Dec. 17, 1968 W. L. BUSLER ET AL 3,416,212
APPARATUS FOR APPLYING INSULATING HOUSINGS TO ELECTRICAL TERMINALS
Filed Aug. 3, 1966 5 Sheets-Sheet 1

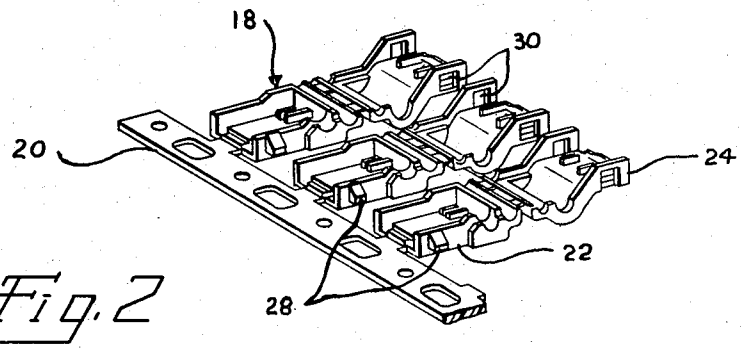



Fig. 2

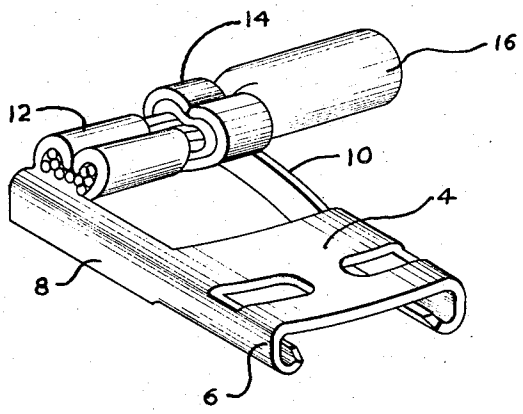



Fig. 1

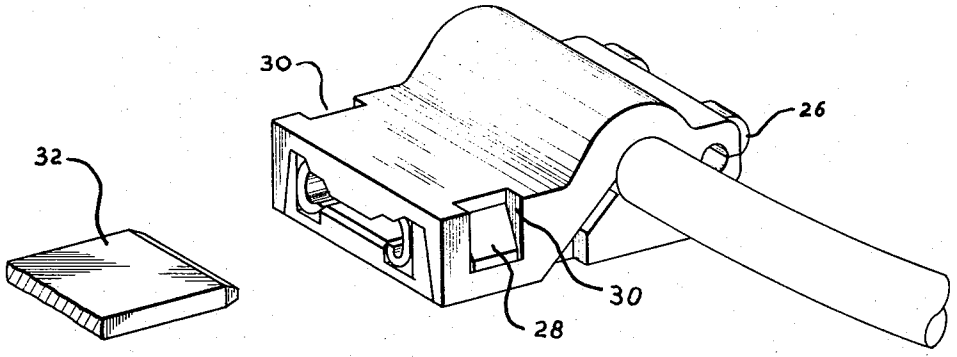



Fig. 3

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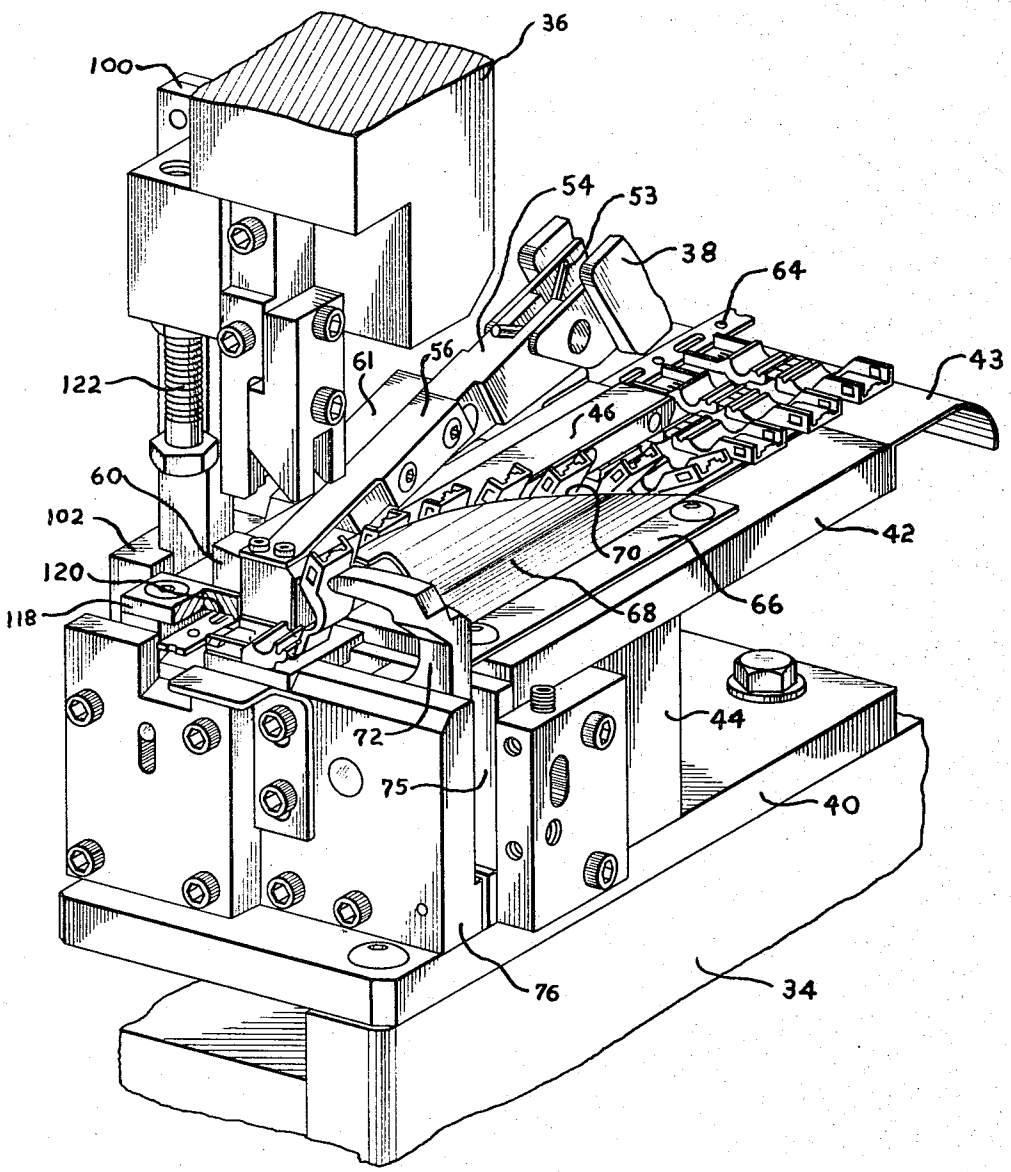



Fig. 4

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Fig. 5

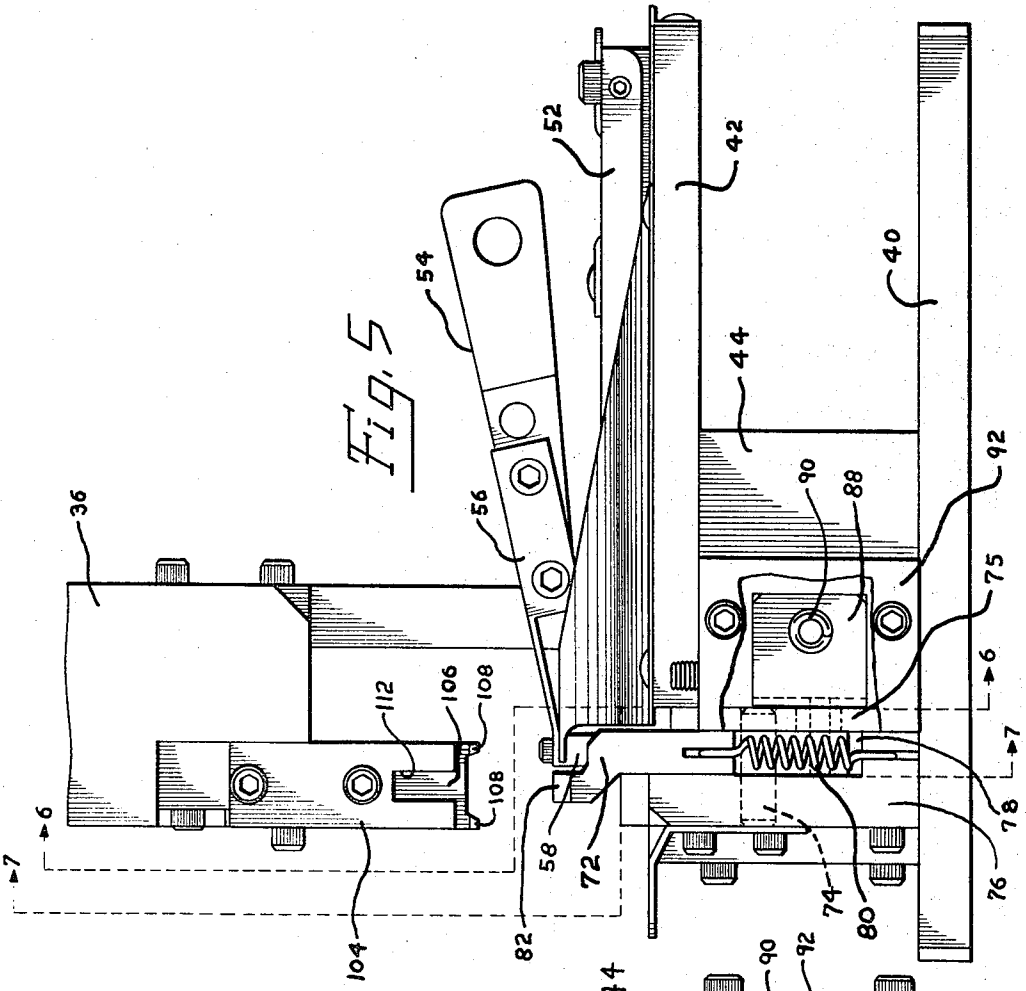
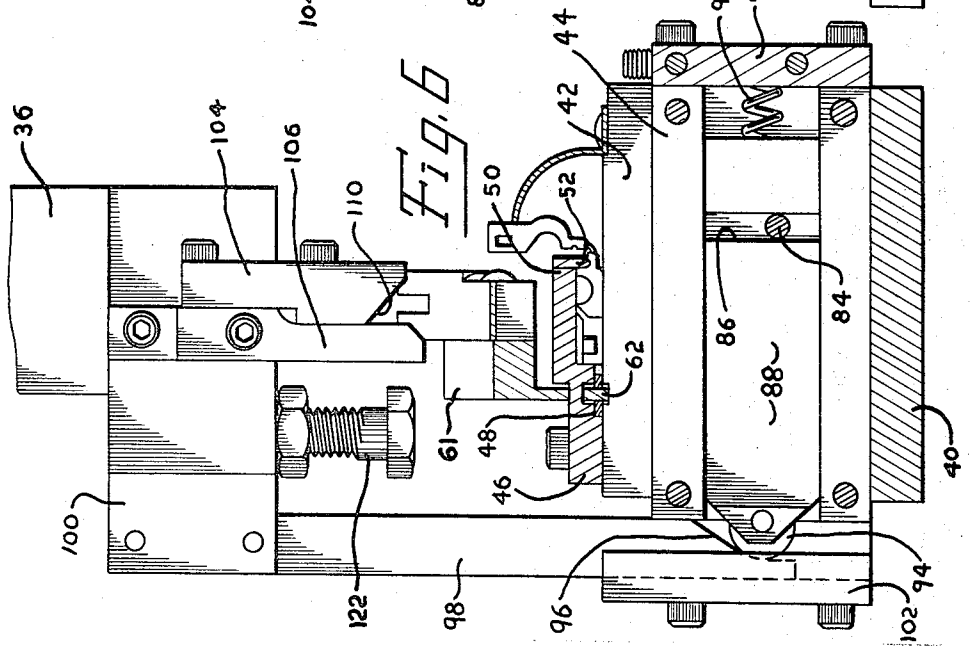



Fig. 6



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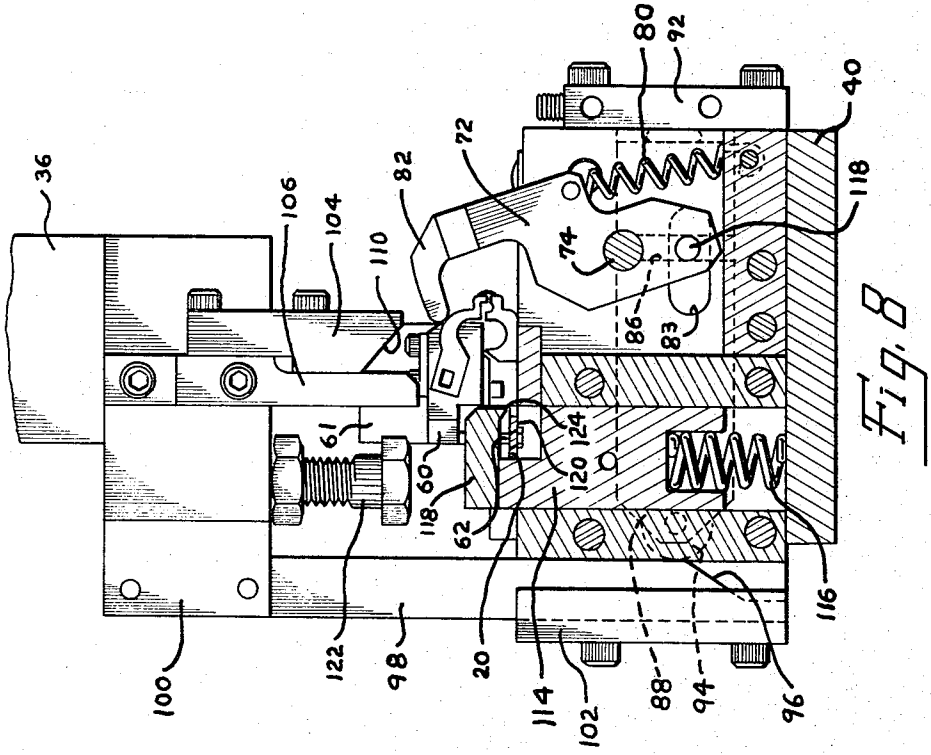



Fig. 8

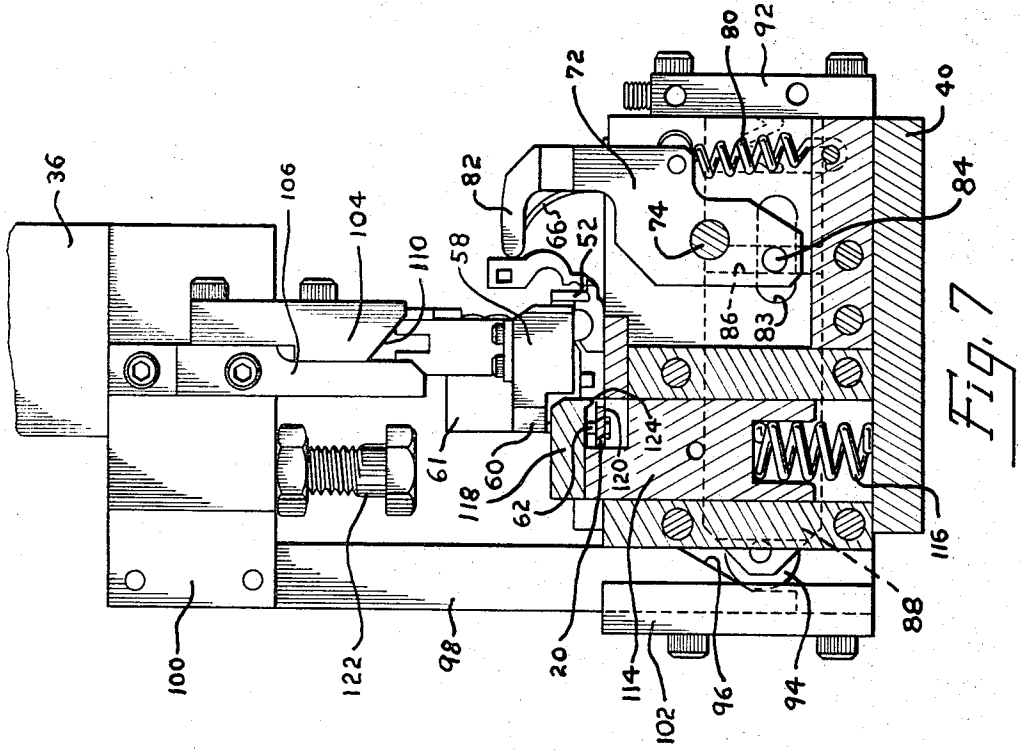



Fig. 7

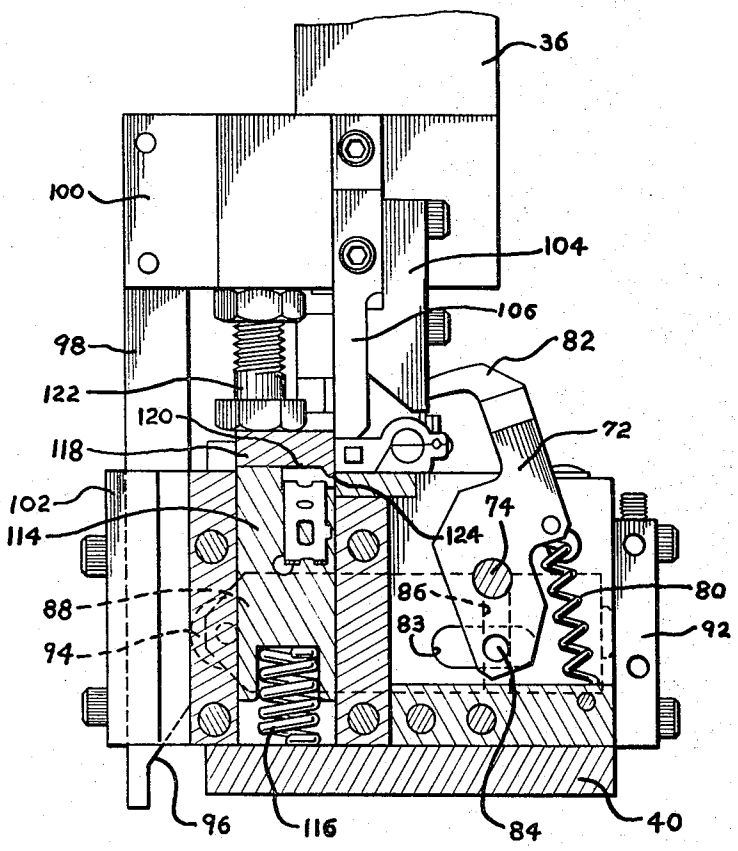

36
100
104
106
98
82
122
120
72
118
102
74
114
124
86
80
88
83
92
94
96
116
84
40

Fig. 9

United States Patent Office 3,416,212 Patented Dec. 17, 1968



3,416,212

# APPARATUS FOR APPLYING INSULATING HOUSINGS TO ELECTRICAL TERMINALS

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Filed Aug. 3, 1966, Ser. No. 570,054
5 Claims. (Cl. 29—203)

This invention relates to machines for applying insulating housings to electrical terminals.

One commonly used type of electrical terminal comprises a receptacle having a ferrule portion which is crimped onto a wire. The receptacle is adapted to receive a generally rectangular tab on a mating conductor to which the wire is to be connected. Terminals of this general type are often used in an appliance and automotive wiring for the reason that they accept a standard type of rectangular tab which is widely used in industry. Under some circumstances, it is desirable to mount terminals of this type in an insulating housing, particularly, where a shock hazard or the danger of a short circuit exists. Terminals of this type are relatively inexpensive so that the housings themselves and the cost of applying the housings to the terminals must also be relatively low.

An object of the invention is to provide an improved apparatus for applying terminal housings to contact terminals. A further object is to provide a relatively simple apparatus which functions to partially fold a hinged housing into enveloping relationship with a terminal and to close the housings onto the terminal as a final step. A further object is to provide a device which is relatively fool-proof and which can be operated by unskilled personnel.

These and other objects of the invention are achieved in a preferred embodiment comprising a housing applicator which is adapted to be used with a conventional bench press having a strip feeding means. The housings are manufactured in a side-by-side strip form and are fed to the operating zone of the applicator by feeding means of the press. The housings comprise a base section and a cap section hinged together, the cap section being adapted to be folded over onto and latched to the base section when the housing is applied to a terminal. An applicator in accordance with the invention has a folding guide which progressively and partially folds the cap section towards the base section as the strip is fed towards the operating zone. The cap is then pressed down onto the base section by a pivoted bending arm and is firmly pressed against the base section and latched thereto by a pair of punches which are mounted on the press ram. The arrangement is such that the operator need only position the wire with the terminal or its end in a well-defined area of the operating zone and actuate a suitable switch to drive the press through its operating cycle and to complete the assembly of the housing to the terminal.

In the drawings:

FIGURE 1 is a perspective view of one type of terminal to which insulating housings of the type shown in FIGURE 2 are adapted to be applied.

FIGURE 2 is a perspective view of a short section of a housing strip.

FIGURE 3 is a perspective view showing an individual housing applied to a terminal of the type shown in FIGURE 1.

FIGURE 4 is a perspective view of a housing applicator in accordance with the invention showing portions of the press on which the applicator is mounted.

FIGURE 5 is a side view of the applicator of FIGURE 4.

FIGURES 6 and 7 are sectional views taken along the lines 6—6 and 7—7 of FIGURE 5.



FIGURES 8 and 9 are views similar to FIGURE 7 but showing the positions of the parts during succesesive steps of the operating cycle.

Referring first to FIGURE 1, a commonly used type of disengageable terminal for wiring appliances comprises a receptacle portion 4 having sidewalls 6, this receptacle portion being connected to a crimp portion by struts 8, 10. The crimp portion comprises a wire crimp 12 and a insulation crimp 14 by means of which a terminal is secured to the conducting core and to the insulation of a wire 16. The type of terminal shown is commonly referred to as a flag type for the reason that the receptacle portion extends laterally from axis of the wire.

FIGURE 2 shows a short section of insulating housings 18 in strip form which are adapted to be applied to terminals of the type shown in FIGURE 1 in the manner shown in FIGURE 3. These housings are integral with, and extend from, a carrier strip 20. Each housing comprises first and second sections 24, 22, the first section 24 comprising a cap and the second section comprising a base. The two sections are hinged together at 26 so that the terminal can be positioned in the base portion and the cap portion folded over onto the base portion. The two sections 22, 24 are latched together by bosses 28 on the base portion which snap into suitable openings 30 in the cap portion. The insulated terminal can then be mated with a generally rectangular tab 32 as indicated in FIGURE 3.

Referring now to FIGURE 4, a housing applicator in accordance with the invention is adapted to be used on a conventional bench press having a supporting surface or platen 34, a reciprocable ram 36, and a reciprocable feed arm 38 for feeding the stock to a position beneath the ram. The press itself is shown fragmentarily since it does not constitute part of the present invention. The applicator comprises a base plate 40 bolted to the press frame 34 and a horizontally extending feed platform 42 which is supported above plate 40 by a block 44. The strip of housings is fed from a suitable reel or other endless source across an apron 43 thence across the upper surface of the platform 42 by the feed arm 38. During feeding, it is guided along a predetermined path towards the operating zone of the applicator by a guide bar 46 bolted to the upper surface of the plate arm 42. This guide bar 46 has a relatively narrow slot or recess 48, on its underside, which is adapted to receive the carrier strip 20, a flange 50 which overhangs the base portions 22 of the housings. A lip 52 depends from the right-hand side of the flange 50, as viewed in FIGURE 6, and bears against the sides of the base portions of the housings to hold them against the surface of the platform 42.

The feed arm 38, has an extension 45 pivoted thereto and resiliently biased by a spring means 53 towards the upper surface of the platform. A feed finger 56 is secured to this extension and has a block 58 on its end which, during each stroke, engages the housing of the strip that is next adjacent to the leading housing and feeds the strip a distance equal to the width of an individual housing. The underside of block 58 has projections conforming to, and engaging the base portion of this next adjacent housing and which function to transmit the pushing force or thrust to the strip. During rearward movement of the feed arm, it is permitted to pivot upwardly and ride over the strip by virtue of the pivoted arm 54 and the spring means 53. Block 58 has a leftwardly extending portion 60 as viewed in FIGURE 7 which functions as a guide for the terminals when they are positioned in the applicator as will be described below. An additional block 61 is secured to feed finger extension 56 rearwardly of the block 58 and is located above the guide bar 46. A depending pin mounted in block 61 extends through an elongated slot in the guide bar and is adapted to

enter the pilot holes **64** in the carrier strip **20**. This pin equalizes the pushing force on the strip during feeding and accurately positions the leading housing of the strip beneath the ram **36**.

A bending means or flexing guide **66** is mounted on the upper surface of feed platform **42** beside the path of the feed strip which comprises a cylindrical plate which extends over the path of strip feed. This cylindrical portion has a helical edge **70** that extends from a location beside the path of strip feed progressively into over-hanging relationship with respect to this path. The cap portions **24** of the individual housings move against edge **70** and are progressively bent upwardly relative to the base portions **22** during feeding as shown in FIGURE 4 in a manner such that these cap portions are substantially vertically oriented when the leading housing arrives to a location beneath the press ram **36**.

The vertically extending cap portion **24** of the leading housing of the strip is further folded over towards the base portion in the assembling zone of the applicator by means of an arm **72** pivotally mounted on a pin **74** which, in turn, is mounted in a spacer plate **75** and a face plate **76**. The face plate **76** has a recessed side **78** as shown in FIGURE 5 in which arm **72** is contained. Arm **72** is resiliently biased by a spring **80** to the position shown in FIGURE 7, but is permitted to swing in a counterclockwise direction as shown in FIGURES 8 and 9. The upper end of arm **72** is provided with an offset finger **82** which bears against the cap portion of the leading housing so that during counterclockwise swinging movement of this arm, the cap is partially folded over as shown in FIGURE 8. The arcuate movement of this arm is accomplished by means of a pin **84** mounted in its lower end which extends through a slot **83** in spacer plate **75** and onto a vertical slot **86** in a slide member **88**. This slide member is mounted for horizontal reciprocation in a recess in block **44** and is normally biased leftwardly as viewed in FIGURE 6, by a spring **90** which is interposed between the right-hand side of the slide and the surface of cover plate **92** which is secured to block **44**. On its left-hand side, slide **88** is provided with a roller **94** which bears against the lower end of a camming bar **98**. This camming bar has an inclined surface **96** arranged to cause rightward movement of the slide **88**, and, therefore, counterclockwise swinging movement of the arm **72** when the ram **36** moves downwardly from the position of FIGURE 7 to the position of FIGURE 8. Camming bar **98** is mounted on a bracket **100** secured to the lower end of the ram **36**. The lower end of this camming bar is guided by a suitable guide bracket **102** which is secured to, and extends from, the block **44**.

After the cap portion **24** of the leading housing has been folded over to the position of FIGURE 8, it is pressed downwardly and latched to the base portion **22** by latching punches **104**, **106** which are also secured to the ram. The punch **104** has a slot **112** which provides clearance for the finger **82** and has an inclined surface **110** on its underside which cams to the cap leftwardly while it is being bent downwardly to ensure proper alignment of the cap portion with the base portion. The final latching of the cap portion to the base portion is accomplished by depending ears **108** on the punch **106** which engages the cap portion on opposite sides.

During the final portion of the downward stroke of the ram, the housing is sheared from the carrier strip and the carrier strip itself is transversely cut by a shearing member **118** on the upper end of a shearing block **114**. The block **114** is mounted in a recess adjacent to the operating zone is normally biased upwardly by a spring **116**. This block is depressed during final portions of the stock by a depressor bolt **122** mounted on the bracket **100** which engages the upper surface of the shearing block as shown in FIGURE 9. Referring to FIGURE 9, the leading housing is sheared from the carrier strip along the shearing edges **124** and the carrier strip itself is sheared along the shearing edges **120**.

At the beginning of the operating cycle, the parts will be positioned as shown in FIGURE 4 with the ram in its raised position and with the feed arm **38** in its forward position. The operator merely locates the terminal against the face of the block **58** which functions as a locating means. He then actuates a suitable switch (not shown) to operate the press. Initially, the feed arm **38** is retracted so that the feed finger and block **58** will move from beneath the ram **36**. As the ram descends, the arm **72** is swung through the counterclockwise arc shown in FIGURES 7 and 8 and the cap portion of the leading housing is assembled to the terminal as shown in FIGURE 9. After completion of the shearing operation and during upward movement of the ram, the feed arm is advanced to push the terminal-housing assembly out of the operating zone and feed the next housing to a location beneath the ram.

Changes in construction will occur to those skilled in the arm and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

What is claimed is:

**1.** Apparatus for assembling insulating housings to terminals, said housings being in ladder strip form and each housing comprising first and second hinged-together parts adapted to close into enveloping relationship with a terminal, said apparatus comprising means for feeding a strip of said housings along a predetermined path to an assembling zone, supporting means in said zone for supporting the leading housing of said strip, ram means reciprocable towards and away from said supporting means, bending means in said zone for bending said first one of said parts partially towards the second one of said parts until said first part is on the path of reciprocation of said ram, and punch means on said ram for further bending said first part towards said second part and into assembled and enveloping relationship with a terminal.

**2.** Apparatus as set forth in claim **1** wherein said bending means comprises arm means engageable with said first part, said arm means being movable along a path extending transversely of the path of reciprocation of said ram, and means effective between said ram means and arm for moving said arm along said transverse path prior to engagement of said punch means with said first part.

**3.** Apparatus as set forth in claim **1** including shearing means adjacent to said supporting means for severing said leading housing from said strip, and means on said ram for actuating said severing means concomitantly with final assembly of said leading housing to said terminal.

**4.** Apparatus as set forth in claim **1** including a bending edge extending alongside said predetermined path and towards said assembling zone, said bending edge extending progressively above and over said path, the one part of each housing of said strip being engageable with said edge whereby said one part of each housing is bent partially towards said second part during movement of said strip along said path.

**5.** Apparatus for assembling insulating housings to terminals, said housings being in ladder strip form and each housing comprising first and second hinged-together parts adapted to be closed into enveloping relationship with a terminal, said apparatus comprising means for feeding a strip of said housings along a predetermined path to an assembling zone, supporting means in said zone for supporting the leading housing of said strip, ram means reciprocable towards and away from said supporting means, a bending edge extending alongside said predetermined

path and towards said assembling zone, said bending edge extending progressively above and over said path, the one part of each housing of said strip being engageable with said edge whereby said first part of each housing is bent partially towards said second part during movement of said strip along said path, and punch means on said ram means engageable with said first part of the housing disposed in said assembling zone to further bend said first part towards said second part and to assemble said housing to a terminal located in said operating zone.



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THOMAS H. EAGER, *Primary Examiner.*

U.S. Cl. X.R.

72—428; 29—243.57