MACHINE FOR FEEDING A CONTINUOUS STRIP OF ELECTRICAL CONNECTORS

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ABSTRACT

A continuous strip of U-shaped electrical connecting devices is fed to a crimping anvil to position the leading connector of the strip on the anvil preparatory to attachment to a conductor. The feed stroke is controlled by feeding the strip through a confined passageway. During each stroke of the press, a connecting device which is upstream from the confined passageway is reformed so that it can pass through the passageway. The next adjacent connector, which has not been reformed cannot pass through the passageway and limits the feed stroke.

1 Claim, 7 Drawing Figures
MACHINE FOR FEEDING A CONTINUOUS STRIP OF ELECTRICAL CONNECTORS

This application is a continuation of application Ser. No. 739,316 filed June 24, 1968 and now abandoned.

BACKGROUND OF THE INVENTION

It is common practice to crimp electrical connecting devices onto the ends of conductors by means of automatic or semi-automatic crimping presses. In such presses, a strip of connecting devices is fed towards a crimping anvil and the leading connecting device of the strip is located on the anvil at the end of the feeding stroke. When it is desired to apply a connecting device to a wire, the wire is positioned above this leading connecting device and a crimping die, which is carried by a press ram, is moved towards and away from the anvil to crimp the connector onto the wire.

The crimping of electrical connecting devices onto wires is a precise and exacting operation in that the connecting devices, the dies, and the crimping anvil are manufactured to exacting and precise dimensional tolerances in order to ensure consistently good performance in the crimped connections produced. The connecting device which is being crimped onto a wire must be precisely positioned on the anvil and the feeding operation, in which the connector strip is fed toward the anvil, must therefore be rigidly controlled and precise.

The instant invention is directed to an improved applicator means and particularly to an improved means for controlling the feeding of a strip of connecting devices through an applicator. It is accordingly an object of the invention to provide an improved feeding means for feeding a strip of electrical connecting devices. A further object is to provide a feed means which will ensure that the leading connecting device of a strip of connecting devices will be precisely positioned on the crimping anvil of a connector applicator.

A further object is to provide a relatively simple and foolproof means for controlling the feeding of a strip of electrical connecting devices which is positive in its effects and which does not require precise and exacting control of a reciprocable feed means or the like.

These and other objects of the invention are achieved in a preferred embodiment thereof which is briefly described in the foregoing abstract, which is described in detail below, and which is shown in the accompanying drawings in which:

FIG. 1 is a sectional view of an electrical connecting device adapted to be crimped onto the end of a wire.

FIG. 2 is a perspective view of a short section of connector strip.

FIG. 3 is a fragmentary semi-diagrammatic perspective view of a feeding and crimping apparatus in accordance with the invention.

FIG. 4 is a sectional view of a reforming tool in accordance with the instant invention illustrating the manner in which a connecting device is reformed during feeding to control the strip feeding operation.

FIG. 5 is a perspective view of a typical crimping press having a connector applicator in accordance with the principles of the invention mounted thereon.

FIG. 6 is a side view of a connector applicator in accordance with the principles of the invention.

FIG. 7 is a view taken along the lines 7--7 of FIG. 6.

Referring first to FIGS. 1-4, the instant invention is addressed to the problem of feeding a strip 10 of U-shaped connecting devices 2 towards an anvil 12 so that the leading connector of the strip can be crimped onto a conductor as will be described below. Each connecting device is U-shaped, as noted above, and has sidewalls 4 which are integral in a bight section 5. The disclosed form of connector has indentations 6 on the outwardly facing surfaces of its sidewalls 4, these indentations having shoulders 8 which extend transversely of the connector axis and which are adapted to be engaged by a feed finger to feed the connector strip. It should be noted that the shoulders 8 of the two sidewalls face in opposite directions so that the strip can be fed in either direction and need not be preferentially oriented when it is fed into the applicator.

During a crimping operation, the leading connector of the strip is supported on the anvil 12 and the wire (not specifically shown) is located between the anvil and a crimping die 16 having forming surfaces 18 extending upwardly from its lower end. When the die 16 is moved downwardly from the position of FIG. 3, the wire positioned between the die and anvil is moved between the sidewalls 4 of the leading connector and the sidewalls are crimped into embracing relationship with the wire.

The connector strip 10 is fed towards the anvil along a predetermined path which is defined by a groove 20 in a plate 22, a suitable cover plate 23 being provided to confine the connector strip in the groove. Additionally, the cover plate 23 has a projection 25 on its lower side which extends between the sidewalls of the strip to further assist in guiding it along its path of movement.

The strip is fed by means of a reciprocable feed finger 24 having a laterally extending pawl 26 which is adapted to enter the indentation or recess 6 of one of the connectors of the strip. Feed finger 24 is pivotally mounted at 28 on a block 30 and is biased in a counterclockwise direction, as viewed in FIG. 3, by a spring 31 which is interposed between the end of the feed finger in an upwardly projecting ear on block 30. Block 30 is connected by means of a connecting link 32 to a reciprocable actuator member 34. It will thus be apparent that upon reciprocation of the member 34, the strip 10 will be fed leftwardly in FIG. 3 towards the anvil 12.

As noted above, the structure shown in FIG. 3 is semi-diagrammatic; a specific applicator is shown in FIGS. 5-7 and will be described below.

In order to control the length of the feed stroke, and thereby precisely position the leading connecting device of the strip on the anvil 12, a barrier plate means 36, is provided adjacent to the anvil and extending transversely of the feed path of the strip. This barrier plate has a generally U-shaped notch 38 therein, the width of which at its upper end is somewhat less than the normal width of an individual connecting device of the strip 10. It follows that the strip, in its normal condition, cannot be fed through the notch 38.

In order to permit feeding of the strip 10 through notch 38, a reforming tool 40 is provided which is movable with the crimping die 16 and which has forming surfaces 42 comprising the sides of a recess extend-
ing upwardly from its lower end. This forming tool is effective, when it is moved downwardly to the position of FIG. 4 to bend the sidewalls of the connecting device 2' (which is adjacent to the barrier plate 36) inwardly until they are spaced apart by a distance which is less than the width of the notch 38 in the barrier plate 36 as illustrated in FIG. 4. During each complete cycle of the crimping apparatus, the leading connecting device of the strip is crimped onto a conductor and the connecting device 2' (the fourth connecting device along the strip from the leading connecting device) is reformed and its sidewalls are bent inwardly. After the crimping and reforming operations have been carried out, the feeding mechanism comprising the feed finger 24, the block 30, and actuator 34 is actuated to feed the strip a distance which is approximately equal to, and no less than, the length of a single connecting device. The connecting device which was reformed in the preceding cycle of operation will feed through the notch 38 in plate 36 but the connecting device which is next adjacent to the connecting device 2' cannot move through this notch and its leading edges will move against the surface of plate 36 thereby limiting the length of the feed stroke and ensuring precise feeding of the strip.

It will be understood that the individual connecting devices of the strip 10 are joined to each other in the limited area indicated at 7 at their bights so that during crimping of the leading connecting device on the wire, this leading connecting device will be severed from the next adjacent connecting device by virtue of the stresses imposed as a result of crimping. The sidewalls of the individual connecting devices can be formed inwardly independently of each other as is done by the reforming tool 40.

The apparatus which is shown in the semi-diagrammatic form in FIG. 3 can be provided on any suitable conventional press in accordance with known principles and techniques in the art of crimping electrical connecting devices. A suitable press 44 can be of the type generally disclosed in U.S. Pat. No. 3,046,636. This press has a housing 46 and a reciprocable ram 48 on which the crimping die 16 of the reforming tool 40 are mounted as shown. The terminal feed assembly 50 is mounted on the previously identified plate 22 which is supported on a block 58 secured to a base plate 52 that in turn is secured to the press platen 54. The reciprocable feed finger and feed block are indicated by the same reference numerals as those used in the semi-diagrammatic view of FIG. 3. Actuation of the feeding mechanism is achieved by a suitable pneumatic piston cylinder 56, the piston rod of which is connected to the previously identified actuator block 34. The barrier means 36 is provided in a suitable block mounted adjacent to the support block 58. Cover plates 23 and 60 may be provided as shown to confine the strip as is commonly known to the art.

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.

We claim:
1. In an apparatus for applying electrical connectors onto the ends of wires, said connectors being in the form of a continuous strip with the connectors of said strip in axial alignment, each connector being generally U-shaped in cross-section, having sidewalls which are spaced apart by a first predetermined distance, said apparatus comprising:
a crimping die and a crimping anvil, said die being movable towards and away from said anvil, feeding means for feeding said strip of connectors along a predetermined path towards said anvil, a stop block on said path, said stop block having a generally U-shaped opening therein, said opening having sidewalls which are spaced apart by a second predetermined distance which is less than the predetermined distance between said sidewalls of said connectors, a bending die, said bending die being beside, and movable with, said crimping die, said bending die having forming surfaces which engage the one of said connectors which is against said stop block and bend said sidewalls towards each other until said sidewalls are spaced apart by said second predetermined distance whereby, during each operating cycle of said apparatus, the leading connector of said strip is crimped onto a wire, and a remote connector which is against said stop block is reformed by said forming die to permit it to pass through said notch during subsequent feeding of said strip, and the connector behind said reformed connector moves against said stop block thereby to control feeding of said strip.

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