

Sept. 26, 1967

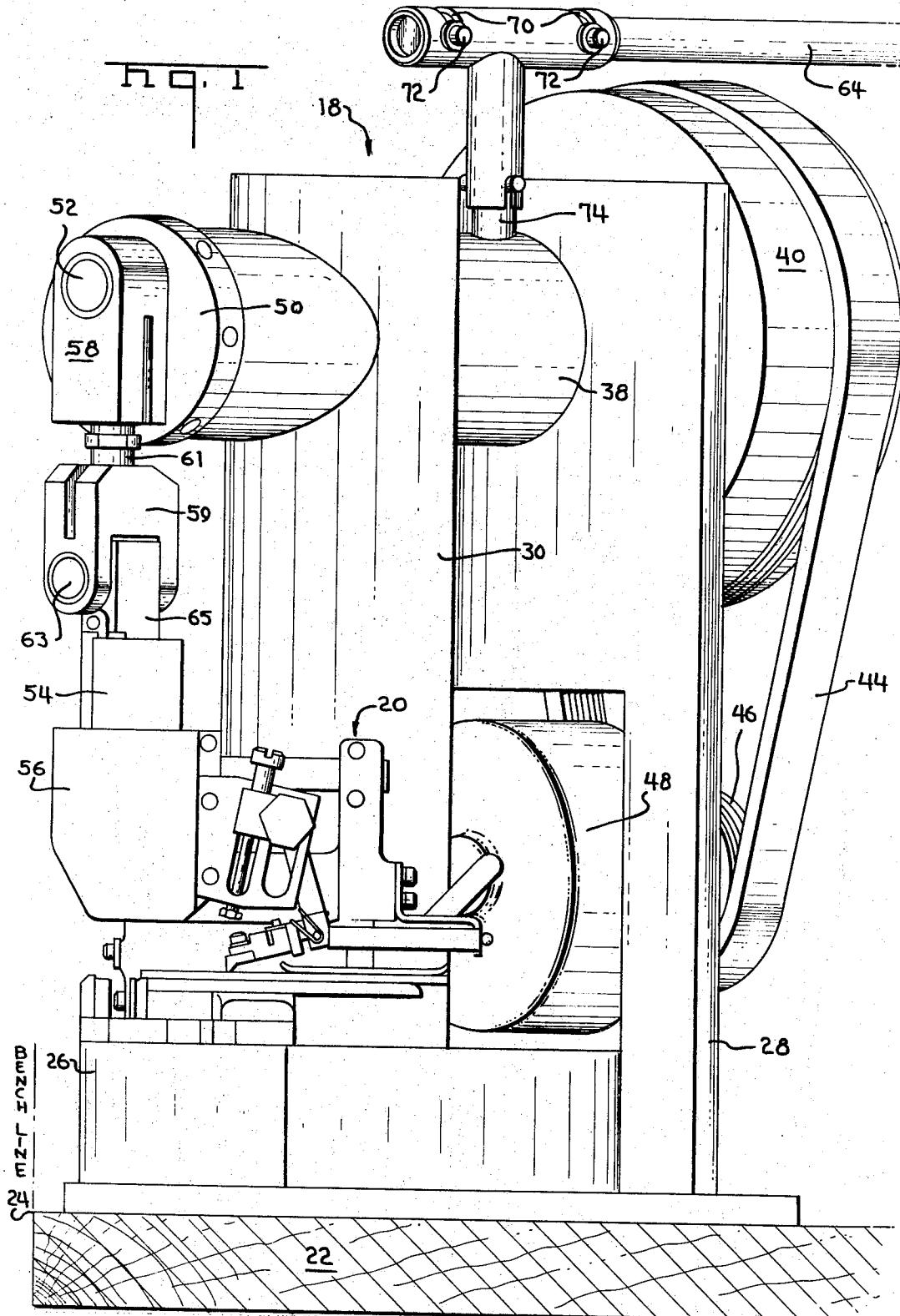
D. R. KERNS

3,343,398

Filed Oct. 15, 1964

## CRIMPING PRESS

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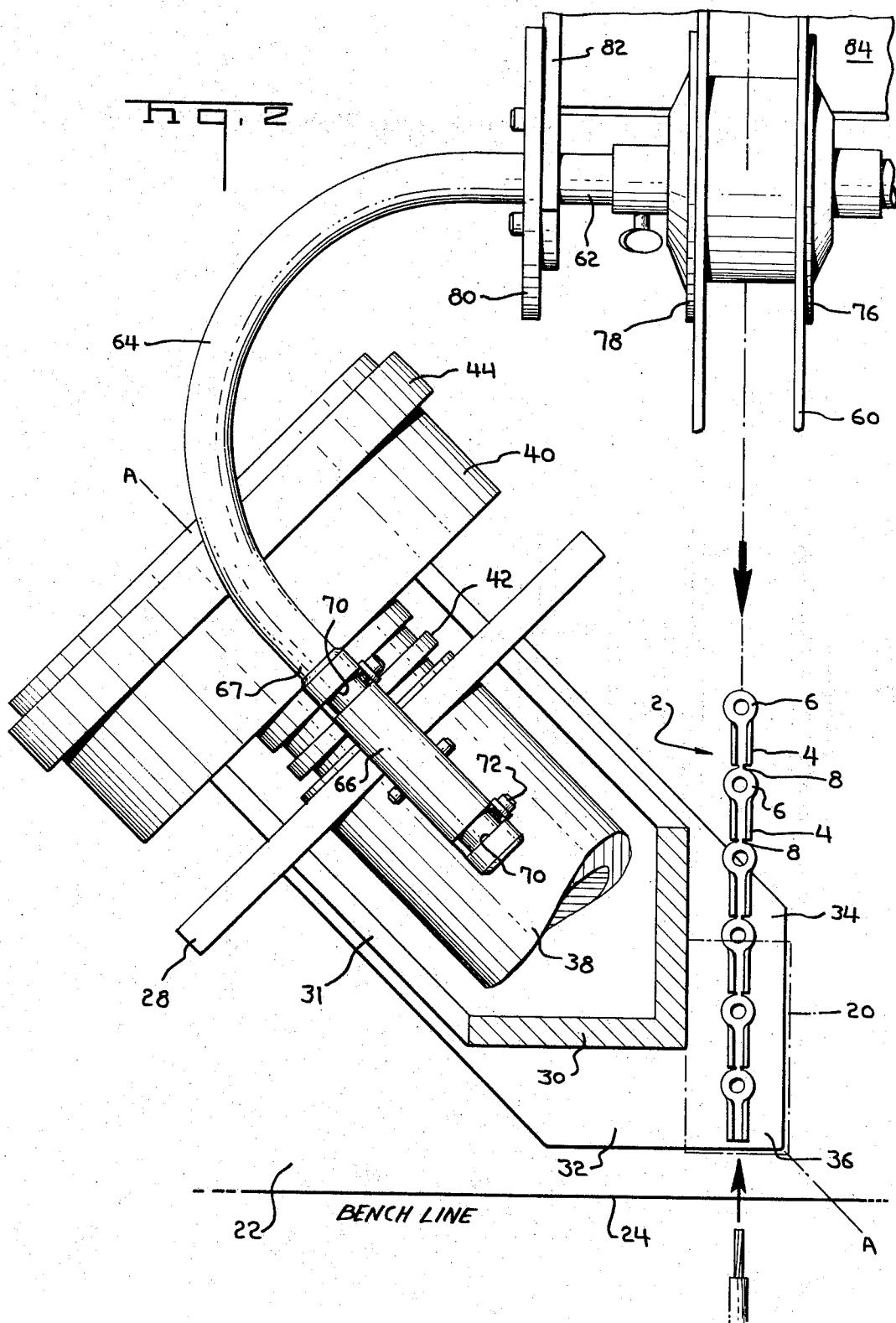
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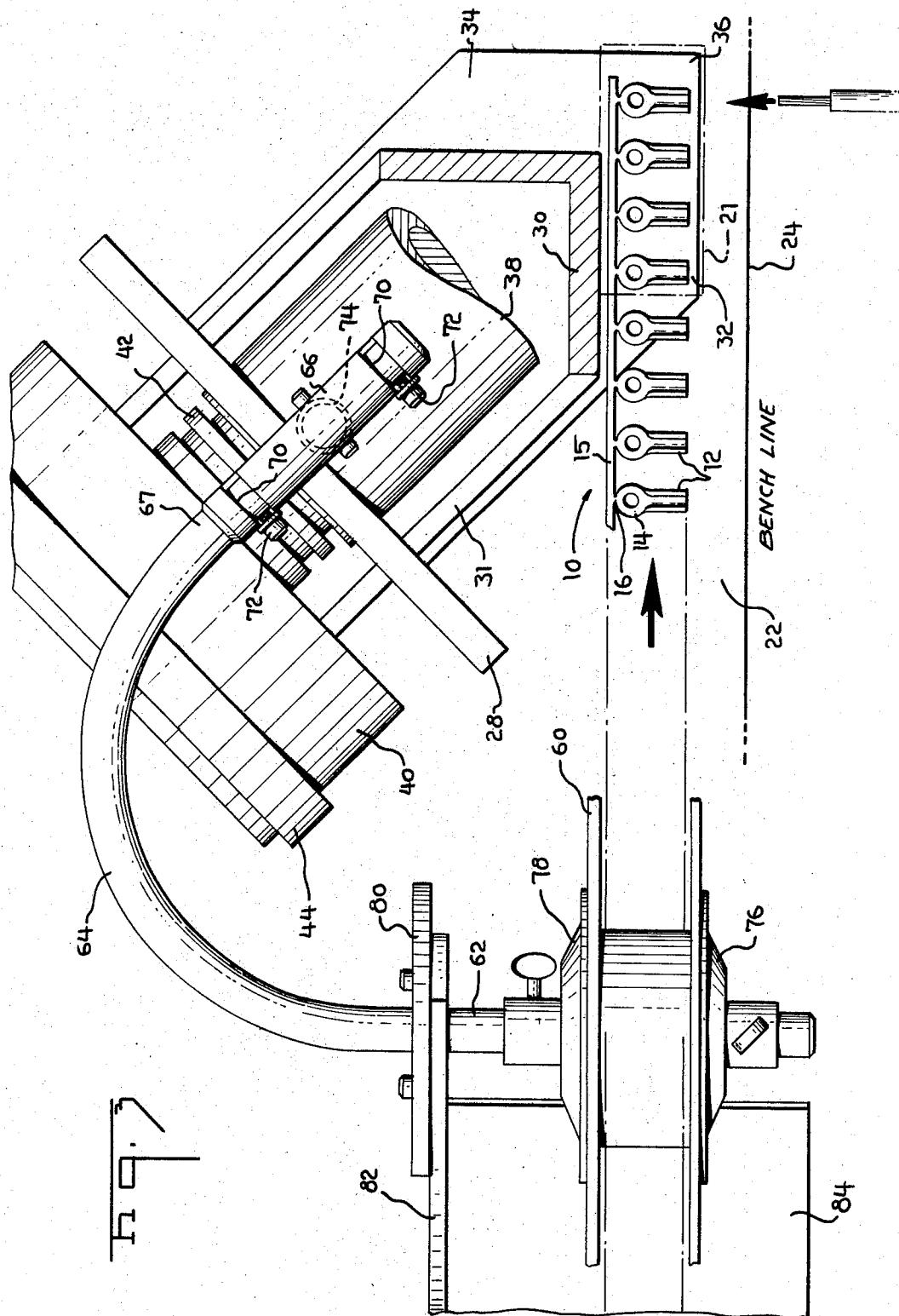
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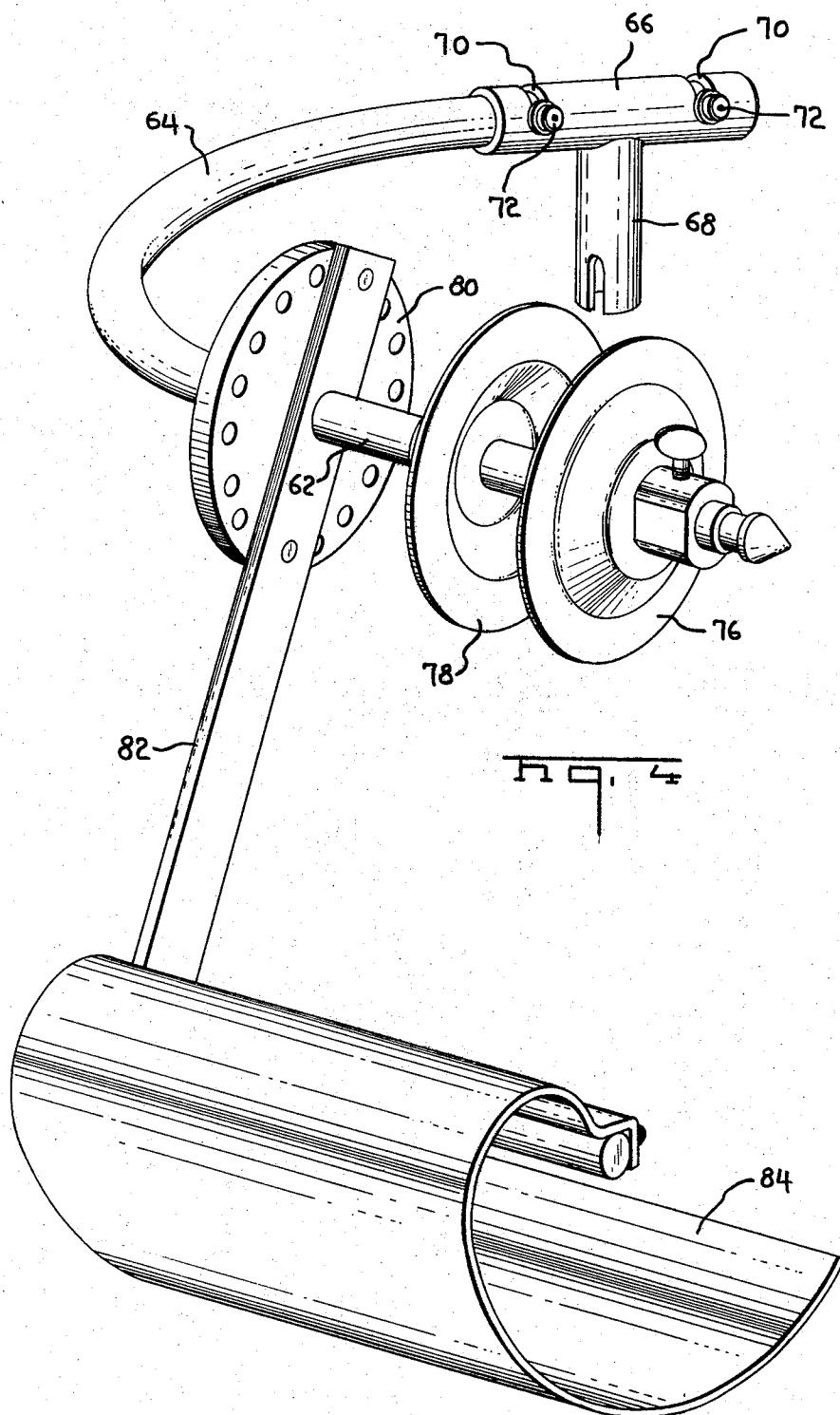
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## CRIMPING PRESS

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## ABSTRACT OF THE DISCLOSURE

Press for crimping electrical connectors in either ladder strip form or end-to-end strip form has first and second applicator supporting surfaces extending at right angles to each other and merging in common area. Press ram is disposed above common area so that either end-to-end or ladder strip applicator can be placed in press and ram of the applicator will be beneath the press ram. Reel supporting means for supporting reel of terminals is mounted on press and is shiftable between first and second positions to support reel of ladder strip or end-to-end terminals in operative relationship to either ladder strip or end-to-end applicator.

This invention relates to presses for applying electrical connecting devices in strip form to the ends of wires.

Electrical connecting devices, such as contact terminals, are frequently manufactured by die stamping and forming operations in the form of a continuous strip with each connecting device integral with the adjacent connecting devices. At the time of crimping, the strip is fed to the crimping zone of a press and the leading connecting device is crimped onto a wire end and simultaneously severed from the strip. Connecting devices in strip form fall into two general classes: end-to-end strip in which the connecting devices of the strip are in axial alignment with each other, and ladder strip in which the connecting devices are in side-by-side relationship with their axes extending parallel to each other. The crimping press used to crimp the connecting devices onto the wire ends must be designed to handle the particular type of strip being used since an end-to-end strip, for example, requires a feeding mechanism which is different from that required for a ladder strip.

In order to provide maximum versatility in a crimping press as regards the different types and sizes of strip used in the industry, it is common practice to design applicator units which are adapted to be mounted in a press and which contain the necessary strip feeding mechanism and crimping dies. Thus, a single press can be utilized with many different types of applicators, each of which contains the necessary tooling and feeding mechanism for a particular type of strip.

An object of the present invention is to provide an improved press for crimping electrical connecting devices onto the ends of wires. A further object is to provide a press which is adapted to have mounted therein applicators for applying strip of either the end-to-end or ladder type. A further object is to provide a press having an improved means for mounting a supply reel of connecting devices thereon. A still further object is to provide a press which can be permanently mounted on a bench or the like in one orientation and in which either an end-to-end type applicator or an applicator adapted to apply ladder strip can be mounted without changing the orientation of the press on the bench.

These and other objects of the invention are achieved in a preferred embodiment thereof comprising a press frame having first and second applicator supporting surfaces thereon. These applicator surfaces are coplanar and extend substantially normally of each other, the first surface extending parallel to the front of the work bench

## 2

on which the press is mounted and the second surface extending normally of (i.e., inwardly from) the front edge of the bench. The two supporting surfaces merge in a common zone through which the center line of the press passes. The press is positioned on the bench such that this center line extends obliquely of the front edge of the bench. An applicator adapted to apply connecting devices in end-to-end strip form can thus be mounted on the second one of the supporting surfaces while an applicator adapted to apply connecting devices in ladder strip form can be mounted on the first one of the surfaces. In either event, the connecting devices will be fed into the common zone in a manner such that the axes of their ferrule-forming portions will extend normally of the front edge of the bench so that an operator standing in front of the press can insert the wires directly into the ferrule-forming portions of the connecting devices. The preferred embodiment of the invention also includes a spindle for supporting a supply reel of connecting devices, this spindle being mounted in a manner such that it can be shifted from a first position in which its axis extends normally of the front edge of the bench to a second position in which its axis extends parallel to the front edge. The two positions of the spindle correspond with the first and second supporting surfaces of the press so that the spindle can be utilized to support a reel of either end-to-end or ladder strip type connecting devices.

In the drawing:

30 FIGURE 1 is a side view of a crimping press in accordance with the invention having an applicator thereon of the type adapted to apply connecting devices in end-to-end strip form onto the ends of wires;

35 FIGURE 2 is a plan view, with parts broken away, of the press of FIGURE 1, the applicator being indicated schematically in this view in the interest of clarity;

40 FIGURE 3 is a view similar to FIGURE 2 but showing an applicator for connecting devices in ladder strip form mounted on the press; and

45 FIGURE 4 is a perspective view of a fixture, forming a part of the press of FIGURE 1, on which a reel of connecting devices in strip form is mounted during use of the press.

At the outset, reference is made to FIGURES 2 and 3 to illustrate the difference between end-to-end strip 2, and ladder strip 10. As shown in FIGURE 3, terminals manufactured in ladder strip form have their ferrule-forming portions 12 disposed in side-by-side relationship with the axes of these ferrule-forming portions extending parallel to each other. The adjacent terminals of the strip may be connected to a continuous carrier strip 15 by slugs 16 between the end portions or ring tongues 14 of the terminals and the carrier strip. Where the terminals are manufactured in end-to-end strip 2, FIGURE 2, the ferrule-forming portions 4 of the terminals are in axial alignment with each other and the ring tongue portion 6 of each terminal is connected by means of a suitable slug 8 to the trailing end of the next adjacent terminal. It will be apparent that in an automatic crimping press, the strip 10 of FIGURE 3 must be fed rightwardly to position the leading terminal of the strip between the crimping dies of the press while the strip 2 of FIGURE 2 must be fed downwardly, as viewed in the drawing, to position the leading terminal between the crimping dies of the press, these feeding directions being shown by the arrows in FIGURES 2 and 3.

A press 18 in accordance with the invention will ordinarily be mounted on a bench or other suitable support 22 having a front edge 24. The operator will normally stand in front of the press and position the ends of the wires to which connecting devices are to be attached between the crimping dies which are mounted in the appli-

cator 20. The applicator may be of the type intended to apply end-to-end strip or ladder strip as will be explained more fully below. The applicator 20 shown on the press in FIGURE 1 is particularly intended to apply connecting devices in end-to-end strip form.

Press 18 comprises a frame base 26 having a back plate 28, a front plate 30 secured thereto and extending vertically therefrom, and a pair of side plates 31 which extend between the back plate and the front plate. The back plate 28 is secured to base 26 by welding while the front plate 30 comprises a section of structural angle steel which is also secured to the base by welding. The center line, A—A, extends through the apex of the front plate 30 and the press is normally mounted on the surface of bench 22 in an orientation such that this center line intersects the front edge 24 of the bench at an angle of approximately 45°.

Base plate 28 has a first applicator supporting surface 32 which extends parallel to the front edge 24 of bench 22 and a second applicator supporting surface 34 which extends normally of this front edge. These supporting surfaces merge in a common zone 36 through which the center line of the press passes and which is disposed immediately in front of the apex of the plate 30. Suitable securing means (not specifically shown) are provided in the common zone 36 of the supporting surfaces to permit either type of applicator to be mounted on the press.

A cylindrical shaft housing 38 extends through, and is mounted in, the plates 28 and 30, the axis of this housing coinciding with the center line of the press. The shaft in housing 38 is coupled at its rearward end through a single revolution clutch 42 to a flywheel 40. The flywheel in turn is coupled by means of a belt 44 to a pulley 46 on the output shaft of an electric motor 48. In normal usage, as is conventional with crimping presses of this general type, the motor runs continuously to turn the flywheel continuously. When it is desired to crimp a connecting device onto a wire, the single revolution clutch is engaged to drive the shaft through a single revolution, such engagement of the clutch being achieved by means of a suitable foot switch.

A rotatable cap piece 50 is mounted on the forward end of the drive shaft and a pin 52 is eccentrically mounted on this cap piece. This pin extends into a suitable opening in a block 58 which is connected to a block 59 by means of a pin 61 which is threaded into both of the blocks 58, 59. The block 59 is pivotally connected at 63 to an extension 65 on the upper end of the ram 54 of the applicator 20. It will be understood that during each revolution of the shaft, the ram 54 of the applicator is moved downwardly through a guide means in a housing 56 and then back to its initial position thereby to move the crimping die on the end of the ram into engagement with the leading terminal of the strip. Applicators of this general type containing a reciprocable ram, a coupling means for coupling the ram to a press, and a feed mechanism for feeding connecting devices in strip form are known to the art so that a detailed description of the applicator is not presented here.

The connecting devices are ordinarily supplied to the user in the form of a continuous strip which has been wound on a reel 60 and the strip is withdrawn from the reel as the individual connecting devices are crimped onto wires by the feeding mechanism of the applicator 20. The preferred embodiment of the invention, is, therefore, provided with a mounting means for the reel which comprises a generally U-shaped bar 64. The reel 60 is mounted on the free end 62 of this bar in a manner described below. The opposite end 67 of bar 64 extends into a collar 66 having a vertically extending tubular ferrule 68 integral therewith. This ferrule 68 is mounted on an upstanding support post 74 on the upper surface of the shaft housing 38. Pins 72 are provided in the end portion 67 of the bar 64 which extend through slots 70 in sleeve 66, the arrangement being such that the bar 69 can be shifted between the positions shown in FIGURES 2 and 3. It

will be evident that when the reel support is in the position of FIGURE 2, the axis of the end 62 of bar 64 is disposed above and behind the applicator supporting surface 34. When the reel support is in this position, a reel of connecting devices in end-to-end strip form can thus be mounted on the end portion 62 and fed to the applicator 20 mounted on the supporting surfaces 34. When the reel support is in the position of FIGURE 3, the end portion 62 of the bar 64 extends normally of the front edge 24 so that it is adapted to support a reel of connecting devices in ladder strip form which would be fed to a suitable applicator mounted on the supporting surface 32.

The reel of connecting devices is held in position on the end portion 62 of the bar 64 by means of a pair of plates 76, 78, which are adjustably secured to the bar by means of suitable lock nuts as shown. The strip of connecting devices is guided from the reel and towards the rearward end of the applicator by means of a curved guide plate 84 mounted on the end of a bar 82. This bar in turn is secured by means of fasteners to a disc 80 on the end portion 62 of the bar, the arrangement being such that the bar 82 can be angularly shifted with respect to the plate 80 since the position of this bar must be changed by an angle of 180° when the reel support is shifted from the position of FIGURE 2 to the position of FIGURE 3 in order to locate the guide plate behind the applicator and below the reel in both cases.

When the press 18 is initially installed on the supporting surface or bench 22, it is secured through the upper surface of the bench in an orientation shown in FIGURES 2 and 3 with the center line of the press extending obliquely of the front edge of the bench. When it is desired to apply connecting devices in end-to-end strip form to wires, a suitable applicator 20 is mounted on the supporting surface 34 and the reel support shifted to the position shown in FIGURE 2. During usage, the strip of terminals will be withdrawn from the reel, fed into the rearward end of the applicator 20, and fed towards the common zone beneath the crimping dies on the ram 54 so that the leading terminal will have its axis extending normally of the front edge 24 of edge 22. The operator thus need merely insert the wires into the applicator and actuate the press to crimp the leading terminal onto a wire.

When it is desired to apply contact terminals in ladder strip form, the applicator 20 is removed from the supporting surface 34 and a suitable applicator 21 adapted to crimp terminals in ladder strip form is mounted on the supporting surface 32. The reel support is shifted from the position of FIGURE 2 to the position of FIGURE 3 so that the end 62 of the bar 64 is disposed to the left of, and above, the left-hand side of the applicator. The strip of terminals is fed from the reel, over the guide surface 84 and into the applicator and the leading terminal of the strip will be positioned between the crimping die and anvil with the axis of its ferrule-forming portion extending normally of the front edge of the bench. Again, the operator need only insert the wire and actuate the press in order to carry out a crimp operation.

The invention permits the provision of an extremely compact press which is adapted to be used with either type of applicator commonly used in the connector crimping art; that is, an applicator of the type 20 intended to apply terminals in end-to-end strip or with an applicator of the type 21 (FIGURE 3) intended to apply terminals in ladder strip form. The reel support 64 can also be shifted to accommodate either type of terminals. The distinct advantage of the invention is that the two types of applicators mentioned above can be mounted on the press without changing the position of the press on the supporting surface 22. It will thus be apparent that the invention permits a quick change over from one type of terminal strip to another type with an absolute minimum of lost "down time."

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

I claim:

1. A bench press of the type adapted to have an applicator mounted thereon, said applicator comprising a reciprocable ram, crimping die means mounted on said ram, and strip feeding means for feeding connecting devices in strip form to position the leading connecting device of said strip beneath said die means, said press comprising a press frame, first and second applicator supporting surfaces on said frame, said surfaces being coplanar and extending substantially normally of each other, said surfaces merging with each other in a common zone, applicator ram actuating means in said press above said common zone for coupling to said applicator ram and for imparting reciprocatory motion thereto, said press being mounted on a supporting surface having a front edge extending parallel to the side of one of said surfaces whereby, an applicator intended to apply connecting devices in ladder strip can be mounted on one of said surfaces and an applicator intended to apply connecting devices in end-to-end strip form can be mounted on the other of said surfaces, and said connecting devices will be delivered to said common zone with the axes of their ferrule-forming portions extending normally of said front edge, a reel spindle for supporting a reel of said connecting devices, said spindle being mounted on said press frame and above the plane of said surfaces, said spindle being shiftable from a first position in which the axis of said spindle extends normally of said front edge to a second position in which said axis extends parallel to said front edge whereby, said spindle can be utilized for supporting reels of either end-to-end strip connecting devices or ladder strip connecting devices.

2. A bench press of the type adapted to receive an applicator for crimping terminals onto wires, said press being disposed on a support having a front side, said press comprising a press frame including two applicator supporting surfaces, a first one of said surfaces extending parallel to said front side of said support and a second one of said surfaces extending normally of said front side, said surfaces merging in a common zone adjacent to said front side, a crank shaft extending obliquely with respect to said front side and above said common zone, means on said crank shaft for coupling said shaft to an applicator on one

of said surfaces whereby, an applicator for applying terminals in ladder strip form can be mounted on said first surface and an applicator for applying terminals in end-to-end strip form can be mounted on said second surface, 5 and reel holding means for holding a reel of terminals in strip form, said reel holding means comprising a spindle shiftable between a first position and a second position, the axis of said spindle extending normally of said front side when said spindle is in said first position and extending parallel to said front side when said spindle is in said second position.

10 3. A bench press of the type adapted to have an applicator mounted thereon, said applicator comprising a reciprocable ram, crimping die means mounted on said ram, and strip feeding means for feeding connecting devices in strip form to position the leading connecting device of said strip beneath said die means, said press comprising a press frame, first and second applicator supporting surfaces on said frame, said surfaces being coplanar and extending substantially normally of each other, said surfaces merging with each other in a common zone, applicator ram actuating means in said press above said common zone for coupling to said applicator ram and for imparting reciprocatory motion thereto, said press being adapted 15 to be mounted on a bench or the like having a front edge extending parallel to the side of one of said surfaces whereby, an applicator intended to apply connecting devices in ladder strip can be mounted on said first surface and an applicator intended to apply connecting devices in end-to-end strip form can be mounted on said second surface and said connecting devices will be delivered to said common zone with the axes of their ferrule-forming portions extending normally of said front edge, said press frame having reel supporting means thereon above the 20 plane of said surfaces, said reel supporting means being shiftable between first and second positions, said reel supporting means being adapted to support a reel of ladder strip terminals in said first position for feeding to a ladder strip applicator mounted on said first surface, and said reel being adapted to support a reel of end-to-end strip terminals in said second position for feeding to an end-to-end strip applicator mounted on said second surface.

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