

Oct. 9, 1956

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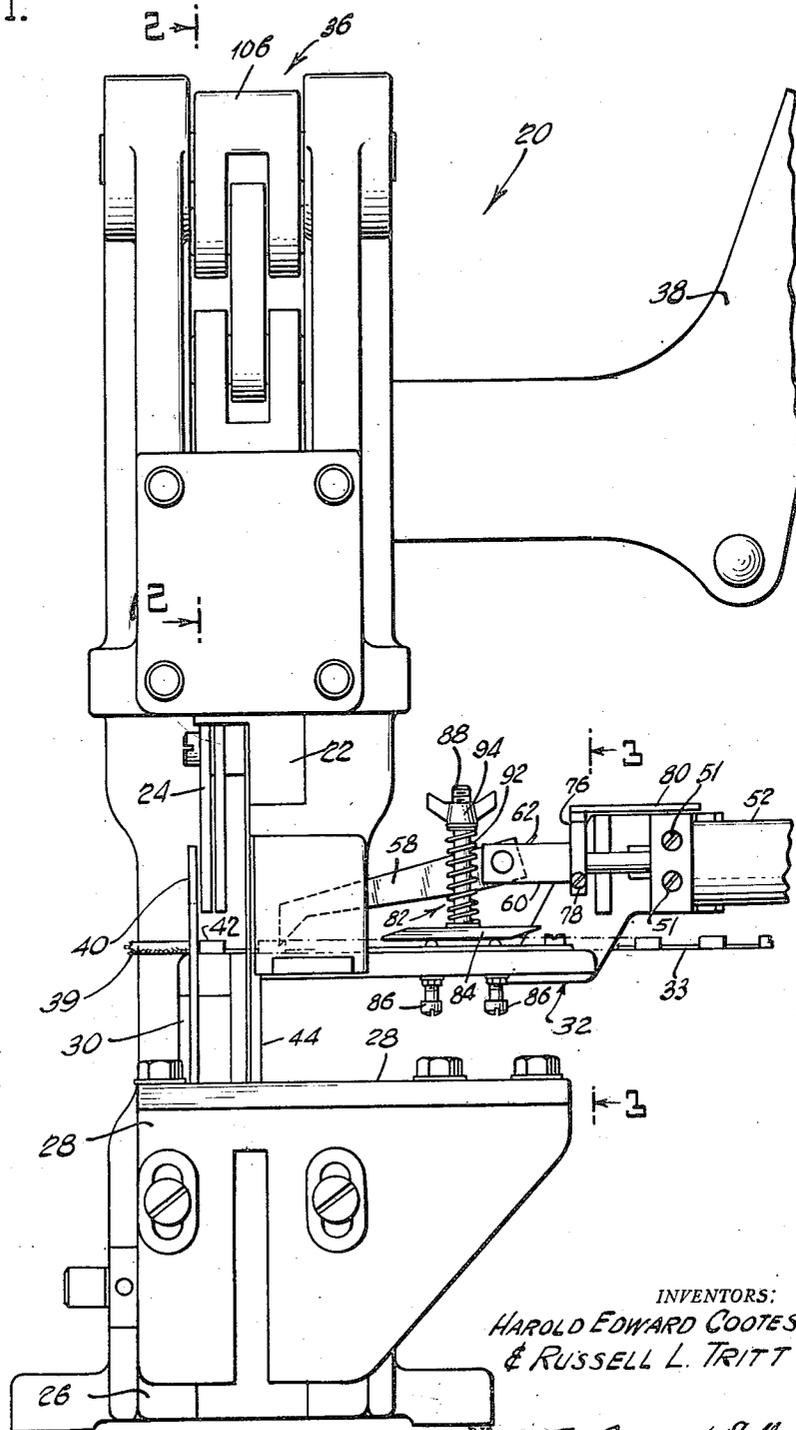
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FEEDING MECHANISM FOR AUTOMATIC TERMINAL APPLYING MACHINE

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5 Sheets-Sheet 1

Fig. 1.



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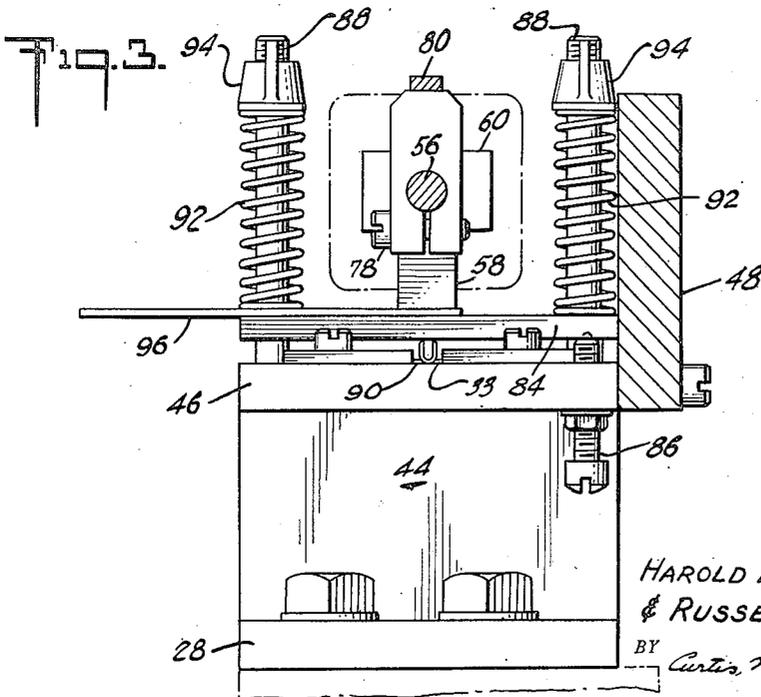
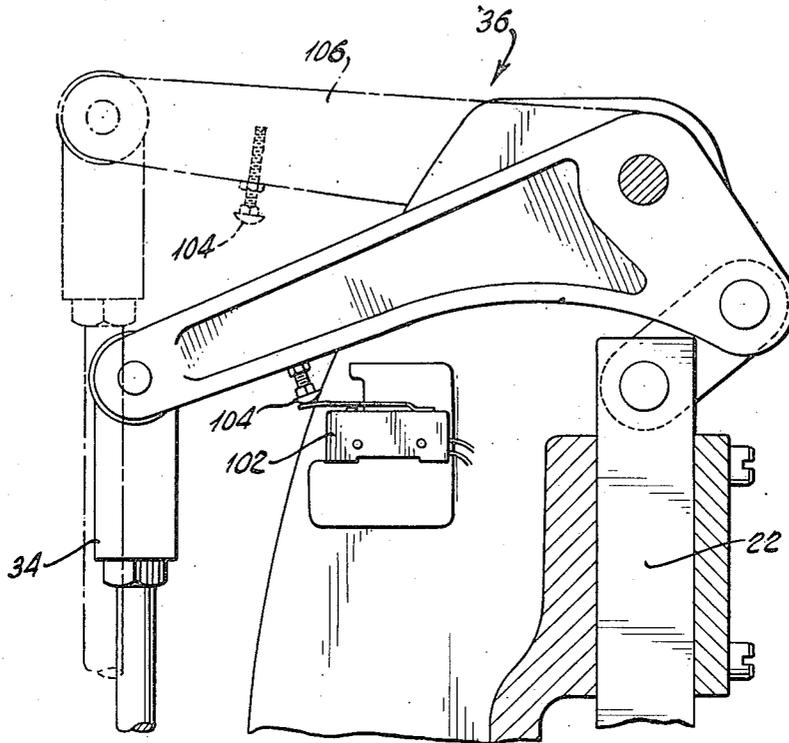
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Fig. 2.



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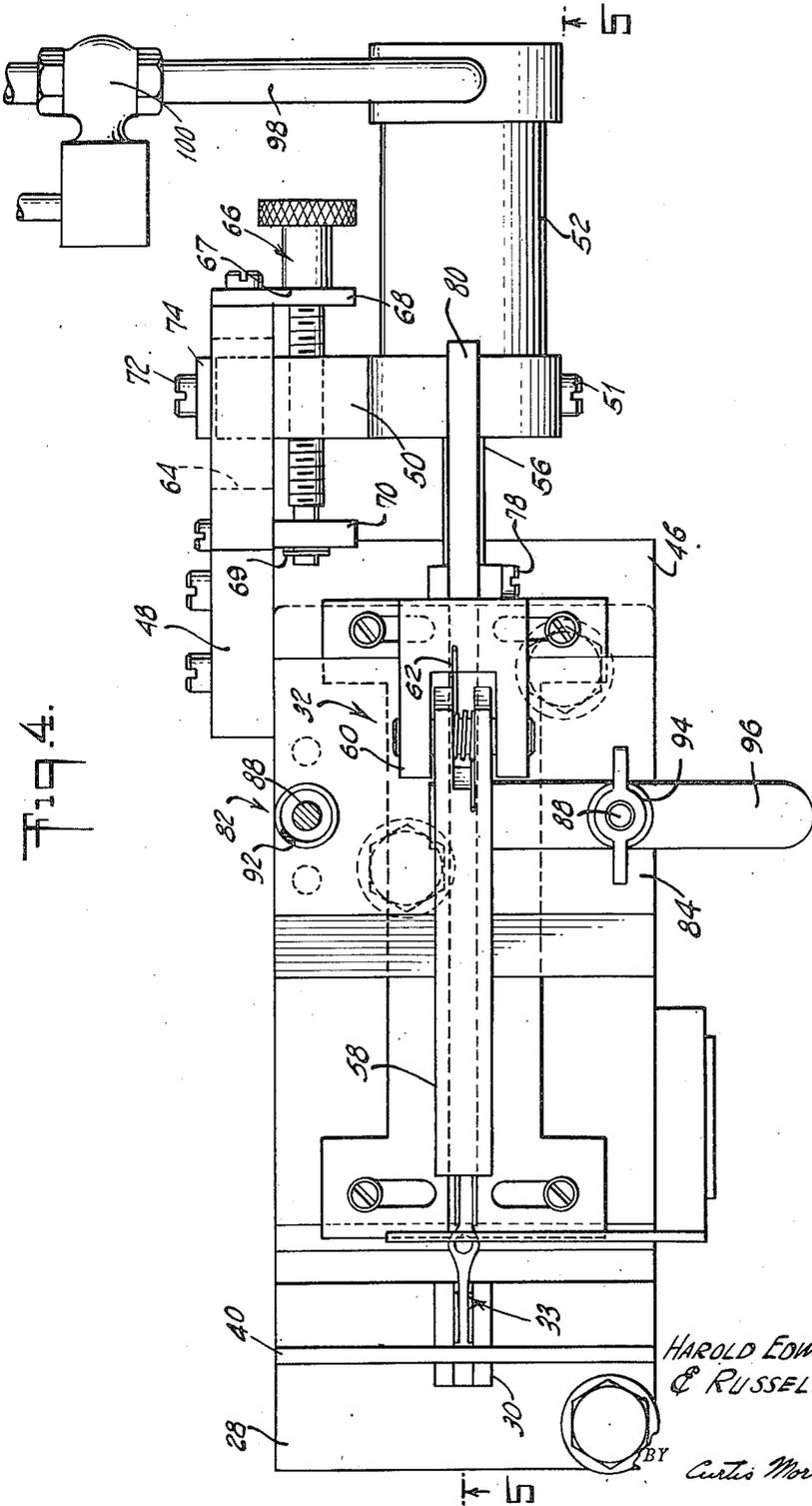


Fig. 4.

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Fig. 7.

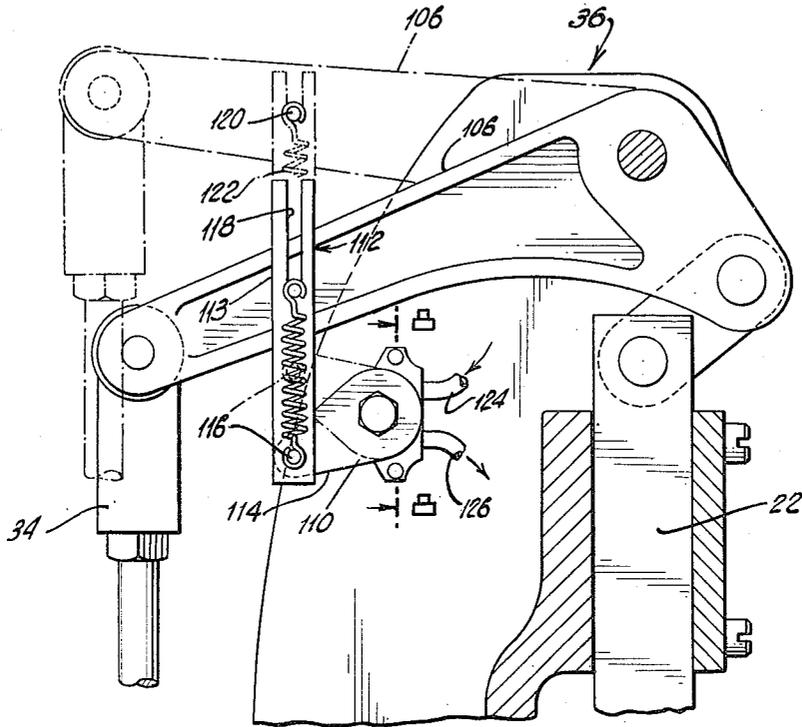


Fig. 8.

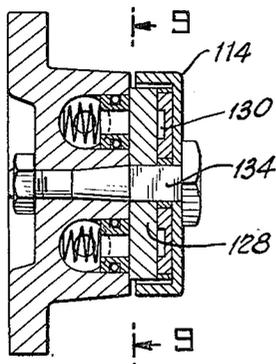
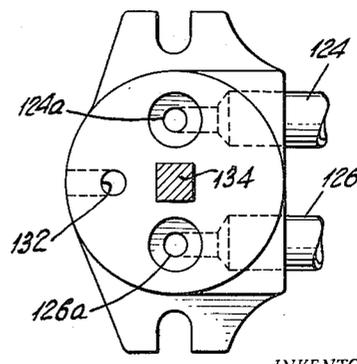


Fig. 9.



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FEEDING MECHANISM FOR AUTOMATIC TERMINAL APPLYING MACHINE

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Application September 9, 1953, Serial No. 379,115

9 Claims. (Cl. 1—177)

This invention relates to a machine for automatically applying connectors and terminals to the end of a wire; certain aspects of the invention have more particularly to do with a feeding mechanism for use in such a machine.

In the electrical terminal field it is often necessary to apply terminals to the end of wires in a number too great to be done economically by hand and yet insufficient to justify the capital expense of a large fully automatic machine. To meet this situation automatic machines have been developed which are sufficiently flexible that one of them can be used on many different types of terminals and connectors by simply and readily converting the machine for use on a number of different types of terminal applying jobs. Such a machine is shown and described in detail in the co-pending application of Harold E. Cootes, filed December 16, 1948, Serial No. 65,645.

With machines of this type it is necessary to provide feeding mechanisms that may be quickly and easily adjusted to a wide variety of terminals and connectors and yet which will positively and accurately position each individual terminal in relation to the applicator mechanism for crimping the terminals and connectors about the ends of the wires. One such mechanism is shown in the above application, and the present invention in certain respects constitutes an improved alternative form thereof.

The present invention contemplates a pneumatic feeding mechanism that may be easily adjusted to accurately feed and position terminals within a wide range of sizes relative to the crimping dies of the terminal applying machine. It is an object of the present invention to provide a feeding mechanism that will always feed every terminal to a predetermined position in the terminal applying machine. It is another object to provide a feeding mechanism having a positive stroke-limiting control capable of insuring the feeding of only one terminal at a time. It is a further object of the present invention to provide a feeding mechanism that may be used interchangeably on a variety of different terminal applying machines. It is a still further object of the present invention to provide a commercially feasible feeding mechanism of a simplified form that may be easily and economically manufactured, operated and maintained. Still a further objective resides in the provision of terminal-applying assemblies and subassemblies which overcome certain of the disadvantages inherent in the prior constructions known in this art. These and other and further objects will be in part apparent and in part pointed out as the specification proceeds.

In the drawings:

Figure 1 is a front elevational view of a machine embodying a feeding mechanism according to the present invention;

Figure 2 is a fragmentary sectional view on line 2—2 of Figure 1 showing the driving linkage for the press and the switch control means for the feeding mechanism;

Figure 3 is a sectional view on line 3—3 of Figure 1 showing details of the stroke limiting bracket and terminal strip drag plate;

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Figure 4 is a top plan view of the feeding mechanism of Figure 1;

Figure 5 is a sectional view on line 5—5 of Figure 4;

Figure 6 is a sectional view on line 6—6 of Figure 5 showing details of the stroke limit adjustment;

Figure 7 is a view similar to Figure 2 showing another form of control means for the feeding mechanism;

Figure 8 is a sectional view on line 8—8 of Figure 7; and

Figure 9 is a sectional view on line 9—9 of Figure 8.

Figure 1 shows a terminal applying press 20 which comprises generally a ram 22 having mounted thereon upper crimping dies 24 and a base platform 26 adjustably carrying thereon base plate assembly 28. Assembly 28 has mounted thereon a lower die assembly 30 and a feeding mechanism 32. Press 20 is driven by any suitable means such as an air cylinder connected through a rod 34 (see Figure 2) and a driving linkage 36 to the ram member.

In operation a supply of terminals 33 in continuous strip form is mounted on a bracket (not shown) and fed around through suitable guides into feeding mechanism 32, which moves strip 33 from right to left as shown in Figure 1 to position the end terminal between upper and lower die assemblies 24 and 30 respectively. A length of wire 39 having the insulation stripped from the end is then fed through shield 40, from the left as shown in Figure 1, into the end terminal 42 positioned between die assemblies 24 and 30. The press is triggered to crimp the terminal about the bared end of the wire, the terminal being severed from the next adjacent terminal of the strip during the crimping operation. The crimping operation triggers feeding mechanism 32 to move the strip of terminals to the left as shown in Figure 1 after the return stroke of the ram to position the now end terminal between die assemblies 24 and 30.

Figure 5 shows feeding mechanism 32 mounted on base plate assembly 28 on a base plate block 44 which carries thereon a strip guide plate 46 which in turn carries thereon an air cylinder mounting plate 48. Plate 48 has adjustably mounted thereon an air cylinder block 50 which has fixed thereto by screws 51 an air feed cylinder 52 for actuating feeding mechanism 32.

Feed cylinder 52 has positioned therein a piston 54 connected to a piston rod 56. Rod 56 extends outwardly of cylinder 52 and pivotally carries at its end feed finger 58 in a forked block member 60 threaded onto the end of piston rod 56. Spring 62 urges feed finger 58 in a downward direction to insure engagement with the strip of connectors and yet to permit it resiliently to slide thereover upon the return stroke of piston 54, thus providing in effect a ratchet action. As piston 54 is moved backward and forward in cylinder 52, the feed finger is similarly moved to feed the terminals of the terminal strip one at a time, from right to left, into proper position between die assemblies 24 and 30. As shown in Figure 5, feed finger 58 has just reached the limit of its forward stroke, this limit being determined by the abutment of piston 54 against the stop 55 on the end plate of cylinder 52.

According to the present invention the forward limit of feed of the strip by feed finger 58 may be controlled by moving adjustably mounted cylinder block 50 in cylinder mounting plate 48. As may be seen more clearly in Figures 4 and 6, block 50 is mounted in a slot 64 in plate 48 on feed adjustment screw 66. Screw 66 is threaded through and is rotatably carried in plates 68 and 70 between shoulder 67 and retaining ring 69.

To adjust the forward limit of movement of feed finger 58, screw 66 may be turned to move block 50 and thus cylinder 52 backward and forward within the limits of slot 64 in plate 48. Block 50 may be locked in the

desired position by tightening down on screw 72 to clamp block 50 to plate 48 between plate 74 and shoulders 75. Thus the forward limit of the stroke and hence the position of the end terminal of the strip may be accurately controlled for various sizes and shaped terminals.

To insure that only one terminal at a time is fed between the crimping die assemblies, there is provided a stroke adjustment clamping block 76 which is clamped about piston rod 56 between block 60 and piston 54 by a screw 78 which is threaded into one leg of block 76, see Figure 3. On the return stroke piston 54 will move to the right, as shown in Figure 5, until block 76 abuts against the end wall of cylinder 52. By loosening and tightening screw 78 block 76 may be positioned with exactness anywhere along piston rod 56 so as to adjust the limit of the return stroke of feed finger 53 to one terminal length only. Block 76 also carries a guide finger 80 which extends over the end of cylinder 52 and prevents rotation of piston rod 56 and piston 54. Undesirable rotation could throw feed finger 58 out of alignment with the terminals of the terminal strip. There is thus provided a wide range of adjustments for the feeding stroke to accommodate it to a wide variety of sizes and shapes of terminals.

Once the terminal strip is properly positioned relative to the die assemblies it is necessary to maintain the strip in that position until the next stroke so that the terminal will be properly crimped about the wire and so that the feed finger will not move the strip as it is dragged backward in ratchet fashion thereover upon the return stroke. Accordingly, a drag plate assembly 82 is provided to engage frictionally the strip and hold it in proper position against accidental movement. This assembly comprises a drag plate 84 adjustably mounted above strip guide plate 46 on leveling screw 86 and bolts 88 mounted in plate 46. Drag plate 84 is forced downwardly into frictional engagement with strip 38 positioned in channel 90 in guide plate 46 by springs 92. Springs 92 are positioned on bolts 88 by wing nuts 94 which may be selectively turned down to place the springs under greater compression and to thus adjust the frictional "drag" on strip 33. As may be seen in Figure 3, plate 84 is in effect balanced upon strip 33 between leveling screws 86 and springs 92. A finger 96 is mounted on plate 84 and extends to one side thereof so that drag plate 84 may be readily raised to release the strip for initial feeding or positioning of the terminals in the machine.

Thus the pressure of drag plate 84 may be adjusted so that the terminal strip may be accurately positioned by feed finger 58 and yet will remain in that position until again engaged by the feed finger on the next positioning stroke.

As may be seen in Figure 4, the air cylinder which drives feed finger 58 is connected through a pipe 98 to a solenoid controlled valve 100 connected to a suitable source of air pressure, not shown. Solenoid valve 100 is actuated by a microswitch 102, Figure 2, which in turn is actuated by an adjustable stop pin 104 mounted on a bell crank arm 106 of driving linkage 36 of cam 22.

In operation, when the press is actuated by a suitable air cylinder or other means rod 34 is driven upwardly until bell crank 106 reaches the dotted line position as shown in Figure 2. This moves ram member 22 downwardly to cause upper die assembly 24 to contact lower die assembly 30. Upon the return stroke arm 106 descends to the full line position causing stop pin 104 to close the microswitch 102. This energizes solenoid valve 100 which actuates feeding mechanism 32 to move the next terminal of strip 33 into position between the die assemblies. Stop pin 104 is adjusted so as to trigger feeding mechanism 32 after the end of the crimping stroke of ram 22 so that the feeding operation takes place after the dies have been retracted and the completed con-

nection removed but before the next cycle of operation.

As piston 54 moves forward under the influence of the air introduced by solenoid valve 100, a spring 108 positioned between piston 54 and the end wall of cylinder 52 is compressed. Upon the shutting off of solenoid valve 100 an exhaust port is opened and the compressed spring will return the piston toward the retracted position until stopped by block 76 on rod 56 as described above. The spring may be positioned in a recess in the end wall of cylinder 52 or as shown a shoulder 55 may be provided to contact the piston to insure a positive forward limit to the feeding stroke so that the terminal will be accurately positioned relative to the die assembly.

Referring now to Figures 7 through 9, there is shown another embodiment of a control valve for the feed finger air cylinder 52. In this embodiment the solenoid valve 100 and microswitch 102 are replaced by a mechanically actuated valve 110 connected by a mechanical linkage 112 to bell crank arm 106 of the press driving linkage 36 for the ram 22. Mechanical linkage 112 comprises a rod 113 pivotally connected at one end by a pin 116 to the valve actuating arm 114. Rod 113 has in the other end a slot 118 which rides about a pin 120 mounted on arm 106 of the main driving linkage. Pins 116 and 120 have connected therebetween a spring 122 which in cooperation with slot 118 insures the positive actuation of the valve 110 as will be described in detail herein.

In operation, as the driving mechanism moves upwardly on the crimping stroke from the position shown in full lines in Figure 7, pin 120 moves upwardly and through spring 122 draws lever 114 upward until the valve 110 reaches the completely "off" position. Further movement of the arm 106 causes pin 120 to move upward in slot 118 stretching the spring 122. Upon the return stroke of the driving linkage 106 pin 120 moves downwardly until it engages the bottom of the slot 118 to force rod 113 downward moving the lever arm 114 to the position shown in dotted lines which turns the valve 110 to the "on" position. Valve 110 in this position admits air to the feed finger cylinder 52 and causes feeding of the strip of connectors as described above. This prevents injury to the valve 110 yet provides a positive "on-off" action.

As may be seen best in Figures 8 and 9, valve 110 is connected at the inlet 124 to a source of compressed air while the outlet 126 is connected to the feed finger air cylinder 52 so that when the valve is in the "on" position air from the main supply is provided through valve 110 to the feed finger 52 to actuate it as described above.

When in the "on" position, air enters the inlet 124, flows upwardly through orifice 124a and a hole in the plate 128 into the annular chamber 130 around to a second hole positioned over the outlet orifice 126a, and thence to the feed finger cylinder 52. In the "on" position the exhaust port 132 is closed by the plate 128. In the "off" position, as shown, the orifice 124a of the inlet is closed by the plate 128 while a hole in plate 128 is positioned over the exhaust port 132 and the outlet orifice 126a. Air pressure in the feed finger cylinder 52 may then enter the outlet 126, proceed through the orifice 126a and the corresponding hole in plate 128 into the annular chamber 130 down through a hole in the plate 128 to the exhaust port 132 and out to the atmosphere. Thus with the valve 110 in the "off" position spring 108 may return the feed finger piston until stopped by the block 76 on rod 56 as described above.

As may be seen in Figures 8 and 9, the shaft 134 is square in cross-section at one end and carries at that end the lever 114 and the plate 128 so they move together during the actuation of the valve to open and close the respective ports.

There is thus provided a feeding mechanism of simplified design that may be easily and quickly adjusted for a

large variety of terminal sizes in accordance with the foregoing objects of the invention.

While there are given above certain specific examples of this invention and its application in practical use and also certain modifications and alternatives, it should be understood that these are not intended to be exhaustive nor to be limiting of the invention. On the contrary, these illustrations and the explanations herein are given in order to acquaint others skilled in the art with this invention and the principles thereof and a suitable manner of its application in practical use, so that others skilled in the art may be enabled to modify the invention and to adapt and apply it in numerous forms, each as may be best suited to the requirements of a particular use.

What is claimed is:

1. In a machine for applying connectors to conductors from a substantially continuous connector-forming strip, a fluid-pressure strip feeding mechanism comprising, a fluid-pressure cylinder having therein a piston and piston rod assembly, a feed finger connected to said assembly and positioned to contact the strip of connectors, adjustable stop means to limit the movement of said piston rod into said fluid-pressure cylinder, and adjustable mounting means for said fluid-pressure cylinder to position said cylinder longitudinally relative to said strip whereby the limits of each feed stroke of said strip may be accurately adjusted.

2. A device as described in claim 1 wherein said adjustable mounting means includes a mounting block attached to said cylinder and threaded onto an adjusting screw and locking means for fixing said block at any given position of adjustment.

3. A device as described in claim 2 wherein said adjustable stop means comprise a stopping block adjustably mounted on said piston rod to abut against said air cylinder and to limit the inward movement of said piston rod.

4. In a machine for applying terminals to wires one at a time from a substantially continuous strip of connector forming metal, a fluid operated strip feeding mechanism comprising, a cylinder adapted to be coupled to a source of fluid-pressure, a piston and piston rod assembly mounted therein for movement back and forth from end to end, spring means within said cylinder urging said piston in one direction, a feed finger pivotally mounted on the end of said piston rod, second spring means urging said feed finger into contact with the strip of connectors, a stop plate adjustably fixed to said piston rod to limit the movement thereof under the influence of said spring means, adjustable mounting means for said cylinder to position said cylinder longitudinally relative to said strip and valve means for selectively introducing fluid into said cylinder to move said piston against said spring until it abuts against the end of the cylinder whereby the forward limit of each stroke of said strip may be accurately determined by adjusting said adjustable mounting means and the length of the stroke of said feeding mechanism may be accurately determined by adjusting said stop plate.

5. A device as described in claim 4 wherein said stop plate carries thereon a finger to engage said cylinder to prevent rotation of said piston rod relative to said cylinder.

6. A press construction including a reciprocatory ram, a unitary supporting structure provided with a guide for said ram and providing a support structure along which

work pieces may be fed to said ram, a cylinder adjustably mounted relative to the length of said guide on said support and carrying a piston and piston rod therein, a feed finger adapted to engage said work pieces pivotally mounted on the end of said piston rod, a valve control for admitting fluid to said cylinder, means actuated by said ram for opening and closing said valve, spring means associated with said cylinder for effecting the idle stroke thereof and stop means for limiting the length of said idle stroke.

7. A device as described in claim 6 wherein said valve means comprises a solenoid operated valve in the fluid line to said cylinder and said means actuated by said ram comprises a microswitch positioned in the circuit to said solenoid valve and adapted to be closed by the driving linkage of said ram when in the forward limit of the crimping stroke whereby said strip of terminals is fed on the return stroke of said ram.

8. In a machine for applying terminals to the bared ends of wires one at a time from a substantially continuous strip of terminals, a pneumatic strip feeding mechanism comprising an air cylinder and piston arrangement carrying thereon a feed finger adapted to contact said strip of terminals, stop means on said piston arrangement for limiting the idle stroke thereof, adjustable mounting means for said cylinder for determining the forward limit of the feeding stroke of said mechanism, a drag plate adjustably mounted above said strip of terminals to frictionally engage said strip, and adjustable spring means for varying the pressure on said drag plate so as to permit said strip to be moved on the forward stroke of said feeding mechanism but to hold the strip stationary upon the idle stroke thereof.

9. A press construction including a reciprocatory ram, a unitary supporting structure provided with a guide for said ram and providing a supporting structure along which work pieces may be fed to said ram, a driving linkage for said ram mounted in said unitary supporting structure, a cylinder adjustably mounted on said support structure and carrying therein a piston and piston rod, a feed finger pivotally mounted on the exposed end of said piston rod adapted to engage the work pieces fed along said support structure, a valve control for admitting fluid to said cylinder comprising a two-way valve having inlet and outlet and exhaust ports, said valve being connected between a source of fluid and said cylinder to permit entry of fluid to said cylinder in the on position and to permit discharge of fluid from said cylinder in the off position, spring means associated with said cylinder for effecting the idle stroke thereof, stop means for limiting the length of said idle stroke, and lever means resiliently connecting said valve and driving linkage for actuating said valve and cylinder in accordance with the position of said ram.

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