

Oct. 8, 1946.

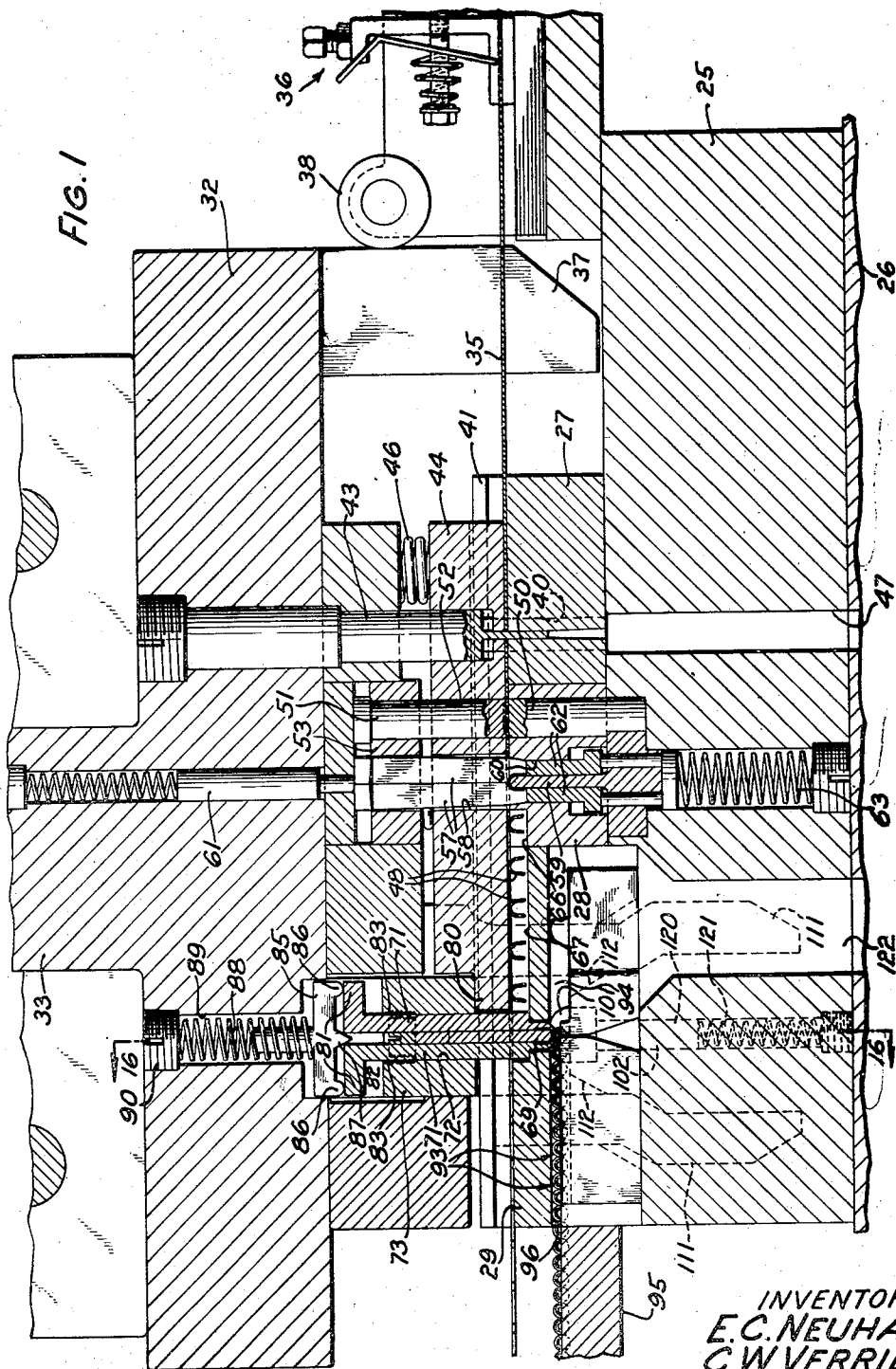
E. C. NEUHAUS ET AL

2,409,147

APPARATUS FOR FORMING AND ASSEMBLING ARTICLES

Filed July 20, 1943

5 Sheets-Sheet 1



INVENTORS
E.C. NEUHAUS
C.W. VERRILL
BY *Harry L. Sufka*
ATTORNEY

Oct. 8, 1946.

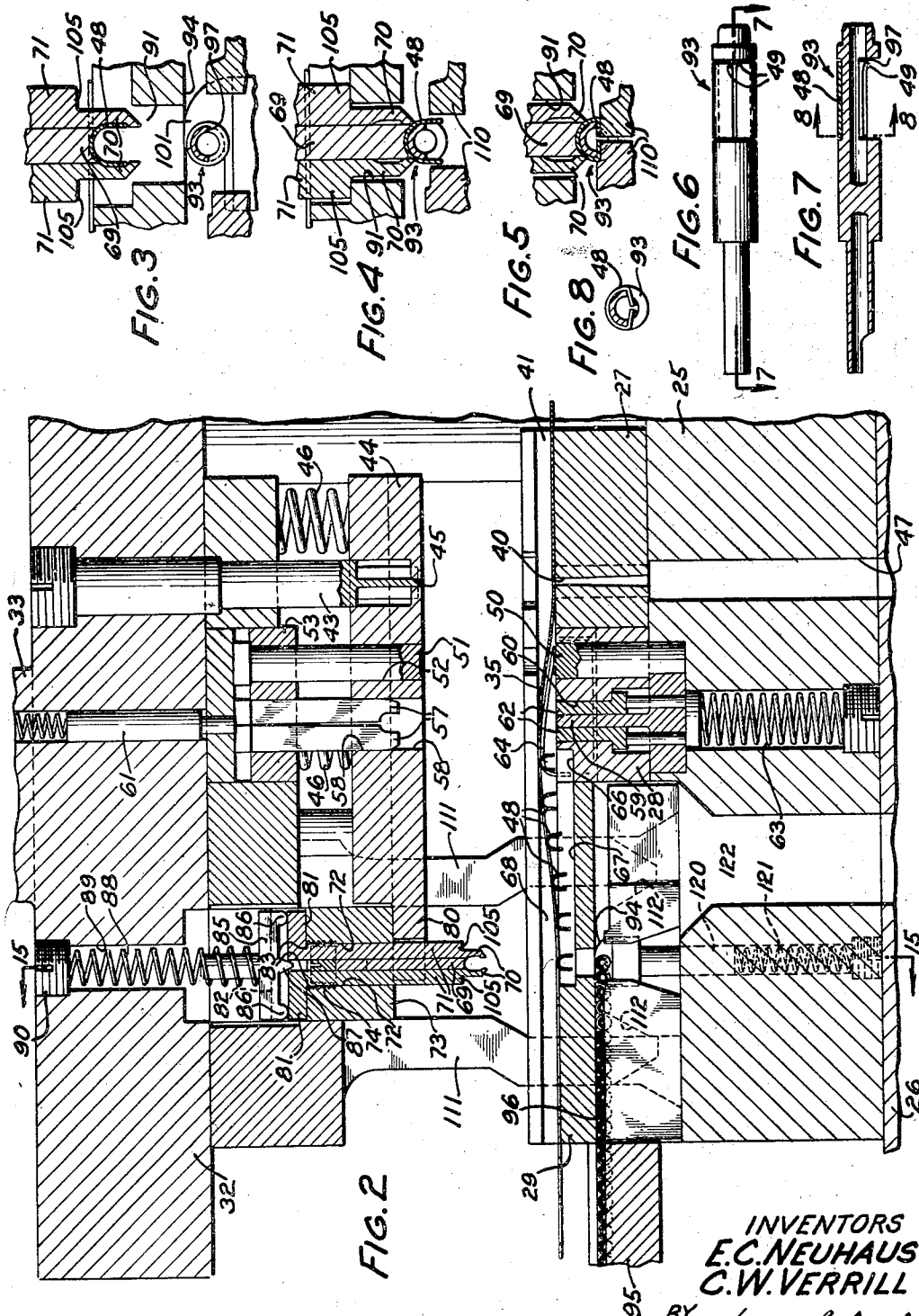
E. C. NEUHAUS ET AL

2,409,147

APPARATUS FOR FORMING AND ASSEMBLING ARTICLES

Filed July 20, 1943

5 Sheets-Sheet 2



INVENTORS
E.C. NEUHAUS
C.W. VERRILL

BY *Harry L. Smith*
ATTORNEY

Oct. 8, 1946.

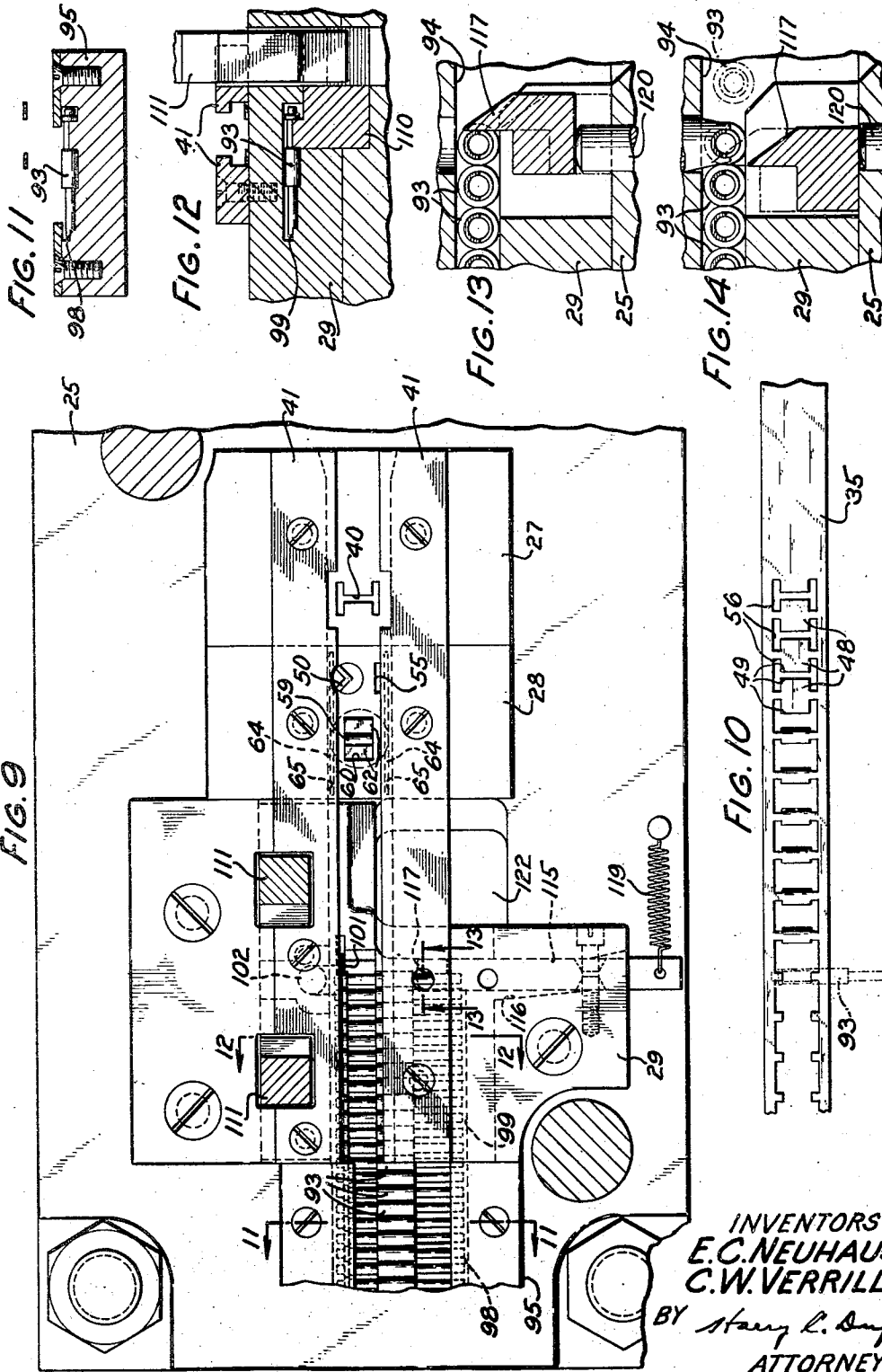
E. C. NEUHAUS ET AL

2,409,147

APPARATUS FOR FORMING AND ASSEMBLING ARTICLES

Filed July 20, 1943

5 Sheets-Sheet 3



INVENTORS
E.C. NEUHAUS
C.W. VERRILL

BY *Harry L. Swift*
ATTORNEY

Oct. 8, 1946.

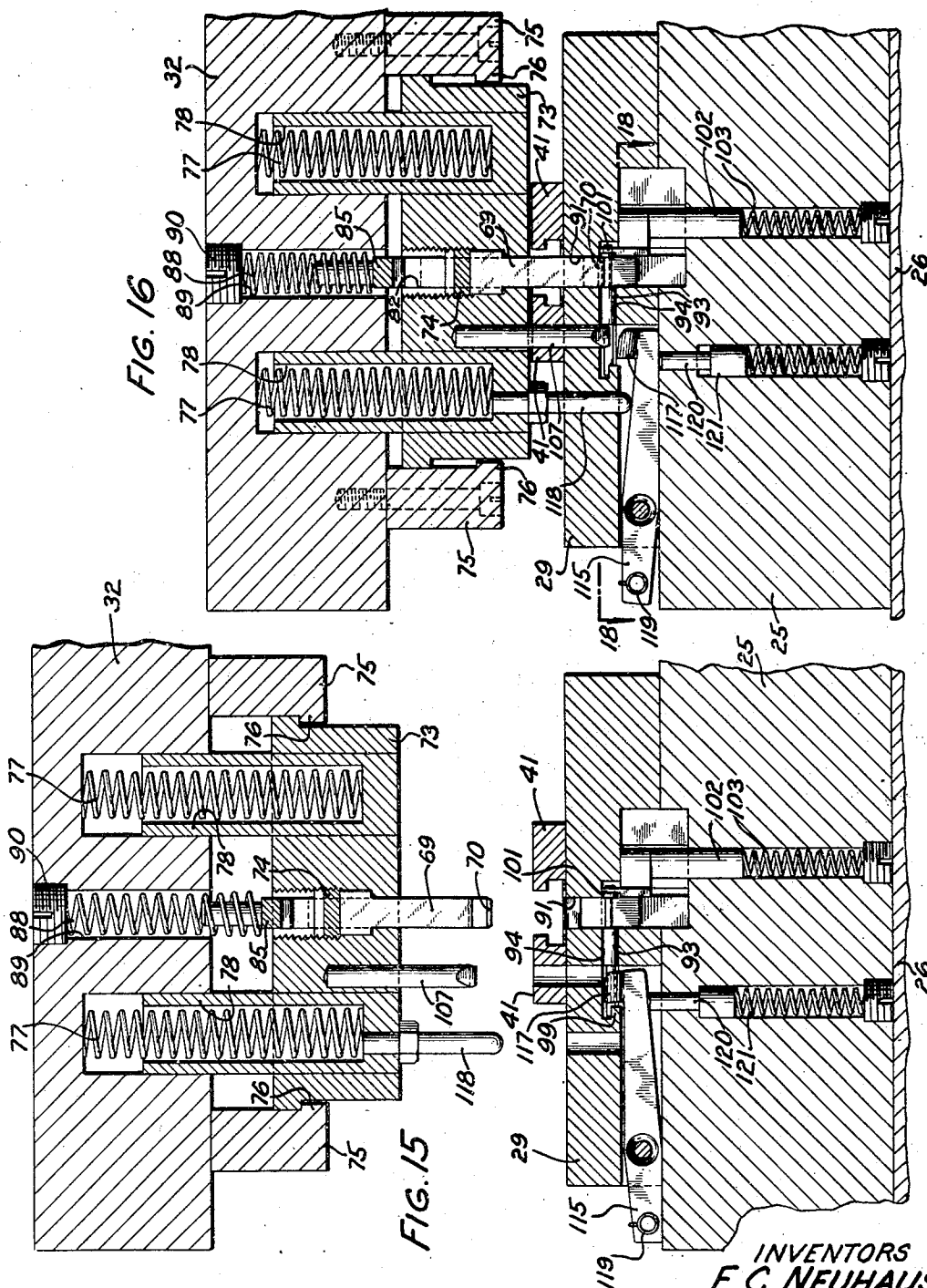
E. C. NEUHAUS ET AL

2,409,147

APPARATUS FOR FORMING AND ASSEMBLING ARTICLES

Filed July 20, 1943

5 Sheets-Sheet 4



INVENTORS
E. C. NEUHAUS
C. W. VERRILL
BY *Harry R. Buft*
ATTORNEY

Oct. 8, 1946.

E. C. NEUHAUS ET AL

2,409,147

APPARATUS FOR FORMING AND ASSEMBLING ARTICLES

Filed July 20, 1943

5 Sheets-Sheet 5

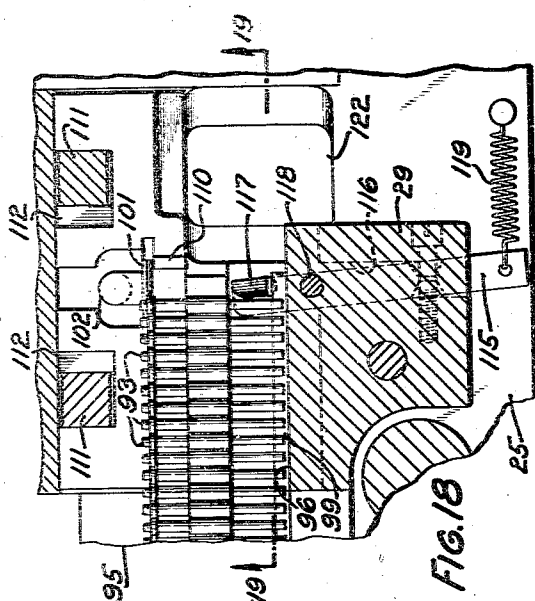


FIG. 18

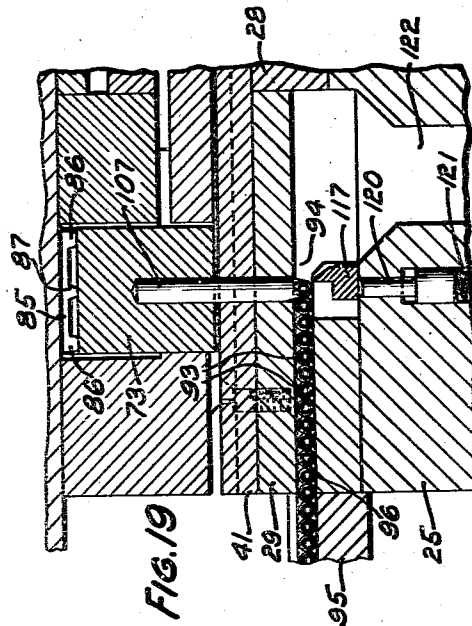


FIG. 19

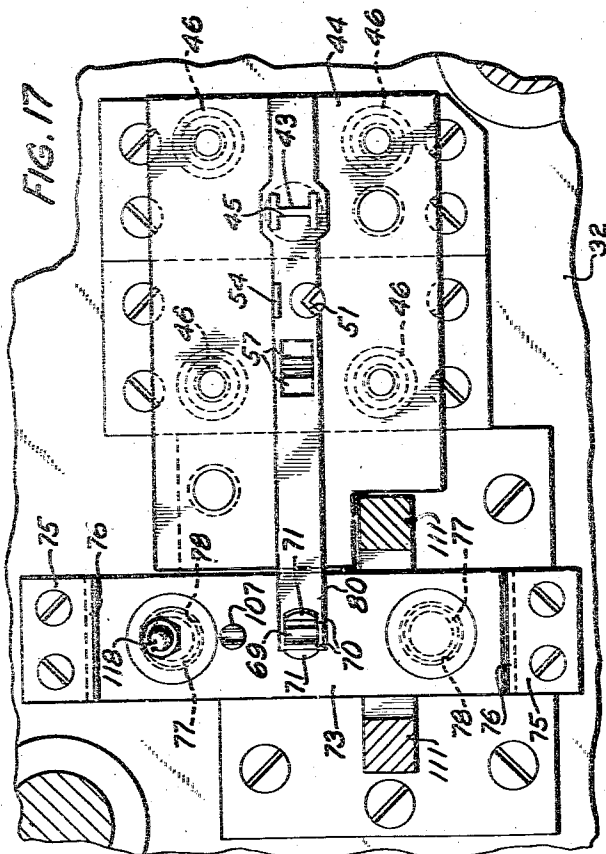


FIG. 17

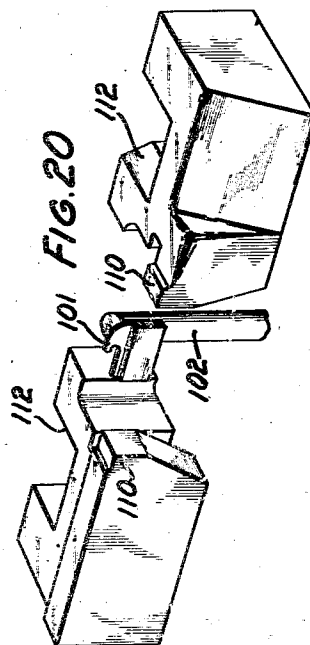


FIG. 20

INVENTORS
E. C. NEUHAUS
C. W. VERRILL
BY *Harry C. Swift*
ATTORNEY

UNITED STATES PATENT OFFICE

2,409,147

APPARATUS FOR FORMING AND
ASSEMBLING ARTICLES

Elmer C. Neuhaus, Chicago, and Charles W. Ver-
rill, Hinsdale, Ill., assignors to Western Electric
Company, Incorporated, New York, N. Y., a cor-
poration of New York

Application July 20, 1943, Serial No. 495,472

5 Claims. (Cl. 153—1)

1

This invention relates to apparatus for forming and assembling articles, and more particularly to an apparatus for forming a spring clip from a strip of material and assembling it on a jack such as used in making an electrical contact.

In the manufacture of some types of jacks, such as used in making electrical contacts, it may be desirable to assemble a resilient clip on the jack to aid in retaining a plug when inserted therein. In accordance with one practice, the clips are formed and then later manually assembled on the jacks with the aid of specially designed tools. This is a slow and difficult operation.

An object of the present invention is to provide an effective and efficient apparatus for forming and assembling articles.

In accordance with one embodiment of this invention, an apparatus may be provided having a punch and die mechanism for punching and forming a clip from strip material, severing the partially formed clip from the strip, transferring it to another level and then assembling it on a jack blank.

Other objects and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the drawings, wherein

Fig. 1 is a vertical, sectional view taken substantially along the midline of the apparatus;

Fig. 2 is an enlarged, fragmentary, vertical, sectional view of the apparatus, shown in Fig. 1, showing, however, the punch mechanism in raised position;

Fig. 3 is an enlarged, fragmentary, sectional view of the assembling punch in elevated position;

Fig. 4 is a view similar to Fig. 3 showing the position of the punch as it assembles the clip on the jack blank;

Fig. 5 is a view similar to Fig. 4, showing the forming jaws as they engage the clip;

Fig. 6 is a detail view of the completed jack;

Fig. 7 is a sectional view along the line 7—7 of Fig. 6;

Fig. 8 is a vertical sectional view along the line 8—8 of Fig. 7;

Fig. 9 is a plan view, partly in section, of the die assembly;

Fig. 10 shows a strip of material as a clip is formed therefrom;

Fig. 11 is a vertical sectional view along the line 11—11 of Fig. 9;

Fig. 12 is a vertical sectional view along the line 12—12 of Fig. 9;

2

Fig. 13 is a vertical sectional view along the line 13—13 of Fig. 9;

Fig. 14 is a view similar to Fig. 13 showing the ejector arm in lowered and advanced position;

Fig. 15 is a vertical sectional view along the line 15—15 of Fig. 2;

Fig. 16 is a vertical sectional view along the line 16—16 of Fig. 1;

Fig. 17 is a bottom view of the punch mechanism as shown in Fig. 2;

Fig. 18 is a horizontal sectional view along the line 18—18 of Fig. 16;

Fig. 19 is a vertical sectional view along the line 19—19 of Fig. 18; and

Fig. 20 is a perspective view showing the forming jaws.

Referring to the drawings, and particularly to Fig. 1, an apparatus is illustrated for forming a clip from a strip of material and then assembling the clip on a jack in which punching, forming and assembling operations are simultaneously performed on different portions of the strip. In this apparatus, a die bolster block 25 is mounted on a table 26 and supports a number of die members 27, 28 and 29, to be described hereinafter, which are rigidly fixed to the bolster block 25. A number of cutting and forming punches, also to be described hereinafter, are mounted on a punch block 32 which is fixed to the lower end of a ram 33 by which the punch assembly may be reciprocated with respect to the several die members, the assembly being positioned above the die assembly.

In the operation of this apparatus, a strip 35 of a suitable material may be supplied from a reel (not shown) and is fed to the punch and die assembly by a hitch feed designated generally at 36, the feed being operated during the reciprocation of the punch assembly by a cam 37 mounted on the lower right side of the block 32, as shown in Fig. 1. The cam 37 engages a roller 38 associated with the hitch feed and advances the strip a predetermined amount during each reciprocation of the punch assembly.

As the strip is fed forward by the hitch feed, it is moved into position over an I-shaped aperture 40 formed in the die member 27, the strip being guided across the die member by two spaced retaining plates 41 which are bolted to the upper surfaces of the die members 27, 28 and 29. After the strip is moved into position over the aperture 40, the strip then becomes stationary and a punch 43, suitably shaped to punch an I-shaped blank from the strip in cooperation with the I-shaped aperture 40 in the die mem-

3

ber 27, is then moved downwardly by the ram. A stripper plate 44 is associated with the I-shaped punch 43, and provided with an aperture 45 through which the punch may extend. A number of springs 46 are also provided to move the stripper plate relatively to the punch 43 when the punch is raised after punching a blank from the strip. The blank so punched drops through a recess 47 formed in the bolster block 25, which communicates with the I-shaped aperture 40 in the die member 27.

As the punch assembly rises, the hitch feed, which has been moved to the right by the cam 37, advances the strip 35 a predetermined distance and in the next reciprocation of the punch assembly, a similar I-shaped blank is punched from the strip, forming thus a clip blank 48, as shown in Fig. 10. In the succeeding reciprocation of the punch assembly, the strip having been again advanced a predetermined distance, a corner 49 of two adjacent clip blanks is bent slightly upwards. This bent corner facilitates the insertion of a plug in the completed jack. The bending is performed by a wedge-shaped raised member 50 mounted in the die member 28. The member 50 bears against the lower side of the strip and cooperates with a suitably recessed punch 51, which extends through an aperture 52 in the stripper plate 44 and is engageable with the upper side of the strip. The punch 51 is mounted in a supporting block 53 which is fixed to the punch block 32. Immediately adjacent this punch and fixed also to the lower side of the block 53 is a strip aligning finger 54 which, when the punch assembly is moved downward, extends into a suitably formed recess 55 in the die block 28 and engages a lower blanked portion 56 of the strip 35, thus aligning the clip blank with the bending punch and die assembly and also with the other parts of the assembly.

Upon the next reciprocation of the punch assembly, forming fingers 57, which are mounted in the block 53 and extend through an aperture 58 in the stripper plate 44, move downwardly and engage the edges of the blank 48 and in cooperation with a fixed die member 59 positioned in an aperture 60 in the die member 28, bend the edges downwardly, as shown in Fig. 1, to form the blank into a U-shape. These fingers are normally urged apart by a spring pressed plunger 61 slidably mounted in the block 32; however, as the lower ends of the forming fingers, which are beveled as shown in Figs. 1 and 2, engage the sides of the aperture 60, they are moved inward and complete the bending of the clip blank.

A pair of ejector members 62 is positioned adjacent the fixed member 59 and when the fingers 57 move downwardly, these ejector members are thereby moved downward against the pressure of a helically coiled spring 63 mounted in the block 25. As the punch assembly and fingers 57 move upward, the ejector pins engage the downwardly bent edges of the clip blank 48 and raise it above the fixed member 59.

In order to insure, however, that the strip at this point will be raised sufficiently to permit it to be advanced to the next operating position, a pair of parallel, spaced, flat springs 64 is mounted in the upper surface of the die member 27. The springs extend along the inner edges of the retaining plates 41 and across the die member 28. As the strip is advanced, its edges rest on the springs 64 and, consequently, when the punch assembly is in elevated position, the strip is raised to the position shown in Fig. 2. When the punch

4

assembly moves downward, however, the flat springs 64 are also pressed downward and are received in longitudinally extending recesses 65 formed in the die members 27 and 28. Then, as the punch assembly again rises, the springs 64 raise the strip and the partially formed clips over the edge of the die member 28.

As will be seen in Fig. 2, the left upper corner of the die member 28 is provided with a recess 66 which communicates with a similar recess 67 formed in the right upper corner of the die member 29, thus providing a space for the formed clips to move in. The portions of the retaining plates 41 which extend over the die member 29 are provided with a tapering undercut 68 to guide the strip downward into the recess 67 and to aid in bringing a partially formed clip into position for the assembling operation.

Prior to assembling the clip on the article, the clip is severed from the strip 35 by a cutting member 69 which is positioned between a pair of clip retaining jaws 70 which is integrally formed at the lower ends of a pair of fingers 71. The fingers 71 and the cutting member 69 are positioned in aperture 72 formed in a cross block 73, the fingers being slidably mounted therein while the cutting member 69 is fixed to the block by a suitably formed nut 74 which threadably engages the block 73, as shown in Figs. 1, 2, 15 and 16. The block 73 is itself positioned between a pair of spaced housing blocks 75 which is fixed to the underside of the punch bolster block 32, the block 73 being held in place between these blocks by inwardly extending shoulders 76, integrally formed with the lower ends of the blocks 75. As may be seen in Figs. 15 and 16, the block 73 is vertically movable with respect to the housing blocks 75, being urged downward, however, by a pair of coiled springs 77, which is positioned in sleeves 78 slidably mounted in the bolster block 32, and which bears against the upper side of the cross block 73. When the punch assembly is moved downward and into engagement with the fixed die assembly, the cross block 73 is moved upward relatively to the housing blocks 75 against the pressure of the springs 77, as shown in Fig. 16, being lifted by a shelf 80 which is integrally formed with the left end of the stripper plate 44 and which engages the lower side of the block 73. The left end of this shelf is suitably recessed to permit the fingers 71 to extend therethrough.

In order to retain the fingers 71 in the block 73, the upper ends of the fingers are provided with integrally formed portions 81 which extend at right angles to the upper ends of each finger, as shown in Figs. 15 and 16. These horizontal portions of the fingers are vertically movable in a slot 82 which is formed in the upper portion of the cross block 73. The aperture 72 in the block 73 in which the lower ends of the fingers are positioned is made large enough to permit the fingers to move slightly apart when the punch is raised and to rest on opposite upper edges 83 of the aperture 72. The fingers are then pivotable on these edges so that the jaws 70 may be moved apart as they first engage a clip blank and then move together to retain the severed blank as the punch assembly is moved downward. The jaws are urged together by a spring pressed plate 85 having projections 86 integrally formed on the lower sides thereof so as to engage the outer edges of the horizontally extending edges of the portions 81 and a cone-shaped projection 87 formed in the center thereof so as to bear against the opposite inner corners of the upper portions of

5

the fingers 71 to urge them apart. A helically coiled spring 88, which is positioned in an aperture 89 formed in the punch block 32 and retained therein by a threaded member 90, bears against the upper surface of the plate 85 and provides the resilient pressure.

As the punch assembly moves downwards, the jaws 70 engage the partially formed clip blank which is attached to the strip 35, the jaws moving apart to permit the blank to be positioned therebetween, as shown in Fig. 3, and the cutting member 69, in cooperation with an aperture 91 formed in the die member 29, severs the clip from the strip 35. Continued downward movement of the jaws 70 positions the severed clip on a jack 93 which is positioned in a chamber 94 formed in the die block 29, as shown in Figs. 1 and 2. The jacks are supplied from a magazine 95 positioned in the left portion of the die block 29 and communicating with a rectangularly slotted aperture 96 formed in the left upper portion of the block 29, as shown in Figs. 1, 2 and 11 through 14. The jacks may be manually fed into the die block. In a jack of the type shown, the portion thereof about which the spring clip is to be assembled is provided with a recess 97, as shown in Fig. 7, to receive the inwardly bent portions of the clip. Since the left end of the jack is also recessed to facilitate soldering in a subsequent operation, proper positioning of the jack may be effected by providing a ledge 98 extending along the left interior portion of the magazine 95 and ledge 99 positioned along the corresponding portion of the slot 96 and extending into the chamber 94 in the die member 29. As the jacks are fed through the magazine and into the die member 29, the recessed left ends of the jacks bear against these ledges, as may be seen in Figs. 11 and 12, and the clearances of the interior of the slot 96 and magazine 95 are such that the correct axial position of the jacks for the assembling operation is thereby obtained.

The forward jack, after it is fed from the magazine 95 into the slot 96 of the die member 29, is engaged by a stop member 101, shown in detail in Fig. 20, which is held in elevated position by a plunger 102 against the lower end of which bears a spring 103 positioned in the die bolster block 25.

As the clip is positioned on the jack, shouldered portions 105 formed in the lower ends of the fingers 71 engage the upper edges of the aperture 91 formed in the die member 29, as shown in Fig. 4, and are prevented from moving further downwardly. However, the punch assembly itself continues to move downward and the cutting member 69 positions the clip on the jack, as shown in Fig. 4, the cutting member being moved downward relatively to the now stationary jaws 70. At the same time, as the cutting member 69 deposits the clip on the jack, a retaining finger 107, rigidly mounted on the underside of the cross block 73 and extending downwardly therefrom, as shown in Fig. 15, engages the left end of the jack and holds the jack in position for the next operation in which the downwardly extending sides of the clip blank are formed about the jack.

After the clip has been positioned on the jack, a pair of cam operated jaws 110, which are slidably mounted in the die member 29, are moved together by a pair of cam arms 111 which are fixed to the lower side of the punch assembly, as shown in Figs. 1 and 2, and which engage camming surfaces 112 integrally formed with the jaws 110. These jaws are shown in detail in Fig. 20 together

6

with the stop member 101. As these jaws move together, as shown in sequential illustration in Figs. 3, 4 and 5, the lower edges of the partially formed clip are thereby bent about the jack. A completely assembled article is shown in Figs. 6, 7 and 8.

Ejection of the finished article from the die member 29 is accomplished by a universally mounted ejector arm 115 positioned in a recess 116 in the die member 29 and having a knife edged projection 117 integrally formed with the jack engaging end thereof and extending into the chamber 94. A rod 118, fixed to the lower end of the punch block 75, pivots the jack engaging end of the ejector arm downwards as the punch assembly is moved downward and out of engagement with the front edge of the jack 93 on which a clip is being assembled, while a helically coiled spring 119, having one end attached to the outer end of the ejector arm 115 and its other end attached to the die bolster block 25, pivots the ejector arm sideways and to the left, as shown in Figs. 1, 13 and 14, bringing the rear edge of its knife edge projection 117 into contact with the rear edge of one end of the jack which is at the same time held motionless by the retaining finger 107. Then, as the punch assembly is raised and the retaining finger 107 moved out of engagement with the jack, thus releasing the jack, the ejector arm 115 is pivoted upward by a plunger 120 actuated by a helically coiled spring 121 which bears against the underside of the plunger. The recess in the die block 29 in which the knife edge projection 117 is positioned is so formed that, as the arm 115 is moved upward, the projecting end portion 117, which is then in engagement with the left side of the completed jack, is cammed to the right, as viewed in Fig. 9, thus pivoting the completed jack on the stop member 101 with sufficient force to eject the jack and to deposit it in an aperture 122 formed in the bolster block 25 which communicates with the assembly chamber 94 of the die member 29. The path of the knife edge member 117 is thus substantially rectangular.

While, in describing the operation of this apparatus, the several steps performed have been described successively and with regard to the forming and assembling of a single clip, it will be understood that the several steps are simultaneously performed on different portions of the strip upon each reciprocation of the apparatus. Also, while but one embodiment of this invention has been shown and described, it will be understood that many changes and modifications may be made therein without departing from the spirit or scope of the present invention.

What is claimed is:

1. In an assembling apparatus, a fixed cutting die, a movable cutting member cooperating with said cutting die for severing a blank from a strip of material, a pair of transfer jaws yieldably carried by said cutting member and projecting in advance of said cutting member and normally movable therewith for receiving said severed blank and transferring said severed blank to a predetermined position, resilient means for maintaining said transfer jaws in said normal advanced relation to said cutting member, means for actuating said cutting member to sever said blank from said strip and carry said blank to said predetermined position, and means for arresting the movement of the transfer jaws adjacent said predetermined position to cause a

7

relative movement between said jaws and said cutting member to eject said blank.

2. In an assembling apparatus, a fixed cutting die, a movable cutting member cooperating with said cutting die for severing a blank from a strip of material, a pair of transfer jaws yieldably carried by and projecting in advance of said cutting member and normally movable therewith for receiving said severed blank and transferring said severed blank to an ejecting position, resilient means for urging said jaws toward each other to retain said severed blank therebetween, resilient means for maintaining said jaws in said normal advanced relation to said cutting member, means for stopping said transfer jaws at said ejection position, and means for actuating said cutting member to sequentially sever said blank from said strip and eject said blank from said transfer members.

3. In an assembling apparatus, a fixed die, a relatively movable cutting member cooperating with said fixed die for severing a blank from a strip of material, an actuator for moving said cutting member to sever and move said blank to a predetermined position, a pair of jaws yieldably disposed on opposite sides of and extending in advance of said cutting member and normally movable therewith for engaging said severed blank and transferring said blank to said predetermined position in cooperation with said cutting member, laterally extending arms on said jaws for limiting the advance movement of said jaws relative to said cutting member, resilient means for urging said jaws in advance of said cutting member, a force transmitting member interposed between said resilient means and said jaws and engaging the arms of said jaws for imparting a force to each of said arms tending

8

to rock said arms and yieldably urge said jaws toward each other, means for arresting the movement of said jaws prior to the completion of the advance movement of said cutting member to cause said cutting member to eject said blank from said jaws.

4. An article assembling apparatus comprising an assembling station, means for transferring parts to said station and assembling them, a fixed stop member at the assembling station for engaging an assembled article adjacent one end thereof, a movable stop member having a stopping surface in the path of said article to engage the article adjacent its other end, said movable stop member having an inclined ejecting surface, means for moving the stopping surface of said movable stop member out of the path of said article upon assembly of the article, and means for thereafter engaging said inclined ejecting surface with the article to pivot the article about said fixed stop member and eject it.

5. An article assembling apparatus comprising means for guiding an article in a predetermined path, a movable stop member having a stopping surface in the path of said article to engage the article, said movable stop member having an inclined ejecting surface, means for limiting the movement of said movable stop member in one direction to stop said article in alignment with a part to be assembled thereon, means for assembling said part with said article, means for moving the stopping surface of said movable stop member out of the path of said article after the part has been assembled thereon, and means for thereafter engaging said inclined ejecting surface with the article to eject said article.

ELMER C. NEUHAUS.
CHARLES W. VERRILL.