United States Patent [19]

Anderson et al.

[11] **3,839,776**

[45] **Oct. 8, 1974**

[54] **WIRE STRIPPING AND CRIMPING APPARATUS AND METHOD**

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[73] Assignee: **International Telephone and Telegraph Corporation**, New York, N.Y.

[22] Filed: **Aug. 20, 1973**

[21] Appl. No.: **389,688**

[52] **U.S. Cl.** ..... **29/203 DT**, 29/628

[51] **Int. Cl.** **H01r 43/04**, H01t 43/00

[58] **Field of Search** ..... 29/203 DT, 628, 630 A, 29/203 D, 33.5; 81/9.51

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3,541,654	11/1970	Hills	29/203 DT
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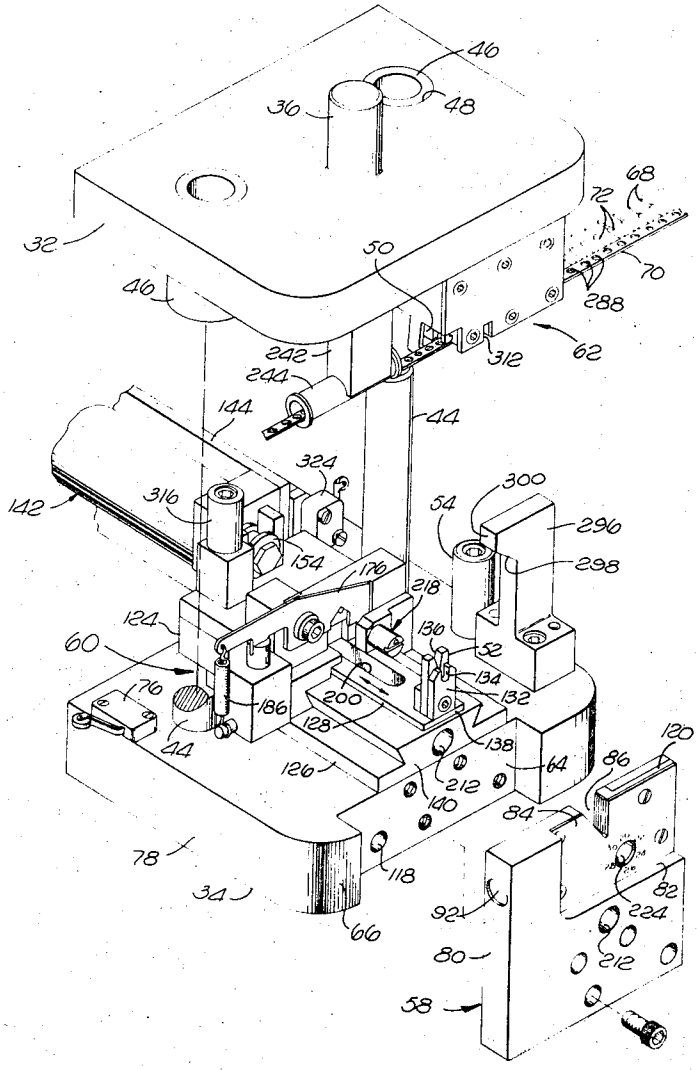
Primary Examiner—Thomas H. Eager

Attorney, Agent, or Firm—Thomas L. Peterson

[57] **ABSTRACT**

An apparatus and method for stripping insulation from an insulated wire and crimping a U-section ferrule forming a part of an electrical contact to the bared end portion of the wire. The apparatus includes upper and lower crimping jaws for performing the crimping operation. A wire clamping device is positioned in front of the lower jaw. A wire insulation stripping mechanism is mounted behind the lower jaw for movement between forward and rearward positions. A mechanism is provided for feeding a plurality of contacts joined side-by-side to a carrier strip between the crimping jaws. The ferrules of the contacts open downwardly. When the stripping mechanism shifts to its rearward position to strip insulation from an end portion of the wire, the upper crimping jaw lowers to sever a contact from the carrier strip and crimp the contact ferrule onto the wire. When the upper crimping jaw rises, the contact feeding mechanism operates to index an additional contact into position for crimping to another wire.

28 Claims, 24 Drawing Figures



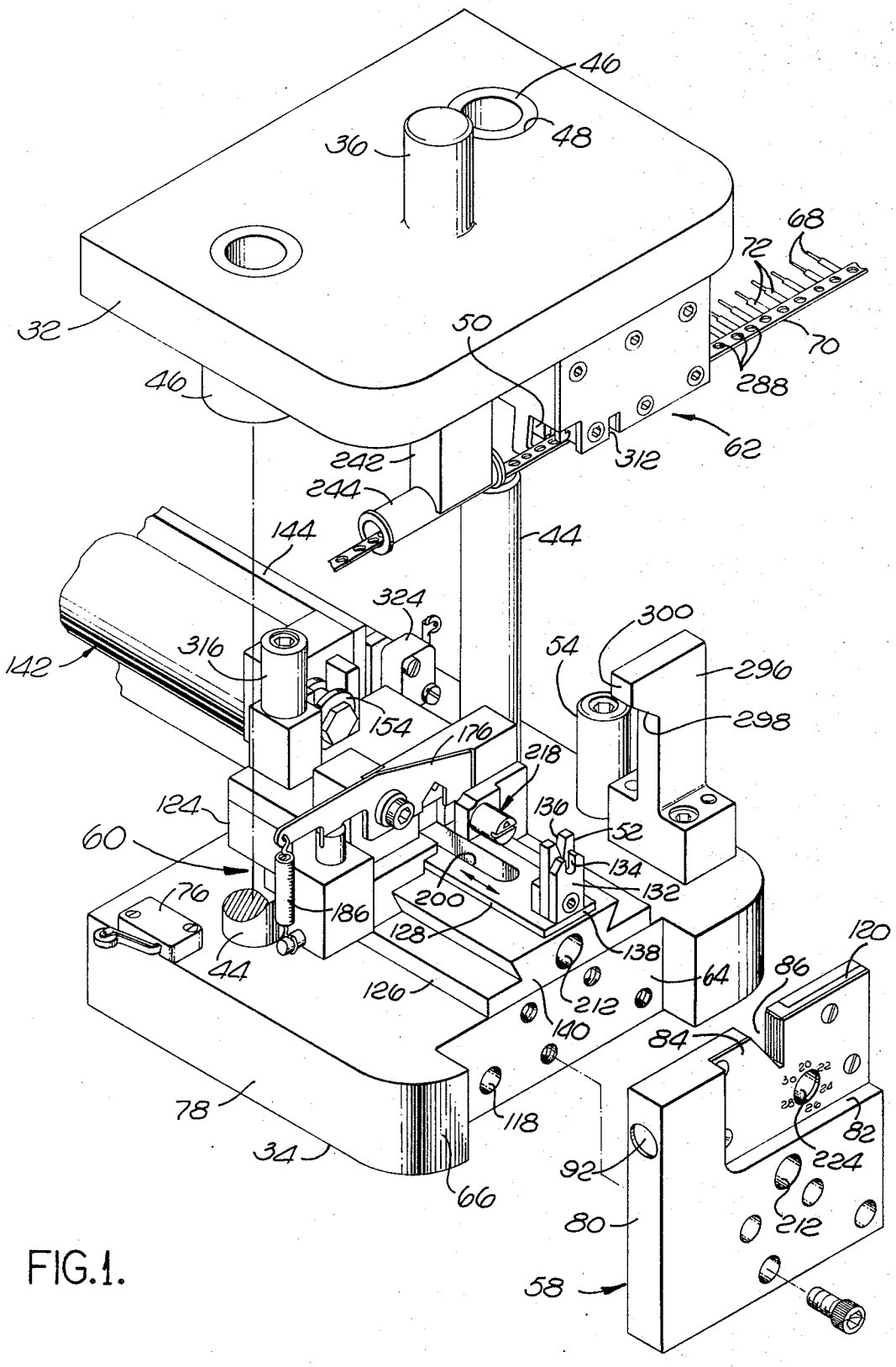

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FIG.1.

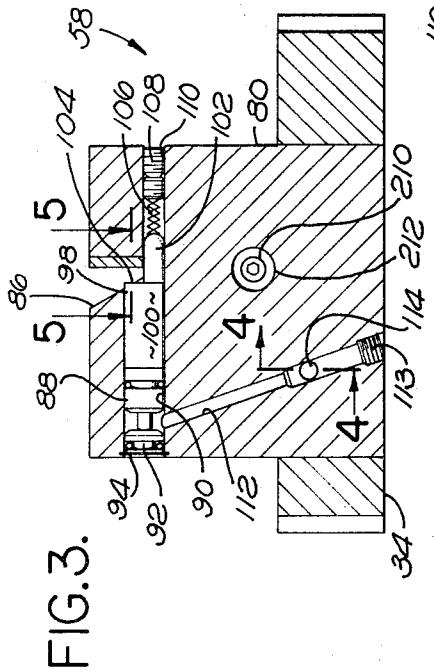


FIG. 3.

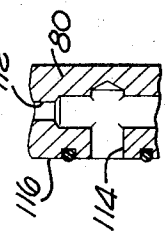


FIG. 4.

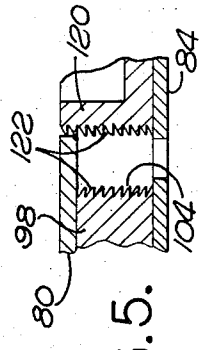


FIG. 5.

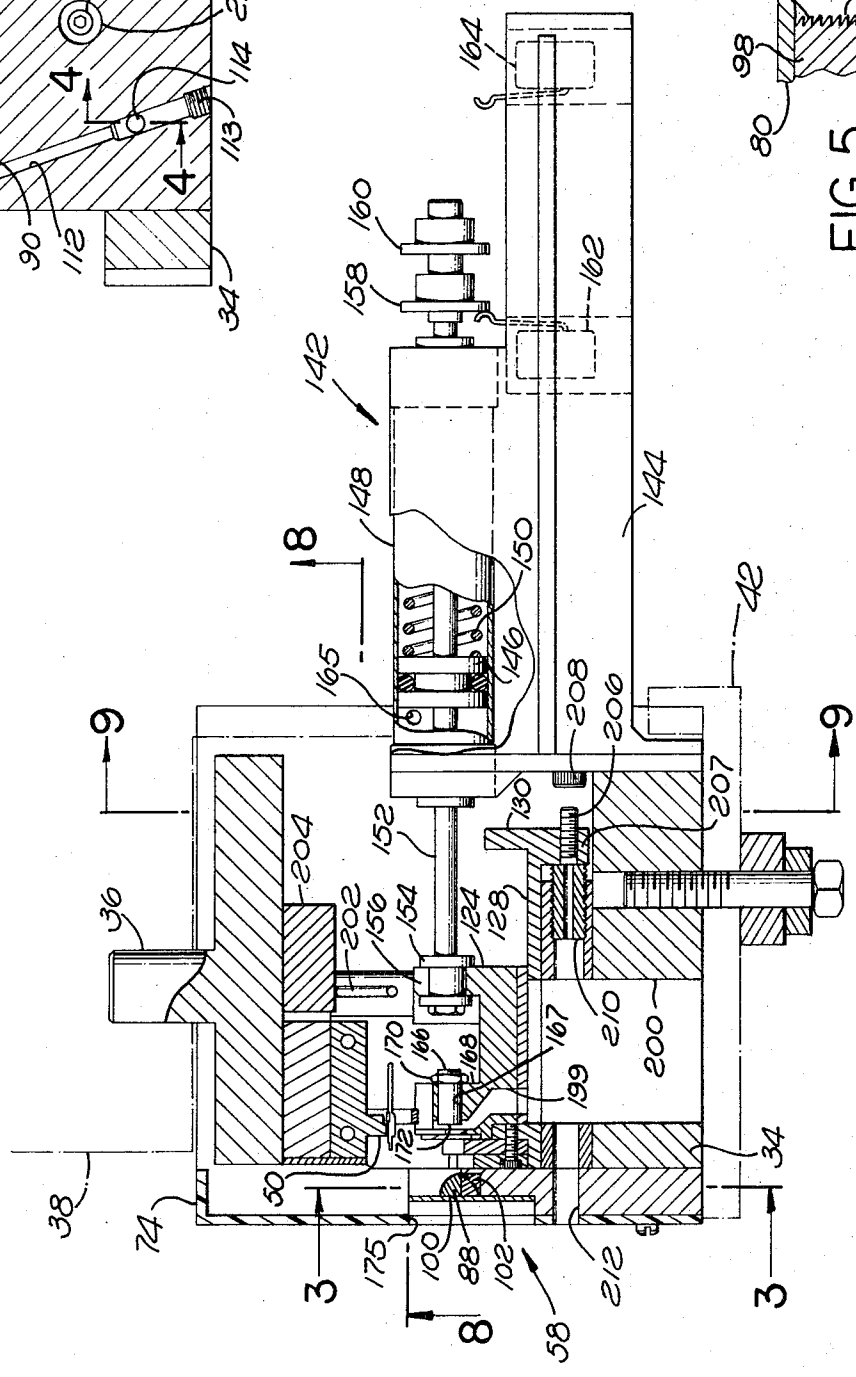


FIG. 2.

FIG.6.

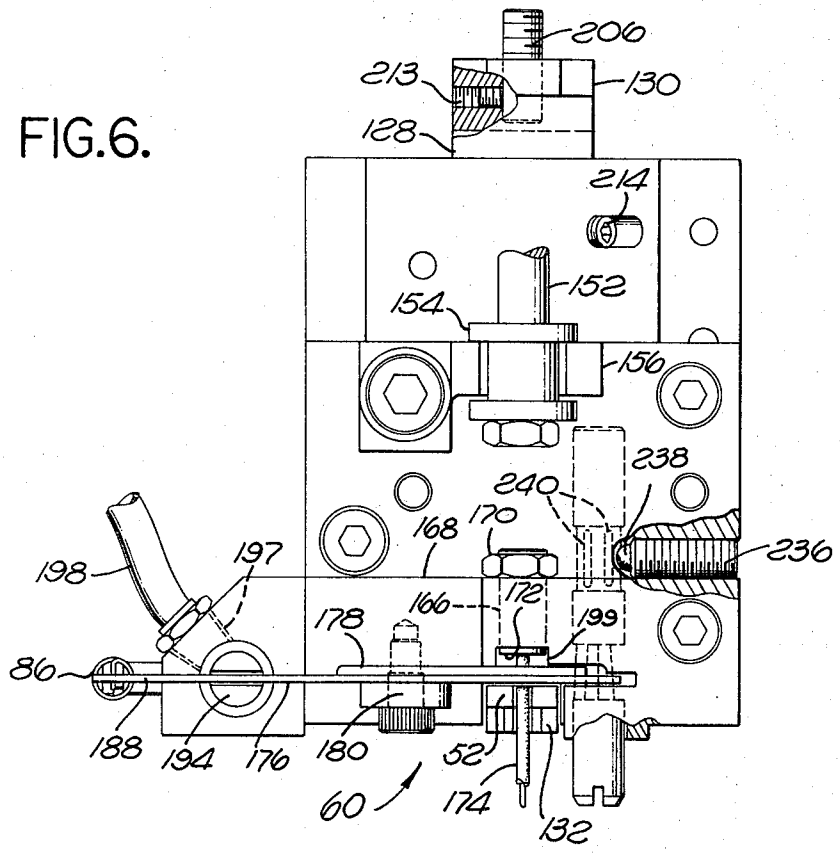

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FIG.7.

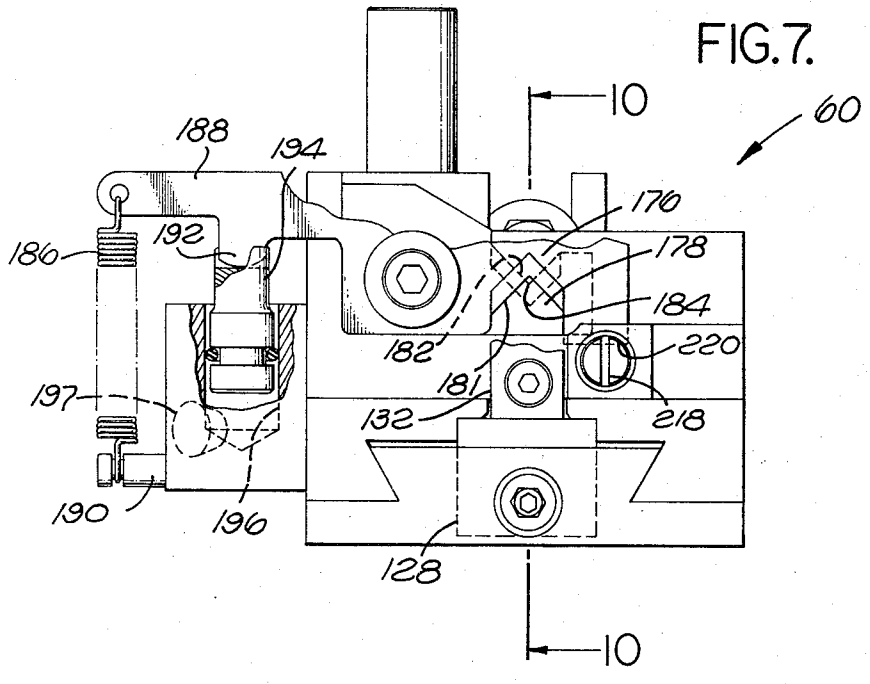
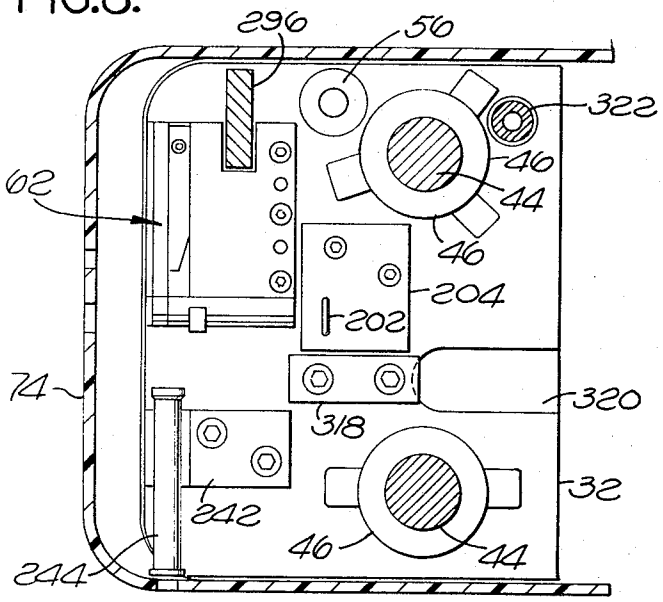

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FIG.8.



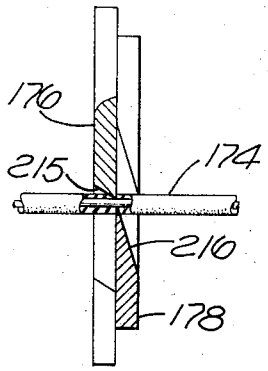


FIG.10.

FIG.11.

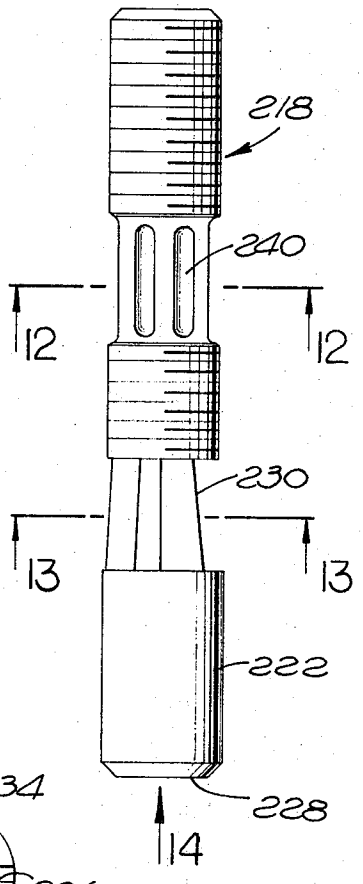
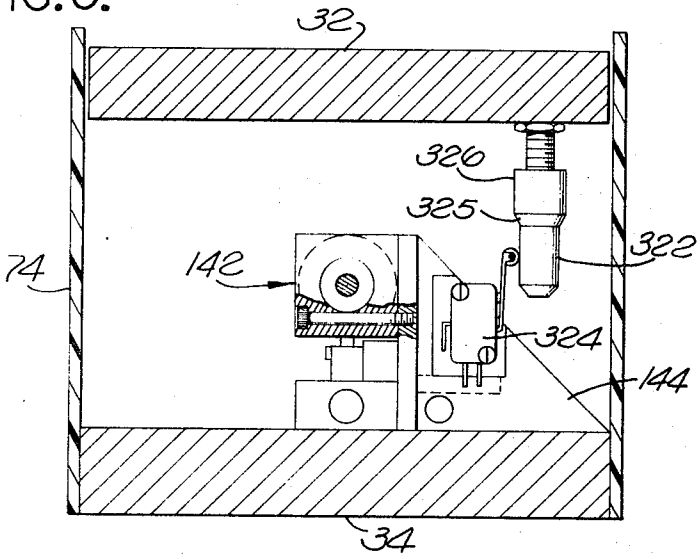


FIG.9.



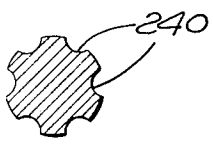


FIG.12.

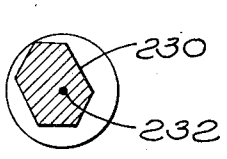


FIG. 13.

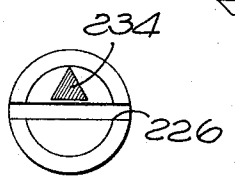


FIG.14.

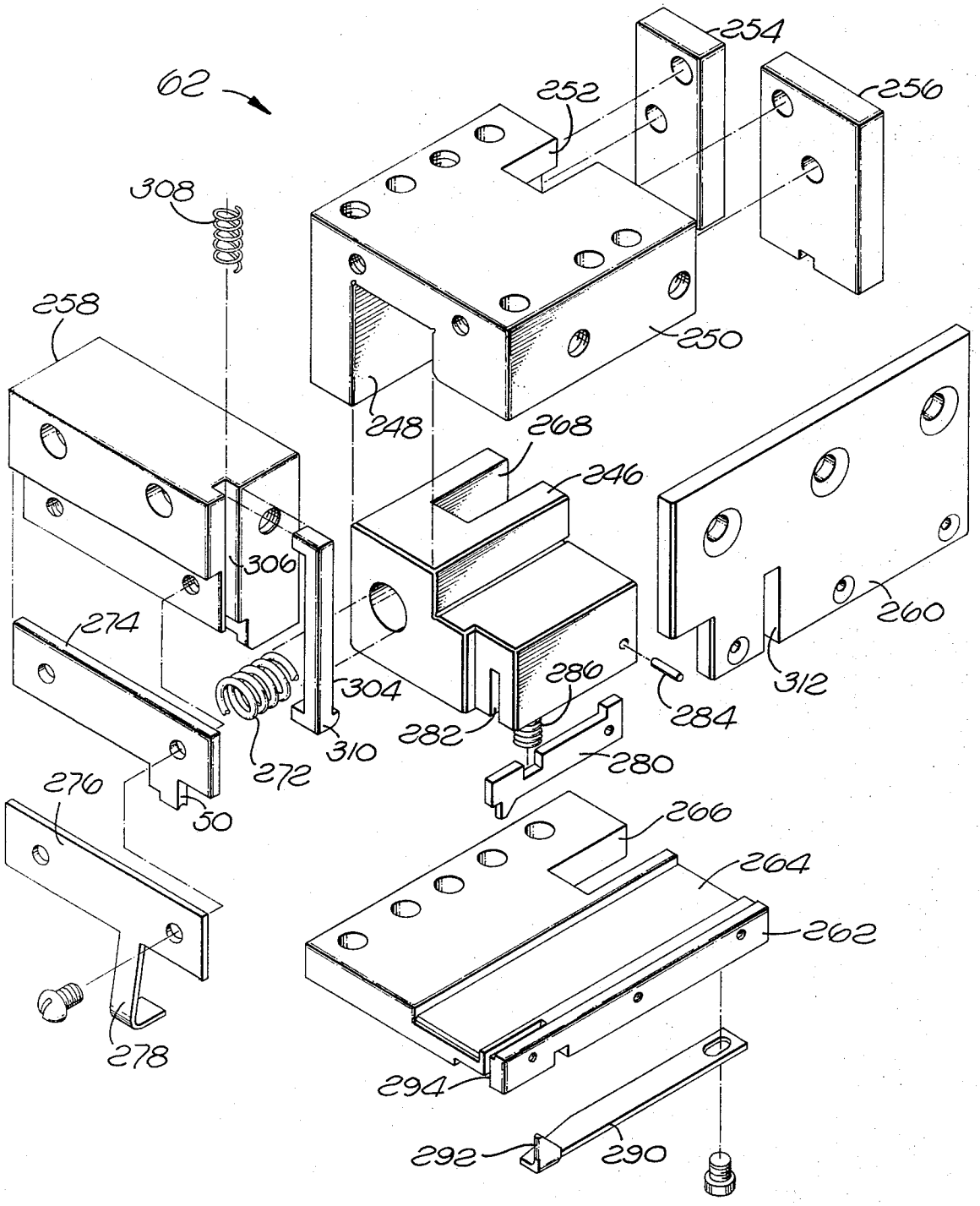

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FIG.15.

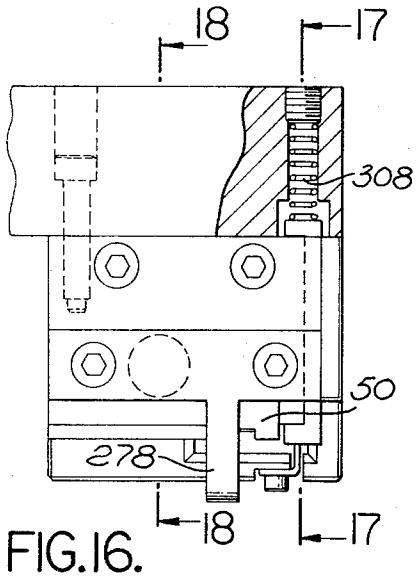


FIG.16.

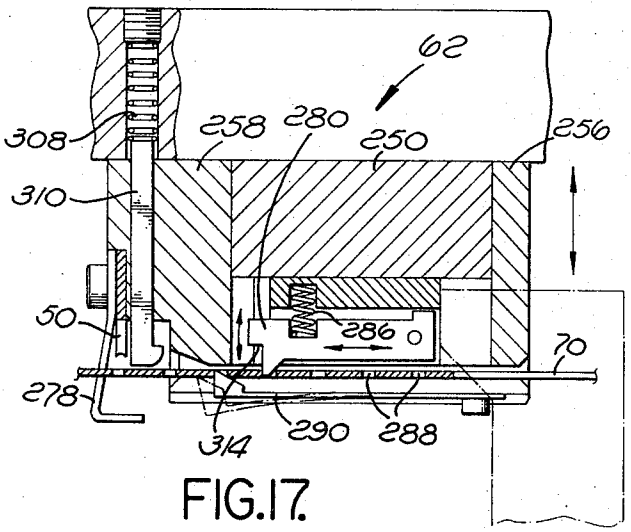


FIG.17.

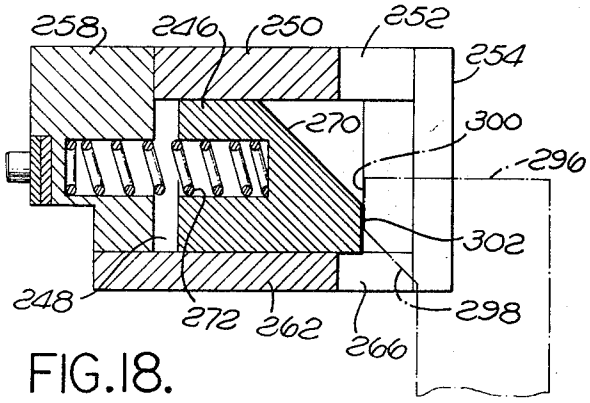
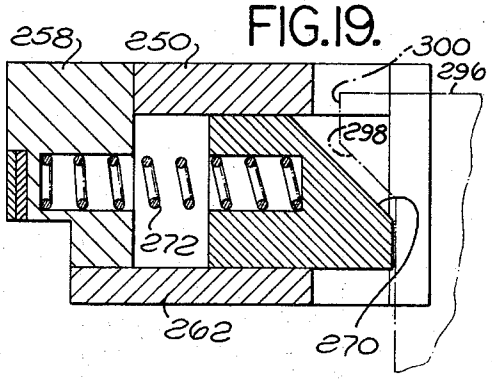


FIG.18.

FIG.19.



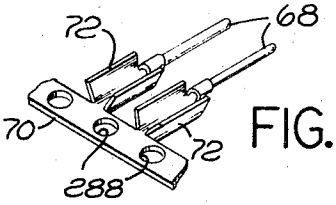


FIG.20.

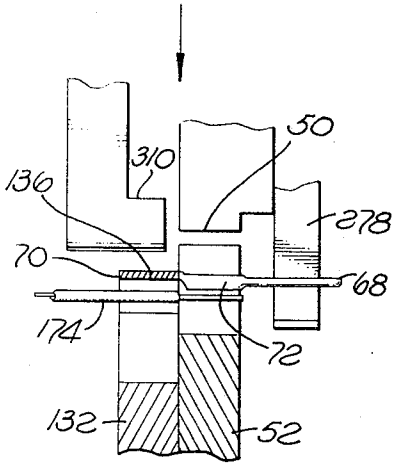


FIG.21.

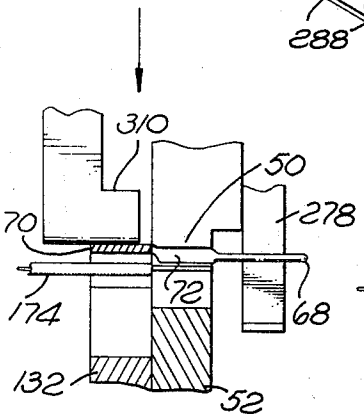


FIG.22.

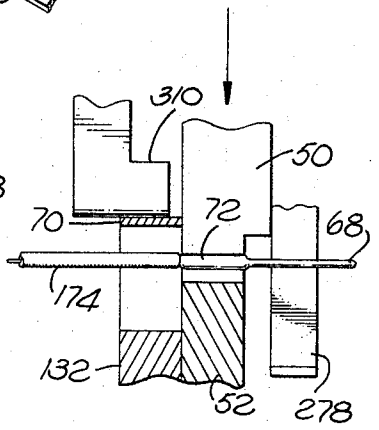


FIG.23.

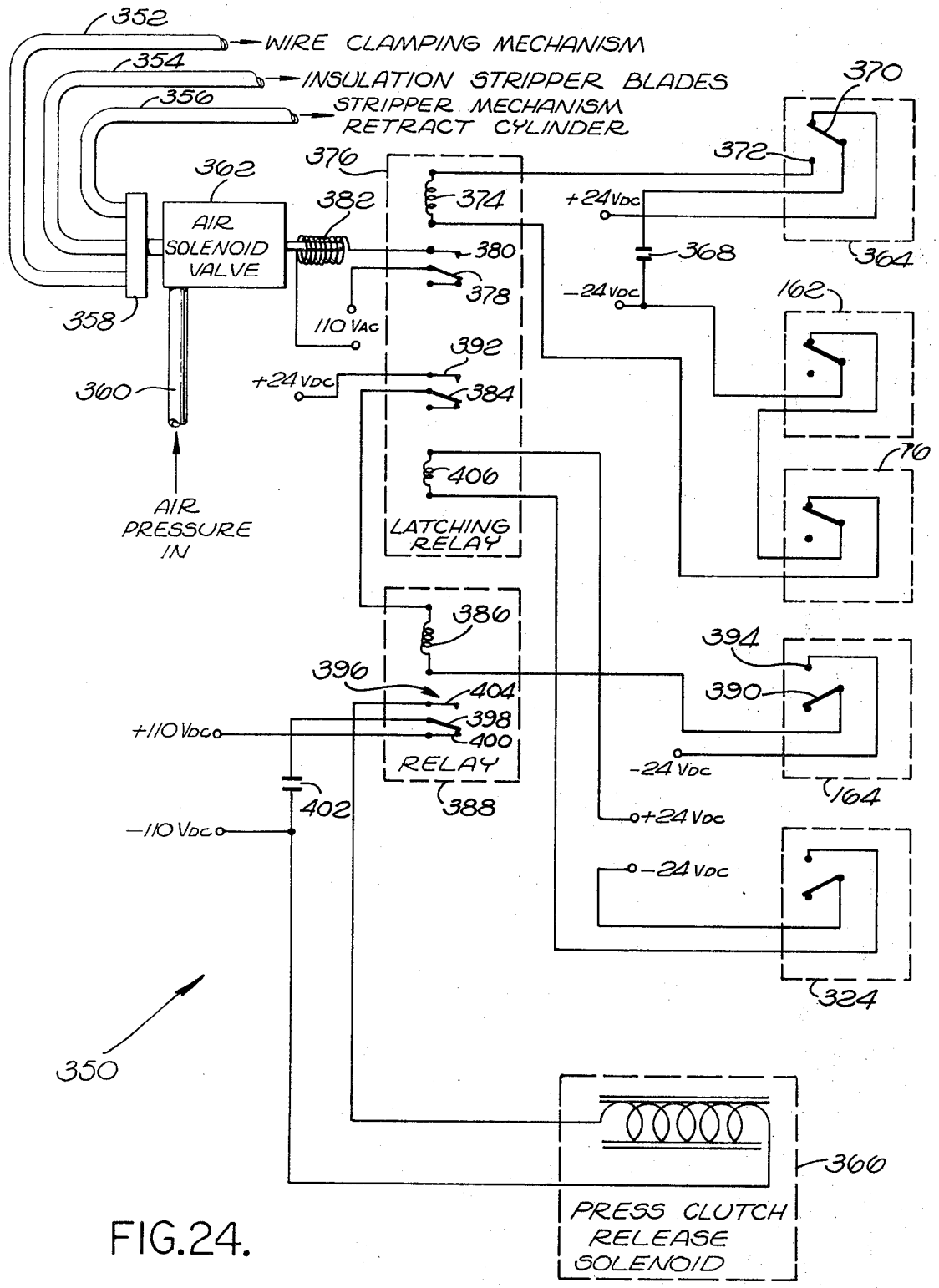

352
WIRE CLAMPING MECHANISM
354
INSULATION STRIPPER BLADES
356
STRIPPER MECHANISM RETRACT CYLINDER
370
372
376
374
+24 VDC
368
364
302
AIR SOLENOID VALVE
382
380
378
110 VAC
358
360
392
+24 VDC
384
162
406
LATCHING RELAY
76
AIR PRESSURE IN
386
394
396
404
390
+110 VDC
398
400
RELAY
-24 VDC
164
402
388
-110 VDC
+24 VDC
-24 VDC
324
350
366
PRESS CLUTCH RELEASE SOLENOID

FIG.24.

WIRE STRIPPING AND CRIMPING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus and method for stripping the insulation from an end portion of an insulated wire and crimping a U-section ferrule forming a part of an electrical contact to the bared end portion of the wire. The apparatus is sometimes referred to in the art as strip-crimp machine.

Strip-crimp machines are well known in the art. Examples of such machines are disclosed in U.S. Pat. No. 3,541,654 to Hills and U.S. Pat. No. 3,570,100 to Kindell et al. In the Hills machine, a plurality of contacts joined side-by-side to a common carrier strip are sequentially fed over an anvil on the table of a press with the U-section ferrules or crimp pots of the contacts open upwardly. A vertically movable die and cutting tool is positioned above the anvil. An insulated wire is positioned in the machine between the die and the ferrule of a contact positioned on the anvil. A stripping device is positioned behind the die and anvil which severs the insulation on the wire and, when shifted rearwardly, strips the severed insulation from the wire. Thereafter, the die is moved downwardly to bring the bared end portion of the wire into position in the ferrule to be crimped thereto. During the crimping step, the contact is severed from the carrier strip by the tool which is connected to the die. Thereafter, the carrier strip is indexed to bring another contact into position for crimping to an additional wire. Kindell et al discloses a somewhat different form of apparatus in which the die and anvil are positioned to one side of the insulation stripping mechanism. After the stripping operation, the stripped wire is shifted laterally to a position between the die and anvil. The die is lowered to bring the bared end portion of the wire into position for crimping to the U-section ferrule of the contact on the anvil. Thus, in both these machines, and those of a similar type presently on the market, the U-section ferrule of the contact is positioned on the anvil with the ferrule open upwardly, the wire is stripped of insulation and is then moved into position for crimping to the contact ferrule positioned on the anvil. These machines have several disadvantages. They are relatively complicated and expensive and require a relatively high level of competence to set up and to adjust or change for different size wires. In addition, these machines require relatively long lengths of wire for crimping to the contacts which is undesirable for some applications.

It is, therefore, desired to provide a strip-crimp machine of somewhat different construction and operation which is relatively simple and easy to operate. In addition, there is a substantial need for a machine which will strip and crimp wires of different size without having to change parts in the machine. It is also desired that such a machine permit the crimping of contacts to relatively short wires.

SUMMARY OF THE INVENTION

The principal object of the present invention is to provide an improved apparatus and method for stripping insulation from an insulated wire and crimping an electrical contact onto the bared end portion of the wire.

According to the principal aspect of the present invention, there is provided an improved and unique apparatus and method for stripping insulation from an insulated wire and crimping the U-section ferrule or crimp pot of a contact to the bared end section of the wire. The machine includes an upper crimping jaw connected to a press ram and a lower jaw connected to the press table. A wire clamping mechanism is positioned adjacent to the lower crimping jaw. A wire stripping mechanism is provided which is movable from a forward position adjacent to the clamping mechanism to a rearward position. A device is also provided for sequentially feeding a plurality of contacts joined side-by-side to a carrier strip in a step-wise fashion between the crimping jaws with the ferrules of the contacts open downwardly, rather than upwardly as in prior strip-crimp machines. Initially, a wire is mounted in the clamping mechanism. The stripping mechanism is actuated to sever the insulation on the insulated wire and is shifted rearwardly to strip the severed insulation from the wire. After the stripping mechanism reaches its rearward position, the upper crimping jaw is moved downwardly to sever a contact from the carrier strip and to crimp the ferrule of the contact to the bared end portion of the wire. As the upper jaw rises after the crimping operation, the contact feeding mechanism automatically indexes an additional contact into position between the crimping jaws for crimping to another wire. Thus, by the present invention, the contact is moved to a stationary wire for crimping, rather than the wire being moved to the contact. The apparatus of the invention is preferably in the form of an attachment which is mounted in a conventional press. However, the componenets of the apparatus may be made an integral part of a press. According to another desired feature of the invention, there is provided means for adjusting the apparatus to accommodate for different wire sizes without requiring removal or replacement of parts in the apparatus. The apparatus is relatively simple in construction and operation and permits rapid crimping of contacts onto wires.

Other aspects and advantages of the invention become more apparent from the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of a strip-crimp attachment embodying the features of the present invention which may be mounted on a conventional press with the wire stripping mechanism shown in its rearward position;

FIG. 2 is a vertical sectional view through the wire clamping and insulation stripping mechanisms of the apparatus illustrated in FIG. 1 shown mounted to a press ram and table, with a transparent cover mounted on the attachment and the wire stripping mechanism shown in its forward position;

FIG. 3 is a vertical section taken along line 3—3 of FIG. 2 showing the details of construction of the wire clamping mechanism:

FIG. 4 is a fragmentary sectional view taken along line 4—4 of FIG. 3;

FIG. 5 is a fragmentary horizontal sectional view taken along line 5—5 of FIG. 3;

FIG. 6 is a top plan view of the wire insulation stripping mechanism utilized in the apparatus of the present

invention with an insulated wire shown in position for stripping, such mechanism being shown in its forward position adjacent to the lower crimping jaw;

FIG. 7 is a front elevational view of the wire insulation stripping mechanism with the movable wire severing blade shown in its cutting position;

FIG. 8 is a horizontal sectional view taken along line 8—8 of FIG. 2;

FIG. 9 is a vertical sectional view taken along line 9—9 of FIG. 2;

FIG. 10 is a fragmentary sectional view taken along line 10—10 of FIG. 7 showing the details of construction of the insulation severing blades;

FIG. 11 is a plan view of the adjustable device which permits different size wires to be stripped and crimped in the apparatus of the invention;

FIG. 12 is a vertical sectional view taken along line 12—12 of FIG. 11;

FIG. 13 is a vertical sectional view taken along line 13—13 of FIG. 11;

FIG. 14 is an end view taken in the direction of arrow 14 in FIG. 11;

FIG. 15 is an exploded view of the contact feeding mechanism employed in the apparatus of the present invention;

FIG. 16 is an end view of the contact feeding mechanism, a portion being shown in section to show the details of the interior structure thereof;

FIG. 17 is a partial vertical sectional view taken along line 17—17 of FIG. 16 showing details of the contact feeding mechanism in the position when the press ram is in its upper position;

FIG. 18 is a fragmentary sectional view taken along line 18—18 of FIG. 16 showing parts of the feeding mechanism when the press is in its upper position;

FIG. 19 is a sectional view similar to FIG. 18 showing the position of the parts when the press ram is in its lower position;

FIG. 20 is an enlarged fragmentary perspective view of the contacts of the invention joined to a carrier strip, such contacts being shown inverted from their normal position so that the details of the structure thereof may be more easily seen;

FIGS. 21, 22, and 23 are fragmentary vertical sectional views showing the various positions of the upper crimping jaw as it is moved downwardly to sever a contact from its carrier strip and to crimp the ferrule of the contact to the bared end portion of a stripped wire; and

FIG. 24 is a diagramatic illustration of a simplified pneumatic and electrical control system suitable for use in the apparatus of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, there is shown the strip-crimp apparatus of the present invention, generally designated 30, shown in the form of an attachment for a conventional press. The attachment comprises a die set consisting of a top plate 32 and a bottom plate 34. The top plate is formed with an integral upstanding shank 36. As seen in FIG. 2, the shank 36 is attached to the ram 38 of a press, shown in broken lines. The bottom plate 34 is attached by a plurality of bolts 40, only one being shown, to the press table 42, also shown in broken lines. Two vertically extending guide posts 44 are fixed to the bottom plate 34. The tops of the guide posts 44 are slidable in bushings 46 mounted in apertures 48 in the top plate 32.

An upper contact crimping jaw 50 is fixed to the top plate 32 while a lower crimping jaw 52 is mounted on the bottom plate 34. A vertically extending cylindrical stop member 54 is mounted on the bottom plate 34 in vertical alignment with a stop member 56 mounted on the top plate, as seen in FIG. 8. The length of the stop members are selected such that when the top plate 32 is lowered by the ram 38 to its lowermost position as permitted by the stop members, the upper crimping jaw 50 will be properly disposed with respect with the lower jaw 52 so that a U-section ferrule or crimp pot of a contact will be fully crimped upon a wire in the lower jaw.

The attachment 30 includes basically three different mechanisms, namely: a wire clamping mechanism 58, a wire insulation stripping mechanism 60, and a contact feeding mechanism 62. The wire clamping mechanism 58 is mounted in a recess 64 formed in the front face 66 of the bottom plate 34. The wire insulation stripping mechanism 60 is mounted on top of the bottom plate 34 for oscillatable movement between a forward position adjacent to the clamping mechanism 58 as seen in FIG. 2 to a rearward position as seen in FIG. 1. The contact feeding mechanism 62 is mounted on the bottom of the top plate 32. This mechanism is designed to sequentially feed a plurality of contacts 68 joined side by side to a carrier strip 70 between the crimping jaws 50 and 52. As best seen in FIG. 20, each contact is formed with an integral U-section ferrule or crimping pot 72. The strip of contacts 68 are mounted on a reel, not shown, which is rotatable about a horizontally extending axis adjacent to the attachment 30. The contacts are fed through the feeding mechanism with the U-section ferrules 72 open downwardly.

A transparent plastic cover 74, seen in FIGS. 2 and 8, covers the front and the sides of the attachment 30. A normally open microswitch 76 mounted along one of the sides of the bottom plate 34 is closed when the cover is mounted on the attachment so that the control circuit which operates the apparatus cannot be energized without the cover being in place.

The structure of the wire clamping mechanism 58 is best seen in FIGS. 3–5. The mechanism comprises a generally square plate 80 which has a recess 82 formed in the front face thereof. The bottom of the recess is covered by a cover plate 84. A generally V-shaped notch 86 is formed through the plates 80 and 84. A piston 88 is slidable in a horizontally extending bore 90 formed in the plate 80. The outer end of the bore is closed by a fixed cylindrical element 92 retained in the bore by a snap ring 94. The element 92 is formed with a rod 96 upon which the piston 88 is slidably mounted. The forward portion 98 of the piston 88 behind plate 84 is cut in half to provide a flat side surface 100 which is best seen in FIG. 2. Such surface slides against the flat rear surface of the cover plate 84. An integral extension 102 protrudes outwardly from the end face 104 of the end portion 98 of the piston 88. As seen in FIG. 2, the extension 102 has a generally square cross section. The end of the extension is somewhat rounded. A coil spring 106 is mounted under compression between the extension 102 and a set screw 108 mounted in a relatively small passage 110 which is aligned with the bore 90. As will be appreciated, the spring 106 biases the piston 88 in the leftward direction as viewed in FIG. 3

so that the end face **104** of the piston is normally spaced from the right side of the notch **86.**

The piston **88** is actuated by air which is introduced into the annular space between the fixed element **92** in the bore **90** and the piston through an upstanding passageway **112.** The bottom of the passageway **112** is closed by a plug **113.** A horizontally extending passage **114** extends from the passageway **112** to the rear face **116** of the plate **80.** The passage **114** registers with a passage **118** which opens at the bottom of the recess **64** in the bottom plate **34.** The passage **118** extends to the rear of the plate **34** for connection to an air hose, not shown. Air introduced into the passages **118** and **114** will pass through passageway **112** to the bore **90** to urge the piston **88** in the rightward direction as viewed in FIG. **3** against the force of the spring **106.** An L-shaped clamping insert member **120,** which forms the right side of the notch **86,** is mounted on the plate **80** of the clamping mechanism. A plurality of vertically extending teeth or ridges **122** are formed on the surface **104** of the piston **88** and on the opposing surface of the member **120.** The vertically extending teeth **122** are shaped to resist movement of a wire held therebetween in the direction of the stripping mechanism **60** or upwardly, as viewed in FIG. **5.** Thus, the teeth **122** serve to firmly grip an insulated wire mounted in the notch **86** when the piston **88** is forced in the rightward direction, as viewed in FIG. **3,** as the result of air being introduced under pressure through the passageway **112.** When the air pressure is reduced, the spring **106** will return the piston **88** to its open position, thus allowing the wire to be removed from the notch **86.**

The wire insulation stripping mechanism **60** comprises a block **124** which is slidable on a dovetail-shaped track **126** fixed on the top surface of the plate **34.** A plate **128** is also slidably mounted on the track **126.** The rear of the plate **128** is formed with an upstanding shoulder **130.** The lower crimping jaw **52** is fixedly mounted on the forward end of slidable plate **128.** A stop element **132** is also mounted on the plate **128** in front of the jaw **52.** The stop element is formed with a generally U-shaped upwardly opening groove **134** which is aligned with a generally V-shaped notch **136** formed in the jaw **52.** When the block **124** is positioned in its forwardmost position on the track **126,** the front surface **138** of the plate **128** is flush with the front surface of the track **126** and thus is in engagement with the rear surface of the wire clamping mechanism **58.** In such forwardmost position of the block **124,** the lower jaw **52** is disposed a short distance forwardly of the upper jaw **50** as best seen in FIG. **2.** When the block **124** is shifted rearwardly on the track **126,** the back surface of the block will engage the upstanding shoulder **130** on the plate **128** thereby moving the plate and thus the lower jaw rearwardly a distance sufficient to bring the lower jaw into direct vertical alignment under the upper jaw **50.**

The block **124** of the stripping mechanism is moved between its forward and rearward positions by a pneumatic piston and cylinder assembly **142** which is mounted on a rearwardly extending mounting bracket **144** fixed to the rear of the bottom plate **34.** The assembly **142** comprises a piston **146** which is slidable in a cylinder **148.** The piston is urged in a forward direction by means of a coil spring **150.** The piston rod **152** extends forwardly from the cylinder **148** and terminates in a coupling sleeve **154** which is fixed to an upstanding flange **156** on the block **124.** The opposite end of the piston rod **152** extends rearwardly from the cylinder **148** and carries a pair of axially adjustable sleeves **158** and **160.** A pair of microswitches **162** and **164** are mounted on the mounting bracket **144** in alignment with the sleeves **158** and **160.** When the slide block **124** is in its forwardmost position, as viewed in FIG. **2,** the sleeve **158** actuates the switch **162,** and when the block is in its rearwardmost position, as seen in FIG. **1,** the sleeve **160** actuates the switch **164.** An opening **165** in the wall of the cylinder **148** is connected to an air hose, not shown. Air pressure introduced into the cylinder through hole **165** shifts piston **146** rearwardly to retract the stripping mechanism **60** from the wire clamping mechanism **58.**

As seen in FIGS. **2** and **6,** a cylindrical rod **166** is slidably mounted in a passage **167** in an upstanding flange **168** formed on the forward portion of the block **124.** A nut **170** threaded to the rear of the rod **166** permits axial adjustment of the rod in the passage **167.** The front face **172** of the rod provides a stop for the end of an insulated wire **174** which is positioned by an operator through the notch **86** in the clamping mechanism, the groove **134** in the stop **132** and the notch **136** in the anvil **52,** as seen in FIG. **6.** An aperture **175** is formed in the cover **74** in front of these parts to permit access thereto.

The stripping mechanism includes a pair of insulation severing blades **176** and **178.** The blade **176** is pivotal in a vertical direction about a horizontally extending pin **180** while the blade **178** is positioned behind the blade **176** and is fixed to the block **124.** The blades **176** and **178** are formed with opposed V-shaped notches **181** and **182,** respectively, which define therebetween a wire-receiving opening **184,** as seen in FIG. **7.** The movable blade **176** is biased upwardly to a normally open position by means of a coil spring **186** which is fixed at one end to an extension **188** of the blade and at the other end to a pin **190** fixed to the block **124.** The extension **188** is formed with a downward extending projection **192** which seats on top of a piston **194.** The piston is slidable in a vertically extending bore **196** formed in the block **124.** The bore communicates through a passageway **197** to an air hose **198.** Introduction of air through the hose **198** shifts the piston **194** upwardly so that the blade **176** will move downwardly to sever insulation on the wire **174** positioned between the two blades. After the insulation is severed, the block **124** is shifted rearwardly on the track **126,** thereby stripping the severed insulation from the end of the wire, thus providing a bared end portion of the wire to which the ferrule of the contact **68** may be crimped. As the block **124** moves rearwardly, the insulation which is stripped from the wire falls through a passageway **199** in the block and through a vertical slot **200** which extends through the plate **128,** track **126** and bottom plate **34.** In the event the severed insulation does not fall by itself through the passageway **199,** when the block **124** reaches its rearwardmost position and the press ram **38** is lowered to perform a crimping operation, a generally U-shaped wire **202** mounted on a block **204** on the bottom of the top plate **32** will extend into the upper end of the passage **198** between the front surface **172** of the rod **166** and the rear of the staionary severing blade **178** to force the insulation downwardly through the passages **199** and **200.**

As stated previously, when the block **124** is moved to its rearward position, it engages the shoulder **130** on the plate **128** thereby shifting the lower crimping jaw **52** rearwardly a sufficient distance to become vertically aligned with the upper crimping jaw **50.** This movement of the jaw **52** permits the use of shorter wires for crimping a contact thereto since the contact may be crimped to the immediate end of the wire. The extent of rearward movement of the lower jaw which occurs after the stripping operation and, hence, the length of wire to which the contact is crimped may be adjusted by means of an Allen set screw **206** mounted on a downwardly extending flange **207** on the rear of plate **128.** This screw engages a stop **208** provided on the bracket **144** in alignment with the screw. Also, the extent of forward movement of the plate **128** relative to the track **126** may be screw engages a stop **208** provided on the bracket **144** in alignment with the screw. Also, the extent of forward movement of the plate **128** relative to the track **126** may be adjusted by means of a second Allen set screw **210** which is threaded in the rear of a passage **212** that extends forwardly through the track **126,** the plate **80,** and the cover **74,** as seen in FIG. **2.** The rear of the set screw **210** abuts the flange **207** on the plate **128.** The set screw **210** has a longitudinal extending passage therethrough in alignment with the set screw **206.** Thus, by inserting suitable tools through the passage **212,** the operator may rotate the screws **206** and **210** to adjust for the extent of both the rearward and forward movement of the plate **128.** A set screw **213** is mounted through the side of the plate **128** to fix the position of the Allen screw **206** and a second set screw **214** is mounted in the track **126** to fix the position of Allen screw **210.**

Reference is now made to FIG. **10** which shows the details of configuration of the insulation severing blades **176** and **178.** The regions of the blades adjacent the V-shaped notches **181** and **182** are bevelled to provide cutting faces **215** and **216,** respectively. Typically, the cutting faces of blades in a conventional insulation stripping mechanism are disposed at equal angles of about 45° each with respect to the longitudinal axis of the insulated wire **174** which is disposed between the blades. However, with such an arrangement, occasionally the forward end of the wire will deflect upwardly when the insulation stripping mechanism is retracted to its rearward position, causing the wire to become nicked or scarred. In order to avoid this problem, the angle of the cutting face **216** may be made greater than the angle of the cutting face **214** with respect to the longitudinal axis of the wire **174.** Preferably, the angle of the cutting face **215** is about 45° while the angle of the cutting face **216** is about 75°.

As stated previously herein, in conventional strip-crimp machines, various parts must be replaced in order to accommodate for different size or gauge wires. Means are provided on the apparatus of the present invention for simply and rapidly altering the stroke of the movable insulation severing blade **176** so that different size wires may be stripped of their insulation. Such means comprises a shaft **218** which is threadedly engaged in the slide block **124** below a downwardly facing shoulder **220** formed on an end section of the movable blade **176** (see FIG. **7**). The shaft is horizontally positioned in the block **124** with its forward end **222** extending outside the block a sufficient distance so as to protrude through a bore **224** formed in the wire clamping mechanism **58.** A slot **226** is formed in the end face **228** of the shaft **218** for receiving a suitable tool to rotate the shaft in the block **124.** The shaft **218** is formed with a plurality of ramps **230** which are aligned with the shoulder **220** on the blade **176.** Each ramp is disposed a distance from the longitudinal axis **232** of the shaft **218** different from the other ramps. The height of each ramp is selected so that when an insulated wire of predetermined standard gauge is positioned between the blades **176** and **178,** the movable blade will cut the insulation on the wire without nicking the wire. Six ramps **230** are shown on the shaft **218** by way of example only. Each ramp corresponds to a standard wire gauge. The wire gauges are indicated by the indicia appearing on the front face of the wire clamping mechanism **58** about the bore **224.** A pointer **234** is provided on the end face **228** of the shaft **218** for selecting the desired wire gauge.

After the shaft **218** has been rotated to the appropriate position for a selected wire gauge, sometimes the insulation on the wire is not fully cut or the wire is still slightly nicked due to differences in tolerances of the blades **176** and **178** mounted on the apparatus. Thus, it is desirable to provide a fine adjustment of the position of the ramps **230** will respect to the movable blade **176.** Such fine adjustment is provided by making the ramps **230** inclined with respect to the longitudinal axis **232** of the shaft **218** so that the rear portions of the ramps **230** are lower than the forward portions thereof. Conversely, the forward portions of the ramps could be made lower than the rear portions if desired. It can be appreciated that by rotating the shaft **218** a complete revolution or 360° to shift the shaft longitudinally, the region of the ramp **230** which engages the shoulder **220** on the movable blade **176** will be either higher or lower depending upon the direction of rotation of the shaft. With the ramps **230** inclined as shown in FIG. **11** when the shaft is rotated in the clockwise direction a full revolution, for example, a higher region of a selected ramp **230** will engage the shoulder **220** to increase the size of the cutting opening **184** between the insulation severing blades. Thus, if the adjustment of the shaft **218** by aligning the pointer **234** with the appropriate wire gauge indicia does not effect complete severing of the insulation on the wire or the wire is nicked, a finer adjustment of the size of the wire opening **184** can be achieved by rotating the shaft **218** a full revolution so that the shoulder **220** on the movable cutting blade will abut a different region of the selected ramp **230.** A set screw **236** mounted in the side of the slide block **124** carries a spring loaded ball **238** which engages one of a plurality of elongated recesses **240** formed in the shaft **218** to provide a detent arrangement to releasably retain the shaft in a selected position.

Reference is now made to FIGS. **15–19** of the drawings which illustrate the details of construction of the contact feeding mechanism **62.** The upper crimping jaw **50** is an integral part of the contact feeding mechanism. In general, this mechanism functions to sequentially feed the carrier strip **70** laterally therethrough so that the ferrules or crimping pots **72** on the contacts joined to the strip pass under the jaw **50** in a stepwise fashion. Upon lowering of the press ram **38,** a contact is severed from the strip **70** and is crimped to a bared end portion of wire held in the jaw **52** by the clamping mechanism **58.** An L-shaped bracket **242** mounted on the bottom of the top plate **32** carries a cylindrical

guide 244 which is aligned with the contact feeding mechanism 62. The strip 70 passes through the guide 244 and through an opening, not shown, in the cover 74 to a region outside the attachment 30.

More specifically, the contact feeding mechanism 62 comprises a slider block 246 which is slidable in a transverse slow 248 formed in a housing 240. The housing is fixed to top plate 32. A vertical slot 252 in the housing communicates with the slot 248. A rear end plate 254 is mounted on one side of the housing to the rear of the slot 252 while a second end plate 256 is mounted on the same side of the housing forwardly of the slot 252. An end plate 258 is mounted on the opposite side of the housing. A front cover plate 260 is mounted on the front face of the housing, and a bottom cover plate 262 closes the bottom of the housing. A channel 264 is formed on the upper face of the bottom plate 262. The carrier strip 70 with the contacts joined thereto is slidable in the channel 264. A vertical slot 266 is formed in the bottom plate 262 in alignment with the slot 252 in the housing. A recess 268 is formed in the slider block 246 in alignment with the slots 252 and 266 and adjacent to the end plates 254 and 256. The bottom 270 of the recess 268 is slanted downwardly at an angle of about 45°, as best seen in FIGS. 18 and 19. A coil spring 272 urges the slider block 246 in the rightward direction as viewed in FIGS. 18 and 19.

Two plates 274 and 276 are fixedly mounted on the end plate 258. The upper crimping jaw 50 is an integral part of the plate 274. A hook 278 extends downwardly from the end plate 276. The hook is positioned behind the jaw 50. An index pawl 280 is pivotally mounted by means of a pivot pin 284 in a vertical slot 282 opening at the bottom of the slider block 246. A spring 286 biases the pawl 280 in a downward direction so that the pawl will engage in openings 288 formed in the carrier strip 70. A spring arm 290 is fixedly mounted at one end to the bottom of the plate 262. The other end of the arm 290 carries a back stop 292 which extends upwardly through a vertically extending slot 294 formed in the plate 262. The back stop engages in the openings 288 on the carrier strip 70 from the bottom.

A cam 296 is fixedly mounted on the bottom plate 34 of the attachment 30 in alignment with the slots 252 and 266 in the feeding mechanism 62. The cam is formed with a downwardly facing inclined surface 298 which extends upwardly at an angle of about 45°. When the top plate 32 of the die set is in its normal upper position, a vertical end surface 300 on the cam 296 engages the right hand side 302 of the slider block 246 as seen in FIG. 17 and 18. When the top plate 32 is lowered to perform a crimping operation, the slider block 246 will shift in a rightward direction under the force of a spring 272 as seen in FIG. 19 so that the surface 270 on the block will become disposed under the inclined surface 298 on the cam 296. When the top plate 32 is raised to its upper position after a crimping operation, the slider block 246 will be shifted in a leftward direction due to the cooperative action between the inclined surfaces 270 and 298 on the block and the cam 296, respectively. Such leftward movement of the slider block 246 causes the pawl 280 disposed in an opening 288 in the carrier strip 70 to index the strip one position to locate an additional contact 68 under the crimping jaw 50. The spring biased backstop 292 prevents the carrier strip 70 from shifting to the right or rearwardly in the channel 264 when the slider block 246 is shifted in the rightward direction under the force of spring 272 when the top plate 32 is lowered. Thus, with each cycle of downward and upward movement of the top plate 32 attached to the press ram 38, the strip 70 is indexed to the left. Thus, the contact feeding mechanism 62 sequentially feeds a plurality of contacts 68 in a stepwise fashion under the crimping jaw 50.

A rod 304 is mounted for vertical movement in a slot 306 formed in the end plate 258 of the feeding mechanism. The rod is biased downwardly by a spring 308. A foot 310 is formed on the bottom of the rod 304 and is positioned in front of the jaw 50. This spring biased pressure foot engages the carrier strip 70 to prevent the same from lifting during the crimping operation as will be seen later herein.

A vertical slot 312 is formed in the front cover plate 260 of the feeding mechanism. This slot is adapted to receive a slotted tool, not shown, which will engage at its upper surface with a downwardly facing shoulder 314 formed on the pawl 280 and on its bottom surface with the spring arm 290 to spread the pawl and the backstop 292 apart, thus allowing the carrier strip 70 to be withdrawn rearwardly from the contact feeding mechanism, if desired.

As seen in FIG. 1, stop member 316 is fixed to the slide block 124. This member will engage the block 318 (see FIG. 8) mounted on the bottom of the top plate 32 in the event the insulation stripping mechanism 60 is in its forward position when the press ram is lowered. When the insulation stripping mechanism is in its rearward position, the top of the stop member 316 will be received in a recess 320 formed in the bottom surface of the top plate 32 when the ram is lowered. This arrangement assures that the top plate 32 of the die set cannot be lowered until the stripping mechanism 60 is located in its rearwardmost position out of the path of movement of the contact feeding device and the crimping jaw 50 carried thereby.

As seen in FIG. 9, a vertically adjustable actuating rod 322 is mounted on the top plate 32. This rod engages a microswitch 324 mounted on the bracket 144 which carries the pneumatic piston and cylinder arrangement 142. The rod 322 is formed with a bevelled shoulder 325 which leads to an enlarged upper section 326 that actuates the switch 324 when the top plate 32 is lowered to perform a crimping operation.

The various steps of the crimping operation of the invention are best seen by referring to FIGS. 21 to 23. As seen in FIG. 21, when the top plate 32 of the die set is lowered, the crimping jaw 50 is moved downwardly in alignment with the jaw 52. During this downward movement of the jaw 50, the contact feeding mechanism 62 carries the carrier strip 70 for the contacts 68 downwardly until the strip engages the top surface of the stop 132. The U-section ferrule 72 of one contact 68 joined to the strip 70 is open downwardly in a position immediately above the bared end portion of the wire 174. During further downward movement of the top plate 32, the jaw 50 will shear the contact 68 away from the carrier strip. The spring biased pressure foot 310 will prevent the carrier strip from lifting during the shearing step. Further downward movement of the top plate will cause the ferrule 72 to embrace the bared end section of the wire 174 and the jaws 50 and 52 will cooperate to crimp the ferrule to the wire as seen in FIG. 23. When the press ram 38 rises, the hook 278 will engage under the contact 60 to lift the contact out of the

lower jaw **52.** Further upward movement of the mechanism **62** causes the carrier strip **70** to be indexed one position to bring an additional contact into alignment under the jaw **50** by the cooperative action of the cam **296** with the slider block **246,** as explained previously.

Reference is now made to FIG. **24** which diagramatically illustrates a simplified pneumatic and electrical control system, generally designated **350,** for the apparatus of the present invention. The control system includes three air lines **352, 354,** and **356** which are connected to a manifold **358.** Air pressure is introduced into the manifold through an inlet line **360.** The air is controlled by a solenoid valve **362.** The line **352** is coupled to the passage **118** which opens into the passage **114** in the wire clamping mechanism **58.** The line **354** is coupled to the hose **198** leading to the bore **196** in the insulation stripping mechanism **60.** The line **356** is connected to the air inlet port **165** in the cylinder **148** of the pneumatic piston-cylinder assembly **142.**

The control system **350** also includes the microswitches **76, 162, 164,** and **324,** as well as a foot switch **364** and a press clutch release solenoid **366.** The solenoid **366** operates a "one shot" clutch (not shown) to couple the press ram **38** to a continuously running motor (not shown) so that the ram, which is normally in its top dead center position, is driven through a working, that is, downward stroke and is automatically returned to its top dead center position. The movable contacts of switches **76, 162, 164, 324** and **364** are shown in the position they would assume when the cover **74** is mounted on the attachment **30,** closing the safety switch **76,** and with the stripping mechanism **60** in its forward position wherein the switch **162** is closed. In this position of the switches, a capacitor **368** is charged by a **24** volt DC power source. When the foot switch **364** is actuated by the operator to lower the movable contact **370** to engage fixed contact **372,** a circuit including the switches **76, 162** and a latching coil **374** of a latching relay **376** is closed so that the capacitor **368** will discharge to energize the coil. This causes a movable contact **378** of the relay **376** to rise and engage a fixed contact **380,** thereby closing a power circuit including the coil **382** of the solenoid valve **362.** Preferably, a 110 volt alternating current power supply is connected in the circuit including the coil **382.** Energization of the coil opens the valve **362,** thereby supplying air pressure to the lines **352, 354** and **356** through the manifold **358.** Introduction of air into these lines closes the wire clamping mechanism **58,** closes the insulation stripping blade **176** and retracts the piston **146** of the pneumatic piston-cylinder assembly **142** in sequence. The sequence of movement of the parts results from the particular diameters of the pistons utilized in the wire clamping mechanism **58,** insulation severing blade assembly, and the insulation stripping retraction cylinder **148.** The latching relay **376** includes a second movable contact **384** which is connected to a coil **386** of a standard relay **388.** The coil **386** is connected to the movable contact **390** of the switch **164.** When the latching coil **374** is energized by depression of the foot switch **364,** the contact **384** will rise to engage a fixed contact **392** which is connected to one terminal of a **24** DC power supply, the other terminal being connected to the switch **164.** When the piston **146** is retracted to its rearwardmost position the contact **390** of the switch **164** will engage fixed contact **394,** thereby energizing the coil **386** of the relay **388.** The relay **388** includes a single pole double throw switch **396.** The movable contact **398** and a fixed contact **400** of the switch **396** are normally engaged to close a circuit which includes a capacitor **402** and a 110 volt DC power source so that the capacitor is normally charged. When the coil **386** of the relay is energized upon the closing of the switch **164,** the movable contact **389** lifts to engage fixed contact **404** whereby the capacitor **402** discharges to the press clutch release solenoid **366** so that the press ram will move through its downward stroke to effect a crimping operation. As the ram approaches its lower position, the switch **324** is closed by the actuating rod **322** on the top plate **32** thereby energizing an unlatching coil **406** of the latching relay **376.** This allows the relay **376** to return to its normal position and thereby open the electrical circuit to the coil **382** of the air solenoid valve **362.** With the electric power to the valve off, the valve closes, stopping the flow of air to the wire clamping mechanism, the insulation stripping mechanism and the stripping mechanism retract cylinder **142.** These devices are all spring loaded, so that upon the removal of air pressure, the wire clamping mechanism opens, the stripping blades open, and the piston **146** in the retract cylinder assembly **142** returns to its full forward position. With the air pressure to these devices off, the press completes its cycle by rising to its top dead center position. When the retract piston **146** is returned to its forwardmost position by the spring **150,** the switch **164** opens to de-energize the coil **386,** thus disabling the relay **388.** When the operator raises his foot off the foot switch **364,** the cycle through the foot switch is completed, allowing the capacitors **368** and **402** to be recharged. The machine is now ready for another complete cycle of operation.

The complete operation of the apparatus is as follows. The operator inserts an insulated wire **174** through the aperture **175** in cover **174,** the notch **86** in the clamping mechanism **58,** the groove **134** in the stop **132,** the notch **136** in the anvil **52** and the opening **184** between the insulation severing blades **176** and **178** until the end of the wire abuts the stop member **166.** After the wire has been inserted to the stop, the operator activates the foot switch **364.** This opens the air solenoid valve **362** to close the wire clamping mechanism **58,** close the insulation severing blades **176** and **178** to cut through the wire insulation, and retract the piston **146** to shift the stripping mechanism from its forward to its rearward position, thereby stripping the severed insulation from the wire. As the stripping mechanism **60** moves to its rearward position, the jaw **52** on the plate **128** is moved directly under the stripped portion of the wire and in alignment with the jaw **50** on the top plate **32.** When the stripping mechanism reaches its full extreme of travel away from the clamping mechanism, the switch **164** is actuated automatically. Actuating this switch completes the electrical circuit through the coil **386** of relay **388,** thereby energizing the press clutch release solenoid **366.** Actuation of the solenoid allows the press to move through its downward stroke carrying a contact **68** on the strip **70** downwardly toward the jaw **52.** After carrier strip **70** engages the stop **132,** the crimping jaw **50** will shear the contact **68** from the strip. Further downward movement of the jaw will cause the crimping ferrule **72** to embrace the bared end portion of the wire **174.** Further travel in the downward direction causes the ferrule to become crimped to the

wire in the jaw **52.** As the press approaches its full downward position, the rod **322** on the top plate **32** closes the switch **324,** unlatching the relay **376** and, therefore, opening the electrical circuit to the air solenoid valve **362.** The valve closes, thus stopping the flow of air to the lines **352, 354** and **356.** The wire clamping mechanism **58** and insulation stripping blades open and the spring loaded piston **146** of the retraction assembly **142** returns the slide block **124** of the stripping mechanism **60** to its forward position. On the up stroke of the ram press, the switch **324** opens to unlatch the relay **376,** and the hook **278** on the contact feeding mechanism lifts the contact **68** out of the jaw **52.** The upward motion of the ram also supplies the motion through the cam **296** to advance the next contact into position under the crimping jaw **50** for an additional crimping operation. When the ram has reached its full upward position, the operator removes his foot from the switch **364,** the capacitors **368** and **402** are recharged so that the machine is ready for another complete cycle of operation.

It will be appreciated that various modifications in the apparatus could be made without departing from the invention. For example, the wire insulation stripping mechanism **60** and the wire clamping mechanism **58** could be mounted directly to the press table and the contact feeding mechanism **62** could be connected directly to the press ram. However, it will be appreciated that by the construction of the invention as illustrated in the drawings, the apparatus of the invention is in the form of an attachment which may be conveniently mounted on any conventional press. In addition, the contact feeding mechanism could be mounted on the bottom plate **34** and the cam **296** mounted on the top plate **32** assuming, of course, that the crimping jaw **50** and hook **278** remain on the top plate **32.** In addition, the crimping jaws **50** and **52** could be reversed if desired. Other modifications within the scope of the invention will be apparent to those skilled in the art.

What is claimed is:

1. An attachment for a press for stripping the insulation from an end portion of an insulated wire and crimping a U-section ferrule forming a part of an electrical contact to the bared end portion of the wire comprising:

a die set including a top plate and a bottom plate, said top plate being adapted to be fixed to the press ram and the bottom plate being adapted to be fixed to the press table, upper and lower crimping jaws connected to said top and bottom plates, respectively;

wire-clamping means and insulation-stripping means each mounted on said bottom plate adjacent to said lower crimping jaw, and insulation-severing blades being provided on said insulation stripping means;

means mounting said insulation-stripping means for movement from a forward position adjacent to said wire-clamping means to rearward position;

means for sequentially feeding a plurality of said contacts, with the ferrules thereof open downwardly between said crimping jaws;

means for moving said wire-clamping means into engagement with an insulated wire;

means for operating said insulation-severing blades while said insulation-stripping means is in said forward position and said wire is held by said wire-clamping means to sever the insulation on said wire;

means for shifting said insulation-stripping means to said rearward position while said wire is held by said wire-clamping means to strip the severed insulation from said wire; and

means for operating said press ram upon movement of said insulation-stripping means to said rearward position to lower said upper crimping jaw into engagement with said lower crimping jaw, said lowering of said upper crimping jaw causing one of said contacts to move downwardly so that said ferrule will embrace the bared end portion of said wire and become crimped thereto.

2. An attachment as set forth in claim **1** wherein:

said contact feeding means sequentially feeds a plurality of said contacts joined side by side to a carrier strip in a stepwise fashion between said crimping jaws; and

said upper crimping jaw severs each consecutive contact from said carrier strip during lowering of said top plate by said press ram.

3. An attachment as set forth in claim **2** including:

stop means on said bottom plate engageable by said carrier strip prior to crimping of said ferrule to said bared end portion of said wire.

4. An attachment as set forth in claim **1** including:

hook means carried by said top plate operable to remove said wire with a contact crimped thereto from said lower crimping jaw during the raising of said top plate by said press ram.

5. An attachment as set forth in claim **2** wherein:

said contact feeding means is mounted on said top plate and includes pawl means engageable with said carrier strip: and

cam means on said bottom plate engageable by said feeding means to actuate said pawl means during raising of said top plate by said press ram to index said carrier strip one position and thereby bring an additional contact into position for crimping to a wire.

6. An attachment as set forth in claim **1** wherein:

said lower crimping jaw is positioned between said wire-clamping means and said insulation-severing blades.

7. An attachment as set forth in claim **1** wherein:

said contact feeding means is mounted on said top plate and sequentially feeds a plurality of said contacts joined side by side to a carrier strip in a stepwise fashion below said upper crimping jaw; and

said crimping jaw severs each consecutive contact from said carrier strip during lowering of said top plate.

8. An attachment as set forth in claim **7** including:

stop means on said bottom plate adjacent said lower crimping jaw and engageable by said carrier strip prior to crimping of said ferrule to said bared end portion of said wire.

9. An attachment as set forth in claim **7** including:

hook means carried by said top plate operable to remove said wire with a contact crimped thereto from said lower crimping jaw during the raising of said top plate by said press ram.

10. An attachment as set forth in claim **7** wherein:

said contact feeding means includes a cam follower and a pawl pivotally connected to said cam fol-

lower, said pawl being engageable with said carrier strip; and

cam means on said bottom plate engageable by said cam follower to actuate said pawl during raising of said top plate by said press ram to index said carrier strip one position and thereby bring an additional contact into position for crimping to a wire.

11. An attachment as set forth in claim **1** wherein:

said insulation-stripping means includes a slide member carrying said insulation-stripping blades;

said mounting means comprises a track upon which said slide member is oscillatable between the forward and rearward positions of said insulation-stripping means;

a plate slidable relative to both said track and said slide member and movable in the same direction as said slide member, said lower crimping jaw being fixed to said slidable plate and being positioned forward of said upper crimping jaw when said slidable plate and slide member are in their forwardmost positions relative to said track;

a shoulder adjacent to the rear of said slidable plate engageable by said slide member when the latter shifts rearwardly on said track to said rearward position thereby shifting said slidable plate rearwardly; and

stop means on said bottom plate engageable with said slidable plate to limit the rearward movement thereof such that said lower crimping jaw becomes vertically aligned with said upper crimping jaw upon said slide member reaching said rearward position.

12. An attachment as set forth in claim **1** wherein said insulation-stripping blades include a fixed blade and a movable blade, and including:

adjustable stop means engageable with said movable blade to control the spacing between said blades to accommodate for different size wires to be stripped.

13. An attachment as set forth in claim **12** wherein:

said adjustable stop means comprises a shaft rotatable in said insulation-stripping means;

said shaft having a plurality of ramps formed thereon lying in the path of movement of said movable blade, each said ramp being spaced a distance from the longitudinal axis of said shaft different from the other ramps.

14. An attachment as set forth in claim **13** wherein:

said shaft is threadedly engaged in said insulation-stripping means whereby rotation thereof will shift said shaft longitudinally; and

each said ramp is inclined at an angle relative to said axis of said shaft so that one end of each ramp is closer to the axis than the other end thereof.

15. An attachment as set forth in claim **1** wherein:

said insulation-severing blades include a front blade adjacent to said lower crimping jaw on said bottom plate and a rear blade behind said front blade, each said blade having a cutting face thereon; and

the angle of the cutting face on said front blade relative to a horizontally extending axis positioned between said blades is less than the angle of the cutting face on said rear blade.

16. An attachment as set forth in claim **15** wherein:

said front blade cutting face angle is about 45° and said rear blade cutting face angle is about 75°.

17. An apparatus for stripping the insulation from an end portion of an insulated wire and crimping a U-section ferrule forming a part of an electrical contact to the bared end portion of the wire comprising:

a press including an upper movable member and a lower stationary member;

upper and lower crimping jaws connected to said members, respectively;

wire-clamping means and insulation-stripping means each mounted on said stationary member, said insulation-stripping means being provided with insulation-severing blades;

means mounting said insulation-stripping means for movement from a forward position adjacent to said wire-clamping means to a rearward position;

means for sequentially feeding a plurality of said contacts, with the ferrule thereof open downwardly, between said crimping jaws;

means for moving said wire-clamping means into engagement with an insulated wire;

means for operating said insulation severing blades while said insulation-stripping means is in said forward position and said wire is held by said wire-clamping means to sever the insulation on said wire;

means for shifting said insulation-stripping means to said rearward position while said wire is held by said wire-clamping means to strip the severed insulation from said wire; and

means for lowering said movable member, upon movement of said insulation-stripping means to said rearward position, to lower said upper crimping jaw into engagement with said lower crimping jaw, said lowering of said movable member causing one of said contacts to move downwardly so that said ferrule will embrace the bared end portion of said wire and become crimped thereto.

18. An apparatus as set forth in claim **17** wherein:

said lower crimping jaw is positioned between said wire-clamping means and said insulation-severing blades.

19. An apparatus as set forth in claim **18** wherein:

said contact feeding means is fixed to said movable member and sequentially feeds a plurality of said contacts joined side by side to a carrier strip in a stepwise fashion below said upper crimping jaw; and

said upper crimping jaw severs each consecutive contact from said carrier strip during lowering of said movable member.

20. In an apparatus for severing the insulation on an insulated wire, including a support and fixed and movable insulation severing blades mounted on said support, the improvement which comprises:

adjustable stop means engageable with said movable blade to control the spacing between said blades to accommodate for different size wires; and

said stop means comprising a shaft rotatable in said support, said shaft having a plurality of ramps formed thereon lying in the path of movement of said movable blade, each said ramp being spaced a distance from the longitudinal axis of said shaft different from the other ramps, whereby selective rotation of said shaft will bring a ramp having a predetermined elevation into position for abutting engagement with said movable blade.

21. An apparatus as set forth in claim **20** wherein:

said shaft is threadedly engaged in said support whereby rotation thereof will shift said shaft longitudinally; and

each said ramp is inclined at an angle relative to said axis of said shaft so that one end of each ramp is closer to the axis than the other end thereof.

22. A method of attaching a contact having a U-section ferrule to an insulated wire comprising the steps of:

positioning one of said contacts between upper and lower crimping jaws with said ferrule opening downwardly;

holding an insulated wire in a fixed clamp adjacent to said lower crimping jaw;

severing the insulation on said wire and stripping the severed insulation from said wire while holding said wire in said fixed clamp to provide a bared end portion of said wire; and

lowering said upper crimping jaw to carry said contact downwardly until said ferrule embraces said bared end portion of said wire and becomes crimped thereto in said lower crimping jaw.

23. A method as set forth in claim **22** wherein a plurality of said contacts are joined side by side to a carrier strip and including the additional steps of:

repeating the foregoing series of steps; and

sequentially feeding said plurality of contacts in a stepwise fashion between said crimping jaws following the crimping operation of said foregoing series of steps.

24. A method as set forth in claim **23** including the additional step of:

separating each said contact from said carrier during the lowering of said upper crimping jaw.

25. A method as set forth in claim **24** wherein said contact is separated from said carrier strip by:

providing a stop member adjacent to said lower crimping jaw;

engaging said carrier strip with said stop member; and

engaging said upper crimping jaw with said contact while said strip is engaged with said stop member to shear said contact from said strip during the lowering of said upper crimping jaw.

26. A method as set forth in claim **22** including the steps of

positioning said lower crimping jaw forwardly of said upper crimping jaw when initially holding said wire by said clamp; and

shifting said lower crimping jaw rearwardly to a position in vertical alignment with said upper crimping jaw following severing of said insulation and prior to lowering of said upper crimping jaw.

27. A method as set forth in claim **26** wherein:

said lower crimping jaw is shifted rearwardly simultaneously with said stripping of said insulation from said wire.

28. In an apparatus for stripping the insulation from an end portion of an insulated wire and crimping a U-section ferrule forming a part of an electrical contact to the bared end portion of the wire comprising a crimping jaw attachment to a press ram and table, wire-clamping means and insulation-stripping means, said insulation-stripping means including insulation-severing blades, means mounting said insulation-stripping means for movement from a forward position adjacent to said clamping means to a rearward position, means for moving said wire-clamping means into engagement with an insulated wire, means for operating said insulation-severing blades while said insulation stripping means is in said forward position and said wire is held by said wire-clamping means to sever the insulation on the wire, means for shifting the insulation-stripping means to said rearward position while said wire is held by said wire-clamping means to strip the severed insulation from said wire, the improvement which comprises:

means for sequentially feeding a plurality of said contacts joined side by side to a carrier strip, with the ferrules thereof open downwardly, between said crimping jaws; and

means for lowering said press ram upon movement of said insulation-stripping means to said rearward position to separate one of said contacts from said strip and to crimp the ferrule thereof to said wire.

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