May 2, 1933. F. J. DEDRICK ET AL 1,906,449

METHOD OF MAKING COIL SPRINGS

Filed April 13, 1932

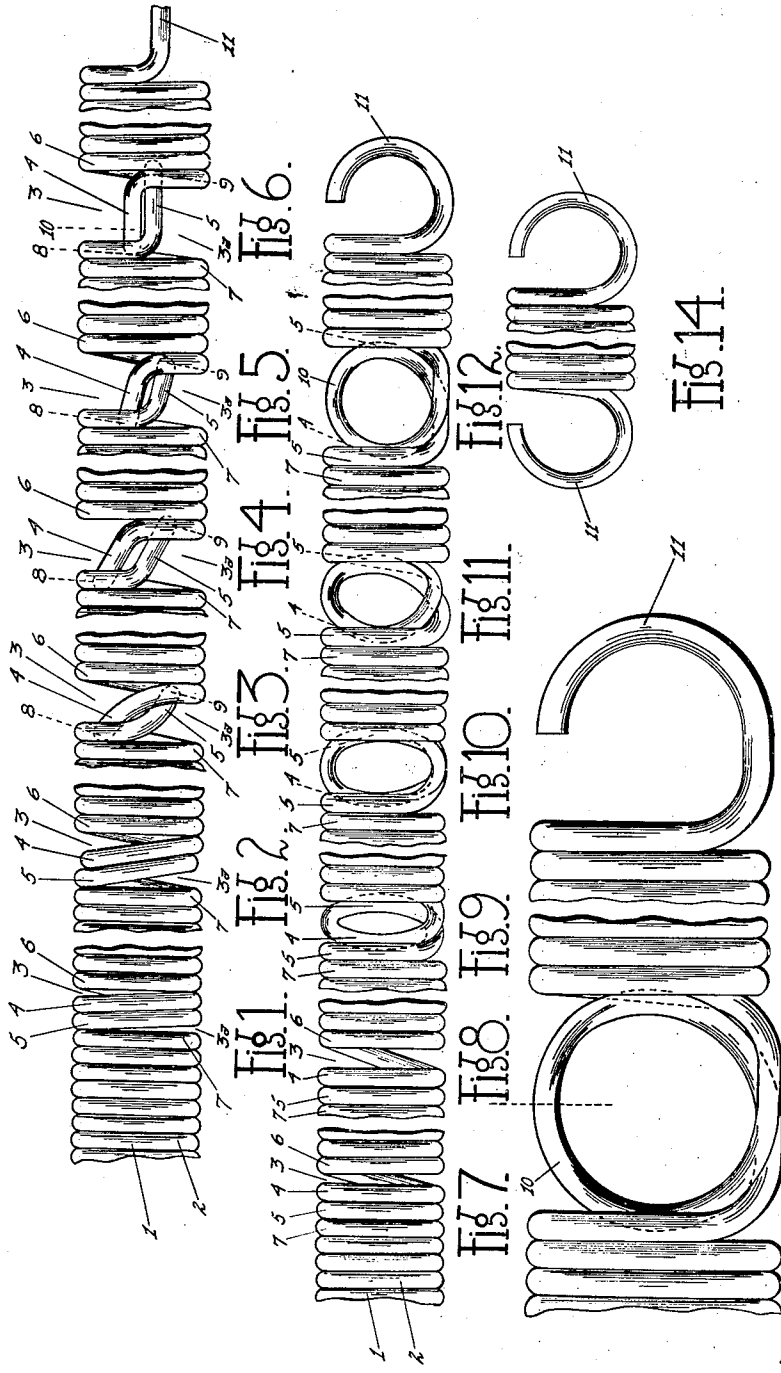

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

INVENTORS,
FRANK J. DEDRICK.
MOSES HIDER.
BY Philip S. Hopkins.
ATTORNEY.

Patented May 2, 1933 1,906,449

UNITED STATES PATENT OFFICE

FRANK J. DEDRICK AND MOSES HIDER, OF BINGHAMTON, NEW YORK, ASSIGNORS TO HIDER STEEL BALL WORKS, OF BINGHAMTON, NEW YORK

METHOD OF MAKING COIL SPRINGS

Application filed April 13, 1932. Serial No. 604,946.

Our invention relates to a method of making coil springs and has for its primary object the provision of a method for forming individual coil springs of predetermined length from a stock length of coiled wire, and providing each individual length with end hooks.

More specifically, it is an object of our invention to provide a method of bending two adjacent coils of a spiral spring stock at oppositely disposed points in their circumference, and in opposite directions, to a predetermined position, said position being in a plane corresponding to the axis of the spring.

Another object of our invention lies in the provision of the various steps necessary in accomplishing the final result of the bending process and including the cutting of the bent portion to provide the end hooks on each individual spring.

Still another object of our invention lies in the final step of the forming process whereby the cutting tool has free access to the cutting off point and thereby facilitating speedy production.

The uses for coil springs provided with integral hooks or attaching means at each end are many and varied as well as the size thereof, namely, the diameter of the coils and the number of individual coils making up the spring length. In the manufacture of such coil springs the known methods have resulted in rendering them rather expensive because of the steps required in such manufacture and the labor involved in the individual handling and formation of them.

Heretofore, the semi-loop or hook provided on each end of each spring has been formed individually and separately by twisting and bending a portion of the end coil of wire to the desired shape and size. This has necessitated, of course, the severing of the wire in the coil at the desired length and then individually forming each hook by this bending process.

By our invention we have provided a method of forming individual coil springs of any selected or desired length, that is, number of coils, with the semi-circular hooks provided at each end of the length, directly from the long length of coiled stock so that as each individual length of coil spring is made, it is severed from the length of stock completely formed and provided with the hooks at each end. This eliminates the necessity for individual handling of each coil spring and multiplies greatly the speed with which the same can be made. This method also insures uniformity in the manufactured springs.

Other objects and advantages in details will be apparent as the description proceeds, reference now being had to the figures of the accompanying drawing forming a part of this application and wherein like reference numerals indicate like parts.

In the drawing:

Figures 1 to 6 inclusive are detail side views of a length of coil spring stock illustrating successively the bending step or operation by means of which the individual coil springs are formed from the length of coiled stock.

Figures 7 to 12 inclusive are top plan views similar to Figures 1 to 6 and showing the same stages of the bending step.

Figure 13 is an enlarged detail top plan view illustrating the completed bending operation and the cutting or severing operation.

Figure 14 is a detail side view of the completely formed individual coil spring.

No particular means or apparatus by way of tools, dies, etc. have been shown for carrying out this invention as obviously such means may take a wide variety of forms and design. Preferably, of course, a die is used in a machine through which the coiled stock is fed step by step and the die intermittently performing the bending, forming and cutting operations automatically, in the interest of speedy production.

In the drawing the operations of bending and forming the coils providing the end hooks on the individual lengths of springs has been illustrated as operating from the top and bottom sides of the stock. It is obvious, however, that the same operations

could be performed at any other opposed points on the circumference of the coiled stock.

The method embodies essentially the selection of two adjacent coils of the stock, the selection depending upon the length of the coil springs it is desired to form, and bending such adjacent coils at diametrically opposed points on their circumference in opposite directions and at right angles to each other, spreading the coiled stock at that point during the bending operation to make room for such bending, resulting in such selected coils being bent for a portion of their circumference at substantially right angles to each other in parallel relation and at right angles to the coil stock, forming in the length of the coiled stock a circular coil as illustrated clearly in Figures 12 and 13. At this point in the operation this angular circular coil is cut as shown by the dotted lines clearly in Figure 13 to form identical hooks, one on the left end in Figure 13 of the coil spring, which having had its opposite end formed by the preceding operation, completes that spring ready for use, and one on the right end in Figure 13 of the length of coiled stock from which the springs are made. Obviously, therefore, at each operation of bending and forming the selected adjacent coils as above described, there is formed an individual coil spring provided with the end hooks.

Referring now specifically to the drawing, the reference numeral 1 refers generally to a length of spiral wire spring stock which has the usual coils 2. This length of spring stock 1 may be formed in the usual manner from suitable wire of the desired size and with the coils 2 of the desired diameter. The stock 1 is usually of great length and may be fed to the individual spring forming means in any suitable manner.

As before stated, the actual forming and separation of the individual coil springs from the stock 1 may be performed by any suitable mechanism but preferably by single die which in one operation performs the bending and forming steps about to be described. No particular means or mechanism for performing the bending and forming operations have been shown as obviously there are many which could be used. Rather, the bending and forming operations will be described in their various stages, from which the method constituting this invention will be clear.

For convenience of description, I have designated two adjacent coils as 4 and 5, they being selected for the bending and forming operations at the proper position in the length of stock 1 to provide the individual coil spring of the desired length. At a point in the circumference of the coil 4, it is by suitable means separated slightly as at 3 from its next adjacent coil 6. Simultaneously at a point diametrically opposite the point 3, the coil 5 is likewise bent or spread away from its adjacent coil 7 as at 3*a*. In other words, the coil 4 is bent to the left in Figure 1 and the coil 5 is bent to the right in Figure 1, at diametrically opposite points on the circumference of the coils. This spreading and initial bending operation of the selected coils with relation to their adjacent coils is continued to substantially the degree and position shown in Figure 2. When these coils 4 and 5 have reached such position, the upper half of the coil 4 and the lower half of the coil 5 are caused to be bent in opposite directions as shown clearly in Figure 3, the lower half of the coil 4 and the upper half of the coil 5 being suitably held against further bending by any suitable means. It will be noted that in this secondary bending operation the upper half of the coil 4 passes through the upper half of the coil 5 as at 8, and the lower bent half of the coil 5 passes through the lower edge of the coil 4 as at 9. Figures 3, 4, 5, and 6 illustrate in side elevation the various steps of this bending operation and it will be noted that as the bending proceeds the adjacent coils 6 and 7 are spread sufficiently far apart to make room for the laterally disposed coil 10 formed by this bending operation partly from the coil 4 and partly from the coil 5.

It will be noted that as the bending progresses and reaches the stage illustrated in Figure 5, the coils 4 and 5 engage each other at the point where they cross and thus facilitate the holding of the portions of the coils which are not bent, such unbent portions resuming their parallel position with the adjacent coils 6 and 7.

At the completion of this bending operation, it will be observed that there is provided a single coil 10 formed partly from the coil 4 and partly from the coil 5 lying at substantially right angles to the stock 1, the wire forming such coil crossing itself at one side, leaving a substantially circular loop portion at the opposite side. This is shown very clearly in Figures 12 and 13.

Figures 7 to 12 inclusive show the same stages of the forming and bending operation as are shown in Figures 1–6 inclusive, but from the top thereof. Although we have shown and described the formation of this lateral loop portion as being from the top and bottom of the stock 1, it will be obvious that the forming and bending tools may be so arranged as to perform the described operations from the sides or any other position around the circumference of the coils, so long as the bending means operates from diametrically opposite points.

It will also be clear from the drawing and description that by bending the coils 4 and

5 at their half way points, to form the single loop 10, brings such loop substantially in the center of the coiled stock 1. The result of this is that when the loop 10 is cut at the dotted line position shown in Figure 13, the two hooks formed thereby on the adjacent ends, are of the same size and are positioned substantially centrally of the coils of stock to which they are attached. This is desirable in most cases, although it will be obvious that if it is preferred to have the hooks offset from center either way, the acute bending of the adjacent coils 4 and 5 would be at a different point in their circumference.

With the coils 4 and 5 bent to the position shown in Figures 6, 12, and 13, providing the single angular loop 10, the individual coil spring is ready for severance from the coiled stock 1 and this is done by any suitable cutting tool cutting through the loop 10 at the dotted line position shown in Figure 13. This permits the coil spring at the end of the stock 1 to drop off ready for shipment or use and provided at each end with the hooks 11. Obviously there is left at the end of the coiled stock 1, a similar hook 11 in the form of the other half of the coil 10, and the stock 1 is then fed along the desired number of coils or the desired distance whereupon the same forming, bending, and cutting operations, are repeated to form the next individual coiled spring with the hooks 11 thereon.

For clearness of illustration I have shown the various stages of the forming and bending operation in different figures. It will be understood, however, that such operations as are illustrated in Figures 1–6 inclusive, constitute but one continuous operation preferably by a suitable die which serves the purpose of bending the portions of the coils 4 and 5, spreading the adjacent coils to make room for the bending operation, and holding the unbent portions of the coils 4 and 5 all as heretofore described. It will be clear that with such a die in a proper machine with proper feeding mechanism for the coiled stock 1, the formation of these individual coil spring lengths may be very rapid. The cutting off operation can take place at any position in the machine after the final bending operation illustrated in Figures 6, 12 and 13.

An additional advantage in this method of forming individual coil springs lies in the fact that all the springs so formed are perfectly uniform as to size and position of the hooks thereon.

By this method we have eliminated the tedious, slow, expensive method of individually and manually forming the desired lengths of coil springs with the hooks at each end thereof and made possible the automatic production thereof at a very rapid rate of speed.

Of course, changes may be made in details of operation without departing from the spirit and scope of my invention. We do not limit ourselves, therefore, to the exact form herein shown and described other than by the appended claims.

I claim:

1. The method of forming individual coil springs from a length of coiled stock comprising first bending selected adjacent coils of the stock to form a loop at substantially right angles to said stock, and then severing said loop.

2. The method of forming individual coil springs from a length of coiled stock comprising bending selected adjacent coils of the stock in opposite directions to form a loop, and severing said loop.

3. The method of forming individual coil springs from a length of coiled stock comprising first bending selected adjacent coils of the stock in opposite directions and through each other at substantially right angles to said stock to form a loop, and then severing said loop.

4. The method of forming individual coil springs from a length of coiled stock comprising first bending portions of selected adjacent coils of the stock to form a loop, and then severing said loop.

5. The method of forming individual coil springs from a length of coiled stock comprising bending portions of selected adjacent coils of the stock in opposite directions, to form a loop, spreading said stock to provide space for said loop, and severing said loop.

6. The method of forming individual coil springs with end hooks from a length of coiled stock comprising first bending portions of selected adjacent coils of the stock to form a loop laterally of said coiled stock, and then severing said loop.

In testimony whereof we affix our signatures.

FRANK J. DEDRICK.
MOSES HIDER.