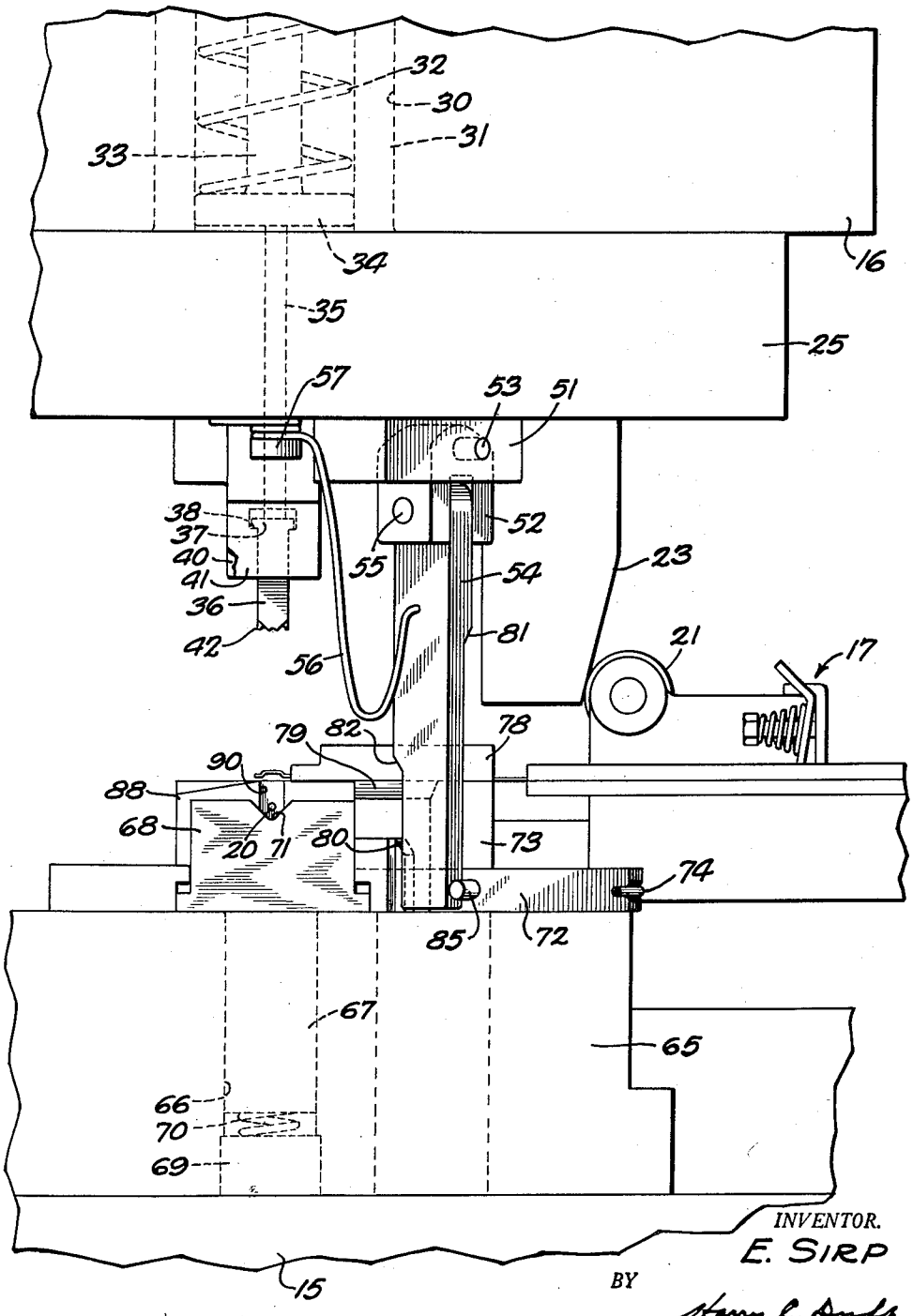
March 16, 1948. E. SIRP 2,438,023

APPARATUS FOR CUTTING WIRES AND FORMING AND ATTACHING A SLEEVE THERETO

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FIG. 1



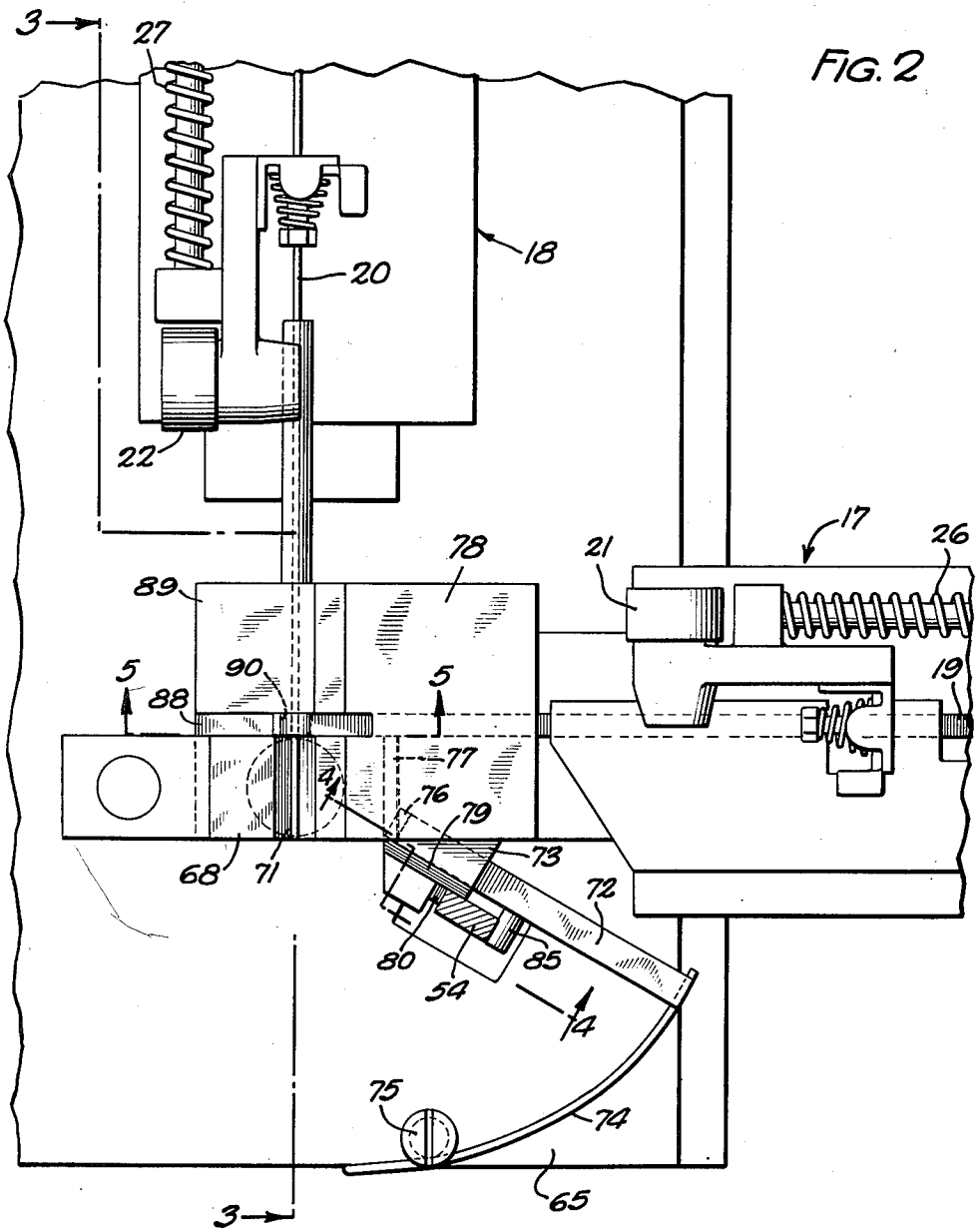
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APPARATUS FOR CUTTING WIRES AND FORMING AND ATTACHING A SLEEVE THERETO

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FIG. 2



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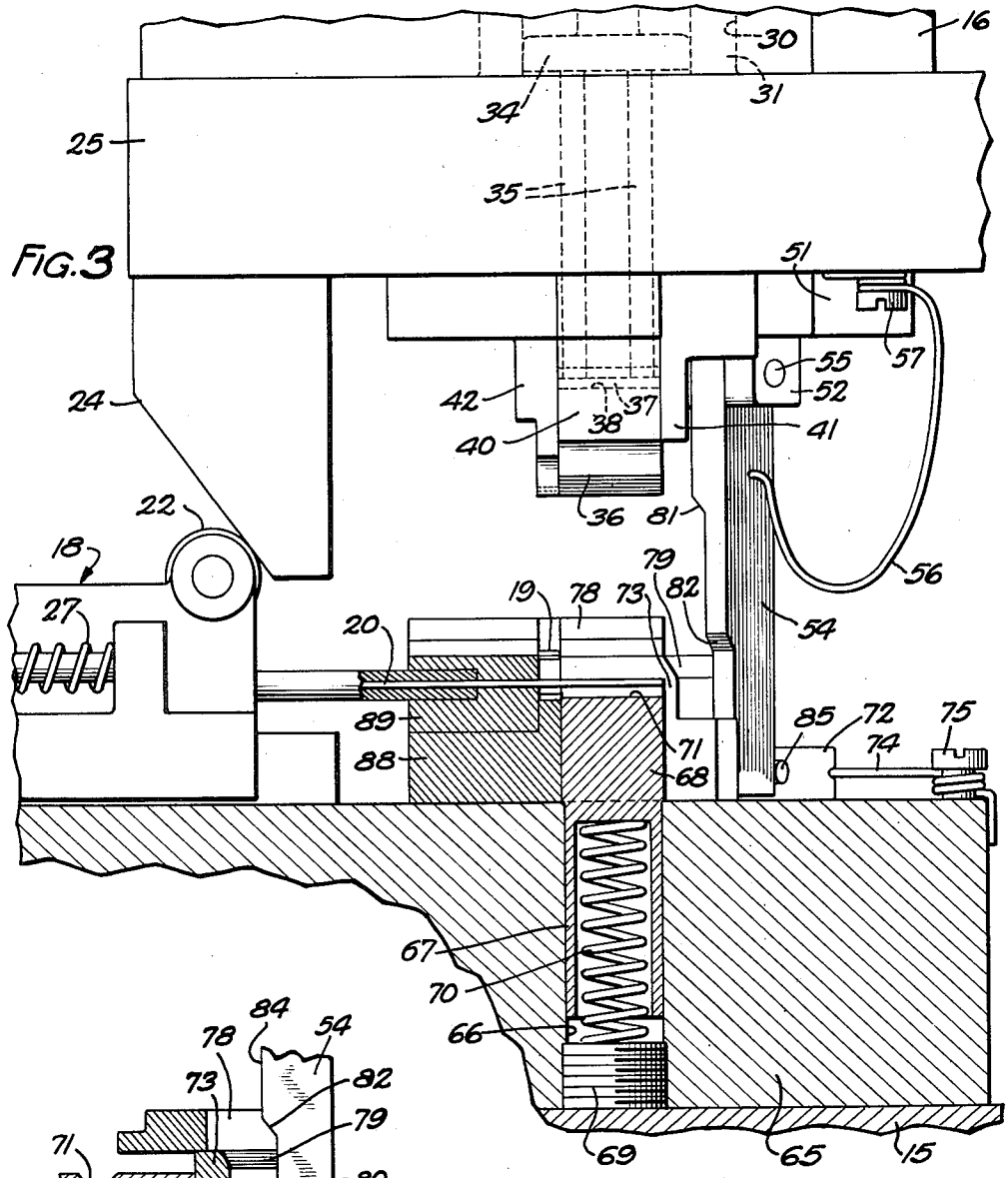
ATTORNEY

March 16, 1948. E. SIRP 2,438,023

APPARATUS FOR CUTTING WIRES AND FORMING AND ATTACHING A SLEEVE THERETO

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FIG. 3



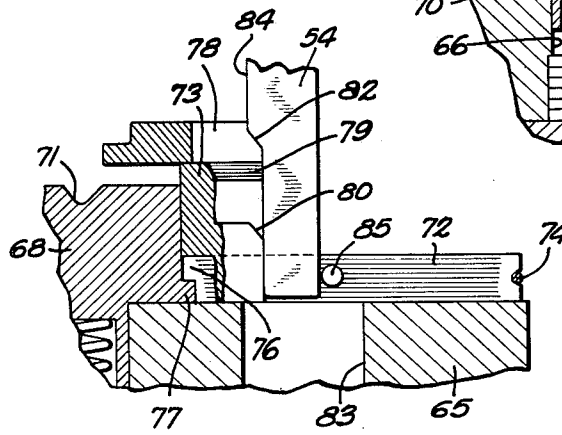


FIG. 4

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March 16, 1948. E. SIRP 2,438,023

APPARATUS FOR CUTTING WIRES AND FORMING AND ATTACHING A SLEEVE THERETO

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FIG. 6

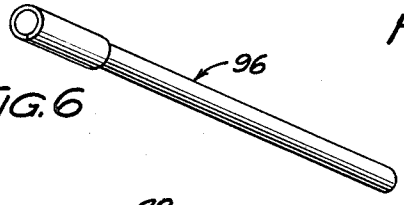


FIG. 5

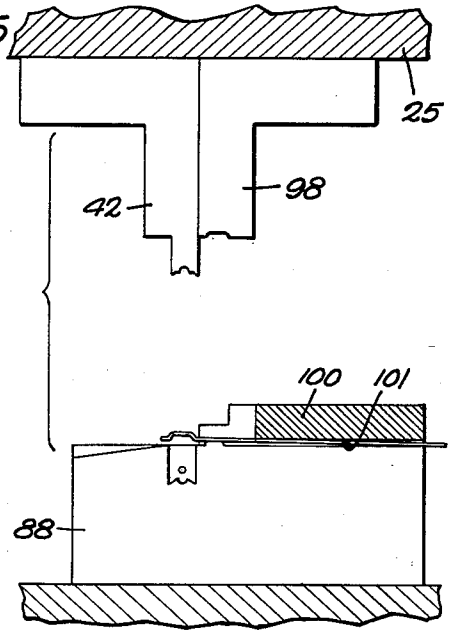


FIG. 7

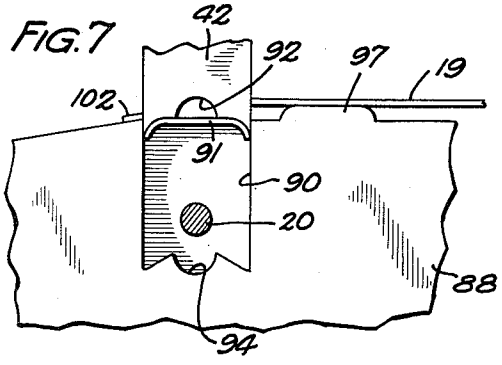


FIG. 8

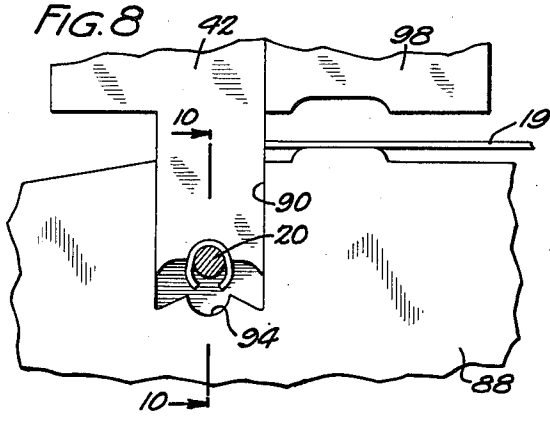


FIG. 10

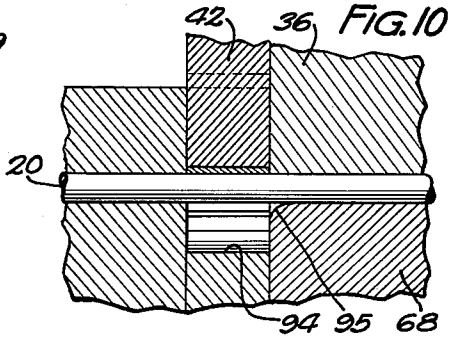


FIG. 9

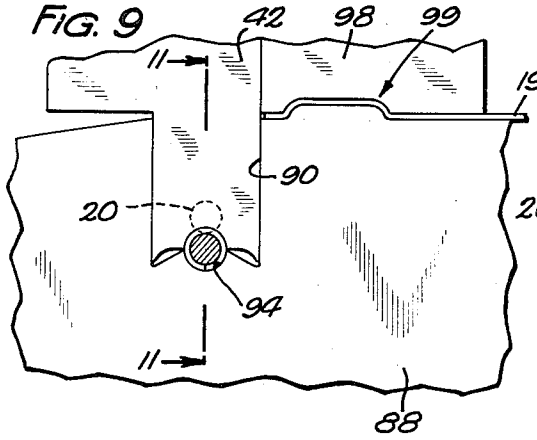
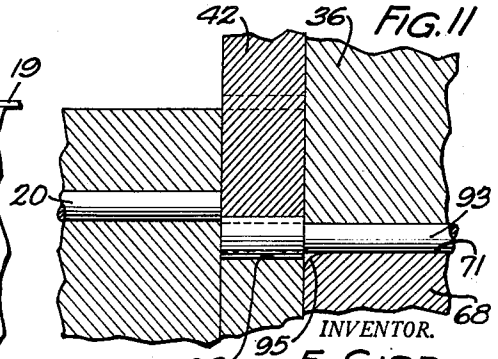


FIG. 11



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Patented Mar. 16, 1948

2,438,023

UNITED STATES PATENT OFFICE

2,438,023

APPARATUS FOR CUTTING WIRES AND FORMING AND ATTACHING A SLEEVE THERETO

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Application September 15, 1943, Serial No. 502,495

11 Claims. (Cl. 29—33.5)

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This invention relates to article forming apparatus and more particularly to apparatus for forming an article by cutting lengths from supplies of differently shaped material and attaching them one to the other.

It is an object of the present invention to provide a simple apparatus for rapidly forming articles.

In accordance with one embodiment of the invention, a copper conductor is fed from a supply thereof simultaneously with the feeding of a strip of nickel from a supply thereof and a short section of the strip of nickel is wrapped around and tightly gripped on the end of the length of copper wire. During the forming of the nickel strip on the copper wire, a length of copper wire is sheared from the supply. The apparatus is adapted for use in conjunction with a punch press, which, in a single stroke, performs all of the forming and shearing operations necessary to produce a complete part.

A complete understanding of the invention may be had by reference to the following detailed description of one embodiment thereof when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a front elevational view of a portion of a punch press having mechanism mounted thereon which constitutes the preferred embodiment of the present invention;

Fig. 2 is an irregular plan sectional view showing the mechanisms mounted on the bed of the punch press and showing one of the cams of the press in section;

Fig. 3 is an irregular vertical sectional view taken substantially along the line 3—3 of Fig. 2 in the direction of the arrows;

Fig. 4 is an irregular vertical sectional view taken substantially along the line 4—4 of Fig. 2 in the direction of the arrows;

Fig. 5 is a fragmentary vertical sectional view taken substantially along the line 5—5 of Fig. 2 in the direction of the arrows;

Fig. 6 is a view in perspective of the article formed in the present apparatus;

Figs. 7, 8 and 9 are enlarged fragmentary sectional views similar to Fig. 5 and showing some of the operating parts of the apparatus in the positions they occupy progressively during the formation of the article shown in Fig. 6; and

Figs. 10 and 11 are fragmentary sectional views taken substantially along the lines 10—10 and 11—11, respectively, of Figs. 8 and 9, respectively.

Referring to the drawings, particular reference being first had to Figs. 1 and 2, it will be

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seen that the apparatus includes a bed 15 and a ram 16 of a punch press. Mounted in any suitable manner on the bed 15 of the punch press are two intermittently operable feeding devices 17 and 18, which may be of any suitable construction for feeding measured lengths of strip material 19 and wire 20, respectively. As is usual in such feeding devices, cam rollers 21 and 22 are provided in the feeding devices 17 and 18, respectively, which, upon reciprocation of the ram 16, will be positively driven away from the center of the press by cams 23 and 24, respectively (Figs. 1 and 3), latched to a tool plate 25, which is, in turn, suitably connected to the ram 16. The feeding devices 17 and 18 are adapted, on movement of the ram 16 upwardly, to feed a predetermined length of strip material and wire, respectively, toward the center of the press due to the energy stored in springs 26 and 27, respectively, forming a part of the feeding devices. Since the details of these feeding devices do not form an essential part of the present invention, but may be of any suitable construction, no further description of these mechanisms is believed to be necessary, it being sufficient to state that each time the ram 16 moves upwardly, the feeding devices 17 and 18 will feed predetermined lengths of strip material 19 and wire 20 to the tools of the press.

The ram 16 is cut away, as shown at 30, to receive a sleeve 31, in which a spring 32 may be positioned, the upper end of the spring abutting against either a portion of the ram 16 or a closed end of the sleeve 31 (not shown) and encircling the stem 33 of a spring-pressed plunger 34. The plunger 34 is urged against an actuator rod 35, which normally urges a clamping tool 36 to assume the position shown in Figs. 1 and 3. The clamping tool 36 is provided with a head portion 37 (Fig. 1), which is nested in a T-shaped slot 38 formed in a tool supporting block 40, which is interposed between a retainer block 41 (Fig. 3) and a shearing and crimping tool 42. The shearing and crimping tool 42 and the retainer block 41 serve to hold the clamping tool 36 in its T-shaped slot 38 and the tool 36 is normally urged downwardly through the action of the plunger 34 on the upper ends of the pressure rods 35. The shearing and crimping tool 42, the retainer block 41 and the tool supporting block 40 are all fixed to the tool plate 25 in any suitable manner and the clamping tool 36 may be moved upwardly slightly against the action of the spring 32 in the operation of the apparatus, but the shearing and crimping tool 42 is rigid

with respect to the tool plate 25 and will be positively reciprocated by it when it is reciprocated in the operation of the punch press.

In addition to the just-described mechanism, the tool plate 25 carries the cams 23 and 24, as described hereinbefore, and has a cam supporting block 51 fixed to it (Figs. 1 and 3). The cam supporting block 51 has a U-shaped member 52 pivotally attached to it by means of a pivot pin 53. The U-shaped member 52 has a cam member 54 pivoted on it by means of a pivot pin 55, which extends through the cam member 54 and through both depending legs of the U-shaped member 52. In this manner, the cam member 54 is pivoted for movement in two opposed planes. The cam member 54 has one end of a spring 56 fixed in it, the other end of the spring being attached to the tool plate 25 by means of a machine screw 57. The spring 56 is biased to normally tend to hold the cam member 54 in the position shown in Figs. 1, 2, 3 and 4, but the cam member may be moved in two planes, as pointed out hereinbefore, in the operation of the apparatus.

Suitably mounted upon the bed 15 of the punch press is a tool supporting block 65, which supports the lower set of tools for operating on the article being formed in the apparatus. The tool supporting block 65 has an aperture 66 formed in it for receiving a sleeve-like extension 67 of a lower clamping tool 68. The lower end of the aperture 66 is closed by a threaded member 69, against which a compression spring 70 bears. The spring 70 extends upwardly into the sleeve-like extension 67 and normally urges the clamping tool 68 to assume the position shown in Fig. 3. The clamping tool 68 is rectangular in cross section and has a wire-receiving notch 71 formed in it for receiving the end of the wire 20, a latch bar 72 slidably mounted on the upper surface of the tool supporting block 65 and extending into a guide member 73 being normally urged toward the lower clamping tool by a spring 74 coiled around a machine screw 75 and bearing against an edge of the tool supporting block 65. The latch bar 72 is provided with a latching extension 76 (Fig. 4), which is adapted to extend over a shoulder 77 formed on the lower clamping tool 68. The guide member 73 is of very irregular shape and extends from the top of the tool supporting block 65 upwardly to support a cover plate 78. A pair of cam surfaces 79 and 80 are formed on the guide block 73 and are adapted to cooperate with cam surfaces 81 and 82, respectively, on a cam member 54, which, in the operation of the apparatus, will be moved downwardly with the ram 16 into a suitable aperture 83 formed in the tool supporting block 65 and will carry the cam surface 82 into engagement with the cam surface 80 to shift the latch bar 72 to the right (Fig. 4) to carry the latching extension 76 out of engagement with the shoulder 77 on the lower clamping tool 68 and will later carry the cam surface 81 into engagement with the cam surface 79 to disengage the straight side 84 of the cam member 54 from the cam surface 80, thus to permit the latch bar 72 to spring back to the position shown in Fig. 4, pin 85 on the latch bar 72 serving to interconnect the latch bar 72 with the cam member 54. Thus, in the operation of the apparatus, the cam member 54 will first unlatch the clamping tool 68 and will then release the latch bar 72 to relatch the clamping tool, the spring 74 being stronger than the spring 56. The release of the clamping tool 68 by the latch bar 72 will take place at just about the time that the upper clamping tool 36 engages the wire

20 so that the wire will be clamped between the clamping tools 68 and 36 and will move downwardly with the clamping tool 36.

Positioned alongside the clamping tool 68 and fixed to the tool supporting block 65 is a forming block 88 carrying, in a cut-out upper surface of it a wire guiding member 89. The wire guiding member 89 also serves as a shear block against which the wire will be sheared by the shearing and crimping tool 42 when the shearing and crimping tool 42 moves downwardly, as illustrated in Figs. 7, 8, 9, 10 and 11. The forming block has a slot 90 formed in it, the edges of which cooperate with the shearing edges of the shearing and crimping tool 42, as shown in Fig. 7, to shear a length 91 of strip material from the supply 19 thereof. The shearing and crimping tool 42 is provided with a forming notch 92, which serves to partially wrap the length 91 of material 19 around the wire 20 while the wire 20 is held between the clamping tools 36 and 68 and while these tools are in the position shown in Fig. 10. Continued downward movement of the shearing and crimping tool 42 will cause the left edge of the tool 42 (Fig. 10) to shear the length 93 of wire from the wire 20 and as the sheared-off length 93 of wire is moved downwardly, a crimping surface 94 will complete the forming of a sleeve of material on a length of wire 93, as shown in Figs. 9 and 11. The left edge of the wire-receiving notch 71 is rounded, as shown at 95, thereby to facilitate the removal of the article 96, shown in Fig. 6, from the apparatus by the wire 20, pushing the article out of the notch 71.

Prior to being fed to position directly above the slot 90 formed in the forming block 88, the end of the supply of material 19 will project over a forming hump 97 and a forming tool 98 fixed to the tool plate 25 will cooperate with this forming hump to bend the strip material 19, as shown at 99 in Fig. 10. This operation will occur at the end of the downstroke of the ram 16 simultaneously with the completion of the forming of the previously formed length 91 of strip material 19 around the length 93 of wire 20. The completed article will be ejected from the apparatus by the wire 20 being fed into position between the clamping tools 36 and 68, it being understood that the strip of material 19 is fed between an extension of the forming block 88 and a top plate 100, which is suitably cut out as shown at 101 (Fig. 5) to permit the passage of the strip of material between it and the upper surface of the forming block 88. By reference to Fig. 7, it will be seen that a short length 102 of strip material 19 is sheared from the supply thereof as the crimping and forming tool 42 engages the strip 19, whereby the length 91 will not be inclined to tilt in the slot 90, but will be wedged therein slightly and will be carried straight down onto the wire 20. In the operation of the apparatus, a complete article 96 will be formed for each stroke of the punch press ram and the sequence of operations will be as follows:

As the ram moves upwardly after the formation of an article, the feeding devices 17 and 18 will feed a length of strip material 19 and a length of wire 20 into position beneath the crimping and forming tool 42 and the clamping tool 36. When the strip material 19 and wire 20 are in this position, the ram having reached the upper end of its stroke, the downstroke of the press may be initiated in any suitable manner. As the ram 16 moves downwardly, the cam surface 82 will engage with cam surface 80 and through the action of the pin 85 will move the

latch bar 72 to the right (Fig. 4), thereby to release the clamping tool 68, which will move upwardly to engage its shoulder with the underside of the slot in the guide member 73, where the notch 71 will receive the wire 20 in it. Continued downward movement of the ram 16 will cause the clamping tool 36 to cooperate with the clamping tool 68 and grip the length 93 of wire between them to move downwardly after the clamping tool 36 has moved upwardly a relatively short distance as limited by the depth of the horizontal portion of the T-shaped slot 38. As the clamping tool 36 engages the length 93 of wire 20, the crimping and forming tool 42 will form the length 91 of strip material 19, as shown in Fig. 8, the length 91 having been cut from the supply of material 19 as the crimping and forming tool 42 entered the slot 90. It will be understood that on a previous operation, the end of the length of material 19 had been bent, as shown at 99. After the crimping and forming tool 42 has reached the position shown in Fig. 8, the cut off length of strip material 91 will have been formed, as shown in Fig. 8, and continued downward movement of the crimping and forming tool 42 will cause the length of wire 93 to be sheared from the wire 20 and the cooperating forming notches 92 and 94 will completely crimp the sleeve of strip material on the wire. Simultaneously with the completion of the forming of the length 91 of strip material around the length of wire 93, the end portion of the strip material 19 will be formed, as shown at 99 by the forming tool 98. In this manner, a complete article 96 will be formed in the apparatus and as the ram 16 moves upwardly, the feeding device 18, in feeding a new length of wire 20 into position between the tools of the apparatus, will force the completed article 96 out of the clamping tool 68 and a new cycle may be initiated.

What is claimed is:

1. An article forming apparatus for severing a length of wire from a supply thereof and forming and attaching a sleeve to the length of wire comprising wire feeding means, strip material feeding means, a ram, means actuated thereby and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, clamping tools on the ram and block for clamping the wire during the forming operations, and means for releasing one of said clamping tools to resiliently clamp the wire on the operating stroke of the ram, including a cam member mounted on the ram, a latch for normally latching the clamping tool in inoperative position, and means on the latch engageable by the cam member to operate the latch.

2. An article forming apparatus for severing a length of wire from a supply thereof and forming a sleeve and attaching it to said length of wire comprising wire feeding means, strip material feeding means, a ram, means actuated by said ram and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, clamping tools on the ram and block for clamping the wire during the forming operations, and means for releasing one of said clamping tools to resiliently clamp the wire on the operating stroke of the ram, including a cam member, a universal joint for connecting the cam member to the ram, a latch bar actuatable by the cam member, and cam surfaces on the tool supporting block for first moving the cam member to release the latch bar and to then render the cam member ineffective with respect to the latch bar.

3. An article forming apparatus for severing a length of wire from a supply thereof and forming and attaching a sleeve on said wire comprising wire feeding means, strip material feeding means, a ram, means carried by said ram and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, clamping tools on the ram and block for clamping the wire during the forming operations, and means for releasing one of said clamping tools to resiliently clamp the wire on the operating stroke of the ram, including a cam member, a universal joint for connecting the cam member to the ram, a latch bar actuatable by the cam member, a cam for cooperating with said cam member to move the cam member in one direction for releasing the latch bar, and a second cam for cooperating with the cam member to disengage the cam member from the first-mentioned cam.

4. In an apparatus for cutting lengths of wire from a supply thereof and attaching sleeves thereto, the combination of a punch press including a bed and a ram with a clamping tool on the bed of the press, a clamping tool on the ram of the press, a cam member carried by the ram, and latching means releasable by said camming member for normally holding one of the clamping tools in a non-clamping position.

5. In an apparatus for cutting lengths of wire from a supply thereof and attaching sleeves thereto, the combination of a punch press having a bed and a ram with a shearing and forming tool mounted on the ram, and a cooperating shearing and forming tool mounted on the bed, said shearing and forming tools each having three shearing edges for cutting a piece of strip metal at two edges and a wire at the third edge and each having forming surfaces for forming the piece of strip material around the wire.

6. An article forming apparatus for cutting lengths of wire from a supply thereof and concurrently forming and attaching a sleeve to said length of wire comprising wire feeding means, strip material feeding means, a ram, means actuated by said ram and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, clamping tools on the ram and block for clamping the wire during

the forming operations, means for releasing one of said clamping tools to resiliently clamp the wire on the operating stroke of the ram, including a cam member, a universal joint for connecting the cam member to the ram, a latch bar actuatable by the cam member, cam surfaces on the tool supporting block for first moving the cam member to release the latch bar and to then render the cam member ineffective with respect to the latch bar, and means for normally urging the cam member toward said cam surfaces.

7. An article forming apparatus for cutting lengths of wire from a supply thereof and concurrently forming and attaching a sleeve to said length of wire comprising wire feeding means, strip material feeding means, a ram, means actuated by said ram and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, clamping tools on the ram and block for clamping the wire during the forming operations, means for releasing one of said clamping tools to resiliently clamp the wire on the operating stroke of the ram, including a cam member, a universal joint for connecting the cam member to the ram, a latch bar actuatable by the cam member, a cam for cooperating with said cam member to move the cam member in one direction for releasing the latch bar, a second cam for cooperating with the cam member to disengage the cam member from the first-mentioned cam, and a spring having its ends fixed to the ram and cam member for urging the cam member toward both of said cams.

8. An article forming apparatus for cutting a length of wire from a supply thereof and concurrently forming and attaching a sleeve to said length of wire comprising wire feeding means, strip material feeding means, a ram, means actuated by said ram and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, and cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, said feeding means being simultaneously operable to feed a length of wire and a length of strip material to position between the tools.

9. An article forming apparatus for cutting a length of wire from a supply thereof and concurrently forming and attaching a sleeve to said length of wire comprising wire feeding means, strip material feeding means, a ram, means actuated by said cam and operable to actuate both of said feeding means, a tool supporting block positioned to cooperate with said ram, cooperating shearing tools on the block and ram for shearing lengths of wire and strip fed to the tools by the separate feeding means, and cooperating forming tools on the ram and block for wrapping the sheared length of strip material around the wire to form a sleeve thereon, said feeding means being simultaneously operable to feed a length of wire and a length of strip material to superposed relation between the tools.

10. In an apparatus for severing a length of wire from a supply thereof and forming and attaching a sleeve on said wire, a reciprocable ram, a clamping tool on the ram for engaging the wire, a tool supporting bed cooperating with said ram, tools on said ram and bed for forming a sleeve around the wire, a fixed wire support on said bed, a movable clamping tool on said bed cooperating with the clamping tool on the ram and the fixed wire support to clamp opposite ends of the wire in position to serve as a mandrel for a part of the formation of the sleeve by the sleeve forming tools, and means for rendering the movable clamping tool on the bed operative to engage one end of the wire prior to said part of the formation of the sleeve.

11. In an apparatus for cutting lengths of wire from a supply thereof and forming and attaching a sleeve thereto, the combination of a punch press having a bed and a ram with a shearing and forming tool on said ram, a cooperating shearing and forming tool on the bed, means for feeding strip material at an upper level of said tool on the bed, means for feeding wire at a lower level of said tool on the bed, forming surfaces on said tools for bending the strip at said upper level, cooperating shearing edges on the tools for shearing a bent portion from the strip at the upper level, and forming surfaces on said tools for forming the bent portion around the wire at the lower level, said last mentioned forming surface of the tool on the ram being operative to push the cut-off bent portion to said lower level.

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