Sept. 9, 1969 F. V. BROSSEIT 3,465,409

TERMINAL ATTACHING MACHINE

Filed Dec. 23, 1966 3 Sheets-Sheet 1

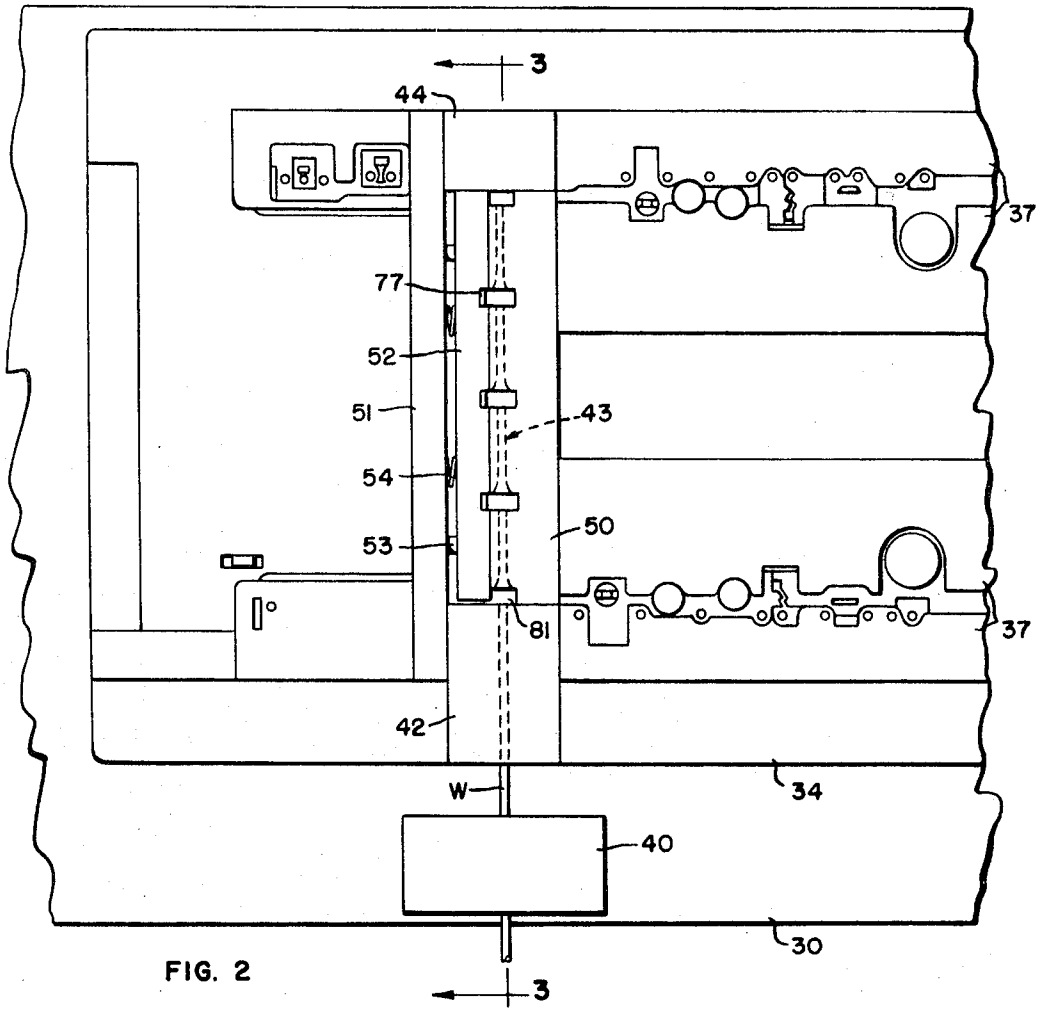


FIG. 2

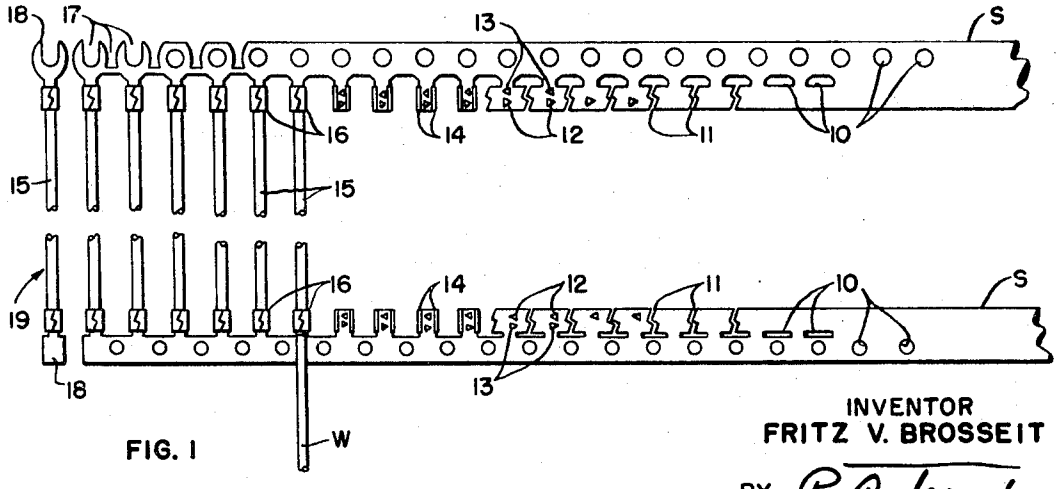


FIG. 1

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TERMINAL ATTACHING MACHINE

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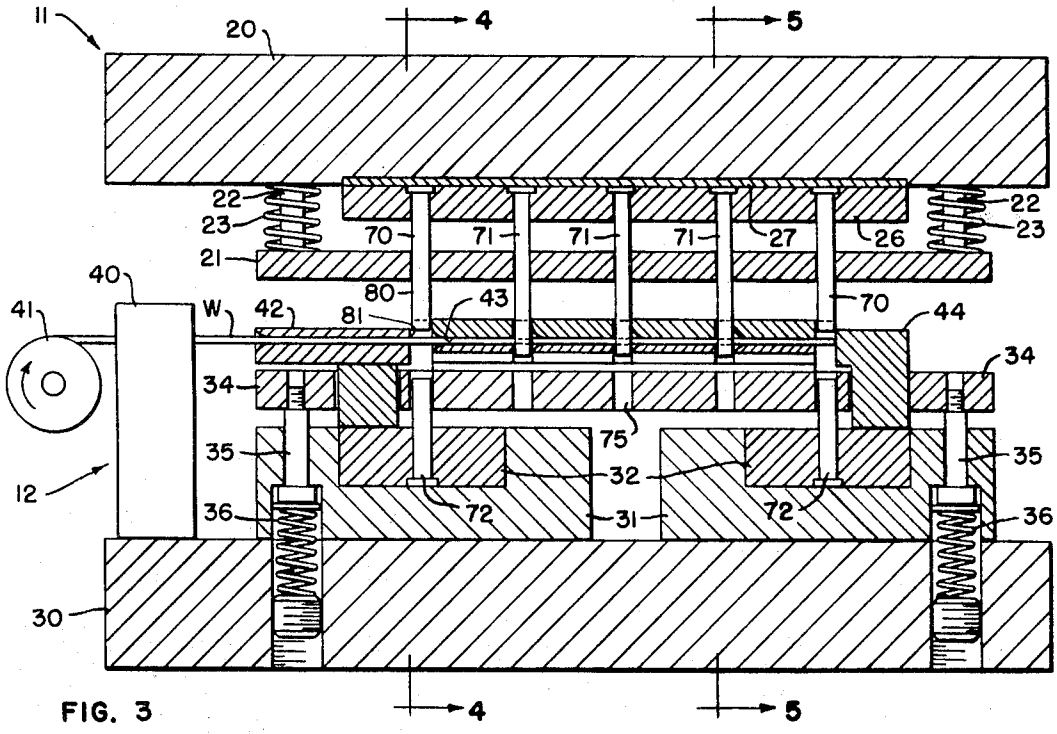


FIG. 3

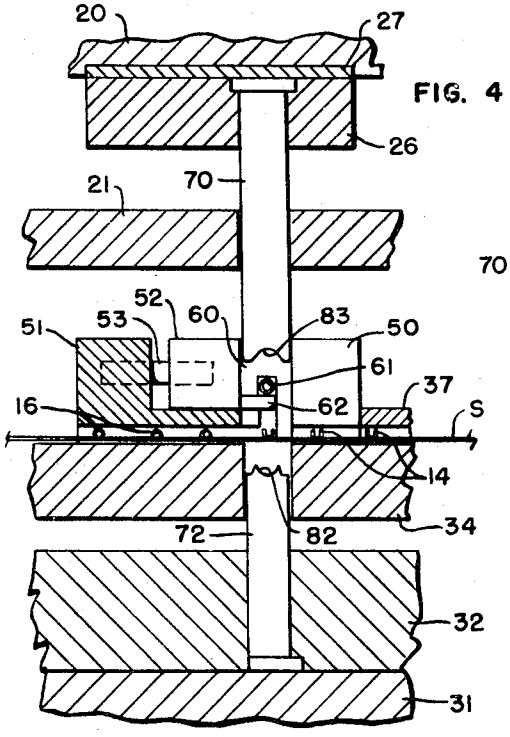
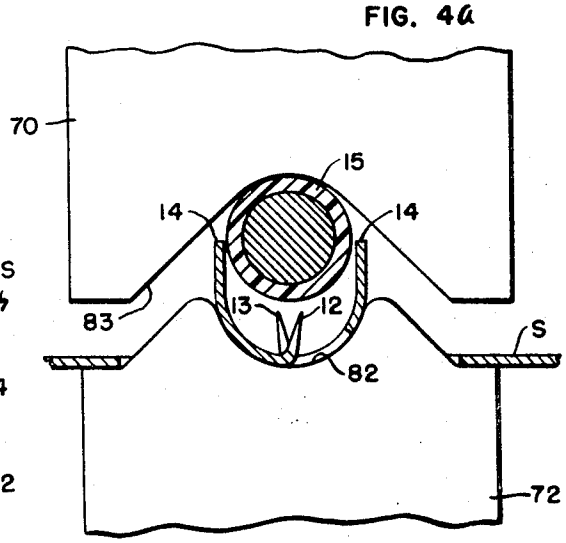


FIG. 4

FIG. 4a



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FIG. 5

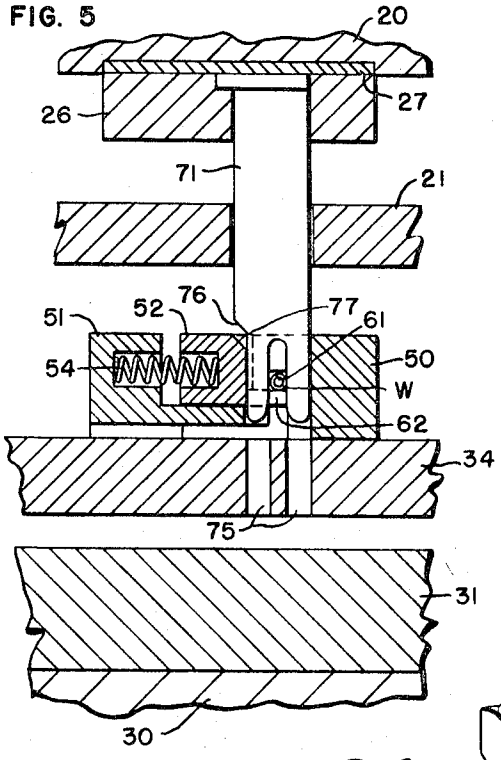
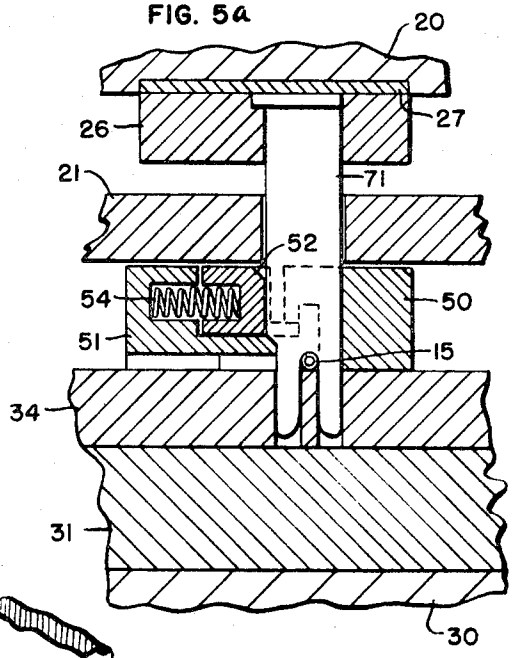


FIG. 5a



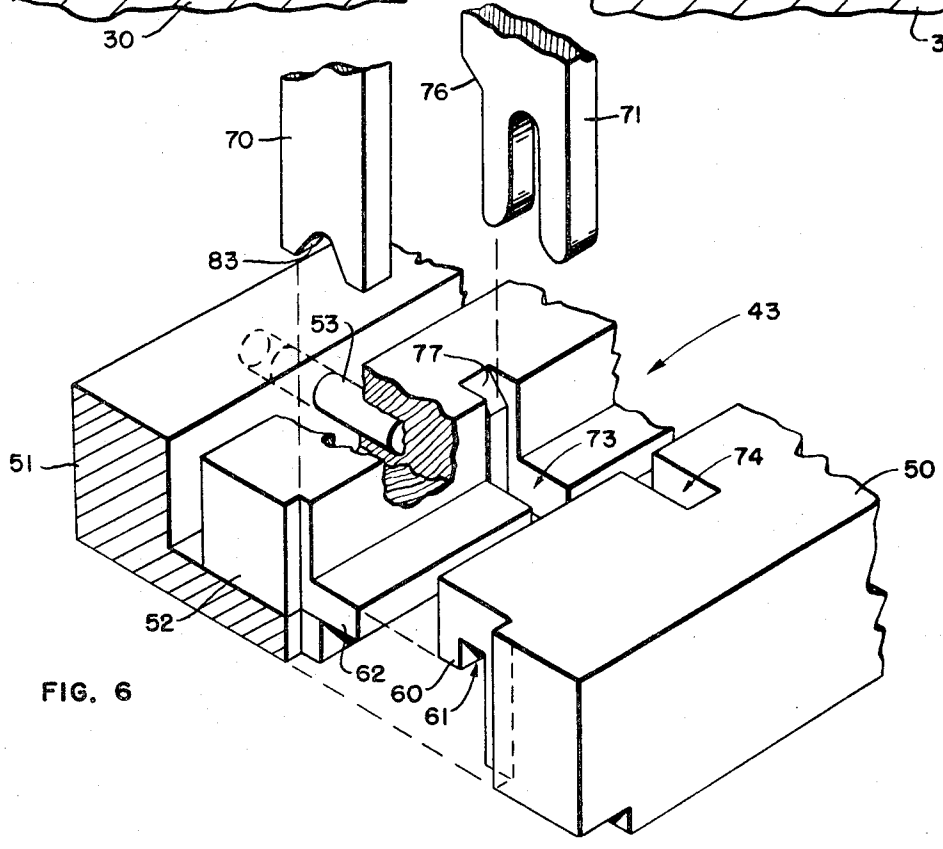


FIG. 6

United States Patent Office

3,465,409

Patented Sept. 9, 1969

3,465,409

TERMINAL ATTACHING MACHINE

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Filed Dec. 23, 1966, Ser. No. 604,350

Int. Cl. B23p *11/00*; H01r *43/00*

U.S. Cl. 29—203 9 Claims

ABSTRACT OF THE DISCLOSURE

A device for attaching terminals to both ends of a length of wire including a normally closed wire guiding channel, means for feeding wire into the channel, a pair of anvils positioned under the channel, means for feeding strips of terminals over the anvils, and a plurality of transfer members for movement into the channel, for camming the channel open, for severing the wire, for moving the severed wire out of the channel into engagement with the strips of terminals on the anvils and for cooperation with the anvils to crimp terminals on the strips around the wires.

In the past it has been the practice to wind strips of interconnected terminal blanks into coils and then to use the coils as the input to terminal attaching machines wherein wires are either manually or semiautomatically fed into engagement with the terminal blanks for attachment to the blanks. The inherent costs of winding, transporting, storing and unwinding the coils of terminal blanks together with the fact that the operation of terminal attaching machines frequently requires much manual labor causes this procedure to be very costly, especially when it is used in the manufacture of large numbers of identical parts.

Accordingly, an object of this invention is to reduce the cost of attaching terminals to wires.

A further object of this invention is to provide a terminal attaching machine which automatically forms pairs of terminal blanks, cuts wires to length and attaches the terminal blanks to the wires.

In accordance with the preferred embodiment of the invention these and other objects are achieved by simultaneously advancing two strips of terminal material along parallel paths and by progressively forming the strips into strips of interconnected terminal blanks. A normally closed wire guiding channel positioned between the strips positions an insulated wire over a terminal blank in each of the strips. A wire cut off and transfer mechanism positioned over the normally closed wire guiding channel cuts the wire to length, opens the wire guiding channel, moves the cut off wire into engagement with the terminal blanks and crimps a terminal blank around each end of the wire. Finally, the terminals are completed and separated so that the entire operation results in finished assemblies, each comprised of a length of wire having a terminal attached to each of its ends.

A more complete understanding of the invention may be had by referring to the following detailed description when taken in conjunction with the drawings wherein:

FIG. 1 is a flow diagram showing the operations performed by a terminal attaching machine employing the present invention;

FIG. 2 is a top view of the die member of a terminal attaching machine employing the present invention;

FIG. 3 is a sectional view taken along the line 3—3 in FIG. 2 showing the terminal attaching portion of a terminal attaching machine employing the present invention;

FIG. 4 is a partial sectional view taken along the line 4—4 in FIG. 3;

FIG. 4*a* is an enlarged view similar to FIG. 4 showing the parts in a partially closed position;

FIG. 5 is a partial sectional view taken along the line 5—5 in FIG. 3;

FIG. 5*a* is a view similar to FIG. 5 showing the parts in a closed position; and

FIG. 6 is an exploded, partial perspective view of the channel defining components of a terminal attaching machine employing the present invention.

Referring now to the drawings, wherein like reference numerals designate like parts throughout the several views, with particular reference being had to FIG. 1, there are shown two strips of terminal material stock S and a length of wire W. The strips S are advanced step-by-step along parallel paths through the terminal attaching machine shown in the remaining figures of the drawings and are progressively transformed from raw material to finished parts.

As the strips pass through the terminal attaching machine, various holes **10** are first formed in the strips S. Then, zig-zag cuts **11** are formed in the strips to separate the strips into unitary sections.

After the strips S are separated into unitary sections a pair of insulation piercing tabs **12** and **13** are formed in each section. Then, the tabs **12** and **13** are sharpened and wire engaging sides **14** are formed from the unitary sections. The cutting and sharpening of the tabs **12** and **13** and the forming of the sides **14** are described in U.S. Patent 3,434,324 to F. V. Brosseit issued Mar. 25, 1969.

Upon completion of the tabs **12** and **13** and the sides **14** the strips of terminal material S are ready to have the lengths of wire attached to them. The mechanism shown in FIGS. 2, 3, 4, 5 and 6 positions the wire W over the strips S, cuts the wire to length, moves the wire into engagement with the strips S and crimps the walls **14** around the wire. This results in cut-off lengths of wire **15** which are attached to the strips by crimps **16**.

After the wires **15** are attached, various perforations **17** are made in the strips of stock S to form the strips into finished terminals **18**. Finally, the terminals **18** are separated one from another so that complete assemblies **19**, each comprised of a length of wire **15** having a finished terminal **18** attached to each of its ends, result.

Referring now to FIG. 3, the details of a terminal attaching machine employing the present invention are shown. The terminal attaching machine is comprised generally of a punch member **11** and a die member **12**. The punch member **11** includes a punch shoe **20** suitably formed for attachment to the ram of a standard punch press. An upper stripper member **21** is supported on the punch shoe **20** by upper stripper supporting screws **22** and is normally urged away from the punch shoe **20** by upper stripper springs **23**. The punch shoe **20** supports various punch elements which are attached to the punch shoe **20** by a punch holder **26** mounted on the punch shoe **20**. The elements are suitably positioned with respect to the punch shoe **20** by a spacer plate **27**.

The die member **12** includes a spacer plate **30** having a pair of die shoes **31** mounted on it. The die shoes **31** support various die elements which are retained on the individual die shoes by a pair of die holders **32**. A lower stripper **34** is supported on the die member **12** by lower stripper support screws **35** and is normally held in a spaced relationship to the die holders **32** by lower stripper springs **36**. As is shown in FIG. 2 the lower stripper **34** supports two pairs of stock guides **37** which serve to guide the strips of stock S through the terminal attaching machine and the various work stations of the device.

In use, the punch press to which the punch member **11** and the die member **12** are attached moves the punch

member **11** cyclically toward and away from the die member **12**. As is fully disclosed in the above-identified co-pending F. V. Brosseit application, the upper stripper **21** supports various components (not shown in this application) which engage the lower stripper **34** during movement of the punch member **11** toward the die member **12** and which drive the lower stripper **34** into engagement with the die shoes **31** against the action of the lower stripper springs **35**. All that need be understood for the purposes of this application is that during movement of the punch member **11** toward the die member **12** the lower stripper **34**, and therefore the strips of stock S carried on the lower stripper are moved toward the die shoes **31**.

As is shown in FIGS. 2 and 3 a feeder **40** is mounted on the spacer plate **30**. The feeder **40** advances the wire W from a roll of wire **41** into the die member **12** of the terminal attaching machine. The wire passes from the feeder **40** through a guide **42** supported on the die holder **32** nearest the feeder **40** and through a normally closed wire guiding channel **43** into engagement with a stop **44** mounted on the die holder **32** remote from the feeder **40**. As is shown in FIGS. 2 and 3 the wire guiding channel **43** has funnel-shaped leading edges at each point where the wire W could possibly become jammed. This prevents any interference with the movement of the wire W from the feeder **40** into engagement with the stop **44** and assures rapid movement of the wire W throughout the complete length of the wire guiding channel **43**.

Referring now to FIG. 6 the details of the wire guiding channel **43** are shown. The channel is comprised of a channel defining frame block **50** mounted on the lower stripper **34**, L-shaped frame block **51** also mounted on the lower stripper **34**, and an L-shaped channel defining member **52** slidably mounted on the L-shaped frame block **51**. As is best shown in FIG. 2 the L-shaped channel defining member **52** is guided on the L-shaped frame **51** by a pair of guide pins **53** and is urged toward the channel defining block **50** by a pair of channel member springs **54**.

Referring again to FIG. 6 is may be seen that the channel defining frame block **50** has a ledge **60** extending outwardly toward the L-shaped frame block **51** and that the ledge **60** has an inverted U-shaped channel **61** formed on its bottom side. The L-shaped channel defining member **52** has a ledge **62** extending outwardly toward the frame block **50**. The ledge **62** normally underlies the inverted U-shaped channel **61** in the frame block **50** thereby forming a completely closed wire guiding channel defined by the three walls of the channel **61** and by the upper surface of the ledge **62**.

Referring again to FIG. 3 it may be seen that a pair of upper anvils **70** and three fork-shaped wire moving members **71** are attached to the punch shoe **20** by the punch holder **26**. The upper anvils **70** are positioned directly above a pair of lower anvils **72** attached to the die shoe **31** by the die holder **32**. As is shown in FIGS. 5 and 6 the wire moving members **71** are positioned in a plurality of notches **73** and **74** formed in the L-shaped channel defining member **52** and in the channel defining frame block **50**, respectively, above a plurality of holes **75** formed in the lower stripper **34**. The wire moving members **71** each have a camming surface **76** formed on their edge adjacent the L-shaped defining member **52** and the member **52** has camming surfaces **77** formed in the notches **73** for cooperation with the camming surfaces **76**.

As is shown in FIG. 3 operation of the device proceeds from the advancement of the wire W through the normally closed wire guiding channel **43** which occurs each time the punch shoe **20** is raised. Upon downward movement of the punch shoe **20** the outer edge **80** of the upper anvil **70** adjacent the guide **42** cooperates with the inner edge **81** of the guide **42** to sever the wire W. After the severing of the wire W, the camming surfaces **76** on the wire moving members **71** engage the camming surfaces **77** on the L-shaped channel defining member **52**. As is shown in FIGS. 5 and 5*a* this drives the L-shaped channel defining member **52** toward the L-shaped frame block **51** against the action of the channel member springs **54**. Movement of the channel defining member **52** away from the channel defining frame block **50** opens the normally closed wire guiding channel defined by the channel **61** and the ledge **62** on the L-shaped member **52** thereby allowing downward movement of the cut off wire **15** in the channel **43**. At this time the upper anvils **70** and the wire moving members **71** engage the wire and drive it downwardly into engagement with the lower stripper **34**. The engagement of the wire with the lower stripper has the effect of straightening the wire which assures that the cut-off wire extends its full length between the lower anvils **72**.

As is best shown in FIGS. 4 and 4*a* the strips of stock S are guided by the stock guides **37** on the lower stripper **34** into a position directly above the lower anvils **72**. Therefore, as the lower stripper **34** is moved downwardly by the punch member **11**, one of the unitary sections of each of the strips S is brought into engagement with each of the lower anvils **72**. Thus, as the cut-off wire **15** is moved downwardly by the upper anvils **70** it is driven into engagement with the insulation piercing tabs **12** and **13** formed in the strips of stock S. Since downward movement of the tabs **12** and **13** is prevented by the lower anvils **72**, this causes the tabs **12** and **13** to penetrate the insulation of the wire **15** and to come into electrical contact with the conductive portions of the wire.

As is best shown in FIG. 4*a* the lower anvils **72** have upper surfaces **82** and the upper anvils **70** have lower surfaces **83** suitably shaped to bend the wire engaging sides **14** of the unitary sections of the strips S around the cut-off wires **15**. This forms the crimps **16** around each end of the wire **15** and causes the wire **15** to be connected to the two strips S.

After the formation of the crimps **16**, the punch member **11** is moved away from the die member **12** and the lower stripper **34** returns to the position shown in FIG. 3. As is shown in FIG. 4 this positions the strips S for advancement to a new station in the terminal attaching machine and positions the wire **15** for passage under the L-shaped block **51** out of alignment with the normally closed wire guiding channel **43**. Thus, the mechanism shown in FIGS. 3, 4, 5, and 6 operates to cut the wire W to length, to transfer the cut-off wire **15** from the normally closed wire guiding channels **43** into a crimping position, and simultaneously to form a crimp **16** around each end of the wire.

Although only one embodiment of the invention is shown in the drawings and described in the foregoing specification, it will be understood that invention is not limited to the specific embodiment described, but is capable of modification and rearrangement and substitution of parts and elements without departing from the spirit of the invention.

What is claimed is:

1. Apparatus for assembling terminals to wires which comprises:

a frame having at least one channel defining surface;

a channel forming member movably mounted with respect to the frame and having means positioned for cooperation with the channel defining surface on the frame to define a normally closed wire guiding channel;

a wire moving member mounted adjacent the frame and the channel forming member for movement toward and away from the frame to transfer a wire from the wire guiding channel to a remote point;

means on the wire moving member for displacing the channel forming member relative to the frame thereby opening the normally closed wire guiding channel;

means for advancing a wire into the wire guiding channel;

means on the wire moving member for cutting off a length of the wire in the wire guiding channel as the wire moving member moves toward the frame; and

means for attaching terminals to the cut length of wire.

2. The apparatus according to claim 1 wherein the means for attaching includes:

a terminal supporting anvil mounted adjacent the wire guiding channel;

means on the wire moving member for moving a wire from the wire guiding channel into engagement with the terminal supporting anvil; and

cooperating means on the wire moving member and the terminal supporting anvil for forming a terminal around a wire when the wire is in engagement with the anvil.

3. The apparatus according to claim 1 wherein the means for attaching includes:

a pair of anvils one positioned adjacent each end of the wire guiding channel; and

means on the wire moving member for moving a wire out of the wire guiding channel and into engagement with the anvils and for cooperation with the anvils to simultaneously attach a terminal to each end of the wire.

4. In a terminal attaching machine of the type wherein a forming member is reciprocated into engagement with an anvil to form a terminal around a wire, the combination with the forming member of:

a wire guiding member mounted in the path of the forming member as it travels into engagement with the anvil for defining a normally closed wire guiding channel; and

means on the forming member for moving the wire guiding member out of the path of the forming member thereby opening the wire guiding channel so that a wire may be moved therefrom into engagement with the anvil.

5. The combination according to claim 4 further including:

means for advancing a wire into the wire guiding channel; and

means on the forming member for cutting a wire in the wire guiding channel to length.

6. A device for assembling wires and terminals including:

means for feeding two strips of terminal material in parallel paths a predetermined distance apart;

means for forming the strips into interconnected terminal blanks;

means for defining a normally closed wire guiding channel extending transversely to the paths of the terminal material;

means for feeding a wire through a channel;

means for cutting the wire in the channel to a length approximately equal to the distance between the paths, for opening the channel and for moving the wire out of the channel and into engagement with one terminal blank in each of the strips; and

means for separating the terminal blanks one from the other thereby forming lengths of wire having terminals attached to each of their ends.

7. The assembling device according to claim 6 wherein the channel defining means includes means for guiding a wire as it is fed through the channel and wherein the wire moving means includes means for straightening the wire as it is moved out of the channel.

8. The assembling device according to claim 6 wherein:

the wire is comprised of an electrical conductor and insulating covering on the conductor;

the blank forming means forms the strips into insulation piercing terminal blanks, and

the wire moving means causes the terminal blanks to pierce the insulation of the wire and to make an electrical connection with the conductor of the wire.

9. The assembling device according to claim 6 wherein the blank forming means forms the strips into terminal blanks having wire surrounding sides and wherein the wire moving bends the sides of the terminals around the wires.

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THOMAS H. EAGER, Primary Examiner

U.S. Cl. X.R.

29—243.57; 72—324