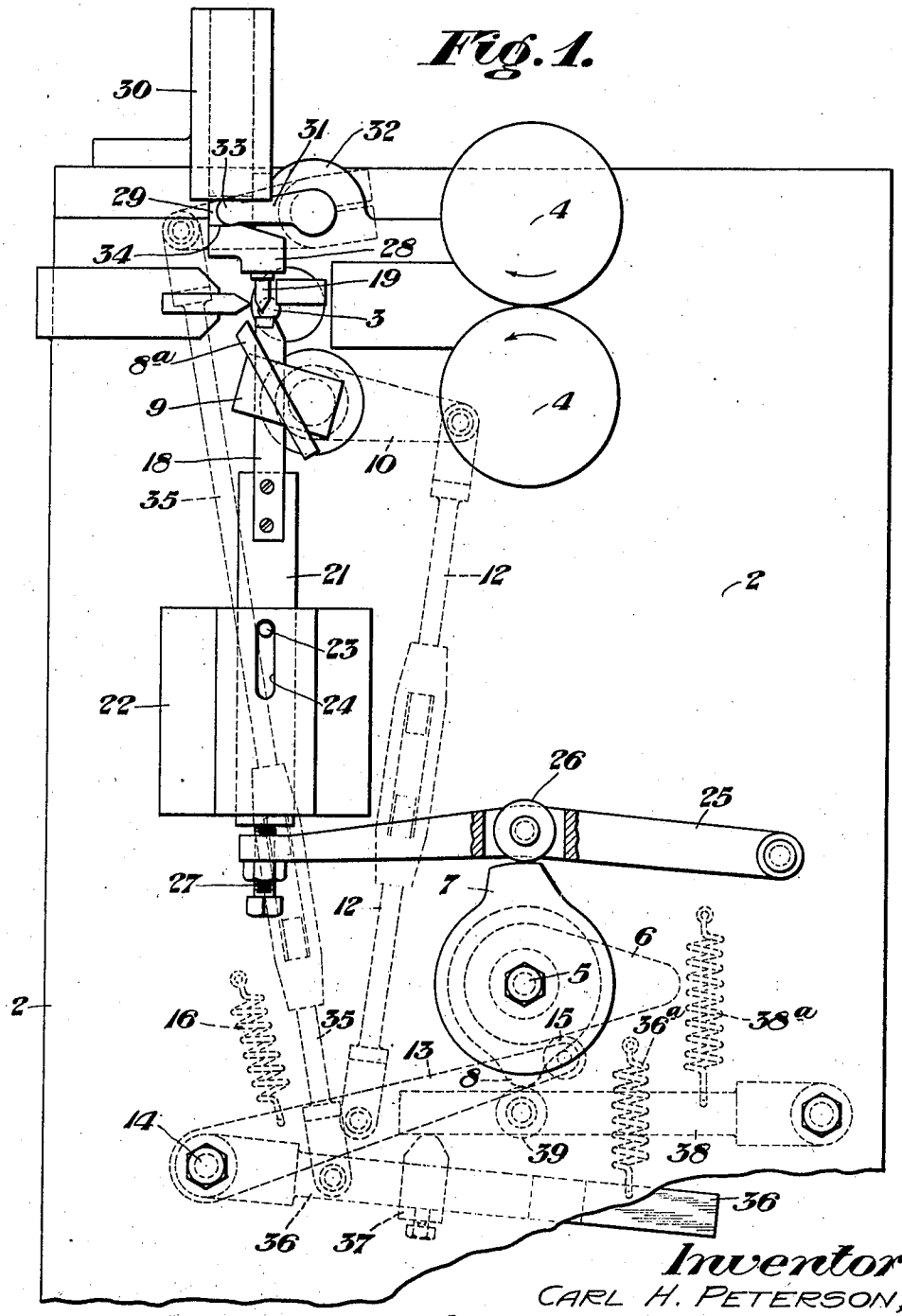
Aug. 2, 1932. C. H. PETERSON 1,869,501

APPARATUS FOR AND METHOD OF MANUFACTURING SPRINGS

Filed March 14, 1932 3 Sheets-Sheet 1

Fig. 1.



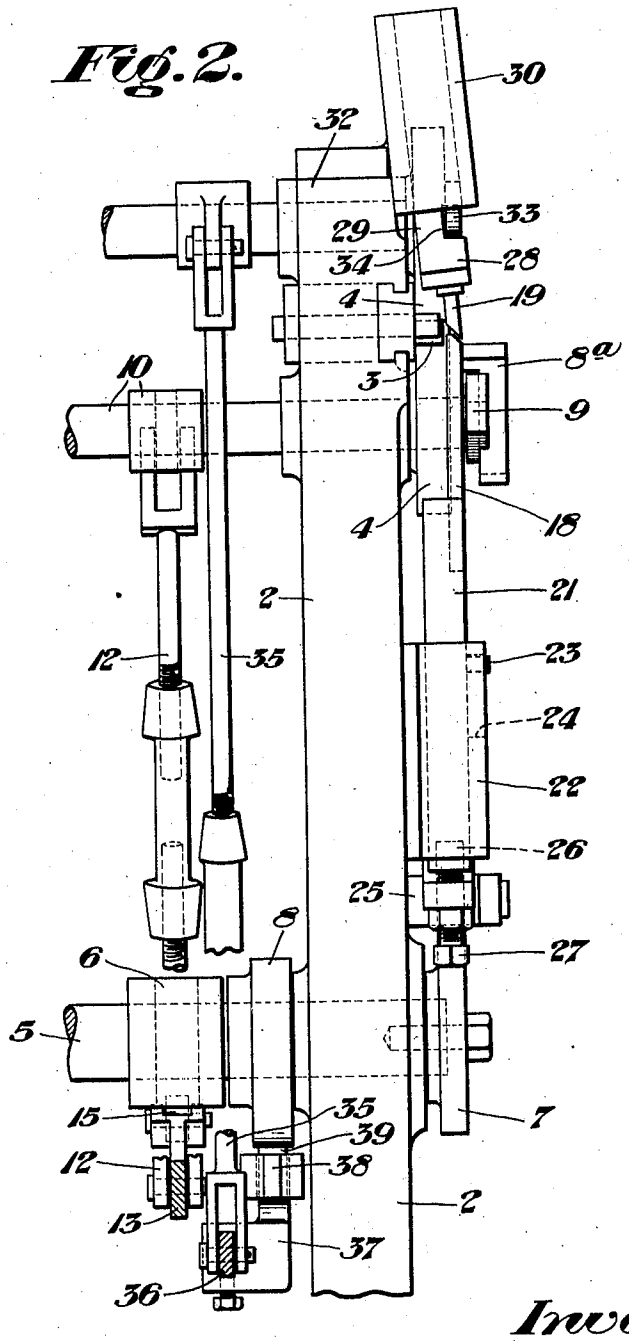
Inventor:
CARL H. PETERSON,
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his Attorneys.

Aug. 2, 1932. C. H. PETERSON 1,869,501

APPARATUS FOR AND METHOD OF MANUFACTURING SPRINGS

Filed March 14, 1932 3 Sheets-Sheet 2

Fig. 2.



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APPARATUS FOR AND METHOD OF MANUFACTURING SPRINGS

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Fig. 3.

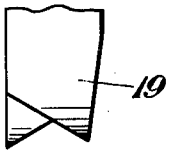
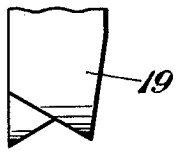
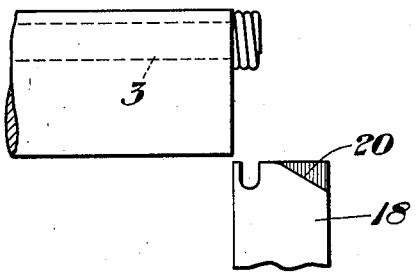


Fig. 4.





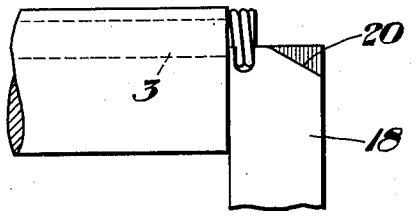


Fig. 5.

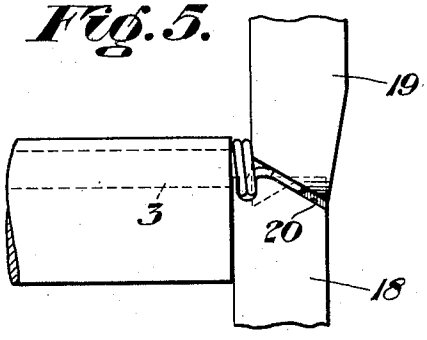
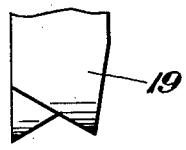


Fig. 6.



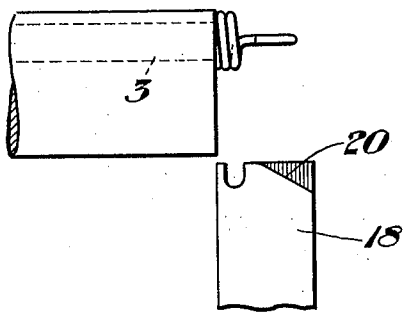
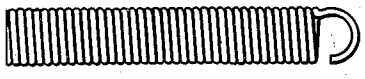


Fig. 7.



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Patented Aug. 2, 1932 1,869,501

UNITED STATES PATENT OFFICE

CARL H. PETERSON, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY, A CORPORATION OF NEW JERSEY

APPARATUS FOR AND METHOD OF MANUFACTURING SPRINGS

Application filed March 14, 1932. Serial No. 598,746.

This invention relates to apparatus for and method of manufacturing springs, and more particularly to an apparatus for and method of forming hook ends on coiled springs, and has for one of its objects the provision of apparatus capable of being attached to substantially all of the ordinary universal coiling machines now in general use.

Another object is to provide an apparatus and method by which the hook ends may be automatically formed on coiled springs while said springs are being formed on the universal coilers, thereby eliminating the separate operation which has been generally employed in formed such ends.

In the drawings:

Figure 1 is an elevation of a coil forming machine having my invention applied thereto.

Figure 2 is a side elevation of the same.

Figures 3 to 6, inclusive, show the successive steps of forming the hook end on the coiled spring.

Figure 7 shows the completed spring.

Referring more particularly to the drawings, the numeral 2 designates the portion of the frame of a standard universal coiling machine, which machine is provided with the usual mandrel 3 and feed rolls 4 by which the wire from which the spring is formed is fed to the forming mandrel 3. The coiling machine is provided with a shaft 5 on which are mounted a plurality of cams 6, 7 and 8. The shaft 5 is adapted to be operated through suitable drive connections (not shown), and is interlocked with the main machine drive (not shown) so as to be rotated in timed relation with the coil forming mechanism.

A suitable cutting tool or die 8^a is carried by a head 9 which is mounted on a rocking lever 10 pivotally secured to the frame 2 of the machine. The lever 10 is connected by an adjustable link member 12 to a cam-operated lever 13 pivotally mounted on a shaft 14 secured in the frame 2. The lever 13 is provided at its upper end with an anti-friction roller 15 which is normally held in engagement with the cam 6 by a spring 16. As the high point of the cam 6 engages the roller 15 the lever 13 will be rocked about the shaft 14, thereby rocking the lever 10 through the link connection 12 and moving the cutting tool or die 8^a upwardly into engagement with the preformed spring on the mandral 3 so as to cut off a short length of spring.

The cutting tool 8^a is positioned so as to cut the preformed spring on the mandrel 3 and leave approximately two and one-half coils of the preformed springs on the mandrel. After the cutting tool or die is operated a pinch die 18 is adapted to move upwardly into engagement with the two complete coils of a preformed length of spring remaining on the mandrel 3 so as to grip said coils against the mandrel 3, and a bending die 19 is adapted to move down and engage the half coil which is free of the die 18 and force said half coil downwardly into engagement with a die face 20 on the die 18, thereby forming a hook portion from the half coil which is positioned substantially on a line parallel with the longitudinal axis of the spring.

The die 18 is carried by a reciprocating bar member 21 mounted in a guide block 22. The bar 21 is provided with a pin 23 projecting through a slot 24 in the guide 22 which serves to prevent displacement of the bar 21 from the guide 22 and to limit the reciprocatory movement of the bar. A rocking lever 25 is pivotally mounted on the frame 2 of the machine, and carries an anti-friction roller 26 intermediate its ends which is adapted to be engaged by the cam 7 to force the lower end of the bar 25 into engagement with the bar 21, and thereby moves the bar 21 and its die 18 upwardly into engagement with the completed coils of the preformed length of spring. An adjusting screw member 27 is mounted in the lower end of the lever 25 and is adapted to be adjusted toward and away from the bar 21 to vary the length of stroke of the bar 21 relative to the mandrel 3.

The die 19 is carried in the head end 28 of a bar 29 which is mounted for reciprocatory movement in a guide 30 on the frame 2 of the machine. The bar 29 is adapted to be moved toward and away from the mandrel 3 by means of a crank lever 31 mounted in a suitable bearing 32, and having one end provided with a head portion 33

which is engaged in a recess 34 in the bar 29 and the other end of which is connected by an adjustable link member 35 to a rocking lever 36 pivotally mounted on the shaft 14. The lever 36 is provided with a vertically adjustable pin member 37 which is adapted to be engaged by a second rocking lever 38 pivotally connected to the frame 2 of the machine. The lever 38 is provided with an anti-friction roller 39 adapted to be engaged by the cam member 8. The pin member 37 is adapted to be adjusted vertically in the lever 36 so as to be engaged by various points in the length of the lever 38 and thus vary the stroke of the lever 36 and the die member 19.

The lever 36 is normally urged toward the lever 38 by a spring 36ª, and the lever 38 is normally urged toward the cam member 8 by means of a spring 38ª.

In carrying out the method of this invention with the apparatus above described, a length of spring is first coiled on the mandrel 3. The cutting die is then operated to cut off the short length of preformed spring, leaving approximately two and one-half coils of completed spring on the mandrel. The die member 18 next moves upwardly so as to grip the two complete coils of preformed spring, leaving the one-half coil free, the die 19 then moves downwardly and forces the half coil over the end of the mandrel 3 and into engagement with the die face 20 of the die 18, thus positioning the half coil in the form of a hook substantially parallel with the longitudinal axis of the spring. After the hook has thus been formed the dies 18 and 19 return to their normal or neutral position and the coiling mechanism continues to operate to form the length of spring desired plus approximately two and one-half coils to be used on the next succeeding spring, after which the coiling mechanism is momentarily stopped while the cutting off tool again operates to shear off a completed spring and complete the cycle of operations.

While I have shown and described one specific embodiment of my invention, it will be understood that I do not wish to be limited thereto since various modifications may be made without departing from the scope of my invention, as defined in the appended claims.

I claim:

1. The combination with a spring coiling machine having a forming mandrel, of means for cutting off short lengths of the spring as formed, said means being positioned and operated so as to leave approximately two and one-half coils of preformed spring on the mandrel, a die member movable toward said mandrel and adapted to clamp the complete coils against said mandrel, and a second die movable toward said mandrel and cooperating with said first named die to bend the half coil of the preformed coils down into a position parallel with the longitudinal axis of the spring to form a hook.

2. The combination with a spring coiling machine having a forming mandrel, of means for cutting off short lengths of the spring as formed, said means being positioned and operated so as to leave at least one and one-half coils of preformed spring on the mandrel, a die member movable toward said mandrel and adapted to clamp the complete coil against said mandrel, and a second die member movable toward said mandrel and cooperating with said first named die to bend the preformed half coil down into a position substantially parallel with the longitudinal axis of the spring to form a hook, and cam operated means for automatically operating said cutting off means and said die members.

3. The combination with a spring coiling machine having a forming mandrel, of a reciprocable cutting off tool for cutting off short lengths of the spring as it is formed on said mandrel, said tool being positioned and timed in its operation to leave at least one and one-half coils of preformed spring on said mandrel, a reciprocating die member movable toward said mandrel and provided with a clamping surface adapted to clamp the complete coil of the spring against said mandrel, and a die face portion, a second reciprocating die member movable toward said mandrel and provided with a die face adapted to engage and force the half coil from said mandrel and into engagement with the die face of said first named die member to form a hook portion.

4. The combination with a spring coiling machine having a forming mandrel, of a reciprocable cutting off tool for cutting off short lengths of the spring as it is formed on said mandrel, said tool being positioned and timed in its operation to leave at least one and one-half coils of preformed spring on said mandrel, a reciprocating die member movable toward said mandrel and provided with a clamping surface adapted to clamp the complete coil of the spring against said mandrel and a die face portion, a second reciprocating die member movable toward said mandrel and provided with a die face adapted to engage and force the half coil from said mandrel and into engagement with the die face of said first named die member to form a hook portion, and cam-operated lever and link mechanism for automatically operating said cutting off tool and said die members.

5. The method of forming coiled springs having an integral hook on one end thereof which consists in coiling a portion of the spring, gripping said preformed portion of spring, bending approximately one-half of the endmost coil of the spring down into a

position approximately parallel with the longitudinal axis of the spring, continuing to coil the spring to a greater length than that desired for the finished spring, and then cutting off the preformed spring.

6. The method of forming coiled springs having an integral hook on one end thereof which consists in coiling a portion of the spring, gripping said preformed portion of spring, bending approximately one-half of the endmost coil of the spring down into a position approximately parallel with the longitudinal axis of the spring, continuing to coil the spring to a greater length than that desired for the finished spring, and then cutting off the preformed spring, leaving a short length of preformed spring from which the hook end of the next spring is to be formed.

In witness whereof, I have hereunto set my hand.

CARL H. PETERSON.