Dec. 18, 1956 E. E. FOLKENROTH 2,774,130

INSULATION STRIPPING APPLICATOR AND METHODS OF APPLICATION

Filed April 27, 1953 3 Sheets-Sheet 1

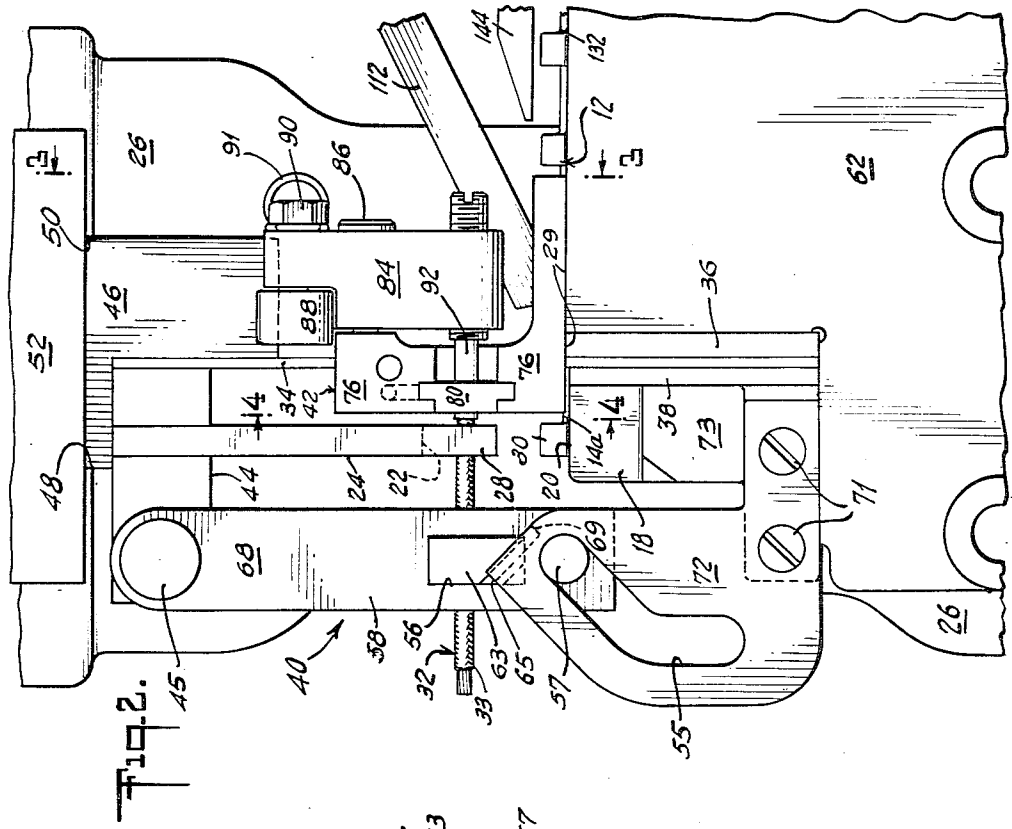

Fig. 2.

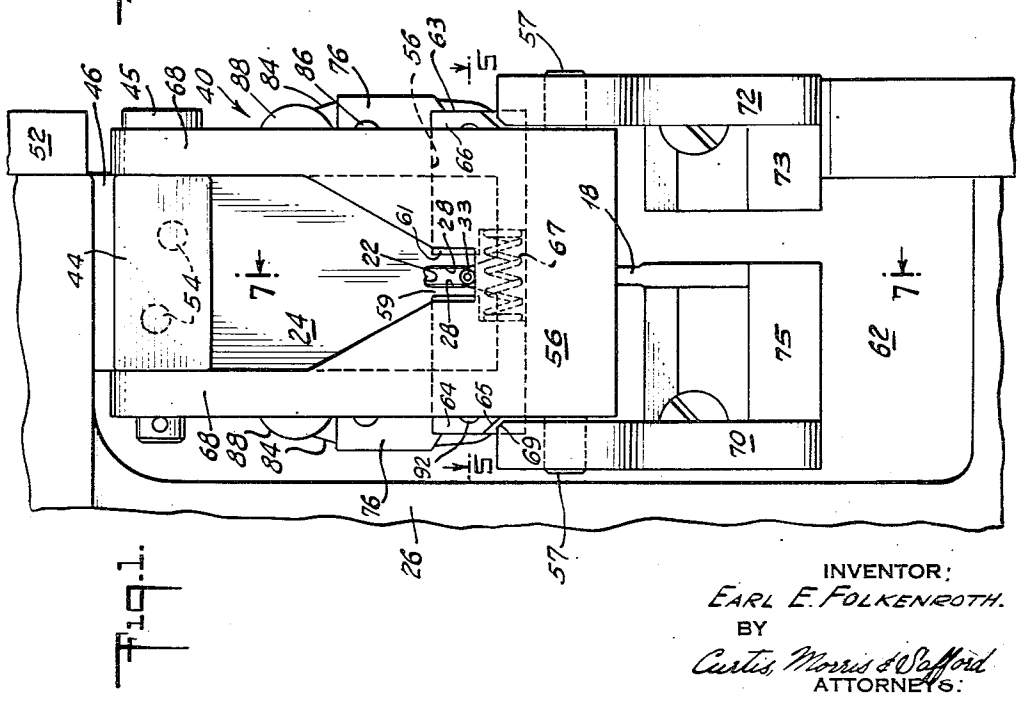

Fig. 1.

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Fig. 6.

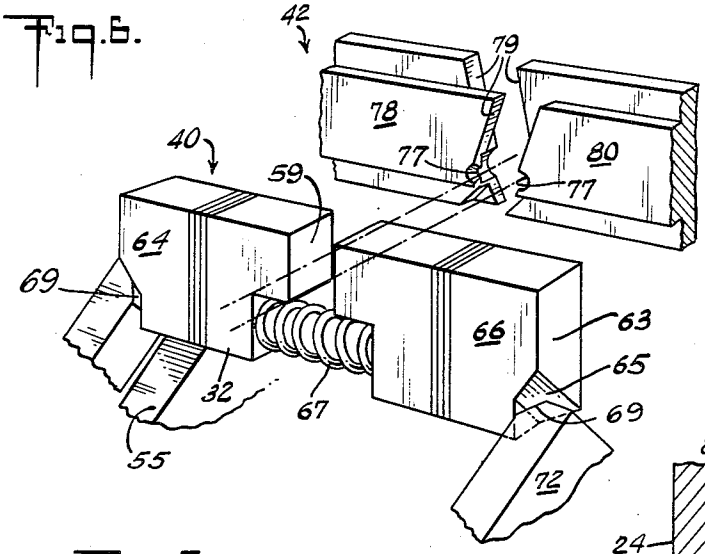

Fig. 7.

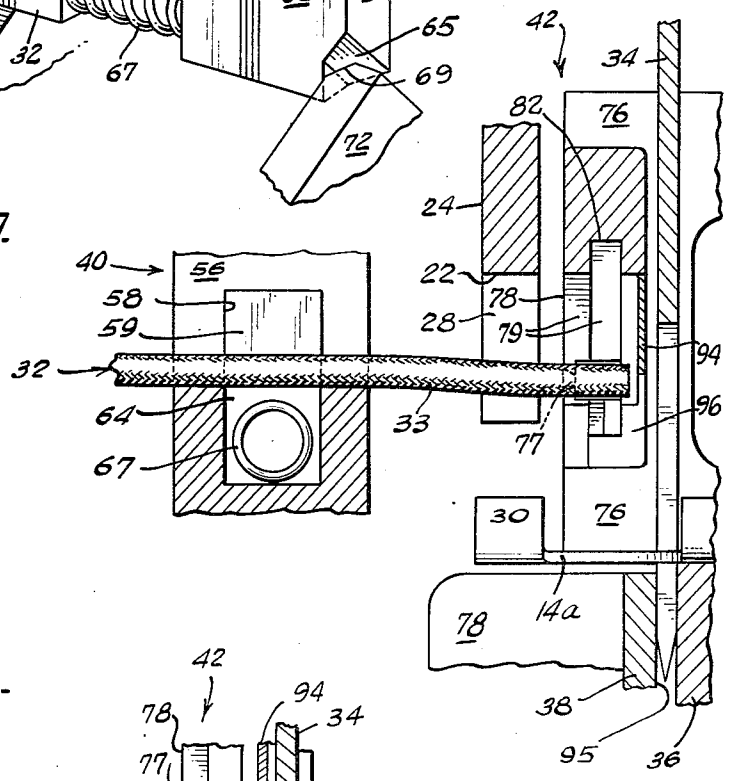

Fig. 8.

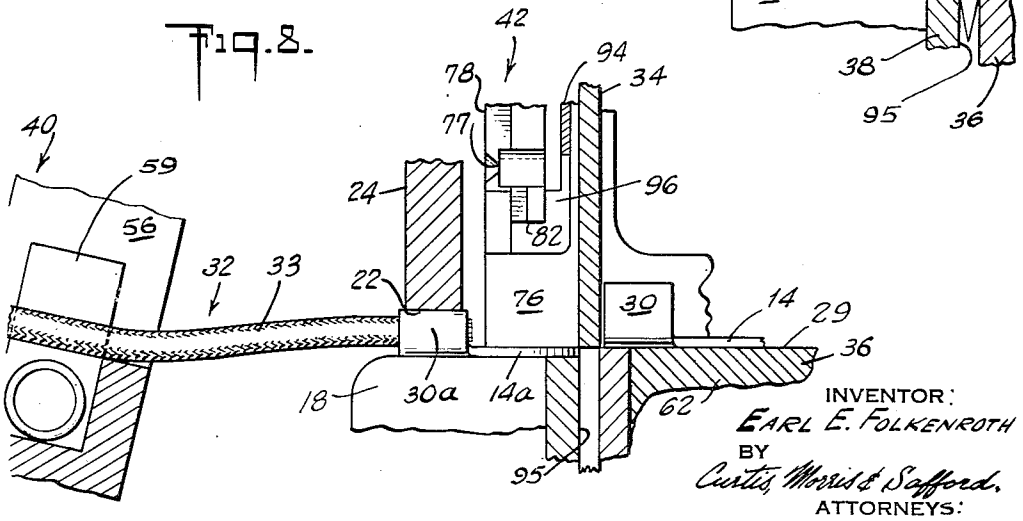

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Fig. 3.

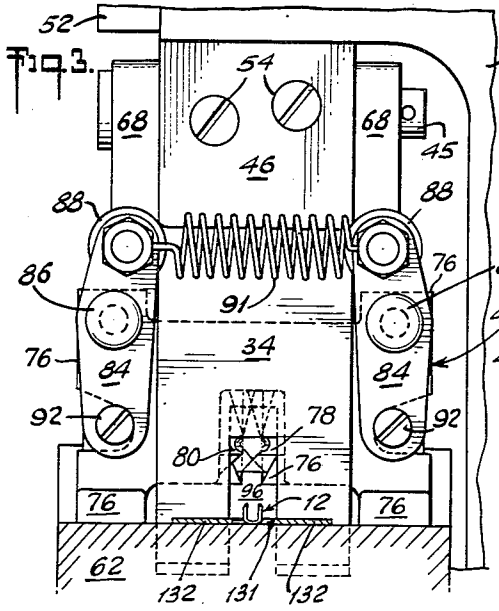


Fig. 4.

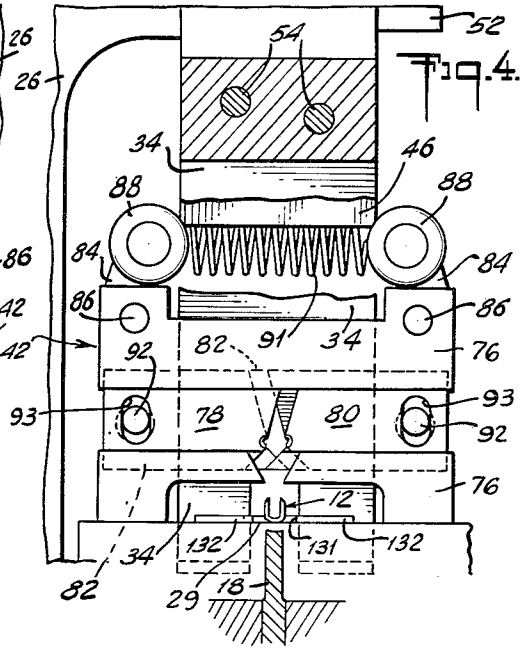


Fig. 9.

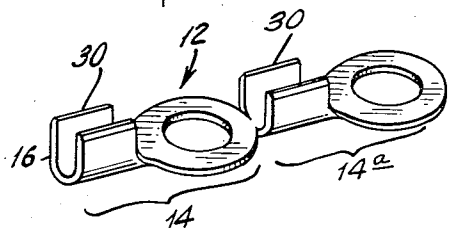


Fig. 10.

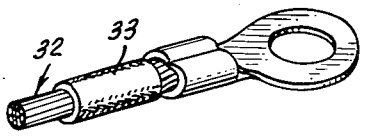
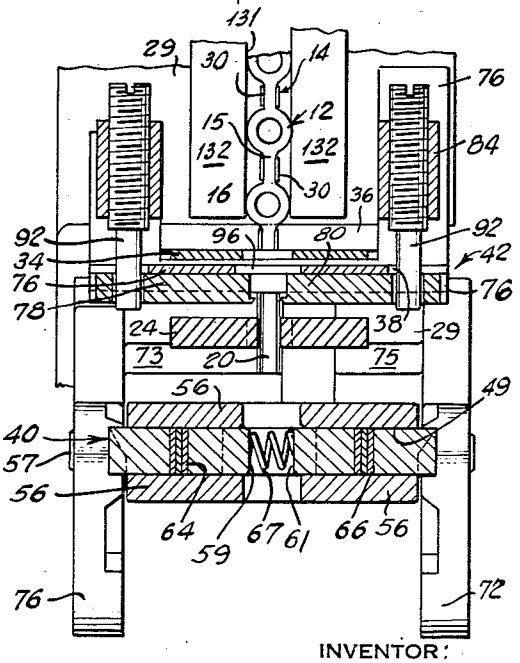


Fig. 5.



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2,774,130

INSULATION STRIPPING APPLICATOR AND METHODS OF APPLICATION

Earl E. Folkenroth, Harrisburg, Pa., assignor to Aircraft-Marine Products Inc., Harrisburg, Pa.

Application April 27, 1953, Serial No. 351,158

15 Claims. (Cl. 29—33.5)

This invention is related to apparatus for applying electrical connectors to insulated wire and comprises a novel combination of means for stripping a portion of the insulation from an insulated wire and for pressure-crimping connectors onto such wires.

Electrical connectors with wire-engaging ferrule portions have for some time been applied to wires and conductors by compressing the ferrule portion and an insulation-stripped wire portion inserted therein between crimping dies which forge the assembly compactly together.

Automatic connector applying machines, such as disclosed and claimed in Carlson Patent No. 2,396,913, issued March 19, 1946, have been developed in many forms; they utilize continuous strips of connector-forming portions by severing portions from the strip and crimping them as connectors or terminals onto wires at rates measured in hundreds, or even thousands, of connections per hour.

There have been various production line arrangements of machines for pressure-applying connectors and machines which cut measured lengths of insulated wire from a reel and prepared the ends of the cut lengths for insertion into the connector-applying machines; there have been other, more complicated machines in which insulated wires were bared and connectors thereafter applied at the bared portions. All of these were complex, costly, and limited in application. Stranded wire conductors are in common use and demand; in the machines of the prior art it has happened too frequently that between the stripping operation and the connector applying operation a strand or two would be unintentionally bent or dislodged from parallelism with the main bundle of stripped strands with the result that the bent or dislodged strands would not be caught and crimped inside the connector barrel or ferrule. This gave two main sources of trouble: (1) the crimped connection would not be up to full strength or quality because of less metal in the crimped cross section than the dies had been adjusted to close upon and (2) the strand or two not caught in the crimp could cause short circuits and arcing when the equipment went into use. My invention provides a commercially feasible automatic machine having insulation-stripping means that operate automatically and substantially simultaneously with a connector crimping operation so as to overcome the disadvantages inherent in the prior art.

An object of this invention is to provide simple, compact, and inexpensive apparatus for pressure-crimping electrical connectors onto insulated wire which obviates the preliminary operation of stripping away a portion of the insulation, and/or the use of elaborate insulation-stripping apparatus. I accomplish this object by providing a novel combination of insulation-stripping means and connector crimping dies such that an insulated wire inserted into the apparatus is automatically and almost simultaneously bared of insulation and the bared portion positioned in or operably near the wire-engaging portion

of a connector and then promptly crimped therein to form a secure connection. Other objects consist of providing means to perform these steps which is adapted to use in a standard press means of ordinary power and which further may be completely operated by a single operating cycle of such press means. Another object is to provide apparatus which meets all of the above objects and which further is readily adaptable to different press means, different types and sizes of wire, and different electrical connectors. Another object is to accomplish all of the above objects in a fashion which cooperates with the automatic connector feeding and severing means in automatic connector-applying machines. A major objective resides in the provision of a commercially feasible single-cycle stripper-crimper assembly containing a readily accessible wire gathering region and which will automatically and substantially instantaneously carry out a stripping and connector-applying operation whenever a wire is thrust into the wire gathering region. Yet other objects and novel advantages will be in part pointed out as the description proceeds and in part will become apparent therefrom.

In this specification and the accompanying drawings I have shown and described a preferred embodiment of my invention and suggested various modifications thereof; but it is to be understood that these are not intended to be exhaustive nor limiting of the invention but, on the contrary, are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in various forms, each as may be best suited to the conditions of a particular use.

The invention accordingly consists in the features of construction, combinations of elements, methods of operation and arrangements of parts as will be exemplified in the structure and sequences and groups of related steps to be hereinafter described and the scope of the application of which will be set forth in the accompanying claims.

In the drawings:

Fig. 1 is a front elevational view of my novel applicator mounted in a preferred press means, adjacent parts of the press means being shown and other parts being broken away;

Fig. 2 is a side elevational view of the applicator and press means as they are shown in Fig. 1;

Fig. 3 is a back elevational view taken as indicated at 3—3 in Fig. 2;

Fig. 4 is a cross-sectional view taken as indicated at 4—4 in Fig. 2;

Fig. 5 is a horizontal sectional view taken as indicated at 5—5 in Fig. 1;

Fig. 6 is an enlarged expanded isometric view of my novel wire stripping means with other portions of the applicator omitted for clarity;

Fig. 7 is a fragmentary vertical sectional view, on an enlarged scale, taken at the line 7—7 of Fig. 1;

Fig. 8 is similar to Fig. 7 but showing the parts as they would appear at the bottom dwell of a crimping cycle of the press means;

Fig. 9 shows in side elevation a portion of a strip of connectors used in the applicator; and

Fig. 10 shows a wire after insertion into the wire gathering region of the machine with a connector applied to its stripped end.

These drawings illustrate different aspects of a preferred form of my novel applicator—an assembly which, driven by adequate press means, applies a connector to an insulated wire after first stripping the insulation from the wire to give a consistently high quality, low-unit-cost connection. The applicator shown was adapted to use on

a standard series of commercially available automatic connector applying machines. These machines are powered by a compressed air cylinder, have readily interchangeable crimping dies, and a readily adjustable mechanism for feeding a strip of connectors into the applicator; further disclosure of typical presses may be obtained by reference to the copending applications of Harold E. Cootes, Serial No. 65,645 and George J. Handel, Jr., Serial No. 65,646, both filed December 16, 1948.

The accompanying drawings include a showing of adjacent parts of the air press means disclosed in these applications, and Fig. 2 shows the feed finger **112** and drag plate **144** of the connector strip feed mechanism on these machines.

The strips of connectors used in these and other automatic machines generally consist of individual connectors formed from a continuous strip of sheet metal stock commonly with small joining portions of the stock left to hold the connectors together. In machines such as exemplified by Carlson Patent No. 2,396,913, the strip is fed intermittently to locate repeatedly the end connector of the strip in the crimping area of the machine, between a pair of opposed crimping dies, whereupon the end connector is severed from the strip and crimped onto a wire. This automatic feeding, severing and crimping of the connectors permits the operator merely to insert a wire into a connection-forming region thus to start the power stroke of the machine. Where the connectors have channel-like ferrule-forming portions rather than completed, tubular ferrules, the die means and ferrule portions may be adapted so to cooperate that the sides of the ferrule channel scrape the sides of a crimping die having a channel-like cavity to gather into the ferrule a wire end merely placed between it and this die cavity. This cooperation is more fully disclosed in Macy Patents Nos. 2,557,126 and 2,600,012.

The applicator shown in the drawings is adapted for use with a strip **12** of connectors **14** having channel-like ferrule forming portions **16**; use of other connector wire-engaging portions will readily occur to those skilled in this art.

Figs. 1 through 5 show a machine press means which includes a rugged casting **26** in which a ram **46** is constrained to vertical movement by guide faces **48** and **50** (see Fig. 2) of the casting **26** and an end plate **52**. A pedestal on the casting **26** forms a support for an adjustable bed **62** upon which the lower parts of the applicator assembly are mounted. In this preferred form of press means the parts normally occupy the relative positions shown in Figs. 1 and 2 when the ram **46** is at the top of its stroke. Parts not shown, an air cylinder, bell crank, and toggle link, drive the ram **46** downwardly toward the bed **62** when the operator actuates the machine. Also, as the ram **46** moves downwardly, strip feed finger **112** (Fig. 2) is withdrawn to the right to engage the connector adjacent the end connector **14***a* currently being crimped. Parts not shown spring-bias the feed finger **112** downwardly and forwardly (to the left in Fig. 2), and cause this finger **112** to drop behind this next connector and to index the strip **12** forward one connector length when the ram **46** ascends after a crimping operation, placing the next connector in position to be crimped. The withdrawal of the feed finger **112** is accomplished by a cam surface on the ram **46** which drives a push rod, and thus the feed mechanism, in the withdrawal movement. A drag plate **144** (Fig. 2) is spring-loaded downwardly upon the strip **12**, preventing it from sliding back away from the crimping area. The strip **12** is also held by side plates **132** which form a strip-channel **131** (Fig. 5) between them. These driving mechanisms are all shown in detail in the above-referred-to applications of Cootes and Handel, the indication of a one-stroke cycle automatic connector-applying machine with which my novel applicator advantageously cooperates being sufficient for the present application.

The applicator is generally that part of such connector-applying machines which, driven by the press means, severs a connector from the strip and crimps it onto the end of a wire. In Figs. 2, 5, and 7, the strip of connectors **14** is seen resting in guide channel **131** with the end connector **14***a* located over a lower crimping die. This lower die illustratively consists of an anvil **18** having a crimping surface **20** which cooperates with the crimping surface **22** on the upper die or crimper **24**. The crimper **24** shown is of that type having a deep channel-like cavity whose side walls **28** are adapted to slide frictionally along the upturned side walls **30** of the channel-like ferrule-forming portion **16** of the end connector **14***a* and, with the crimping surface **22**, to curl these side walls **30** over to gather a wire end, such as that of the representative wire **32**, in the ferrule channel, as the crimper **24** moves down over the anvil **18**. The final movement of the downward stroke of the ram **46** then presses the connector side walls **30** and the enclosed wire end compactly together, as is shown in Fig. 8.

In Figs. 2, 7 and 8 there is shown spaced behind the crimper **24** a shear blade **34** which cooperates with shear edges on the feed table **29** at the top of plates **36** and **38** mounted on the bed **62** to cut away the joining portion **15** (Fig. 5) between the end connector **14***a* and the adjacent connector in the strip, thus severing the end connector **14***a* from the strip as the ram **46** moves downwardly and crimper **24** crimps the connector ferrule portion onto a wire. Shearing by pressing an end of the end connector downwardly away from the supported adjacent connector without the removal of a joining portion **15** may also be used, permitting more economical use of a strip sheet metal stock, as in the strip shown in Figure 9.

My preferred form of wire-stripping mechanism consists of a wire clamping assembly indicated generally at **40** and a wire stripper assembly indicated generally at **42** (Figs. 1 and 2), the wire clamp being arranged to grip and pull forward a wire **32** inserted through it. The gripping and pulling occur as the ram **46** descends, as will be described in greater detail, to accomplish the stripping.

The wire clamping assembly **40** consists of a wire clamp pivot block **44** which is mounted by recessed bolts **54** to the ram **46**, which bolts also clamp the crimper **24** and the shear blade **34** in place on the ram **46**. A wire clamp holder **56** has a laterally transverse guideway **58**, in which two wire clamp jaws **64** and **66** are disposed, and is bifurcated into a clevis having two arms **68** which fit over the ends of pivot block **44** and are pivotally held thereon by pivot pin **45**. Extending laterally outward from each side of wire clamp holder **56** at its lower end are follower pins **57** which ride in cam slots **55** in left and right side cams **70** and **72** respectively mounted on the press bed **62** by bolts **71**.

Figs. 1 and 6 show how the clamp jaws **64** and **66** have their outer ends formed into cam followers. These followers comprise outer flat surfaces **63** disposed between lead faces **65** which slope inwardly at angles of about 45°. The flat surfaces **63** and lead faces **65** meet along a line at an angle of about 35° from the horizontal. Side cams **70** and **72** carry at their upper edges cam surfaces **69** disposed to engage lead faces **65** and flat surfaces **63** to move the wire clamps **64** and **66** together as they are carried downwardly with the ram **46**. The right side cam **72** is mounted on a support block **73** which in turn is mounted on the bed **62**, while the support block **75** for the left side cam is also a holder for the anvil **18**.

The wire clamps **64** and **66** have opposed wire gripping surfaces **59** and **61**. These surfaces are adapted to grip and pull a wire inserted therebetween. The wire clamp jaws **64** and **66** are urged laterally apart by a spring **67** disposed between recessed areas in the adjacent faces of these jaws. As the ram **46** descends, the entire wire clamp assembly **40** is driven downwardly, the follower pins **57** guiding the clamp jaws **64** and **66** away from the crimping dies **24** and **18** while cam surfaces **69** drive the clamp jaws

64 and 66 laterally together to grip a wire 32 inserted between them.

The wire-stripper assembly 42 includes a wire stripper guide block 76 mounted on the upper surface of the bed 62, left and right wire stripper blades 78 and 80 slidably disposed in a stripper blade guideway 82 in the guide block 76, left and right stripper blade rocker arms 84 pivotally mounted to the guide block at 86, two follower rollers 88 on pivot pins 90 at the upper ends of rocker arms 84, and two stripper blade drive pins 92 extending from the lower end of arms 84 through short vertical slots 93 in blades 78 and 80. The rollers 88 and the upper portions of arms 84 are urged together by a spring 91 between the pivots 90 of the two rollers 88, thus urging apart the two drive pins 92 and stripper blades 78 and 80. The rollers 88 are thus abutted against the lower corners of the ram 46 (see Figs. 3 and 4) when the ram is at rest; spring 91 pulls the rollers partly around the corners and spaces them apart slightly less than the width of the ram 46 so that the descent of the ram causes the two rollers 88 to move laterally apart as the ram 46 passes between them; the rollers 88 ride on the lateral faces of the ram 46 as it completes its descent. The rocker arms are thereby rotated about pivots 86 and the stripper blades 78 and 80 are driven together by drive pins 92.

The stripper blades 78 and 80 have semicircular conical insulation cutting and stripping edges 77 (Figs. 5 and 6) and mating angularly disposed wire guiding surfaces 79. These wire guiding surfaces 79 are arranged so that those on each blade overlap those of the other blade. When the blades 78 and 80 are closed to their wire stripping position by the descent of the ram 46 the surfaces 79 guide the wire to be stripped into the desired position for proper stripping. The angular guiding surfaces 79 center each wire between the insulation cutting and stripping surfaces 77 as the blades 78 and 80 are closed and minimize any likelihood that a strand of the metal conductor may be nicked or unintentionally removed during the stripping operation.

In many commercial applications it is desirable that the electrical connections be of a quality higher than would be apt to result where even a single fine strand of the conductor had been removed during the stripping operation. This is because the crimping dies are designed to function, and do function, to extremely fine tolerances and where a strand has been removed from the conductor in the region of the crimp there is less metal present in the crimped region than the crimping assembly was adjusted for and accordingly a correspondingly inferior crimp results. Where quality connections are desired a metal-sensing unit may be employed in combination with the stripper. Such a unit may operate on capacitance or magnetic flux principles whereby the presence of a strand of copper, for example, in the removal insulation sheath in passing through a region within the sensitivity of the unit will unbalance a circuit to stop the machine or give a visible or audible signal to an attendant indicating that the conductor in the machine no longer has the proper cross section of conductive metal in the region of the crimp.

By stripping and crimping in a single operation I eliminate any chance that a strand from a stripped end may be bent and of parallelism with the main bundle of strands to a position where it may miss the ferrule portion or barrel of a later-applied connector or terminal; accidental bending back of a strand or two is bad not only because the optimum crimped connection cannot result but also because a loose strand or two projecting from the insulation sheath at the mouth of the terminal may cause serious electrical disturbances through short circuits, arcing, etc., later on when the equipment is in use; this difficulty I overcome by my combined stripping and crimping operation which eliminates all opportunity for any strand to be unintentionally bent from parallelism with every other strand of the bundle. By combining a metal-sensing unit arranged to detect every piece of removed insulation which includes any of the electrical conductor I eliminate any chance of a low quality crimp because less than the total number of strands have been left by the stripper.

In the rest (upper) position of the ram, the elements are as shown in Figs. 1 through 7 and feed finger 112 has been pulled forward to locate properly the end connector 14*a* over the anvil 18 as described above. The wire clamp jaws 64 and 66 are open and the stripper blades 78 and 80 are being urged apart by springs 67 and 91 respectively. The crimper 24 is so elevated that an insulated wire may be inserted between the gripping surfaces 59 and 61 of the wire clamp jaws 64 and 66 through the channel-like cavity of the crimper and between the wire stripper blades 78 and 80. A wire stop 94 is advantageously disposed behind the stripper blades 78 and 80 at a distance from their cutting edges 77 equal to the length of bare wire needed for a particular connection. With the inserted insulated wire 32 abutted against this stop a cycle of the press is started and the ram 46 begins to descend. Preferably this stop will be of the micro-switch type which automatically will close a circuit to actuate a press cycle as soon as the wire is inserted far enough into the machine. This switch is not shown on the drawing in order to simplify the showing, but is mounted and related to the other parts shown in the same way as is now ordinary in such sensitive switch controls in automatic machinery.

The initial descent of the ram 46 drives rollers 88 laterally outward and thus drives the insulation cutting edges 77 of the stripper blades 78 and 80 through the insulation sheath 33 of the wire 32 as shown in Fig. 7 and maintains these edges 77 abutted together and slidably abutted against the conductive wire core as rollers 88 roll on the descending ram 46. The wire clamp holder 56 is driven down by the ram 46 and guided longitudinally outwardly by follower pins 57 in cam slots 55, the initial descent also driving cam followers 63 and 65 of the wire clamp jaws 64 and 66 past the cam surfaces 71 of side cams 70 and 72, closing the jaws 64 and 66 to grip the wire 32 between their surfaces 59 and 61. Thus the wire 32 is gripped and pulled away from and out of the stripper blades 78 and 80, leaving the thus severed end portion of the wire insulation 33 behind the stripper blades and bringing forward a wire 32 with a bared end portion. This operation necessarily leaves every strand in parallelism in a compact bundle ready to be embraced as a unit by the ferrule or barrel of a connector. Meanwhile, the crimper 24 is also being driven toward the anvil 18 as the wire 32 is being drawn through the crimping cavity side walls 28.

The gripped wire 32 is pulled forward by the cam surfaces 55 until it clears the stripper assembly, at which point the cam followers 57 are approximately at the bend in surfaces 55.

Further downward movement of the ram 46 causes wire clamp holder 56 to center the stripped end of the wire in the terminal 14*a*. The side walls 28 of the crimper cavity are scraped by the side walls 30*a* of the end connector 14*a* upon further descent of the ram and the ferrule portion formed by these side walls curls around the bared bundle of strands of the conductor. The final travel, or bottoming, of the ram 46 compresses the parts together to form a secure connection as shown in Figs. 8 and 10.

As the ram rises, the wire with its newly attached connector is lifted from the anvil surface 20 by swinging of arms 56. With the crimped connector and wire clear of the crimping die, feed finger 112 indexes the strip 12 forward and thus places the next connector 14 over the anvil 18. When the ram 46 is again at rest the clamp jaw cam followers 63 and 65 again clear cam surfaces 69 permitting their spring 67 to open them and finally release the wire 32. The machine is then ready for another complete cycle.

The joining portions 15 of the connector strip 12 are

pushed away from the strip by shear blade **34** in cooperation with shear plate **36** and slug plate **38** during the crimping operation and are ejected through an opening **95** in bed **62**. The stripped portions of wire insulation fall through the opening **96** in guide block **76** and may ultimately be blown out of the applicator by such means as an air jet (not shown) timed to release a blast of air after the metal-sensing, if any, and as the ram ascends. In such a fashion as this the applicator is kept clear of waste.

From the foregoing it will be seen that wire stripping and crimping means made in accordance with the present invention is well adapted to attain the ends and objects hereinbefore set forth and to be economically manufactured since they are suitable for common production methods and are susceptible to a wide latitude of variations as may be desirable in adapting the invention to different applications.

As various embodiments may be made of the above invention and as changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A machine for applying connectors to the end of an insulated wire comprising wire insulation stripping means and connector crimping means both disposed closely adjacent in a single operating zone, operating ram means positioned to engage the crimping means and actuate it to crimp a connector positioned therein, means engaging said ram with said stripping means during a positive stroke of said ram before the dies are driven into crimping engagement with a connector, means to feed a connector into position for crimping by said crimping means, means to move a wire from the stripping position to the crimping position and insert its stripped end into a connector disposed in said crimping means, means actuated by said ram to operate said wire moving means during the same operating stroke of the ram means, but after the wire stripping means has been operated and prior to the crimping of said connector.

2. In a machine for automatically applying an electrical connector onto the end of an insulated wire means for substantially simultaneously stripping the insulation from the wire and crimping a connector thereon comprising a base and ram structure having mounted thereon wire insulation stripping means and connector crimping die means; operative means between said stripping and crimping means for operating said stripping means before the crimping means is actuated in each cycle of operation, and wire engaging means to move a wire from said stripping means, after the insulation stripping operation, into a connector positioned between said die means during each downward stroke of said ram structure.

3. In a machine for automatically crimping an electrical connector onto the end of an insulated wire the combination of, a single operating zone adapted to receive therein the end of a wire; a strip feeding means for feeding a strip of connectors, one connector length at a time, into said zone; ram means positioned within said zone; crimping dies operatively associated with said ram means to crimp the end connector of said strip; wire insulation stripping means positioned in said zone in operative relation with said ram means so as to be actuated prior to said crimping dies in each cycle of operation; and wire guiding means positioned within said zone in operative relation with said ram means to move said wire from said wire stripping means into the ferrule of the end connector of said strip upon actuation of said machine whereby an insulated wire inserted in said zone is stripped of insulation over a predetermined length, inserted in the ferrule of a connector and compacted therewith into a substantially solid mass all in the same stroke.

4. Apparatus for applying electrical connectors to insulated wire comprising press means; upper and lower crimping dies adapted to be driven together to a crimping position and retracted to a rest position by said press means; stripping means to at least partially sever the insulation sheath of an insulated wire inserted therein at a connector-accepting distance from the end of the wire and to remove the severed end portion of insulation when the remainder of the wire is pulled therefrom; clamp means to grip the wire, pull it away from said stripping means, and place the stripped end of the wire in a connector between said crimping dies prior to the crimping action thereof, and to release said wire after the crimping action of said crimping dies; and operating means for sequentially actuating said stripping means, clamp means and crimping dies by one operating cycle of said press means.

5. Apparatus for applying electrical connectors to insulated wire comprising press means, upper and lower crimping dies adapted to be driven together to a crimping position and retracted to a rest position by said press means, stripping means to at least partially sever the insulation sheath of an insulated wire inserted therethrough at a connector-accepting distance from the end of the wire and to retain the severed end portion of insulation against a tensile pull on the remainder of the wire, clamp means to grip the wire, pull it away from said stripping means, and place the stripped end of the wire in a connector between said crimping dies prior to the crimping action thereof, and to release the wire after the crimping action of said crimping dies, and connector feeding means to place an electrical connector between said crimping dies prior to the positioning of the wire between said crimping dies, and said crimping dies, stripping means, and clamp means being actuated by one operating cycle of said press means.

6. Apparatus for applying electrical connectors to insulated wires comprising press means, a pair of connector-crimping dies positioned to be operably driven by said press means, a wire stripper having wire-insulation cutting blades, a wire clamp having wire-gripping jaws, said wire clamp, said wire stripper and said dies being positioned for actuation in that order by said press means, whereby said wire is gripped by the clamp, its insulation sheath is cut by the stripper blades, the remainder of the wire is drawn by said wire clamp to remove said cut insulation and to locate its stripped end in a connector positioned between said crimping dies and the dies are forced together for the crimping operation, and means to release said wire clamp on the return stroke of said press means.

7. Apparatus for applying electrical connectors to insulated wire comprising the combination of a frame, upper and lower crimping dies mounted on said frame, at least one being movable with respect to the other, wire clamp mean mounted in said apparatus to one side of said dies, and a wire stripper mounted in said apparatus on the opposite side of said dies from said clamp, said clamp and said wire stripper each having at least two wire engaging members at least one of which is movable toward the other to a wire-engaging position and away therefrom to an open position, means associated with movable one of said dies to actuate said clamp and said wire-stripper to their respective wire-engaging positions just before one die closes with the other and to open said wire-engaging members when said dies are separated, and cam means associated with said dies to move said wire clamp means away from said wire stripper after both are in wire engaging position but before said dies are fully closed together, and reciprocating means driving said dies and said connected parts.

8. Apparatus for applying electrical connectors to insulated wire comprising press means having upper and lower die holders at least one of which is reciprocable between a pressure-applying position and a rest position; upper and lower crimping dies mounted on said upper and lower die holders respectively; a wire clamping as-

sembly, a wire stripping assembly, and a wire stop disposed between said upper and lower die holders and adjacent said wire stripping assembly; said wire clamping assembly having wire-gripping members forming a wire-receiving aperture therebetween and said wire stripping assembly having insulation-stripping blades forming a wire-receiving aperture therebetween, said wire-gripping members and said insulation-stripping blades being movable between closed, wire-engaging position and open wire-releasing position; motion transmitting means between at least one of said die holders and said wire clamping and wire stripping assemblies to cause said wire-gripping members and said insulation-stripping blades to close on and operably engage an insulated wire inserted through said wire-receiving apertures when said reciprocable die holder is moved to its pressure-applying position, and further motion transmitting means driven by at least one of said die holders to cause said wire clamping and wire-stripping assemblies to be moved farther apart relative to each other when said reciprocable die holder is moved to its pressure-applying position.

9. Apparatus for applying electrical connectors to insulated wire comprising the combination of upper and lower die holders having upper and lower crimping dies mounted respectively thereon; at least one of said die holders being movable with respect to the other enabling the dies to be driven together to a crimping position and retracted to a rest position, said dies having crimping surfaces which may thus be closed to a crimping position and retracted to leave a longitudinally directed aperture therebetween for receiving a wire and a connector; a wire stripper mounted on one of said die holders and having insulation stripping blades which are adapted to be closed to a wire-stripping position and opened to a rest position in which a wire-receiving aperture is left therebetween; a wire clamping assembly spaced from said stripper on the opposite side of said dies, said clamping assembly having wire gripping members which are adapted to be closed to a wire-gripping position and opened to a rest position in which a wire-receiving aperture is left therebetween; the wire-receiving apertures of said wire clamping assembly and wire stripper being longitudinally aligned with said die crimping surfaces in the rest position; means movably mounting said wire gripper in said apparatus with its wire-gripping members movable toward and away from said crimping dies longitudinally of said wire; cam means associated with one of said die holders and cam follower means on said wire clamping assembly to close said clamping assembly to wire-gripping position and to move said assembly away from said dies when said die holders are moved together to said crimping position; and second cam means mounted on the other of said die holders and cam follower means connected to said wire stripping blades to close said blades to their wire stripping position when said die holders are moved toward their crimping position.

10. Apparatus for applying electrical connectors to insulated wire comprising the combination of press means; upper and lower die holders mounted on said press means, said die holders having upper and lower crimping dies mounted respectively thereon; at least one of said die holders being movable with respect to the other of said die holders enabling the dies to be driven together to a crimping position and retracted to a rest position by said press means, said dies having crimping surfaces which may thus be closed to a crimping position and retracted to leave a longitudinally directed wire and connector-receiving aperture therebetween; a wire stripper mounted on one of said die holders and disposed longitudinally to one side of said dies, said wire stripper having stripping blades which are adapted to be closed to a wire-stripping position and opened to a rest position in which a wire-receiving aperture is left therebetween; a wire clamping assembly disposed longitudinally away from said stripper on the opposite side of said dies, said clamping assembly having wire gripping members which are adapted to be closed to a wire-gripping position and opened to a rest position in which a wire-receiving aperture is left therebetween; a wire stop disposed longitudinally beyond said wire-receiving aperture; the wire-receiving apertures of said wire clamping assembly and wire stripper in the rest position being arranged along a common line of insertion for the wire; said wire clamping assembly being movable vertically toward said lower die holder and laterally away from said dies; cam means mounted on one of said die holders and cam follower means mounted on said wire clamping assembly engaging said cam means to move said wire gripping members thus laterally away from said dies when said die holders are moved toward said crimping position; means on said upper die holder connecting it to said wire clamp to move it with said die holders toward said crimping position; second cam means and follower, one associated with said wire-gripping members and one with the die holders to close them to wire-gripping position when said die holders are moved to said crimping position; third cam means operatively associated with one of said die holders; follower means, operatively linked to said stripping blades to close said blades to their wire-stripping position when said die holders are moved together to said crimping position.

11. Apparatus as defined in claim 10 which further comprises connector feeding means to place an electrical connector in position to be crimped onto a wire by said crimping dies during the cycle of operation of said press means.

12. In a machine for applying electrical connectors to the ends of insulated wires, the combination comprising a base plate portion, a ram structure mounted to move to and from a position adjacent said base plate portion, a pair of crimping dies mounted on said base plate portion and ram structure to crimp a connector and wire placed therebetween when said ram structure is brought to its position adjacent said base plate portion, a pair of wire insulation stripping blades mounted on said base plate portion and each carrying thereon a cam follower roll adapted to engage said movably mounted ram structure to move said blades to and from an insulation severing position, a pair of wire gripping blocks mounted in a yoke on said ram structure on the opposite side of said dies from said insulation stripping blades, said blocks, dies and insulation stripping blades being longitudinally aligned to form a wire end receiving cavity, a pair of cam surfaces mounted on said base plate portion, a corresponding pair of cam follower rolls mounted on said yoke and adapted to engage said cam slots, a pair of cam surfaces mounted on said base plates to engage the ends of said wire gripping blocks mounted in said yoke, said wire gripping blocks being forced together by said cam surfaces and moved longitudinally away from said wire stripping blades by said cam slots when said ram structure is moved downwardly adjacent said base plate whereby the end of a wire inserted in said wire-receiving cavity has the end portions thereof stripped of insulation and placed between said dies during a single downward operating stroke of said ram structure.

13. A machine for applying electrical connectors as described in claim 12 including a substantially endless strip of connector blanks mounted on said frame structure and strip feeding means for positioning said connector blanks one at a time between said dies whereby a connector blank is formed into a connector about the stripped end of a wire inserted in said wire receiving cavity on each operating stroke of said ram structure.

14. A machine as described in claim 1 wherein said insulation stripping means includes a pair of stripping blades each comprising a base portion, a raised portion carrying the cutting edge, said portions having at one end

thereof a plurality of angularly displaced faces adapted to interfit with corresponding faces on the other blade portions, said faces being oriented radially with respect to said cutting edge, the faces of each blade portion being disposed at an obtuse angle diverging in opposite directions.

15. In a machine for automatically applying an electrical connector onto the end of an insulated wire, means for substantially simultaneously stripping the insulation from the wire and crimping a connector thereon in a single operating zone including a press means having mounted thereon wire insulation stripping means and connector crimping die means; operative means between said stripping and crimping means for operating said stripping means before the crimping means is actuated in each cycle of operation, and means operative in timed relationship in said press means before actuation of said crimping means to shift a wire relatively out of said stripping means and into a connector positioned between said die means for crimping in said cycle of operation.

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