Aug. 28, 1956 Q. BERG 2,760,195

ELECTRICAL EYELET APPLICATING MACHINE

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Fig. 1.

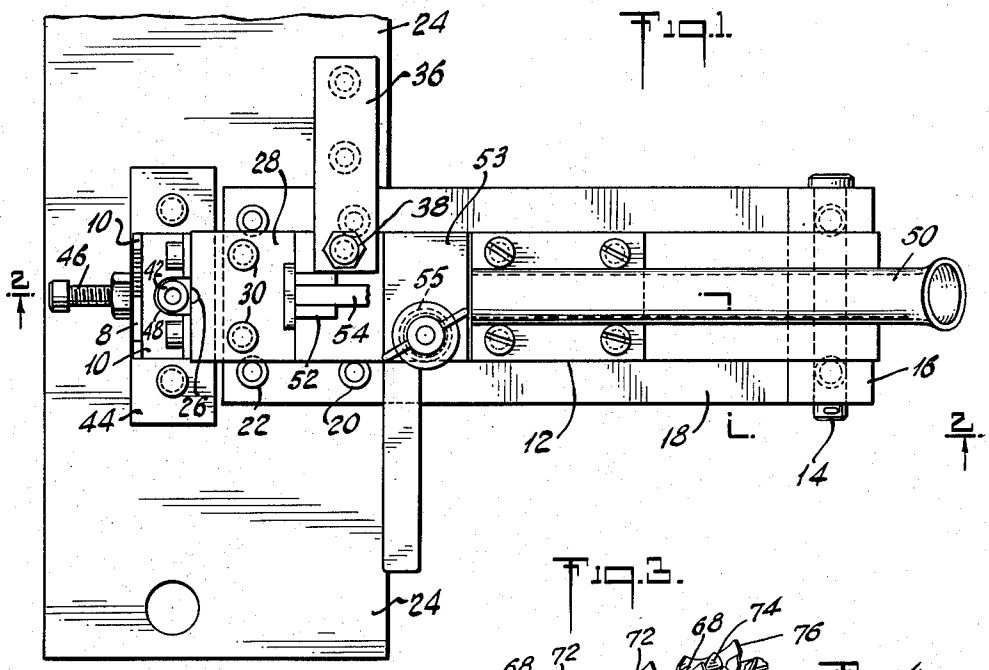


Fig. 3.

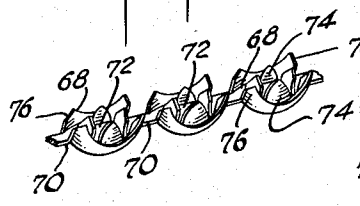


Fig. 4.

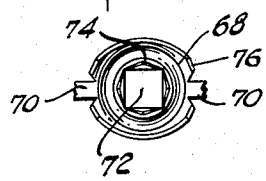


Fig. 2.

INVENTOR:
QUENTIN BERG.
BY
Curtis, Morris & Safford.
ATTORNEYS.

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Fig. 5.

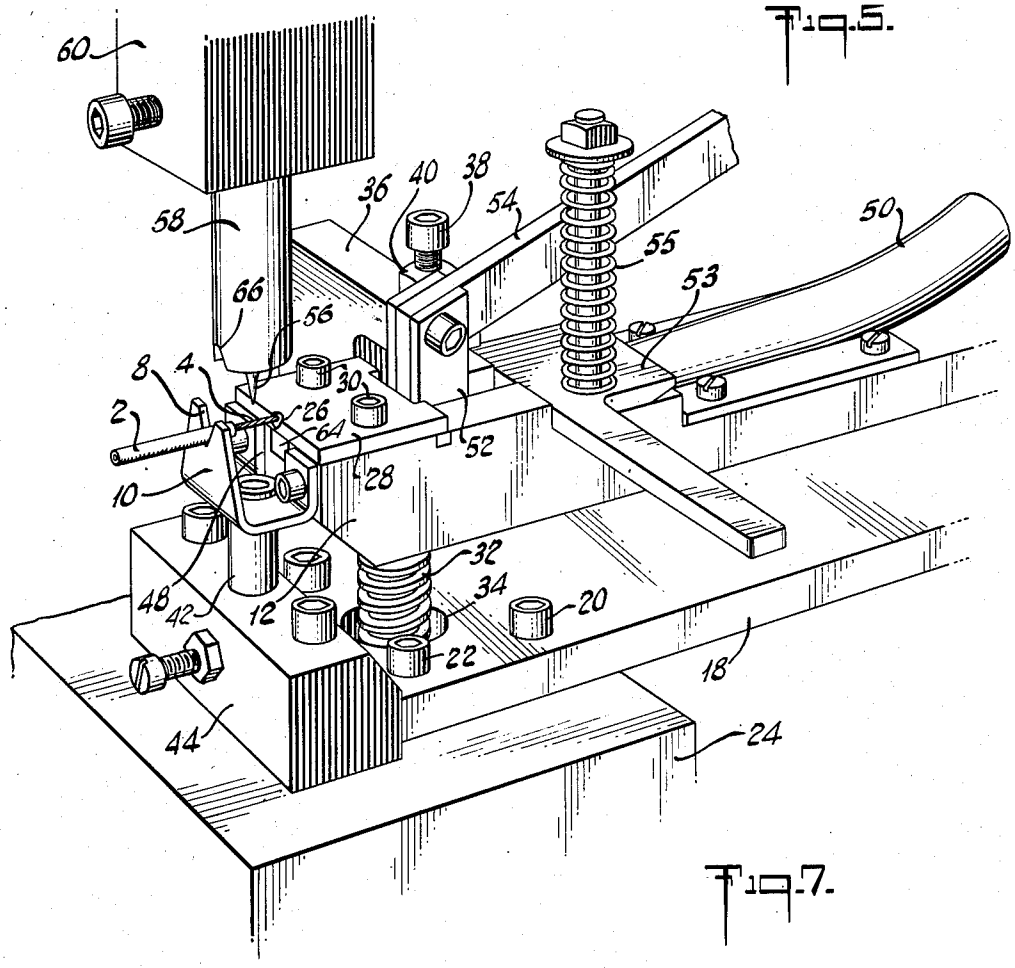
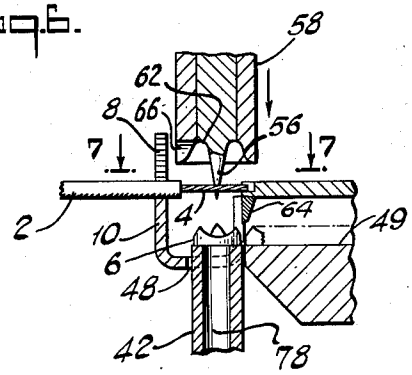
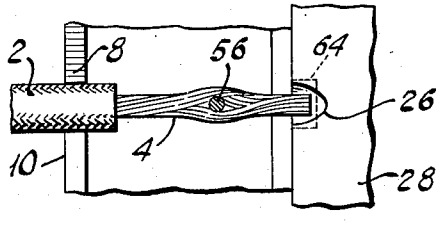


Fig. 7.

Fig. 6.





INVENTOR:
QUENTIN BERG.
BY
Curtis, Morris & Safford
ATTORNEYS:

Aug. 28, 1956 Q. BERG 2,760,195

ELECTRICAL EYELET APPLICATING MACHINE

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Fig. 8.

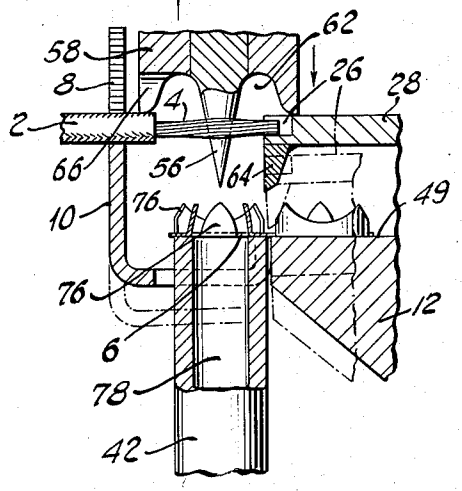


Fig. 9.

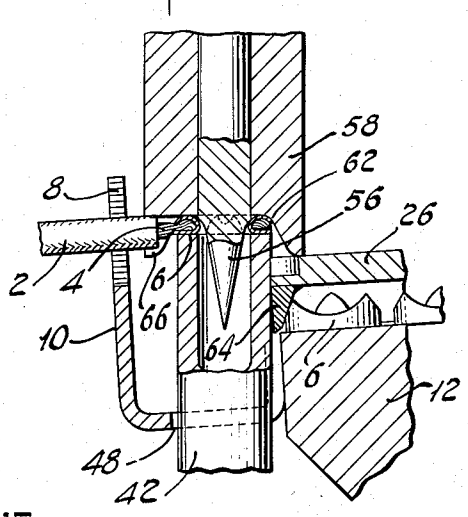


Fig. 10.

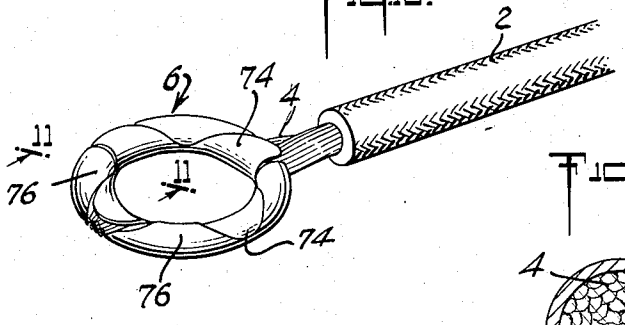


Fig. 11.

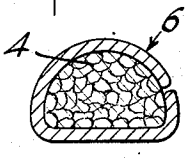


Fig. 14.

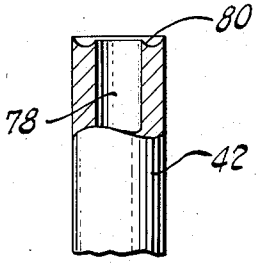


Fig. 13.

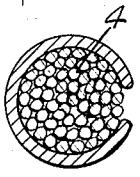
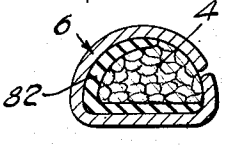


Fig. 12.



INVENTOR
QUENTIN BERG.
BY
Curtis, Morris & Safford.
ATTORNEYS.

United States Patent Office 2,760,195 Patented Aug. 28, 1956

2,760,195

ELECTRICAL EYELET APPLICATING MACHINE

Quentin Berg, New Cumberland, Pa., assignor to Aircraft-Marine Products, Inc., Harrisburg, Pa.

Application February 16, 1953, Serial No. 337,050

5 Claims. (Cl. 1—177)

This invention relates to machines for applying eyelet-type connectors to stranded wire.

Connectors of the eyelet-type, to the application of which the invention is directed, have a central opening surrounded by a channel in which the strands of the conductor are received, these strands being usually precoiled or bent into loop form to fit within the circular channel preparatory to the crimping operation which attaches the eyelet to the conductor. The present invention aims generally to simplify the application of eyelet-type connectors to stranded wire electrical conductors by making the loop-forming and the crimping operations parts of one continuous operation and by so effecting the loop forming and the crimping that the machine may operate either upon a conductor having a stripped end or upon the unstripped end of an insulated conductor.

The invention aims more particularly to provide simple means for applying to stranded wire conductors eyelets of the type described and claimed in my copending application Serial No. 76,070, now Patent No. 2,643,366 issued June 23, 1953. As shown herein, these are one-piece eyelets having petal-like prongs formed on one or both edges of a conductor-receiving channel which extends about the eye of the eyelet. These prongs are so located and arranged that they may be crimped over a conductor located in the channel both to secure it in position in the eyelet channel and to make a good electrically conductive connection between the eyelet and the conductor.

An important feature of the invention is the novel loop-forming device which not only serves to form the loop in the wire strands to fit the conductor-receiving channel in the eyelet but, by its continued movement, also acts to insure the bringing of the conductor loop and the channel into registering relation to each other preparatory to the crimping operation. Another important feature of the invention is the projection of the loop-forming device from the center of one of the crimping dies and the provision for its reception at the center of the cooperating crimping die whereby it cooperates with the crimping dies in the crimping operation. Still another important feature of the invention is the novel eyelet severing mechanism and the timing thereof whereby the machine may be used with a strip of eyelets fed in succession over one of the crimping dies.

Other objects, important features and advantages of the invention to which reference has not specifically been made hereinabove will appear hereinafter when the following description and claims are considered in connection with the acocmpanying drawings, in which—

Figure 1 is a plan view of the lower part of a machine for applying eyelet connectors to conductors which embodies the present invention, the loop-forming mechanism being not shown in this view;

Figure 2 is a section on the line 2—2 of Figure 1, this view showing the loop-forming mechanism partly in section;

Figure 3 is a perspective view of an eyelet strip such as may be used with the machine of the present invention;

Figure 4 is a view looking down upon an uncrimped eyelet;

Figure 5 is a perspective view of the principal operative parts of the machine;

Figure 6 is a sectional detail illustrating the beginning of the loop-forming operation;

Figure 7 is a section on the line 7—7 of Figure 8;

Figure 8 is a sectional detail showing a slightly further advanced step of the loop-forming operation and the start of the movement of the loop toward the eyelet which is to be crimped upon it;

Figure 9 is another sectional detail showing the eyelet severed from the strip and the loop inserted in the eyelet and the eyelet crimped thereover;

Figure 10 is a perspective view of one end of a completed wire lead having an eyelet connector attached thereto;

Figure 11 is a section on the line 11—11 of Figure 10 through one of the crimped-over prongs of the eyelet;

Figure 12 is a similar section through an eyelet that has been crimped upon a loop formed in an insulated conductor;

Figure 13 is a similar section through an eyelet that has been crimped upon a crimping anvil having a concave face to give the crimped eyelet a rounded section, and

Figure 14 shows the modified anvil construction for producing the crimping effect shown in Figure 13.

As hereinabove suggested, the machine for applying eyelets to conductors which is the subject-matter of the present invention may be used without modification to apply an eyelet either to an unstripped insulated conductor or to a conductor having a stripped end, the machine being intended, of course, for use with conductors made up of wire strands so that the strands may be separated into two branches and bent to form a loop. In the drawings, the machine is shown as operating upon an insulated conductor having a stripped end but, as just stated, it may be used without modification to apply an eyelet connector to the unstripped end of an insulated conductor.

In the drawings, the wire 2, to the stripped end 4 of which the eyelet 6 is to be applied, is inserted by the operator into a wire guide 8 in a bracket 10 attached to the front of a pivoted support. This support comprises a grooved plate 12 pivoted at its rear end upon a pivot shaft 14 projecting from the two sides of a vertical block-like support 16 to the under side of which a plate 18 is connected which in turn is secured by machine screws 20 and 22 to the upper face of the machine base 24. The V-shape notch 8 in the front plate of the bracket 10 is shown in Figures 2 and 5 as supporting the wire 2, to the stripped end of which the eyelet 6 is to be attached, at an insulated part of said wire, the stripped end 4 of the wire resting at its tip in a supporting socket 26 in a cross plate 28 secured by machine screws 30, or other suitable connections, to the upper faces of the front parts of the support plate 12.

The support 12, which carries the wire guide and wire end supporting plate 28, is spring biased by suitable springs 32, seated in sockets 34 in the base 24, to remain in its uppermost position, this position being determined by an arm 36 attached to the base 24 and provided with a stop screw 38 adjustable in the arm 36 and secured by a lock nut 40. A stationary anvil 42 clamped by a set screw 46 in a socket member 44 attached to the base 24, is centered beneath the line of the bottoms of guide notches 8 and 26, as shown in Figure 2, where it registers with a slot 48 in the rear part of the bracket 10. A slot 49 in plate 12 provides a guideway for a strip of integrally connected eyelets 6 which are to be fed successively. This guideway communicates at its

rear with an upwardly curved guide tube 50 through which the strip is introduced into the machine from a coil suitably supported outside the machine. A feeding pawl 52 bolted on the end of an arm 54 serves to feed the strip of connected eyelets 6, an eyelet length at a time, as the eyelet-applying parts return to their positions shown in Figure 2 after an eyelet-severing and crimping operation. The mechanism for effecting the reciprocation of the pawl 52 may be similar to ratchet mechanisms as commonly used before my invention. The detail of the preferred reciprocating mechanism is not shown in detail in the drawings but may be of the character of the feeding mechanism shown in the copending application of Quentin Berg, Serial No. 203,305, filed December 27, 1950, or in the application of Harold E. Cootes, Serial No. 68,645, filed December 16, 1948.

A hold-down plate 53, pressed against the upper sides of the eyelets of the eyelet strip may be provided to maintain a suitable drag on the strip and at the same time maintain the eyelets in their face up position.

The wire positioning means above described, comprising the notch 8 in the bracket 10 and the socket 26 in the cross plate 28, are designed to hold the stripped end 4 of the wire 2 in position for the loop-forming operation. The loop-forming means herein shown comprises a stiletto-like tool 56 carried upon a plunger 58 clamped in a reciprocating head 60, the plunger 58 having formed in its lower end the upper eyelet crimping die and the stiletto-like tool 56 being located at the center of and forming a part of this die and taking an active part in the crimping when the crimping operation takes place.

The loop-forming operation of the tool 56 is shown in Figures 6–9 inclusive. From an inspection of these figures it will be seen that, with the wire end positioned in the guide 8 and socket 26, the downward movement of the plunger 58 with the head 60 will cause the sharp point of the tool 56 to pierce the wire, as shown in Figure 6, thus separating the wire strands at the point of entry of the stiletto into two branches at a point substantially midway between the laterally confined wire end in the socket 26 and the point where the insulation begins. The appearance of the wire at this stage of the operation is illustrated in the sectional view in Figure 7.

Further downward movement of the loop-forming tool 56 will, as shown in Figure 8, enlarge the loop, begun in Figures 6 and 7, by reason of the relatively steep taper of the stiletto, this operation, as shown in Figure 8, drawing the end of the stripped portion of the wire somewhat outwardly in the socket 26. At this stage of the operation the end of the plunger 58 in which the upper crimping die 62 is formed engages the cross plate 28 and starts the depression of the support plate 12 against the biasing action of the springs 32, so that the wire guide 10 and support 12 and the stiletto 56 move together downwardly. Meanwhile the eyelet 6 rests upon the upper end of the anvil 42. Welded to the under side of the plate 28 is a shear blade 64 which cooperates with the rear face of the anvil 42, on which the endmost eyelet 6 of the strip of eyelets is resting, to shear off this eyelet from the strip as further depression of the plate 28 with its support plate 12 takes place.

It will be seen that the upper die 62 is provided with a wire-receiving notch 66 so that, as shown in Figure 9, when the downward movement of the wire is checked by the reception of its end in the eyelet 6 the upper die 62, together with the stiletto 56, can continue its movement relatively to the wire, the insulated part of the wire entering the notch 66 in the upper die and the stiletto continuing on to complete the loop, to cause it to register with the channel 68 in the eyelet 6 and to assist in crimiping the prongs of the eyelet over the wire loop thus positioned in the channel.

From an inspection of Figures 3 and 4, it will be seen that the eyelets 6 in the strip of eyelets are connected

by integral connecting straps 70 and that in forming the eyelets, which have a central opening 72, a blank is provided such that a channel 68, of preferably approximately semi-circular cross section, may be stamped in the eyelet and at the same time four petal-like prongs 74 may be caused to extend upwardly from the inner edge of the channel 68 and four somewhat similar prongs 76 may be caused to extend upwardly from the outer edge of the channel 68, the prongs 74 being arranged to alternate with the prongs 76 in their positions about the opening 72, so that, when crimped over the wire loop in the channel 68, they will not interfere with each other. The position of the crimped-over prongs is illustrated in the perspective view of an attached eyelet shown in Figure 10.

In the form of the invention illustrated in Figures 6–9 inclusive, the anvil 42, which has a central bore 78 into which the stiletto 56 enters before and during the crimping operation, is shown as having a flat crimping surface on which the eyelet rests. This results in producing a finished attached eyelet connector having the flat bottom shown in section in Figure 11. If it be desired to have the crimped eyelet present the same sectional contour on the top and bottom, an anvil having a concave upper crimping face 80 such as shown in Figure 14 may be employed. This will result in an eyelet having the section shown in Figure 13.

In Figure 12 is shown a section of an eyelet which has been crimped upon the unstripped end of an insulated wire, the insulation being shown at 82. It will be seen that, regardless of whether or not the end of the wire to which the eyelet is to be attached be stripped, a good electrically conductive connection will be made between the eyelet and the wire, since the loop-forming operation of the stiletto 56 exposes the wire strands on both sides of the stiletto in such manner that both the prongs 74 and the prongs 76 engage the exposed strands.

From the foregoing description it will be seen that the machine of the present invention operates in a novel manner to form an eyelet-receiving loop in a wire to which an eyelet connector is to be applied and that, by a single continuous loop-forming and crimping operation, an eyelet can be quickly and accurately applied in such manner as to insure a good electrically conductive connection between the eyelet and the electrical conductor to which it is applied.

I claim:

1. A machine for applying eyelet-type connectors in strip-form to multiple-stranded electrical conductors comprising a sharp-ended conductor piercing tool having an annular crimping die at the base thereof, an eyelet supporting anvil opposed to said crimping die and having a central bore for receiving the sharp end of said tool, guide means for positioning the leading connector of the strip on said anvil, cutter means mounted over said guide means and adapted to be engaged and actuated by said tool to detach the leading connector from the strip, said cutter means having a blade with cutting edge thereof substantially in alignment with the rear edge of said anvil to form a shear therewith, spaced supports for positioning a stranded wire between said sharp end and anvil, said tool being relatively movable toward said anvil along a common axis to cause said tool end to pierce and form an eye in the wire and to cause said tool to actuate said cutting means, said spaced supports being relatively movable with said tool toward said anvil whereby said tool is caused to introduce the wire eye in the leading eyelet prior to crimping the eyelet upon the wire.

2. A connector applying machine substantially as set forth in claim 1 wherein said anvil is stationary and said guide means, said cutter means and spaced supports are rigidly connected and movable with the wire toward said anvil upon engagement of said tool with said cutter means.

3. A connector applying machine substantially as set

forth in claim 2 wherein said spaced supports include an extension of said guide means having a V-shaped notch on one side of said anvil, and a recess in said cutter means on the other side of said anvil.

4. A machine for applying eyelet-type connectors in strip form to multiple-stranded electrical wires comprising: a sharp-ended wire piercing tool having an annular crimping die at the base thereof, an eyelet supporting anvil opposed to said crimping die and having a central bore for receiving the sharp end of said tool, a machine base, guide means on said machine base for positioning the leading connector of the strip on said anvil, said anvil having a sharp edge over which the leading connector of the strip passes on being positioned for crimping, means interposed between said piercing tool and said anvil for supporting a stranded wire in position to be pierced by said sharp end, cutter means mounted in said machine for movement with said crimping tool toward said anvil to detach the leading connector from the strip, said cutter means having a blade with a cutting edge in substantial alignment with said anvil sharp edge to form a shear therewith for effecting the connector detaching operation, said piercing tool being relatively movable in a crimping cycle toward and away from said anvil

along a common axis to cause the tool end to pierce and form an eye in the wire and to cause said tool to introduce said wire into the leading eyelet prior to crimping the eyelet on the stranded wire.

5. An eyelet applying machine substantially as set forth in claim 4 wherein the supporting means for positioning the wire includes a V-shaped bracket extending from said guide means on one side of said anvil, and a recess in said cutter means on the other side of said anvil.

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