No. 822,445. PATENTED JUNE 5, 1906.

J. B. HALE.

METHOD OF FORMING SPRING CLIPS.

APPLICATION FILED APR. 21, 1905.

Fig. 1.

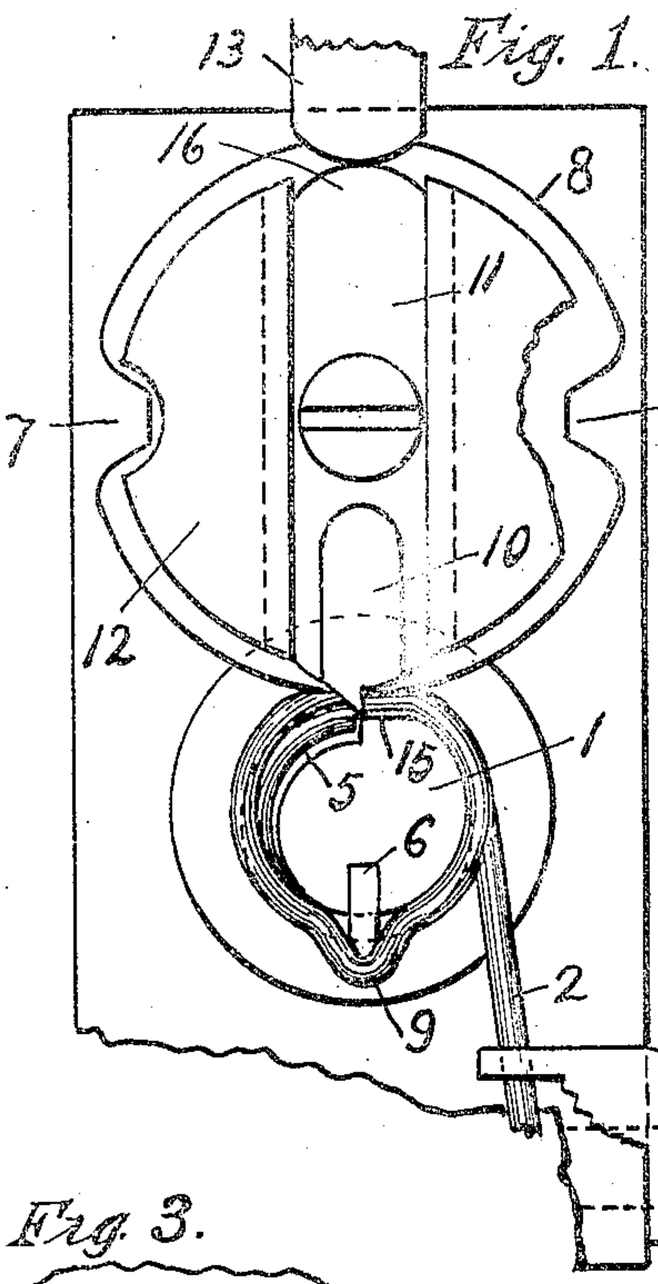


Fig. 2.

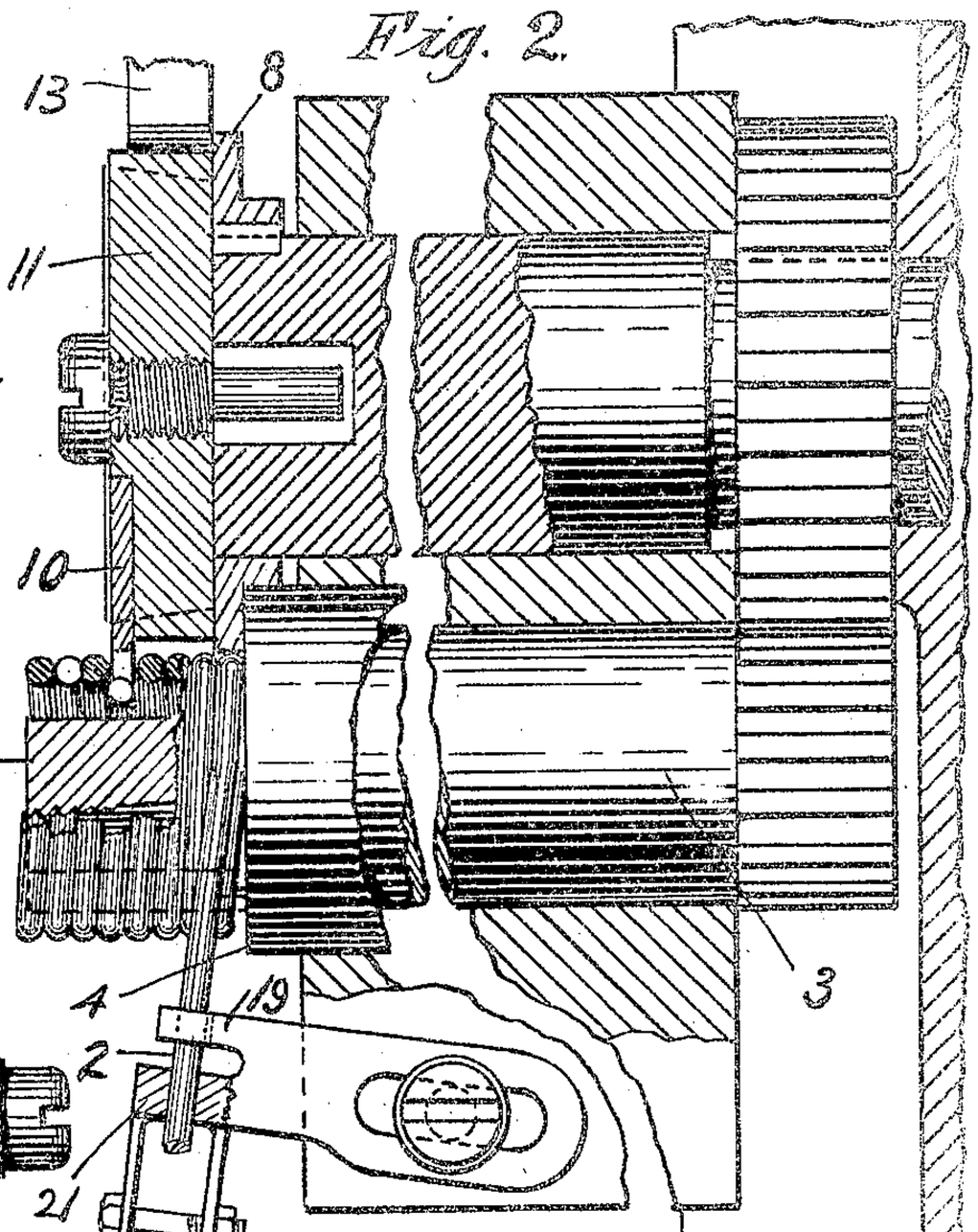


Fig. 3.

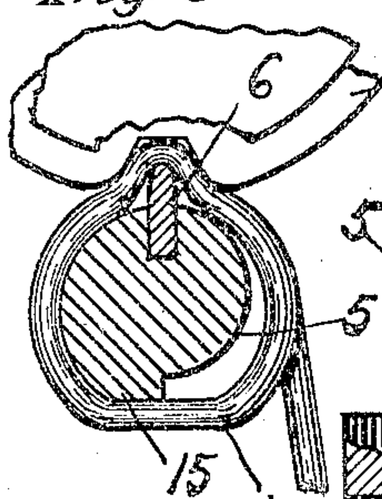
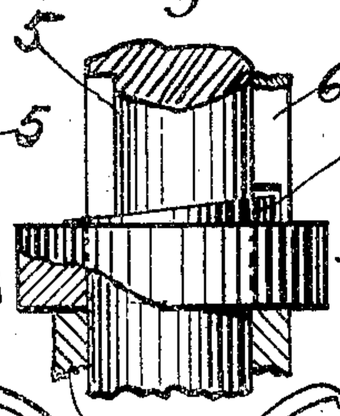


Fig. 4.



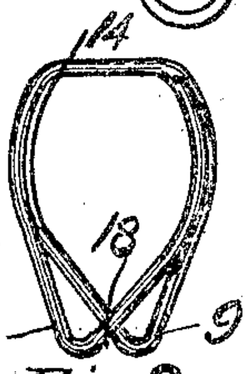


Fig. 9.

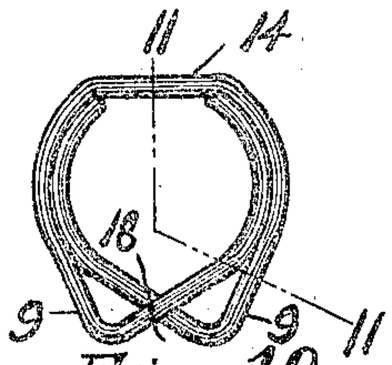


Fig. 10.

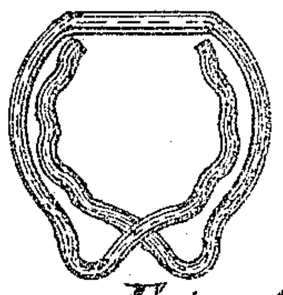


Fig. 12

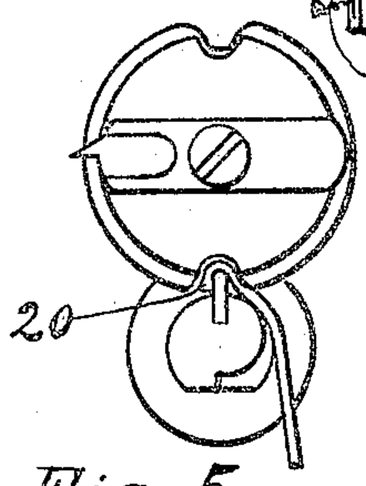


Fig. 5

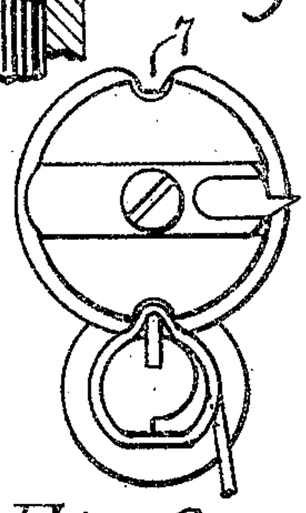


Fig. 6.

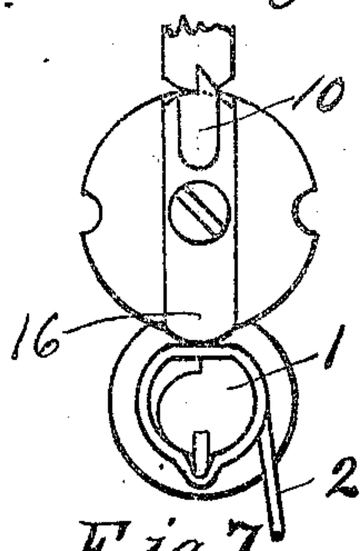


Fig. 7.

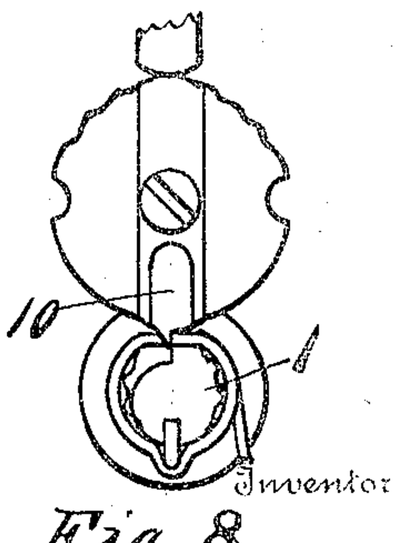


Fig. 8.

Witnesses

Frank A. Foster

E. D. Ogden

Fig. 11.

Joshua B. Hale.

By Howard E. Barlow

Attorney

UNITED STATES PATENT OFFICE.

JOSHUA B. HALE, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO RING PAPER CLIP COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

METHOD OF FORMING SPRING-CLIPS.

No. 822,445. Specification of Letters Patent. Patented June 5, 1906.

Application filed April 21, 1905. Serial No. 256,807.

To all whom it may concern:

Be it known that I, JOSHUA B. HALE, a resident of the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in the Method of Forming Spring-Clips; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention relates to a new method or process of making spring wire clips, and has for its object to facilitate the production of such clips in forming the same by a continuous rotary process. To produce these clips by my improved method, the wire is wound continuously on a rotating arbor and formed into a series of coils around the same. This arbor is provided with a longitudinal anvil or rib extending the length of its winding-surface and over which rib the wire is laid in coils. Suitably-formed rotatable dies are arranged to coact with this rib to press the wire into the desired form over said rib, thereby producing an extending ear on each coil.

The winding is preferably begun at the inner or shouldered end of the winding portion of the arbor, and the coils as they are wound thereon are automatically forced to move or slide longitudinally toward the free end of the arbor as each fresh coil of wire is laid upon it. The wire of every second coil is then cut automatically at a predetermined point in the coil, after which the finished clips are forced off the end of the arbor to drop into the boxes ready for shipment. As the clips drop from the arbor the recoil of the wire instantly separates the ears or projections which were formed on each of the two coils over the said rib, so that they spring apart out of alinement one with the other, thereby jointly providing between them an entering mouth or space opening outwardly from one side of the frame.

The invention is fully set forth in this specification and more particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 represents an end view of the arbor on which the clips are formed, the die-plate, and the cutter in the act of cutting off one of the coils. Fig. 2 is a side elevation illustrating the manner in which the wire is wound on the arbor, also showing the cutter in the act of shearing one of the coils. Fig. 3 illustrates the die forming a projection on one of the coils over the rib or anvil. Fig. 4 illustrates a portion of the arbor on which the coils are wound and also the cam that automatically feeds or slips the coils when formed toward the free end of the arbor. Fig. 5 illustrates the first step in the process, which is that of starting the wire to wind on the mandrel and showing the end of the wire hooked over the anvil. Fig. 6 illustrates the rotary die bending in or forming the projections over the anvil. Fig. 7 illustrates the presser that may be made to roll down onto the back of the coils to form a straight bridge portion thereon when desired. Fig. 8 illustrates the cutter severing one of the wires of the coil after the same has been formed into a clip over the arbor. This figure also illustrates one-half of the die-plate as being corrugated to correspond to corrugations also formed in the arbor for forming a clip like that shown in Fig. 12. Fig. 9 shows a clip having superimposed coils. Fig. 10 shows a clip having its two ends laid within and adjacent to the outer coils. Fig. 11 shows a sectional view taken on line 11 11 of Fig. 10, illustrating the ends of the coil as set back within the circle and in a line with the outside coil. Fig. 12 shows a clip with one plain and one corrugated coil, which construction may be produced by a suitable corrugated arbor and die-plate.

Referring to the drawings, at 1 is the arbor upon which the wire 2 is wound. This arbor may be formed by turning down the end of the driving-shaft 3, or it may be made separate and inserted into the end of the same. At 4 is a collar fixed to the frame of the machine, said collar forming a shoulder against which to wind the wire, as shown in Figs. 2 and 4. This arbor is cut away at 5, so that the wire may bend in when the cutter shears one of the coils. A very important feature in the construction of this arbor is the anvil or rib 6, that extends longitudinally along the length of the winding-surface of the same. The wire is wound directly over this

anvil and pressed into the desired form thereover by a rotatable die. (See Fig. 3.) I do not wish to confine myself to an arbor having a single rib or anvil, as any number of ribs may be placed on the arbor, thereby forming with coacting dies rings with a plurality of indentations or projections, as illustrated in Fig. 12. These dies are formed by cutting away the plate 8 on its two opposite edges, as at 7 7. (See Fig. 1.) This plate is equal in thickness to about the diameter of the wire, as shown in Fig. 2, and as the rotating speed of this plate is one-half that of the arbor two dies are necessarily formed therein, so as to engage and press each individual coil over the anvil, as illustrated in Fig. 3. The shape or form of the projection may be controlled at will by altering the form of the dies or the form of the anvil, or both.

Every second coil may be cut or sheared at a point diametrically opposite the point of the projection 9. These coils are cut by the blade 10, which blade is held to reciprocate in the rotatable plate 12 on the cutter-plate 11.

The relative speed of the arbor 1 to that of the die-plate 8 may be set so as to cut every coil or skip any number of coils, forming a single ring or rings composed of a plurality of coils. Said die-plate may be provided with depressions equal to the number of coils formed. As the die-plate travels one-half the speed of the arbor one half the circumference of said die-plate may be made on a greater radius than the opposite half, thereby forcing one coil of the wire down harder onto the arbor than the next succeeding coil, with the result that the coils may vary alternately in their diameters, or one-half of the circumference of said die-plate may be corrugated, said corrugations coacting with corresponding corrugations on the arbor (see Fig. 8) to form a clip with an alternately plain and a crimped or corrugated coil, as shown in Fig. 12.

The sliding cutter in the cutter-plate 11 is pressed downward by the presser-cam 13 coming in contact with the opposite end of said plate, as shown in Fig. 1, and shears the wire in two. When it is desired to form a straight bridge 14 on the clip, the arbor 1 is flattened off at 15, and the end 16 of the cutter-plate is forced down onto the wire at that point, as illustrated in Fig. 7, forming a straight bridge portion 14 on the clip. This bridge portion is an essential feature in the construction of the clip, as it greatly increases the set or grip of the same. The opening space 18 between the points 9 9 may be controlled to some extent by the shape of the arbor at this point and the amount of pressure brought to bear upon the wire here. This may also change the form of the clip somewhat from a superimposed coil, as shown in Fig. 9, to the form where the ends are laid within the coil, as illustrated in Fig. 10. The change in this form may also be further controlled by regulating the tension of the wire at 21 as it is wound on the arbor.

Another feature of this process that permits of the clips being formed continuously and rapidly is the little semicircular stationary cam 17, preferably held on the face of the collar 4, (see Fig. 4,) which cam engages each coil separately as it is wound upon the arbor and causes all the coils to slide continuously toward the end of the arbor as fast as the wire is wound thereon at the shoulder.

The method or process by which these clips are formed may be further described as follows: A coil of wire is first placed on a reel (not shown) to be drawn therefrom by the turning-arbor. The end of the wire is passed up through an adjustable guide 19 and hooked over the anvil, as shown at 20 in Fig. 5. The arbor is then rotated and the wire wound continuously and automatically into a succession of coils thereon. As fast as the wire is wound onto the arbor at the shoulder end thereof it is forced to move or slide along the same toward the end by its engagement with the little cam 17, thus always making room for another layer of wire as the arbor rotates.

Ears or projections are formed on each coil by being wound over the anvil in the arbor, which projections are formed into the desired shape by dies in the rotating plate 8. Every coil may be bent inward from the circle or straightened for a short distance on its back to form a chord or bridge portion to increase the set or grip of the clip. When it is desired to produce a clip having two coils, every other coil is then sheared or cut automatically, and as the clips are forced off the end of the arbor the points or projections 9 9 spring apart out of alinement one with the other, thereby providing between them an entering mouth or space opening outwardly from one side of the frame, and the clips drop finished in a box ready for shipment.

The expense of manufacturing these clips is by this rotary process reduced to the minimum, as a small and inexpensive machine may be made to produce clips of this form much more rapidly than would be possible by any reciprocating process. The construction of the clip also admits of its being made of the lightest wire and by this particular method of bending produces the maximum gripping power.

The ease and great rapidity with which these clips are thus manufactured proves the practicability of the superior method by which they are produced, and the effectiveness of the clip itself proves the practical utility of the product.

My invention is not restricted to the exact details of forming the clip as herein shown and described nor to the exact construction

of the mechanism employed in forming the same, as the shape or form of the clip, as well as the manner of winding the wire, may be modified or the mechanism for winding the same rearranged in various particulars without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of forming spring wire clips which consists in winding wire into an approximately circular spring-coil and simultaneously bending each turn of the coil to form a projection extending beyond the circumferential plane of the body of the coil, and periodically severing a turn of the coil, whereby the uncoiling action of the severed portion of the coil will cause a separation of the said projections.

2. The method of forming spring wire clips which consists in winding wire upon an approximately circular rotating arbor to form a spring-coil, and simultaneously bending each turn of the coil to form an angular portion projecting beyond the circumferential plane of the body of the coil, and periodically severing a turn of the coil, whereby the uncoiling action of the severed part will cause a separation of said angular portions.

3. The method of forming spring-clips which consists in winding wire into an approximately circular spring-coil and providing each turn of said coil with an irregular portion projecting beyond the circumferential plane of the body of the coil, and severing a turn of said coil at periodical intervals, whereby the uncoiling action of the severed parts will cause a separation of the angular portions of said severed part.

4. The method of forming spring-clips which consists in winding a wire upon a rotating arbor provided with a longitudinal anvil or rib to form an approximately circular spring-coil, the turns of which are provided with an angular portion projecting beyond the circumferential plane of the body of the coil, and finally severing a turn of said coil at periodical intervals, whereby the uncoiling action of the severed part will cause a separation of the angular portions of said severed part.

5. The method of forming spring-clips which consists in winding wire into an approximately circular spring-coil and providing each turn of said coil with an ear or projection extending beyond the circumferential plane of the body of said coil, and severing a turn of said coil at periodical intervals, whereby the uncoiling action of the severed part will cause a separation of the ears or projections of said severed part.

6. The method of forming spring wire clips which consists in winding wire into a spring-coil, simultaneously bending each turn to form an angular portion offset from the body portion of the strand, and periodically severing a turn of said coil at a point opposite said angular portions, whereby the uncoiling action of the severed part will cause a separation of the angular portion of said severed part.

7. The method of forming spring wire clips which consists in winding wire upon a rotating arbor to form a spring-coil, bending each turn of the coil to form an angular member offset from the body of the coil, and periodically severing a turn of said coil at a point opposite said angular members, whereby the uncoiling action of the severed part will cause a separation of the angular members of said severed part.

8. The method of forming spring wire clips which consists in winding wire into a spring-coil, simultaneously bending each turn to form a plurality of alined angular members offset from the body of the coil, and finally severing every other turn of the coil at a point opposite said angular members, whereby the uncoiling action of the severed part will cause a separation of the angular members of said severed part.

9. The method of forming spring-clips which consists in winding wire into a spring-coil, simultaneously bending each turn to form a plurality of alined angular members offset from the body of said coil and pressing in or straightening a portion of each turn of the coil, and finally severing every other turn of the coil, whereby the uncoiling action of the severed part will cause a separation of the angular members of said severed part.

10. The method of forming spring-clips which consists in winding wire into a spring-coil and bending the turns thereof to form a longitudinal rib made up of a plurality of alined ears or projections offset from the body of said coil, and severing a turn of said coil at periodical intervals, whereby the uncoiling action of the severed part will cause a separation of the ears or projections of the severed part.

In testimony whereof I have hereunto set my hand this 7th day of April, A. D. 1905.

JOSHUA B. HALE.

In presence of—

HOWARD E. BARLOW,

E. I. OGDEN.