machine of this type it is necessary to bring the arbor to rest at the beginning of the formation of each coil so that the wire stock may be fed to the arbor, and it is the object of the present invention to provide mechanism for stopping the rotation of the winding arbor at a predetermined point. The stop mechanism of the present invention is always adapted to bring the arbor to rest without subjecting the same to any shock such as would be caused by a stop mechanism of the type shown in the aforementioned Patent No. 1,045,900. The above and other advantageous features of the invention will hereinafter more fully appear with reference to the accompanying drawings in which—

Fig. 1 is a plan view of a spring winding machine embodying the present invention.

Fig. 2 is a view in side elevation of the parts shown in Fig. 1.

Fig. 3 is a fragmentary sectional view along the line 3, 3 of Fig. 1 showing the parts of the stop mechanism on an enlarged scale.

Fig. 4 is a plan view of the parts shown in Fig. 3.

Like reference characters refer to like parts in the different figures.

Referring first to Figs. 1 and 2, the machine comprises a supporting stand 1 in which is journalled a driving shaft 2 to which power is applied by means of a belt pulley 3. Upon the opposite end of the driving shaft 2 is a pinion 4 engaging a gear 5 having on one side suitable ways 6 for receiving an adjustable head 7 providing a crank pin 8. The crank pin 8 is connected by a rod 9 with a rack 10 slidable in horizontal ways 10*a* on the stand 1 and engaging a pinion 11 on the lower end of a vertical shaft 12. The upper end of the shaft 12 carries a gear 13 capable of turning loosely on the shaft 12 and adapted to be driven from the shaft 12 by means of a suitable clutch of the type shown in the aforementioned Patent No. 1,045,900. For purposes of illustration, the clutch is shown in Fig. 3 as comprising a sleeve 14 attached to the shaft 12 and providing a single tooth 14*a* engaging a corresponding tooth 15 formed on the gear 13. When the shaft 12 is turned in one direction the teeth 14*a* and 15 are engaged to positively drive the gear 13, but when the direction of rotation of the shaft 12 is reversed, as on the return movement of the rack 10, the clutch teeth 14*a* and 15 are held in yielding engagement by a coil spring 16 connected to the sleeve 14 and the gear 13 respectively, as shown in Fig. 1. This clutch arrangement permits the rotation of the gear 13 to be arrested, independently of the shaft 12, by means of my improved stop mechanism, the purpose of which will shortly appear.

The gear 13 is in engagement with a pinion 17 carried on a vertical spindle 18 journalled in bearings 19 for longitudinal movement, and the lower end of the spindle 18 carries a winding arbor 20 providing a collar 21 from which projects a stud 22 extending parallel with the arbor and spaced radially therefrom to permit the insertion of the wire to be coiled between the arbor 20 and the stud 22. Wire stock 23 is adapted to be fed between the arbor 20 and the winding stud 22 by means of feed rolls 24 adapted to have an intermittent rotative movement imparted thereto in any suitable manner, as by means of a rack 25 adapted to receive a reciprocatory movement from a cam 26 mounted on a shaft 27 carrying the gear 6, see Fig. 1.

The spindle 18 carrying the winding arbor 20 is adapted to have a longitudinal movement imparted thereto simultaneously with its rotative movement in any suitable manner, as by means of a screw threaded collar 28 carried by the upper end of the spindle 18, the threads of which are engaged by a fixed beveled stud 29 held in the framework of the machine. As the spindle 18 and its threaded collar 28 are rotated, the engagement between the collar 28 and the stud 29 will cause a rising or falling movement of the spindle 18 in accordance with the direction of rotation in which the spindle 18 is driven by the gear 13.

In the operaton of coiling a spring, the wire stock 23 is projected by the rolls 24 between the coiling arbor 20 and its stud 22, the spindle 18 then being in its lowermost position with the stud 29 at the top of the threaded collar 28. The rack 10 then starts its rearward movement, thereby causing the gear 13 to rotate the spindle in such a direction that the spindle 18 is raised as the wire stock is wound on the arbor 20. As the

spindle 18 reaches its uppermost position, the direction of movement of the rack 10 is reversed, thereby reversing the direction of rotation of the spindle 18 and causing it to start its downward movement. However, just as the spindle 18 starts its downward movement, the spring just wound is severed by means of a cutter 30 cooperating with a bushing 31 through which the wire is fed. As shown in Fig. 1, the cutter 30 is mounted on a slide 32 carrying a roll 33 adapted to be operated by a cam 34 mounted on a shaft 35 driven from the shaft 27, at the same speed of rotation.

During the operation of coiling, the gear 13 driving the winding spindle 18 is positively driven by engagement between the teeth 14*a* and 15 on the clutch sleeve 14 and gear 13 respectively. However, upon the reversal of the turning movement of the shaft 12 on the forward stroke of the rack 10, the clutch teeth are merely held in contact by the spring 16 so that the tooth 15 on the gear 13 follows the tooth 14*a* on the sleeve 14. As previously pointed out, the object of the present invention is to provide mechanism for arresting rotation of the winding arbor 20 as it reaches its lowermost position, so that the stud 22 will always be in the proper position for receiving the wire preparatory to forming the next coil. To this end, the invention contemplates means for positively arresting rotation of the gear 13 on the return movement of the rack 10 when the clutch teeth are held in yielding engagement, so that rotation of the arbor is arrested as it reaches its lowermost position without imposing any shock on the spindle 18.

As best shown in Fig. 3, the gear 13 carries a stop ring 36 seated in a groove 37 provided in the upper face of the gear. The ring 36 carries a stop 38 projecting above the face thereof and the angular position of the stop 38 with respect to the fixed axis of the shaft 12 is adapted to be closely adjusted within a wide range by securing the ring 36 in different positions on the gear 13. In order to obtain this adjustment, the gear 13 provides a series of angularly spaced holes 39, while the ring 36 is provided with a series of holes 40 of the same size as the openings 39, but with a slightly greater angular spacing. In order to lock the ring 36 in position on the gear 13, a pair of holes 39 and 40 are brought into registration so as to receive a pin 41 and it is obvious that the stop 38 can be set in a large number of different positions with respect to the axis of the spindle 18 by bringing different pairs of holes 39 and 40 into register. As shown, there are twenty holes 39 in the gear 13 and eighteen holes 40 in the ring 36, thereby giving three-hundred sixty settings for the stop 38, or one setting for each angular degree.

Rotation of the gear 13 is adapted to be arrested by means of a stop arm 42 pivotally mounted on a shaft 43, the free end of the arm 42 extending over the ring 36 so that downward movement thereof will position it in the path of the stop 38. The shaft 43 is strongly supported between bearings 44 and the other end thereof carries a collar 45 providing a projecting lug 46. A second collar 47 is loosely mounted on the shaft 43 closely adjacent to the collar 45 and this collar 47 carries a lug 48 somewhat wider than the collar 47, so that a portion thereof extends parallel to and beneath the lug 46 on collar 45. The loose collar 47 provides a projecting arm 49 carrying a roll 50 at its free end, the overhanging weight of the arm 49 causing the roll 50 to bear on the surface of a cam 51 mounted on the shaft 35 which rotates at the same speed as the shaft 27 driving the rack operating gear 5.

The formation of the cam 51 is such that with the parts in the full line position shown in Fig. 3 the lug 48 on collar 47 engages the lug 46 on collar 45 and so serves to maintain the stop arm 42 in a position in which its free end is held out of the path of movement of the stop 38 on gear 13. This represents the condition of affairs at the beginning of the winding operation, and it is obvious that as the shaft 35 completes one revolution in the direction of the arrow, a projection 51*a* on the cam 51 will raise the arm 49 into the dotted line position. When this occurs, the stop arm 42 will be turned in unison with the arm 49 until it strikes the face of the gear ring 36, the lugs 46 and 48 being yieldingly held in engagement by a spring 52 connected at its ends to lugs 53 and 54 on collars 45 and 47, respectively. When arm 42 strikes the gear ring 36, spring 52 yields, while arm 49 continues to the top of the cam rise, before falling, thereby imparting a dwell to the stop arm 42 during which it is engaged by the stop 38 on the gear ring 36.

The release and subsequent downward movement of the stop arm 42 is so timed as to occur in advance of the arrival of the stop 38 at a point beneath the arm 42 so that engagement of the stop 38 with the arm 42 will positively arrest turning movement of the gear 13. The stoppage of the gear 13 occurs on the return movement of the rack 10 following the winding and severance of a spring, at which time, as previously pointed out, the clutch teeth 14*a* and 15 are merely held in engagement by the spring 16; consequently when the stop 38 engages the arm 42, the spring 16 yields to permit separation of the clutch teeth and the positively driven shaft 12 is free to continue its rotation independently of the gear 13 until reversal of the rack 10 occurs. Since the gear 13 is always operatively connected to the winding spindle 18, it is obvious that the winding arbor 20 will come to rest at the end of its downward movement with the pin 22 always in the proper position to receive the wire as it is fed by the rolls 24.

The cam 51 for operating the stop arm 42 is so timed that continued rotation of the shaft 35 causes the cam projection 51*a* to permit the arm 49 to move downwardly to raise the stop arm 42 just as the rack 10 reverses the direction of rotation of the shaft 12 for the next winding operation, whereupon the clutch tooth 14*a* again engages the tooth 15 to positively drive the gear 13 with the shaft 12.

Obviously the wide degree of adjustment of the stop ring 36 on the gear 13 permits the stop 38 to be set with relation to the stop arm 42 so as to always bring the winding spindle 18 to rest at just the right place for the type of spring being wound. This range of adjustment is necessary since the machine itself is adapted to wind springs of different length and pitch by varying the stroke of the rack 10 and by varying the pitch of the threads on the collar 28 which imparts axial movement to the winding spindle 18. Thus, the gear 13 which drives the winding spindle 18 may make less than one revolution in order to wind a short spring, while it may make several revolutions in winding a long spring. This necessitates considerable variation in the position of the stop 38 with respect to the stop arm 42 in order that the spindle 18 may always be brought to rest with the winding stud 22 in proper posi-

tion to receive the wire fed by the rolls 24. In stopping rotative movement of the gear 13, the stop arm 42 which is strongly supported by the bearings 44, absorbs practically all of the shock due to the inertia of the moving parts, and as a result the winding spindle 18 is brought to rest without imparting any shock directly thereto such as would be caused by disposing an abutment in the path of rotation of the spindle.

I claim:

1. In a stop mechanism for spring winding machines, the combination with a winding arbor, a rotatable shaft, means for imparting an oscillatory movement to said shaft, a driving member interposed between said arbor and said shaft, and means for positively clutching said driving member to said shaft in one direction of rotation and for yieldably clutching said member to said shaft in the opposite direction of rotation, of means for positively arresting rotative movement of said driving member when yieldably clutched to said shaft in order to bring said arbor to rest in a predetermined angular position.

2. In a stop mechanism for spring winding machines, the combination with a winding arbor, a rotatable shaft, means for imparting an oscillatory movement to said shaft, a driving member interposed between said arbor and said shaft, and means for positively clutching said driving member to said shaft in one direction of rotation and for yieldably clutching said member to said shaft in the opposite direction of rotation, of an angularly adjustable stop carried by said driving member, and means operating in timed relation with said shaft for engaging said stop when said driving member is yieldably clutched to said shaft to bring said arbor to rest in any one of a number of different angular positions, as determined by the setting of said stop.

3. In a stop mechanism for spring winding machines, the combination with a rotatable arbor, a rotatably driven shaft, a gear mounted on said shaft adapted by its rotation to rotate said arbor, and a clutch device interposed between said gear and said shaft for positively connecting said gear to said shaft in one direction of rotation of said shaft and for yieldably connecting said gear to said shaft in the opposite direction of rotation, of means for arresting rotation of said gear with said shaft in order to bring said winding arbor to rest in a predetermined angular position.

4. In a stop mechanism for spring winding machines, the combination with a rotatable arbor, a rotatably driven shaft, a gear mounted on said shaft adapted by its rotation to rotate said arbor, and a clutch device interposed between said gear and said shaft for positively connecting said gear to said shaft in one direction of rotation of said shaft and for yieldably connecting said gear to said shaft in the opposite direction of rotation, of means for arresting rotative movement of said gear to cause the driving connection between said gear and said shaft to yield and to bring said winding arbor to rest in a predetermined angular position.

5. In a stop mechanism for spring winding machines, the combination with a rotatable arbor, a rotatably driven shaft, a gear mounted on said shaft adapted by its rotation to rotate said arbor, and a clutch device interposed between said gear and said shaft for positively connecting said gear to said shaft in one direction of rotation of said shaft and for yieldably connecting said gear to said shaft in the opposite direction of rotation, of a stop carried by said gear and means operating in timed relation with said shaft to interpose an abutment in the path of movement of said stop to bring said winding arbor to rest in a predetermined angular position.

6. In a stop mechanism for spring winding machines, the combination with a rotatable arbor, a rotatably driven shaft, a gear mounted on said shaft adapted by its rotation to rotate said arbor, and a clutch device interposed between said gear and said shaft for positively connecting said gear to said shaft in one direction of rotation of said shaft and for yieldably connecting said gear to said shaft in the opposite direction of rotation, of an angularly adjustable stop carried by said gear and means operating in timed relation with said shaft to automatically interpose an abutment in the rotative path of said stop while said shaft is driving said gear with said yielding driving connection therebetween, whereby said gear is brought to rest with the said winding mandrel in a predetermined angular position.

PERCIVAL S. THOMAS.