May 12, 1925.

1,537,150

F. K. SOLLIDAY

SPRING WINDING MACHINE

Filed Sept. 5, 1922

3 Sheets-Sheet 1

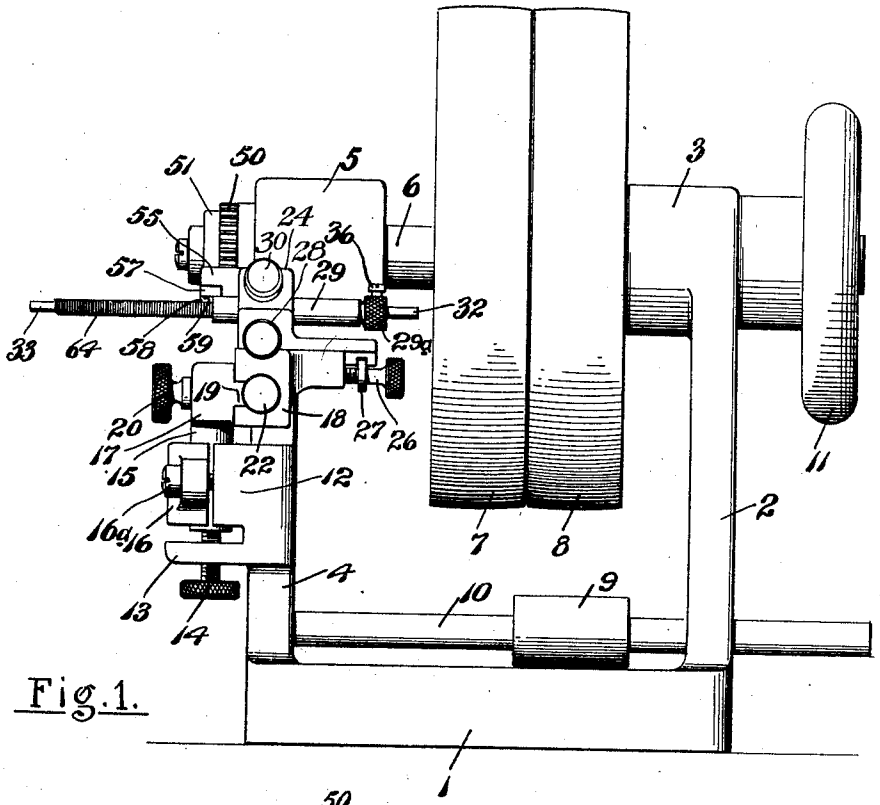


Fig. 1.

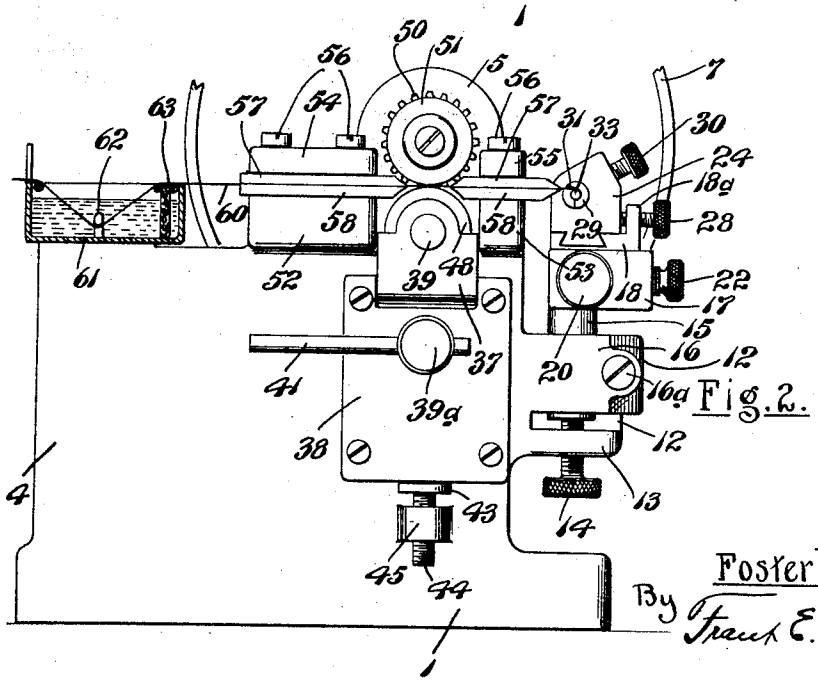


Fig. 2.

Inventor
Foster K. Solliday
By Frank E. Lorance Jr
Attorney.

May 12, 1925.

1,537,150

F. K. SOLLIDAY

SPRING WINDING MACHINE

Filed Sept. 5, 1922

3 Sheets-Sheet 2

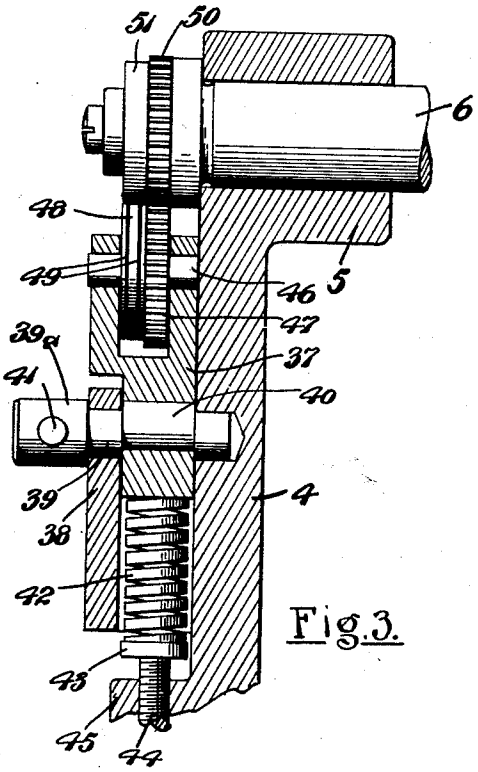


Fig.3.

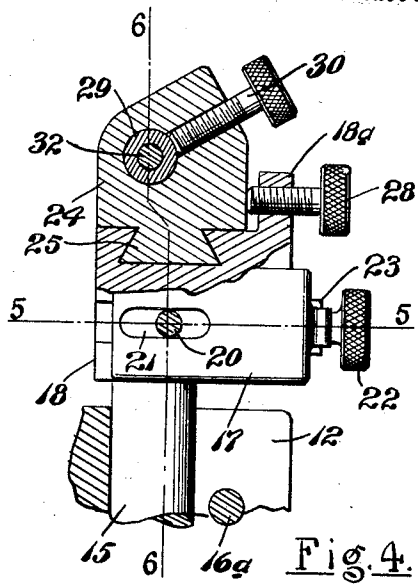


Fig.4.

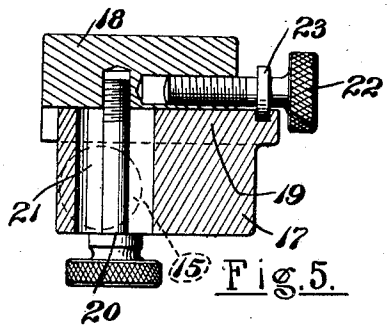


Fig.5.

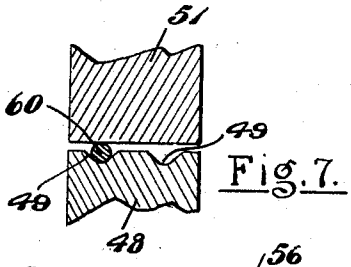


Fig.7.

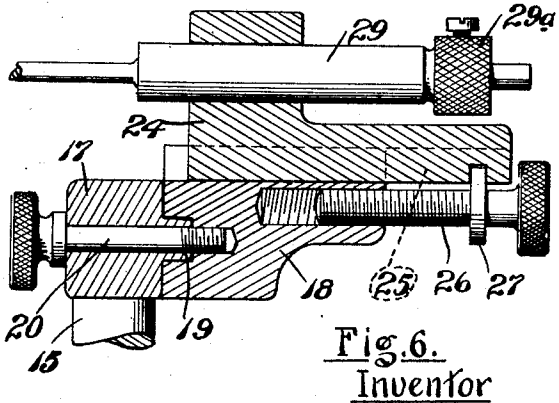


Fig.6.

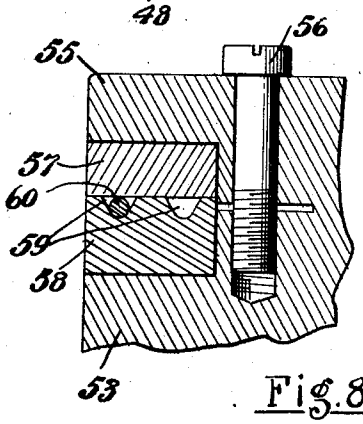


Fig.8.

Inventor
Foster K. Solliday
By Frank E. Lovecraft Jr.
Attorney.

May 12, 1925. 1,537,150

F. K. SOLLIDAY

SPRING WINDING MACHINE

Filed Sept. 5, 1922 3 Sheets-Sheet 3

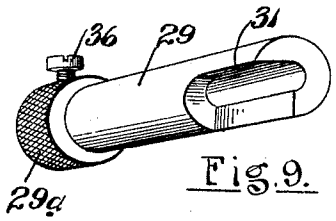


Fig. 9.

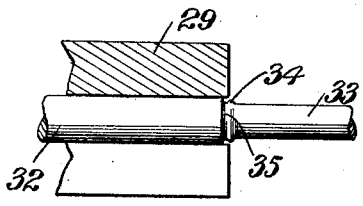


Fig. 10.

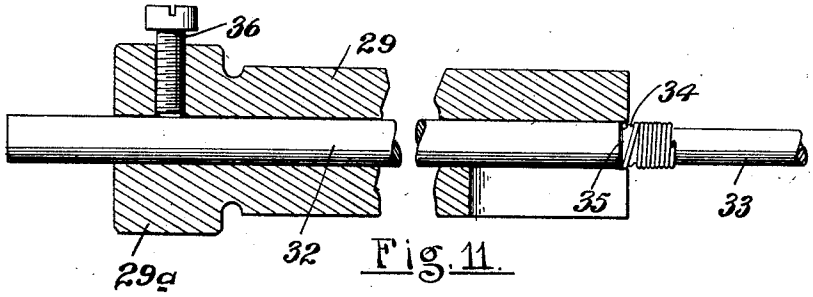


Fig. 11.

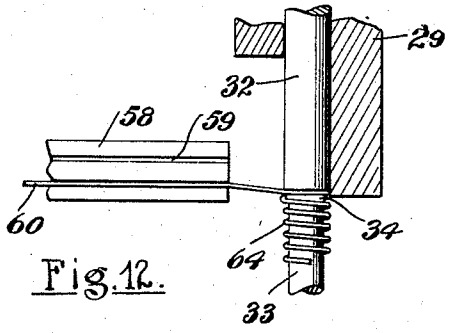


Fig. 12.

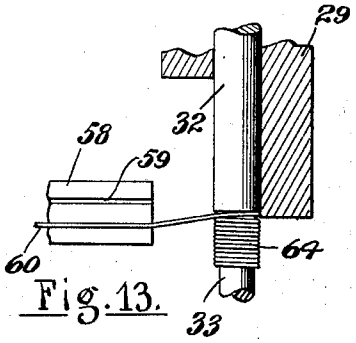


Fig. 13.

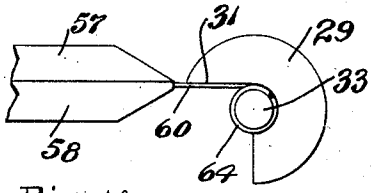


Fig. 14.

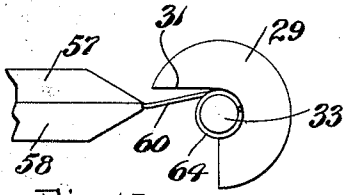


Fig. 15.

Inventor
Foster K. Solliday
By Frank E. Livingston Jr.
Attorney.

Patented May 12, 1925. 1,537,150

UNITED STATES PATENT OFFICE.

FOSTER K. SOLLIDAY, OF GRAND RAPIDS, MICHIGAN.

SPRING-WINDING MACHINE.

Application filed September 5, 1922. Serial No. 586,105.

To all whom it may concern:

Be it known that I, FOSTER K. SOLLIDAY, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Spring-Winding Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a novel construction of spring winding machine with which coiled wire springs may be very rapidly and perfectly made, all of the springs with the machine adjusted for a certain character of spring being absolutely uniform in character, while by varying the adjustments with which the machine is provided, many different types or characters of coiled springs may be made. The machine is primarily designed to have the wire from which the springs are made forced into a coiling die, in which it is wound, the formed coils being automatically transferred from the die to a carrying rod or arbor which serves no purpose other than to support the coils of the springs immediately after they are formed, the coils being eventually forced from said supporting rod as the length of the spring wound increases. It is a primary object and purpose of the invention to make a machine of this character, capable of expeditiously and perfectly winding springs, and particularly, to provide it with a novel form of construction of winding die which furnishes the practical basis of making a practically and commercially operating machine.

Various other objects and purposes than those stated will appear as understanding of the invention is had from the following description, taken in connection with the accompanying drawings, in which,

Figure 1 is a front elevation of the spring coiling machine.

Fig. 2 is a side elevation thereof.

Fig. 3 is a fragmentary vertical transverse section through the machine at a side thereof, illustrating the feed rollers and manner of operating the same.

Fig. 4 is a partial elevation and vertical section of the adjustable coiling die mounting means.

Fig. 5 is a horizontal section taken substantially on the plane of line 5—5, of Fig. 4.

Fig. 6 is a vertical section substantially on the plane of line 6—6, of Fig. 4.

Fig. 7 is a fragmentary transverse vertical section through the wire feeding rollers.

Fig. 8 is a similar section through one of the wire guiding means used.

Fig. 9 is a perspective view of the sleeve forming a part of the coiling die.

Fig. 10 is a fragmentary vertical section through one end of said sleeve, showing the rod associated therewith for completing the coiling die.

Fig. 11 is an enlarged longitudinal vertical section through said sleeve and rod and showing a spring partly formed thereon.

Figs. 12 and 13 are fragmentary plan views illustrating relative positions of the die longitudinally with respect to the wire guide for winding loose and close coiled springs, and

Figs. 14 and 15 are fragmentary elevations showing relative vertical positions of the die with respect to the guide, for producing coiled springs of different diameters on the same die.

Like reference characters refer to like parts in the several figures of the drawings.

In the construction of the machine, a base 1 is provided from which at one side a vertical side 2 extends, formed at one point adjacent its upper edge with a journal 3, as shown in Fig. 1. A second side 4 extends upwardly from the base at its opposite side, it being provided with a journal 5. A shaft 6 is mounted in said journals, extending through the same and on the same a loose pulley 7 and a fixed pulley 8 are mounted, adapted to be driven by a belt which is shifted from one to the other by any conventional type of belt shifter, indicated at 9 and 10. At one end, shaft 6 is provided with a hand wheel 11 for manual rotation of the shaft if it is ever desired.

An arm 12 is formed integrally with the side 4 and extends forward therefrom. An integral laterally extending member 13 is formed at the lower portion of the arm 12, through which an adjusting screw 14 is threaded upwardly, as shown, the lower end of a post 15 resting on the upper end of the

screw. Post 15 is held in a vertical opening made downwardly through the arm 12 which is divided so as to make a clamping portion 16 which may be clamped against the post by a clamping screw 16ª.

At the upper end of post 15 a horizontally positioned head 17 is secured against the inner side of which a table 18 is positioned having interfitting guiding association therewith as indicated by the tongue 19 on the head 17 fitting in a groove in table 18. A set screw 20 passes through a horizontal slot 21 in the head 17 and screws into the member 18. An adjusting screw 22 threads into the front end of the table 18 and is provided with a collar 23 which has engagement in a groove in the head 17, as shown in Fig. 5, whereby the table may be adjusted to different positions, being secured in any position to which adjusted by tightening the clamping screw 20, as is evident.

A die carrying head 24 is slidably mounted on and above the table 18, being provided with a dove-tailed rib 25 on its under side to fit in a corresponding groove in the table. This head is adjustable back and forth in a plane paralleling the shaft 6, an adjusting screw 26 threading into the end of the table 18 and having a collar 27 which fits into a groove in the under side of head 24, as shown in Fig. 6. The die carrying head may be adjusted to any desired position and secured therein by a set screw 28 (see Fig. 4) which passes through an upwardly extending rib 18ª on the table 18, and bears against the side of the head 24, as shown.

The die carrying head is longitudinally bored for the reception of a sleeve 29, adapted to be loosely passed through the head and held in any desired position by the set screw 30. At its inner end, the sleeve is formed with an enlarged knurled head 29ª, and at the opposite end is cut away partially, as shown in Fig. 9, whereby a substantially horizontal surface 31 merging with the inner curved surface of the sleeve is provided. A rod 32 passes through the sleeve, being reduced in size beyond the outer end of the sleeve as shown at 33, an annular rib 34 being made around the rod portion 33 a short distance beyond the larger portion 32 with an annular groove 35 between the rib and the end of said larger portion 32. The rod is held against movement in the sleeve by a set screw 36 passing through the head 29ª. It is designed that the groove 35 shall come just within the end of the die portion of the sleeve. As the die wears in use and has to be ground off at the end, the rod 32 is moved back to correspond and secured in place by tightening screw 36.

On the outer side of the side 4 of the machine, a block 37 is mounted with its lower portion guided by a guide 38 permanently attached to the said side 4. A rod 39 passes through the guide 38, block 37 and into an opening in the side 4, that portion, indicated at 40, passing through the block 37 being formed as an eccentric. At its outer end rod 39 is provided with an enlarged head 39ª, through which a rod 41 passes for manual operation to turn the rod and raise or lower the block 37 through the agency of the eccentric 40. The block at its lower end rests on a strong spring 42 which, at its lower end bears against a head 43 at the upper end of a screw 44, threaded downwardly through a lug 45 cast with and projecting from the side 4.

The upper end of block 37 is divided and a shaft 46 is passed therethrough on which a gear 47 and a roller 48 with annular grooves 49 therein are secured between the two parts of the block at its upper end. The shaft 6 is equipped with a gear 50 directly over and in mesh with the gear 47 and with a roller 51 directly over the roller 48. Rollers 48 and 51 constitute the feed rollers for the wire, as will later appear.

Back of and in front of the roller 48 and gear 47, lugs 52 and 53 project outwardly from the side 4 of the machine, and directly over the same other lugs 54 and 55 similarly project in the same direction. These serve as clamps for the wire guides which are disposed between them and clamped by set screws 56 passing downwardly through lugs 54 and 55 into lugs 52 and 53. The wire guides comprise two parts 57 and 58, the former located over the latter and being received in the spaces between the lugs and clamped therein. The lower guides or blocks 58 are longitudinally grooved at their upper sides, as indicated at 59, the grooves being in alinement with the grooves 49 in the lower feed roller 48.

The wire 60 from which the springs are coiled is fed between the rollers 51 and 48, first passing through oil contained in a receptacle 61, being directed downwardly under a hook 62 in the receptacle below the surface of the oil, and passing therefrom over any suitable wiping material, as 63, to remove any excess of oil. The wire passes to the first guides, going through a groove 59 and thence to the feed rollers by which it is gripped and forced onward through the second guides, through a groove 59 thereof and thence to the die, passing under the horizontal face 31 of the die and around the rod in groove 35 thereof. It will be noted that the rear ends of the front guides come closely to the feed rollers, and that the front ends thereof come as closely as possible to the die. This insures that the wire is sustained against buckling from the pressure forcing it onward into the die. As it comes to the inner curved surface of the die, the wire follows the same and is bent into a coil which continues around in the groove until it again

comes to the wire feeding into the die, being then forced out over the rib 34. The operation continues indefinitely, successive coils of the spring being formed and successively moved outward over the rib 34, the completed spring 64 following outward on the reduced portion 33 of the rod until it comes to the end and thereafter disengages therefrom and continues without support except for its connection to the part on the rod.

By proper adjustment, the character of the spring wound may be varied. For instance, in Fig. 12, the die and rod therein have been moved outwardly farther than in Fig. 13, there resulting a spring in the first instance with coils spaced apart, and in the second in coils very closely together. Every intermediate type of spring between the two shown may be made by adjustments to intermediate relative positions of the die and guide. Also in Figs. 14 and 15, the die has been adjusted as to vertical position, being higher in the position shown in Fig. 15 than that shown in Fig. 14 with a resultant larger diameter of coils for the spring when in the position shown in Fig. 15 due to the different stress applied to the wire in the different positions which serves to make the coils of different diameters when relieved of the dies and guides. The two grooves in the lower feed roller 48 and in the lower guide blocks 58 may be of different size for different diameters of wire. It is also evident that the guide blocks and feed rollers may be removed and replaced by others having different sizes of grooves, and that the die may be one of a number which are interchangeable for handling different diameters of wire or making coiled springs of different diameters. Within certain limits, practically every character of spring of the coiled type may be made. The machine is very practical and useful, makes perfect and uniform springs and in every way has proved its utility as a quantity production machine of perfect coiled springs, dispensing largely with skilled spring coilers now necessary.

I claim:

1. In a machine of the class described, a die comprising a horizontally positioned sleeve having a portion at one end cut away for a part of the length of the sleeve whereby there is formed a flat horizontal surface tangent to the inner curved surface of the sleeve and joining therewith, and a rod extending through the sleeve, said rod having a reduced portion of less diameter at the said cut-away end of the sleeve and provided with an annular outwardly projecting rib spaced a short distance from the end of the larger part of the rod with an annular groove between said rib and the end of the larger portion of the rod, said groove being located immediately within the end of the sleeve at said cut-away portion thereof.

2. In a machine of the class described, a die comprising a horizontally positioned sleeve having a portion at one end cut away for a part of the length of the sleeve whereby there is formed a flat horizontal surface tangent to the inner curved surface of the sleeve and joining therewith, a rod extending through the sleeve, said rod having a reduced portion of less diameter than the cut-away end of the sleeve and provided with an annular outwardly projecting rib spaced a short distance from the larger part of the rod with an annular groove between said rib and the end of the larger portion of the rod, said groove being located immediately within the end of the sleeve at said cut-away portion thereof, and means for forcing wire into the die and around the rod at said groove therein, substantially as described.

3. In a machine of the class described, a die having the elements in combination defined in claim 1, a wire guide for guiding wire to the die and around the rod at said groove therein, means for forcing the wire through the guide, into the die and around the rod, and means for changing the relative positions of the guide and die vertically, substantially as described.

4. In a machine of the class described, a die having the elements in combination defined in claim 1, and a wire guide for guiding wire to the die and around the rod at said groove therein, and means for forcing wire through the guide, into the die and around the rod at said groove therein, substantially as described.

5. In a machine of the class described, a die having the elements in combination defined in claim 1, a wire guide for guiding wire to the die and around the rod at said groove therein, means for forcing wire through the guide, and means for adjusting and changing the relative positions of the guide and die horizontally, substantially as described.

6. In a machine of the class described, a die having the elements in combination defined in claim 1, a wire guide for guiding wire to the die and around the rod at the groove therein, means for forcing wire through the guide, means for changing the relative vertical positions of the guide and die, and means for changing the relative horizontal positions of the guide and die, substantially as described.

7. In a machine of the class described, the elements in combination defined in claim 1, and means for adjustably securing the rod in fixed position with respect to the sleeve.

8. A spring coiling die comprising a sleeve, a rod adjustably secured therein and extending therethrough, said rod having an annular groove therein located immediately

within one end of the sleeve, and said sleeve having a portion cut away at one side and at said end of the sleeve for the passage of wire to the groove, and an annular outwardly extending rib on the rod at the side of the groove toward the end of the sleeve, said rod beyond the rib being reduced in size to a diameter substantially equal to the diameter of the rod at the bottom of said groove.

In testimony whereof I affix my signature.

FOSTER K. SOLLIDAY.