Jan. 12, 1937. H. I. DANZIGER 2,067,521

MACHINE FOR MAKING WIRE ELEMENTS

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Fig.1

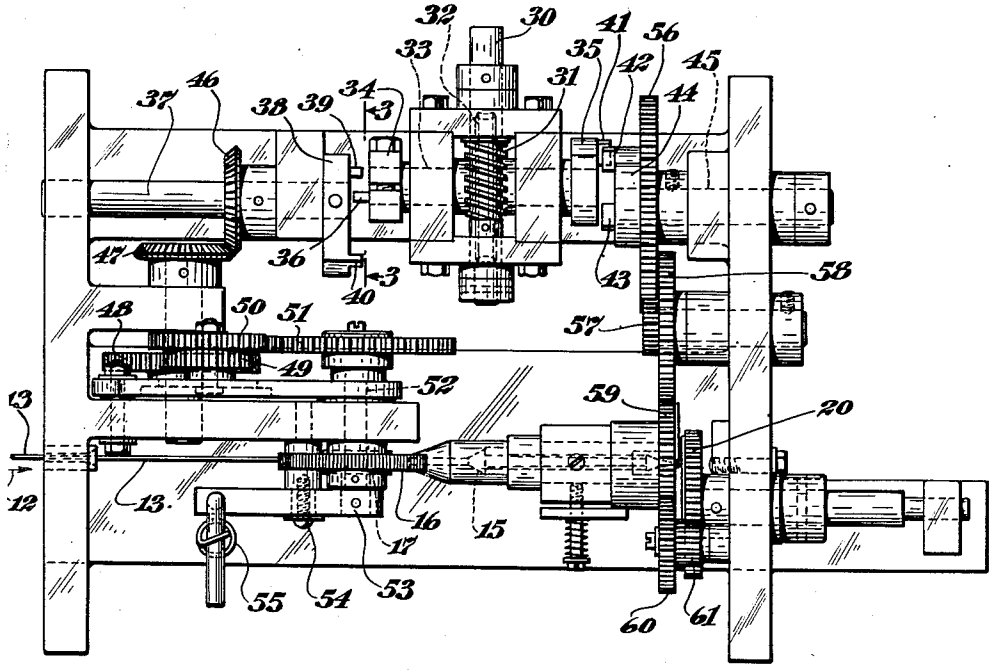
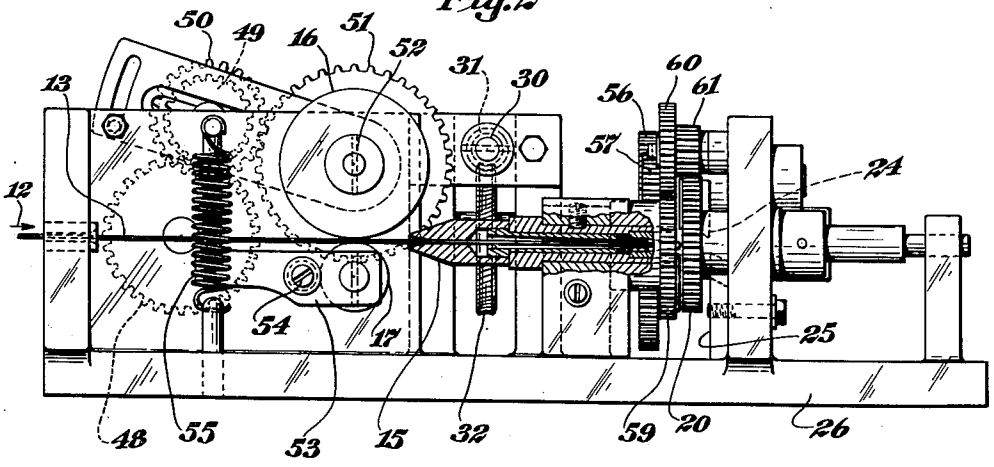


Fig.2



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Fig. 3

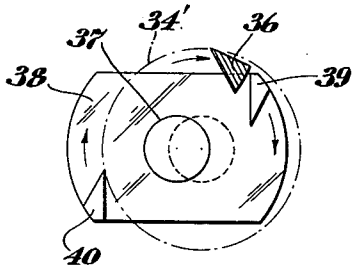


Fig. 4

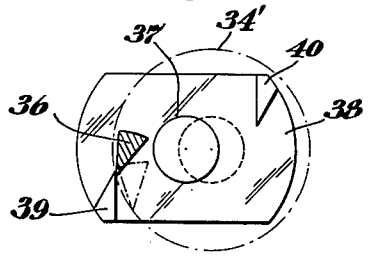


Fig. 8

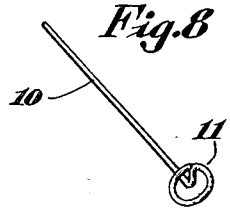


Fig. 5

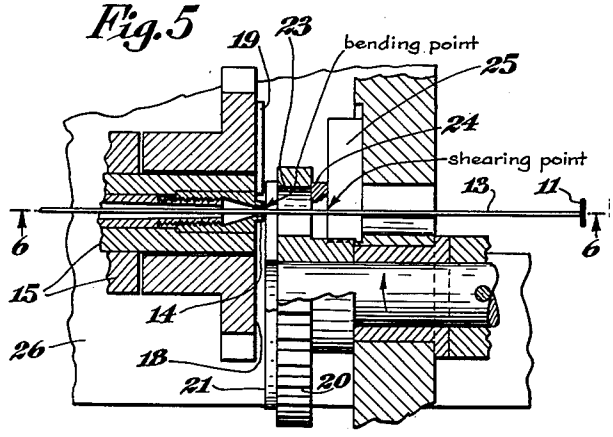
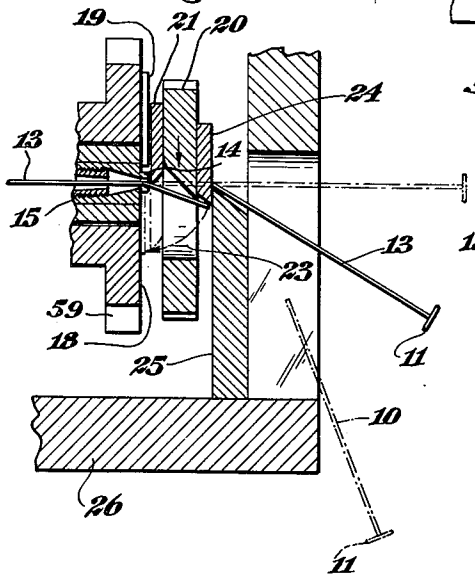


Fig. 6



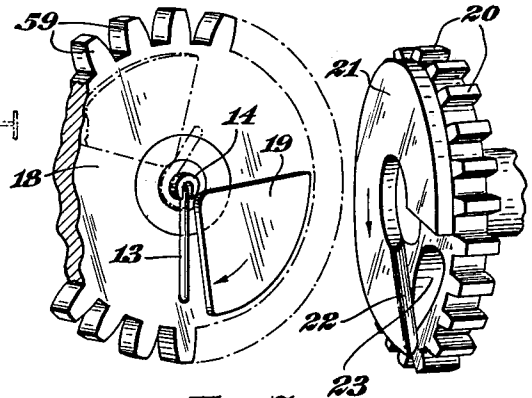


Fig. 7

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UNITED STATES PATENT OFFICE

2,067,521

MACHINE FOR MAKING WIRE ELEMENTS

Harold I. Danziger, Williamstown, Mass.

Application February 7, 1936, Serial No. 62,755

17 Claims. (Cl. 140—92)

My present invention relates to a machine for making special types of wire elements.

In the manufacture of certain types of electrical condensers, a coiled or wound condenser body is inserted into a tubular sheath, and wire contact elements are mounted in the sheath at the opposite ends thereof so as to establish contact with the opposite ends of the condenser body, respectively. These wire elements may be satisfactorily formed from individual lengths of conductive wire, the characterizing feature of each wire element residing in the formation, at one end, of a transverse head, similar to the head of a nail, this enlargement or head being preferably formed by bending a portion of the wire, itself, into a transverse loop.

The primary object of the present invention is to provide a machine for automatically forming wire elements of this character.

One of the features of the invention lies in the arrangement and provision of means for permitting wire elements to be formed successively from a single continuous length of wire, each element as it is completed being severed from the length of wire by a cutter preferably forming part of the machine.

Briefly, the machine functions by permitting a length of wire to be projected through a sort of snout, and by causing a cam element to sweep transversely across the mouth of the snout to bend the wire length into a transverse direction. A wiper then functions to bend this transverse portion of the wire around the snout, thereby forming a transverse loop. An advancement of the wire out of the snout thereupon positions the looped end at a distance from the snout, and a cutter may then be caused to function to sever the wire at a point between the snout and the loop, the latter procedure not only resulting in the delivery of a finished wire element of the character described, but leaving a projecting length of wire in readiness for the succeeding loop-forming operation.

In a preferred embodiment, means are provided for automatically actuating the cam, the wiper, the wire-advancing means, and the cutter, in timed cyclic relation.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawings, wherein—

Figure 1 is a general plan view of a machine embodying the features of the present invention;

Figure 2 is a front elevational view, with parts shown in section;

Figure 3 is a fragmentary diagrammatic cross-sectional view taken substantially along the line 3—3 of Figure 1;

Figure 4 is a view similar to Figure 3, showing a different relationship of the parts;

Figure 5 is an enlarged fragmentary cross-sectional plan view of the wire-manipulating parts of the machine;

Figure 6 is a fragmentary cross-sectional view taken substantially along the line 6—6 of Figure 5 at the moment when a completed wire element is being discharged from the machine;

Figure 7 is an exploded view, on an enlarged scale, showing the snout, the cam, and the wiper, and the manner in which they operate; and

Figure 8 is a perspective view of a completed wire element.

Referring for the moment to Figure 8, the wire element which is produced by the present machine consists of an elongated stem or shank 10, the end portion of which is bent into a transverse loop 11, the loop being substantially circular and concentrically arranged with respect to the axis of the stem 10. An element of this character is admirably adapted to serve as a connector for an electrical condenser of the type hereinbefore mentioned, the looped transverse end 11 being well adapted to bear against the end of a wound condenser body to establish contact therewith; and the stem 10 being adapted to project longitudinally from the end of a tubular sheath so as to be available for electrical connection purposes. The wire that is employed may be of any suitable electrically conductive character, and is preferably of a ductile type. It is furnished to the present machine in the form of a continuous length, preferably wound in the form of a reel (not shown), the wire being continuously drawn from the reel, fed into the present machine at the point and in the direction of the arrows 12 of Figures 1 and 2. In the figures, the wire is designated by the reference numeral 13.

The snout 14, shown most clearly in Figure 7, is formed at the forward end of a tubular assembly 15 into the rear end of which the wire is intermittently fed by a frictional feeding wheel 16, which cooperates with an idler wheel or roller 17 (see Figure 2). The snout 14 has a bore whose diameter is substantially equal to the diameter of the wire 13, and the length of the snout is also substantially of this same length. In a wall of the snout, a slot is provided, so that when the wire is bent transversely into the full-line position shown in Figure 7, it is disposed within this slot.

Reference being had to Figure 7, it will be observed that a transverse disc 18 is arranged immediately behind the snout, and this disc is preferably concentrically rotatable with respect to the snout. It carries on its face a segmentally shaped element 19 which will be hereafter referred to as a wiper.

In front of the snout provision is made for the mounting of a rotatable member 20, which I have shown in the form of a gear with peripheral teeth. This member is mounted eccentrically with respect to the snout 14, and carries on its inner face a U-shaped element 21 which serves as a cam and whose edge 22 is instrumental in initiating the transverse bending of the wire. The member 20 is also provided with an eccentric opening 23 whose function will be hereinafter described in greater detail. On the side of the member 20 opposite to the cam 21 a cutter or shear blade 24 is mounted (see Figure 6) which is adapted to cooperate with a fixed shear blade 25 mounted on the base 26 of the machine.

It is believed that the general nature and purposes of the machine will best be understood by referring first to Figures 5, 6, and 7, in which the parts alluded to hereinbefore are shown in their operative relationships.

Figure 5 depicts the parts at the moment when a projecting length of the wire has had its end formed into a loop, and after the wire has thereupon been advanced in readiness for the final cutting or shearing operation. The wire is designated by the reference numeral 13, and the looped end is designated by the reference numeral 11. With the parts in this relationship, a rotation of the member 20 brings the shear blade 24 into operative relationship to the fixed shear blade 25, thereby cutting the wire, as shown in Figure 6. The cut length or element is shown in full-lines in Figure 6, and falls by gravity into the lower dot-and-dash position; thence into a suitable receptacle.

At the same time, it will be observed that a projecting length of the wire 13 is immediately available for the ensuing loop-forming operation. This operation proceeds as follows. First the edge 22 of the cam 21 bears transversely across the projecting wire length, as shown in Figure 6, and bends this projecting length into the dot-and-dash position of Figure 6, which corresponds to the full-line position of the wire in Figure 7. The cam 21, in addition to bending the wire 13 transversely into the slot of the snout 14, serves to hold the bent wire in sandwiched relation between the outer surface of the cam 21 and the surface of the disc 18. While the wire is thus held, the disc 18 rotates in the direction of the arrow of Figure 7, and the advancing edge of the wiper 19 bears against the wire 13 and winds it around the snout 14, as indicated in dot-and-dash lines in Figure 7. The parts are so arranged and timed that when this wiping operation has been completed, and the end of the wire formed into a transverse loop, the opening 23 in the member 20 comes into alignment with the snout 14, and the advancing means becomes operative. The advancing means pushes the wire (with the looped end on it) forwardly through the opening 23, and ultimately brings the parts into the relationship shown in Figure 5. The cycle of operations is then repeated.

Reference will now be had to the remaining figures to explain the manner in which the advancing means, the wiper, the cam, and the cutter are automatically operated in timed cyclic relation.

Upon a suitable supporting structure or table 26 posts and brackets and other suitable structural supports are provided, which need not be here referred to in detail, and which serve to support the various shafts and gears entering into the driving mechanism. This mechanism is best traced from the driving shaft 30 which is adapted to be connected in any suitable manner to an electric motor (not shown) or other suitable source of motive power. A worm 31 carried by the shaft 30 serves continuously to drive a worm wheel 32 which is mounted on a stub shaft 33. The latter shaft carries at one end the element 34 and at the opposite end the element 35, each of these elements being constructed substantially as indicated in Figures 3 and 4. In the latter figures, I have illustrated the element 34, and it will be observed that a projection 36 is carried thereby.

Arranged in parallel but offset relation to the shaft 33 is the shaft 37 which carries at its end an element 38 having the two diametrically opposed projections 39 and 40. These projections are so arranged, with respect to the projection 36, that when the element 34 rotates the projection 36 encounters the projection 39, as shown in Figure 3; pushes the projection 39 ahead of it until the projection 39 has moved through 180°, as indicated in Figure 4; and then slides out of engagement with the projection 39. Subsequently, the projection 36 encounters the projection 40 and advances the latter through 180° to restore the parts to the relationship of Figure 3. The net result is that, whereas the element 34 continuously rotates, the element 38 rotates intermittently through arcs of 180°. That is, the element 38, and the shaft 37 upon which it is mounted, rotate through 180°; they are then left at rest for a period; they then rotate again through 180°; and so on.

A similar intermittent drive connection is provided in association with the element 35. This element carries a projection 41 which successively engages and disengages the projections 42 and 43 carried by the element 44, the latter being mounted on the shaft 45 which is aligned with but offset with respect to the shaft 33.

The shaft 37 controls the intermittent operation of the advancing means. More particularly, the driving mechanism can be traced from the beveled gear 46, which is mounted on the shaft 37, through the beveled gear 47, and the gears 48, 49, 50, and 51. The latter gear is mounted on the shaft 52 which carries the driving wheel 16 hereinbefore referred to.

The idler 17 which operates with the wheel 16 is mounted upon an arm 53 which is pivoted to the frame at 54 and which is constantly urged in a counterclockwise direction (as viewed in Figure 2) by means of the tension spring 55. This serves constantly to urge the idler 17 in a yieldable manner toward the wheel 16, so that a frictional engagement of the wire 13 is effected. Each time the element 13 is rotated through 180°, the wheel 16 rotates through a predetermined arc (which may be adjusted by varying the gearing relationships) so as to effect a predetermined advancement of the wire 13.

The shaft 45, on the other hand, controls the rotation of the disc 18 (which carries the wiper 19), the cam 21, and the movable shear blade 24. The driving mechanism can be traced from the gear 56, which is mounted on the shaft 45, through the gears 57, 58, 59, 60, 61, and 20. The rotation

of the member 20, hereinbefore described in connection with Figure 7, effects the timed operation of the cam 21 and the cutter 24. Similarly, the rotation of the gear 59 serves to actuate the wiper 19. In the illustrated embodiment, the disc 18 is integrally formed upon the gear 59, and the wiper 19 is similarly mounted on this gear.

Needless to say, the parts are so proportioned and arranged that the advancing means, the cam 21, the wiper 19, and the shearing mechanism, are operated in timed cyclic relation so as to carry out the procedure hereinbefore described in connection with Figures 5, 6.

It should be borne in mind that the specific driving mechanism herein described and illustrated is not the only kind of driving mechanism that could be employed. For example, the elements 34 and 35, and the manner in which they intermittently rotate the shafts 37 and 45, respectively, are merely illustrative of any convenient step-by-step driving mechanism, which will readily be understood, per se, by those skilled in the art.

Nor is it essential that the rotatable member 20 serve simultaneously as one of the driving gears. The cam 21 might, for example, be separately mounted and driven, and the same holds true with respect to the wiper 19 and the cutter 24.

In fact, my invention contemplates, from its broadest aspects, that one or another of the wire bending and cutting operations may be carried out by hand. For example, the operation of the wiper 19, the cam 21, and the cutter 24 is, by itself, the result of a cooperative combination which might be caused to function in connection with a machine where the wire is intermittently advanced by hand. Similarly, the operation of the wiper 19 and the cam 21 may be used as a cooperative assembly in connection with a machine in which not only the advancing means, but also the cutting means, is actuated by hand.

Furthermore, while I have shown a preferred embodiment in which the wiper 19 serves to bend the projecting wire into a loop defined by only a single complete turn of the wire (360°), it will be understood that under certain circumstances it may be desirable to alter the relationship between the projecting length of the wire and the diameter of the snout, so that the wiper will serve to bend the wire through more or less than 360°. In the former case, the wire loop would be formed by a sort of spiral.

The cutting instrumentality may also be mounted in such a way that its distance from the snout could be variable, thereby permitting varying projecting lengths of wire to be acted upon by the cam and wiper.

In general, it will be understood that changes, in the details herein described and illustrated for the purpose of explaining the nature of my invention, may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is, therefore, intended that these details be interpreted as illustrative, and not in a limiting sense.

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

1. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, and a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop.

2. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, and means for moving said cam and wiper in timed relation.

3. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, and a cutter positioned in advance of the snout for severing the wire upon advancement thereof.

4. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, a cutter positioned in advance of the snout for severing the wire upon advancement thereof, and means for moving said cam and wiper and actuating said cutter in timed relation.

5. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, and means for thereupon advancing the wire through the snout to position the loop at a point well beyond the snout.

6. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, means for thereupon advancing the wire through the snout to position the loop at a point well beyond the snout, and means for moving said cam and wiper and effecting said advancement in timed relation.

7. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse lop, means for thereupon advancing the wire through the snout to position the loop at a point well beyond the snout, and a cutter for severing the advanced wire at a point between the snout and the loop so as to leave a projecting length in readiness for subsequent operation.

8. In a machine for making wire elements of

the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, means for thereupon advancing the wire through the snout to position the loop at a point well beyond the snout, a cutter for severing the advanced wire at a point between the snout and the loop so as to leave a projecting length in readiness for subsequent operation, and means for moving the cam and wiper and actuating the advancing means and cutter in timed relation.

9. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, means for thereupon advancing the wire through the snout to position the loop at a point well beyond the snout, a cutter for severing the advanced wire at a point between the snout and the loop so as to leave a projecting length in readiness for subsequent operation, and means for moving the cam and wiper and actuating the advancing means and cutter in timed cyclic relation so that a plurality of wire elements may be automatically and successively produced from an original supply of wire.

10. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, a transverse disc behind said snout, and said cam having a surface parallel to said disc adapted to retain said bent length in sandwiched relation between the cam and disc during the wiping operation.

11. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a transverse disc behind the snout mounted for concentric rotation with respect to the snout, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire against said disc, and a wiper carried by said disc and adapted to bear against said bent length and wind it around the snout to form a transverse loop.

12. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a transverse disc behind the snout mounted for concentric rotation with respect to the snout, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire against said disc, and a wiper carried by said disc and adapted to bear against said bent length and wind it around the snout to form a transverse loop, said cam having a surface parallel to said disc adapted to retain said bent length in sandwiched relation between the cam and disc during said wiping operation.

13. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a rotatable member mounted eccentrically with respect to the snout, a cam carried by said member and adapted to sweep transversely across the mouth of the snout to bend a projecting length of the wire into a transverse direction, and a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop.

14. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a rotatable member mounted eccentrically with respect to the snout, a cam carried by said member and adapted to sweep transversely across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, and a cutter carried by said rotatable member for severing the wire upon advancement thereof.

15. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a rotatable member mounted eccentrically with respect to the snout and having an opening therethrough, said opening aligning with the snout during rotation of said member, a cam carried by said member on one side thereof and adapted to sweep transversely across the mouth of the snout tc bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, and means for thereupon advancing the wire through the snout and through said opening to position the loop at a point well beyond said member.

16. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a rotatable member mounted eccentrically with respect to the snout and having an opening therethrough, said opening aligning with the snout during rotation of said member, a cam carried by said member on one side thereof and adapted to sweep transversely across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, means for thereupon advancing the wire through the snout and through said opening to position the loop at a point well beyond said member, and a cutter carried by said member on the other side thereof for severing the advanced wire at a point between the snout and the loop.

17. In a machine for making wire elements of the character described, a snout adapted to receive a wire therethrough, a cam mounted for transverse sweep across the mouth of the snout to bend a projecting length of the wire into a transverse direction, a wiper mounted for concentric movement around the snout to wind said bent length around the snout to form a transverse loop, and a rotatable member supporting said cam and mounted eccentrically with respect to the snout, said member having an opening which comes into alignment with the snout after the wiping operation, so as to permit the looped wire to be advanced therethrough.

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