

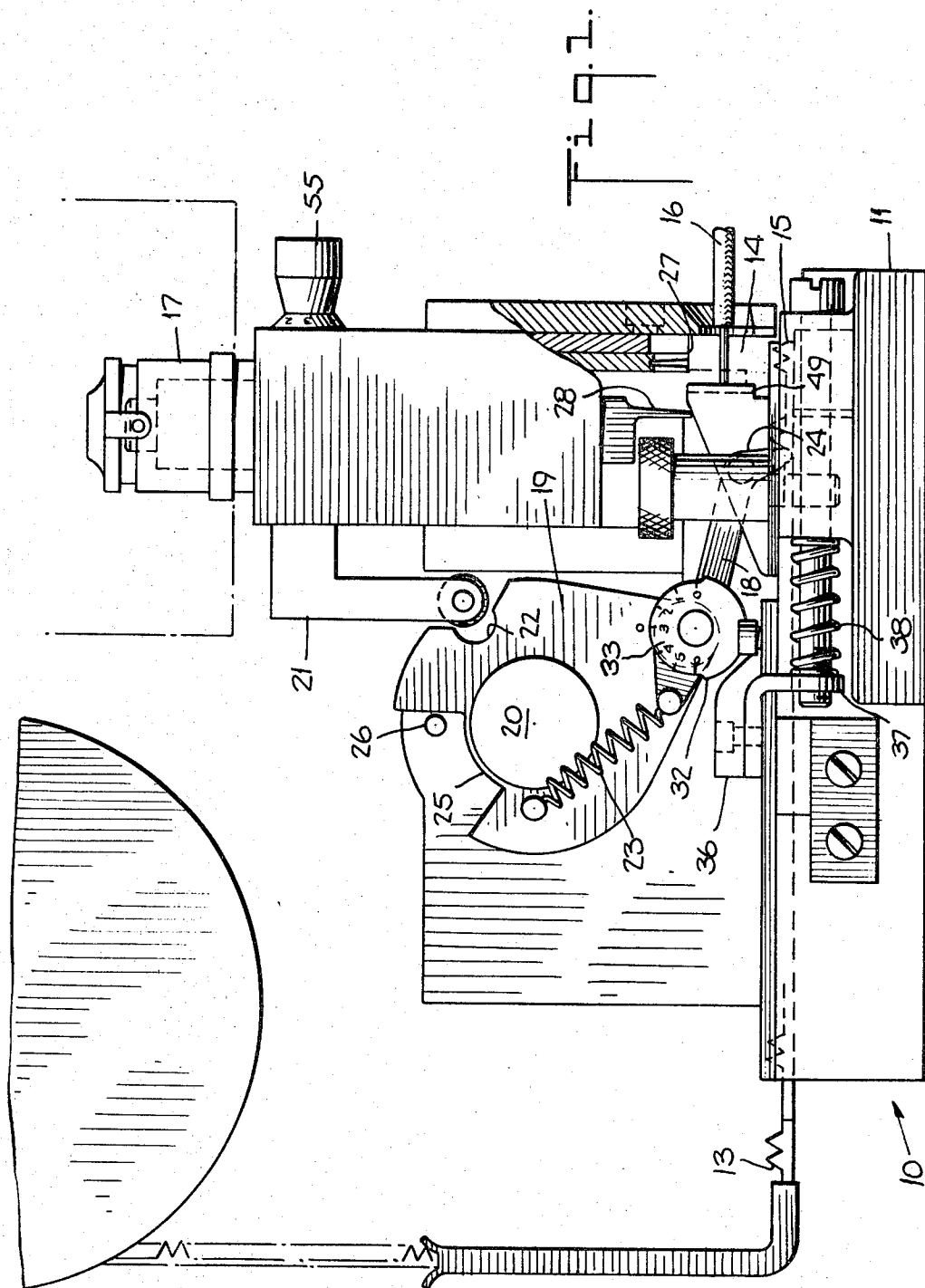
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L. A. NETTA ETAL
TERMINAL ATTACHING MACHINE

3,548,479

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4 Sheets-Sheet 1



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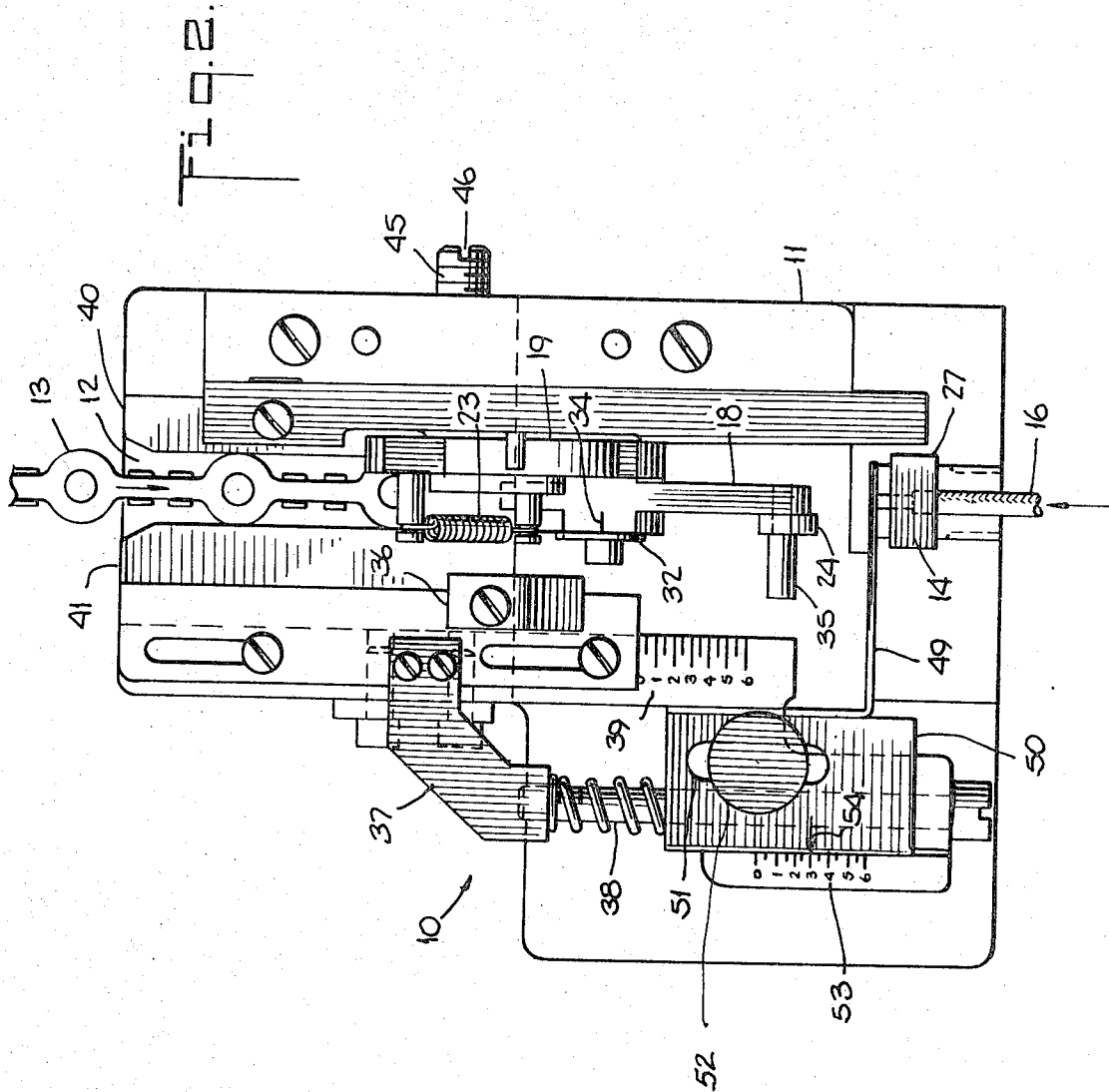
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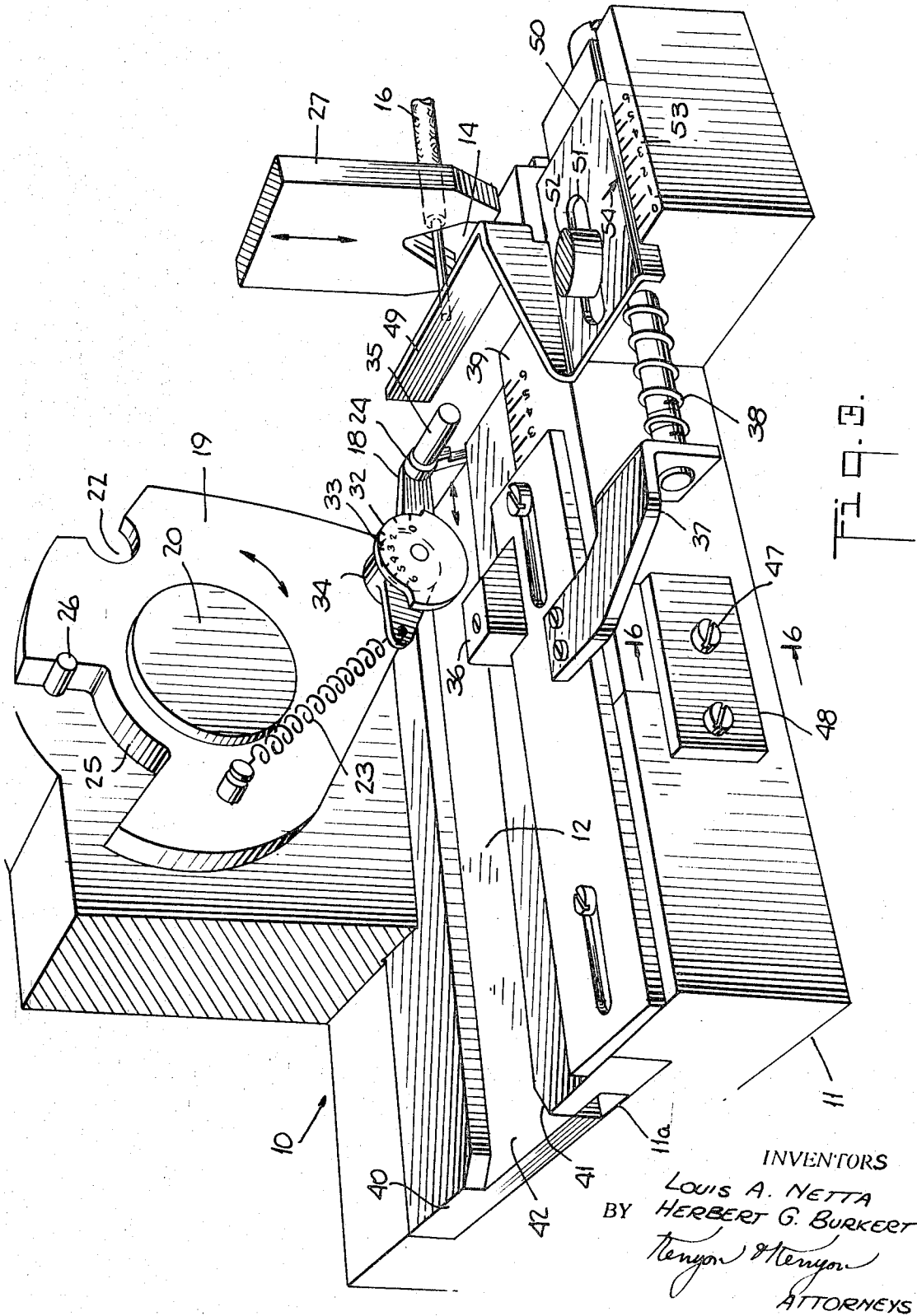
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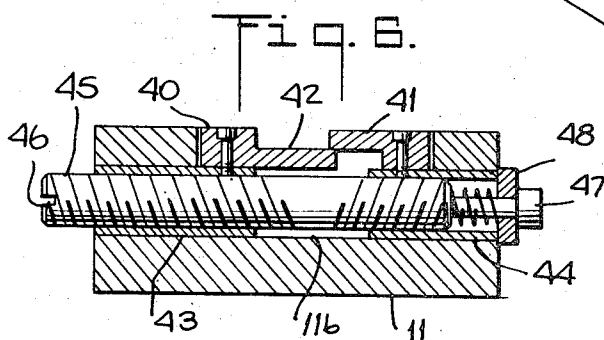
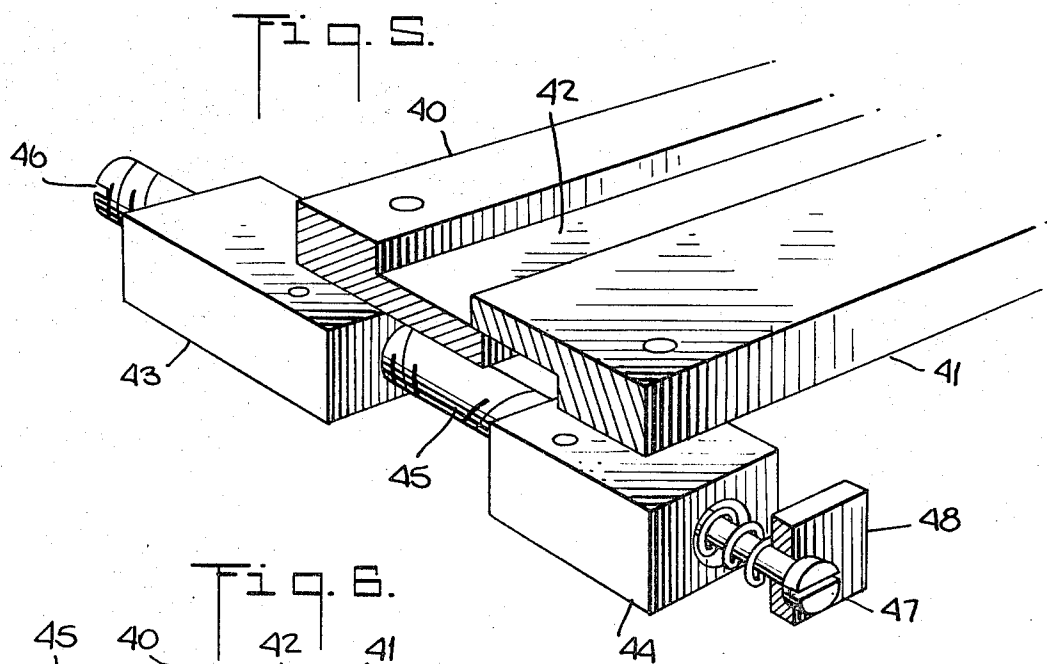
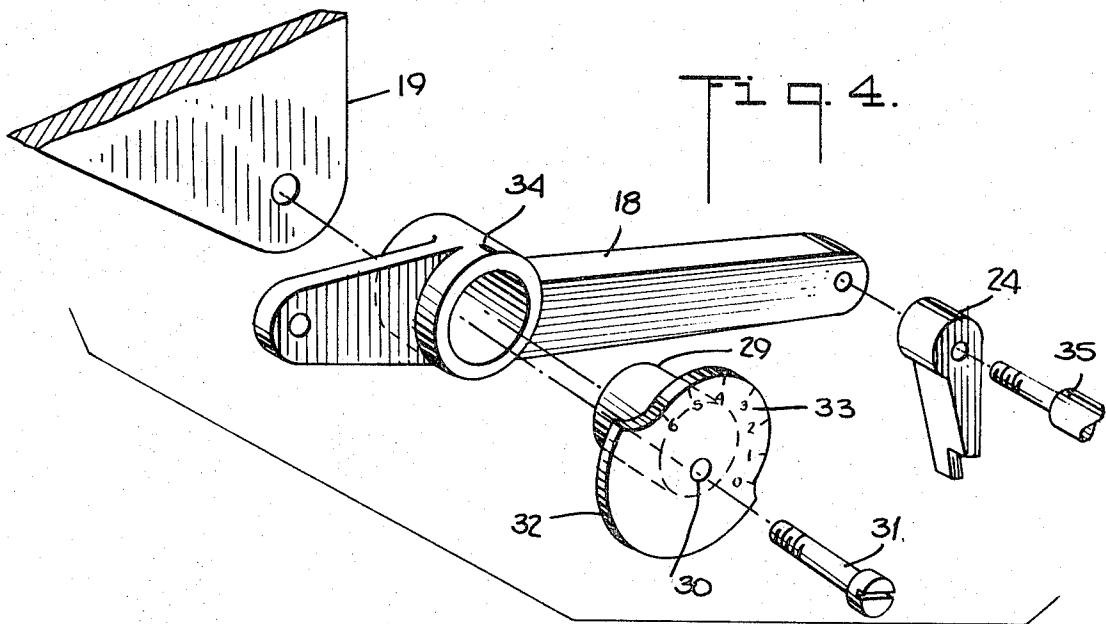
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TERMINAL ATTACHING MACHINE

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20 Claims

ABSTRACT OF THE DISCLOSURE

A terminal attaching machine wherein a strip of terminals is fed into a terminal crimping station by means of an indexing pawl and attached thereat to the end portion of a wire. Means are provided for adjusting the machine to accommodate different size terminals being fed thereinto. A first adjustable means is provided to vary the stroke of the indexing pawl to facilitate engagement and feeding of different size terminals. A second adjustable means is provided to vary the width of the track through which the terminals are fed into the crimping station. Another adjustable means is provided to vary the length of wire being fed into the machine for subsequent attachment to a terminal.

This invention pertains generally to a machine for attaching terminals to the end portion of a wire and more particularly to one wherein adjustable means are provided to accommodate different size terminals.

In standard terminal attaching machines, such as that illustrated in U.S. Pat. No. 3,245,135 issued Apr. 12, 1966, a strip of terminals is fed by an indexing pawl into a terminal crimping station. A reciprocating ram, having attached to it an insulation gripping tool, a wire gripping tool and a cut-off blade, crimps the terminal onto a wire positioned therein. When the ram descends, the insulation gripping portion of the terminal and the wire gripping portion of the terminal are acted upon by separate rolling tools to cause a firm attachment between the insulation on the wire and the insulation gripping portion of the terminal, as well as the wire being firmly attached to the wire gripping portion of the terminal. A cut-off tool is also provided at the terminal crimping station so that the terminal is physically severed away from the strip subsequent to the attachment of the wire. The strip of terminals is fed into the terminal crimping station through an elongated narrow track which provides a guide means therefor. It has been found that as different types or sizes of terminals are utilized, or when a different wire size is employed, the machine must be turned off and disassembled to provide for appropriate tooling to accommodate the different type or size terminal. This machine downtime and the labor associated with changing the tooling contained therein, limits the efficiency and productivity of the machine and results in a higher unit cost for each terminal being attached to an associated wire.

The invention disclosed herein provides several adjustable features to allow different size terminals to be utilized without any disassembly of the terminal attaching machine including a means for adjusting the length of the indexing pawl stroke. The indexing pawl is pivotally mounted to a rotary cam which imparts reciprocating motion to the pawl in a direction transverse to the motion of the reciprocating ram. Means are included to provide for adjustment of the pivot center of the pawl mounted to the rotary cam and thereby permit adjustment of the length of the stroke. A lift block, attached to the base member of the terminal crimping station, is

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positioned to engage and lift the pawl above the terminal strip during the return stroke thereof. The lift block is tapered at one end for engagement with the pawl and also provides a guide for returning the pawl into engagement with the next terminal to be advanced to the crimping station during the forward stroke. Since different size terminals frequently have differing widths, the track through which they are fed into the crimping station is provided with a means for adjusting the width thereof. A pair of walls extending upwardly from the track floor are movable with respect to one another by means of an adjusting screw coupled therewith. Further adjustment is provided to accommodate different lengths of wire as may be necessary when a different type of terminal is to be crimped onto the wire. When a different length of exposed wire is necessary to provide proper engagement with the terminal, adjustable means are provided to vary the length of wire admitted into the crimping station. An abutment member, which terminates the feeding of wire into the terminal crimping station, is slideably mounted to the base member and permits adjustment for the length of wire admitted into the crimping station without any disassembly or removal of parts. Each of the three adjustable means, viz, the adjustable indexing stroke, the adjustable track width and the adjustable wire stop, has associated therewith appropriate graduations and an alignment indicator to provide a simple visual method of changing the terminal attaching machine to accommodate a new and different size terminal.

Accordingly, it is an overall object of this invention to provide an improved terminal attaching machine with adjustable means to accommodate different size terminals.

Another object of this invention is to provide a means for adjusting the stroke of the indexing pawl to permit feeding of different size terminals into the terminal crimping station without any disassembly thereof.

It is a further object of this invention to provide a means for adjusting the width of the track to permit the feeding of different size terminals therethrough.

A still further object is to provide adjustable means to vary the length of wire admitted into the terminal crimping station.

These and other objects, advantages and features of the invention will become more apparent from the following description taken in conjunction with the accompanying drawing wherein:

FIG. 1 is a side elevation view of the adjustable terminal attaching machine partly in cross-section;

FIG. 2 is a top plan view of the adjustable terminal attaching machine;

FIG. 3 is a perspective view of the terminal attaching machine;

FIG. 4 is an exploded view illustrating the manner in which the indexing pawl is mounted to the rotary cam;

FIG. 5 is an isometric view of the adjustable track mechanism; and

FIG. 6 is a cross-sectional elevation view of the adjustable track mechanism taken along the line 6—6 of FIG. 3.

Referring to the drawings, the terminal attaching machine indicated generally at 10, comprises a base member 11 having a longitudinal track 12 positioned in the approximate center thereof. A terminal strip 13 is passed through track 12 to the terminal crimping station 14, wherein an individual terminal 15 is attached to a wire 16. The actual crimping of the terminal 15 onto the wire 16 is accomplished by means of a reciprocating ram indicated at 17. A driving mechanism (not shown) causes ram 17 to be reciprocated in a vertical direction at a constant rate. An automatic wire-handling device (not shown) may be included and be substantially of the type

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described in U.S. Pat. No. 3,245,135. The automatic wire-handling device includes a hopper, in which are positioned a bundle of individual wires and by means described in the aforementioned patent are segregated and fed into the terminal crimping station 14. The strip of terminals 13 is indexed along and through the track 12 so as to position an individual terminal 15 at the terminal crimping station 14 at the time the individual wire 16 is fed therein. Indexing the strip of terminals 13 is caused by the motion of the indexing pawl 18, the stroke of which is substantially transverse to the vertical reciprocating motion of the ram 17. The stroke of the indexing pawl 18 is actuated by means of the rotary cam 19 to which it is attached. Rotation of the cam 19 about a shaft 20 is caused by means of the cam follower 21 which is attached to ram 17 and moves in conjunction therewith. The rotary cam 19 has an opening cut therein at 22 for engaging the cam follower 21. When the ram 17 descends, the opening 22 is acted on by cam follower 21 causing the cam 19 to rotate clockwise. This causes the indexing pawl 18 to be moved toward the left. A spring 23 attached at one end thereof to the indexing pawl 18 and at the other end thereof to the rotary cam 19, tends to bias the indexing pawl 18 downwardly so that as it is moved to the left, the pawl foot 24 will ride over the next terminal in line and fall in the space between the individual terminals of strip 13. When the ram 17 moves upwardly, the cam follower 21 moving in conjunction therewith, acts on the opening 22 in the rotary cam 19 and causes a counter-clockwise rotation thereof. The counter-clockwise motion of the cam 19 causes the indexing pawl 18 to move toward the right, and pushes the terminal strip 13 so as to index the strip along the track 12 for a distance corresponding to the space between the individual terminals 15. The rotary cam is provided with another cutout 25 therein which by means of engagement with a pin 26 limits the rotary motion thereof.

As the reciprocating ram 17 descends, rolling tools, illustrated at 27, contact the wire-gripping and insulation gripping portions of terminal 15 and roll them around the insulation and wire, firmly attaching the individual terminal 15 to a wire 16. As indicated previously, the upward movement of the ram will cause another individual terminal 15 to be positioned in the terminal crimping station 14. At the same time the automatic wire handling device indexes and feeds another individual wire 16 into the appropriate position for attachment to the terminal that has just been fed into the terminal crimping station 14. Operating in conjunction with the rolling tools 27, a cut-off blade 28 is provided so that simultaneous to the crimping action, the individual terminal 15 is severed from the strip 13. The wire 16, having been properly attached to an individual terminal 15, is then removed from the machine and is ready for its intended usage.

Since the stroke of the indexing pawl 18 is governed by the rotary motion of the cam 19, the prior art machine requires a new cam to be inserted each time a different size or type of terminal is to be passed through the machine. By mounting the indexing pawl on an adjustable pivot center, the stroke thereof may be changed to accommodate a different size terminal without the necessity of removing and replacing the cam. With reference to FIG. 4, the indexing pawl 18 is eccentrically mounted to the rotary cam 19 by means of the shaft 29. Shaft 29 is provided with a hole 30, through which a fastener 31 is passed and attached to the rotary cam 19. The hole 30 is positioned eccentric to the center line of the shaft 29 about which the indexing pawl 18 pivots. By rotating the eccentrically mounted shaft 29, the stroke of the indexing pawl 18 may be changed to accommodate various sizes of terminals. A dial 32 is provided on the end of the shaft 29 and contains thereon a series of graduations 33 which are aligned with an indicator 34 located on the

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top of pawl 18. The graduations are numbered and represent positions for the different sizes of terminals. On the end of the pawl 18 is provided foot 24 which is pivotally attached thereto by the fastener 35. Rotation of the foot 24 provides a further means for adjusting the stroke of the indexing pawl 18. It is noted that in lieu of the eccentrically mounted shaft 29, a slot could be provided in the rotary cam 19 and the indexing pawl 18 be mounted therethrough, with any changing of the pivot center providing a variation in the pawl stroke as previously discussed.

Referring to FIG. 3, the protruding end of the fastener 35 engages a lift block 36 when the indexing pawl 18 is on its return stroke, i.e., as it moves to the left. The tapered end of the lift block 36 engages fastener 35 and causes the downwardly biased pawl 18 to be raised and lifted above the strip of terminals 13 being fed into the terminal crimping station 14. As the cam 19 rotates counter-clockwise and imparts a forward motion to the pawl 18, the tapered end of the lift block 36 provides a means for guiding the pawl foot 24 into engagement with the next terminal to be passed into the terminal crimping station 14. In order to facilitate the proper lift point during the stroke of the indexing pawl 18, the lift block 36 is provided with an adjustment means to permit engagement with the fastener 35 on pawl 18 at the appropriate position. The lift block 36 is attached to a bracket 37 which has engaged therewith a spring loaded screw 38. By rotation of the screw 38 which is threaded to the base member 11, the lift block 36 may be moved either in a forward or backward direction to engage the pawl 19 at the desired location. Adjacent to the end of the lift block 36 is a series of graduations 39 with appropriate numbering for different size terminals. The lift block 36 is moved into alignment with the appropriate graduation and provides a means for visual adjustment thereof.

Since different size terminals frequently have a different width, the track 12 which provides a guide means for the entering terminal strip 13 is provided with means for adjustment thereof. Machines included in the prior art necessitated extensive disassembly of the base member to accommodate a different width terminal. FIGS. 5 and 6 illustrate an adjustable track 12 which comprises a pair of aligned parallel wall members 40 and 41 housed in the channel 11a on the top surface of the base member 11. Wall member 40 is provided with a floor 42 upon which slides the mating wall member 41. Each wall member is fixedly attached to a non-rotatable sliding member 43 and 44 respectively. The sliding members 43 and 44 are housed in a non-circular bore 11b positioned transverse to the longitudinal axis of track 12 and passing through the base member 11. A threaded member 45, having each end thereof oppositely threaded, i.e., a left-hand thread on one end and a right-hand thread on the other end thereof, engages each of the slideable members 43 and 44. An adjusting slot 46 is provided on the exposed end of the threaded member 45 with the other end thereof being engaged by a spring loaded screw 47. Below the head of the spring loaded screw 47 is a spacer 48 which bears against the side of the base member 11. By means of rotating the spring loaded screw 47 or the adjustment slot 46, the width of the track 12 may be adjusted since the wall members 40 and 41 slide relative to one another in conjunction with rotation of the screws. Thus, by means of a simple screw driver adjustment, the track may be appropriately adjusted to accommodate any different size or type of terminal. Further, since the wall members are not spring loaded, excessive forces are not imposed on the terminals thereby precluding any distortion of the terminals as they pass through the track.

Frequently, different lengths of wire are engaged into the terminal gripping portion as the size of the terminal or the design of the gripping portion thereof is changed. In order to accommodate a different wire length, an adjustable abutment means is provided for engagement

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with the wire 16. As the wire 16 is automatically positioned into the terminal crimping station 14 by means described in the aforementioned patent, the feeding thereof is automatically terminated when it is appropriately positioned. To provide for the variation in the length of wire admitted into the terminal crimping station 14, an abutment member 49 with a means for adjustment is positioned in the path of the wire 16. Attached to the abutment member 49 is an indicator leg 50 which is fastened to the base member 11. A slot 51 is engaged by the fastener 52 to attach the adjustable abutment means to the base member 11. A series of graduations 53 are located on the base member 11 and have appropriate numbering associated therewith for usage with different size terminals. An indicator 54 is provided on leg 50, and by means of appropriate alignment with the graduations 53 positions the abutment member 49 by a simple movement thereof to accommodate and permit entry of a different length of wire.

Whenever a different size terminal necessitates or is used with a different gage wire, adjustable means may be provided on the rolling tools 27. The dial 55 contains appropriate markings thereon, and by a simple rotation thereof, the rolling tool is adjusted to engage a greater or lesser portion of the wire dependent on its gage. A similar or simultaneous adjustment may be provided to accommodate a different size insulation on the wire. Such an adjustable mechanism for usage with various gages of wires and insulation is described in U.S. Pat. No. 3,051,213, issued Aug. 28, 1962, and may readily be incorporated in the terminal attaching machine described herein.

By means previously described, a simple and rapid change to the terminal attaching machine may be accomplished whenever a different size terminal is being utilized. Three different adjustment features are provided which permit terminals with different lengths, or terminals with different widths, or terminals with different gripping portions, to be passed through the machine and fastened to the end portion of a wire. The machine is thereby extremely versatile and adaptable to usage with a variety of different terminals by making simple adjustments and eliminates the necessity of lengthy shut-down times.

While the disclosure hereinbefore set forth represents a preferred embodiment, it will be appreciated that other modifications and variations may be made without departing from the spirit and scope thereof, and therefore, only such limitations should be imposed as are indicated in the appended claims.

What is claimed is:

1. In a machine for attaching terminals to the end portion of a wire the combination comprising a reciprocating terminal crimping ram, a terminal crimping station, means for advancing a terminal to said crimping station for each reciprocating cycle of said ram, said means being adjustable to accommodate and advance different size terminals to said crimping station, a track through which said terminals are fed into said terminal crimping station, said track having adjustable means associated therewith to vary the width of said track as different size terminals are passed therethrough.

2. The combination of claim 1 which includes a means for receiving said end portion of said wire, an adjustable abutment means for engaging said end portion of said wire and terminating the feeding thereof when said end portion is at a predetermined position with respect to said means for attaching said terminal thereto.

3. The combination of claim 1 wherein said means for advancing said terminal to said crimping station includes a pawl for advancing said terminal to said crimping station and a means for imparting reciprocating motion to said pawl transverse to the motion of said reciprocating ram.

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4. The combination of claim 3 wherein said means for imparting reciprocating motion to said pawl comprises a rotatable means activated by said reciprocating ram, said rotatable means having said pawl pivotally mounted thereto and includes therewith a means for adjusting the pivot center thereof thereby providing a means for adjusting the stroke of said pawl to accommodate different size terminals.

5. The combination of claim 1 wherein said track comprises a pair of parallel wall members extending upwardly from opposing ends of a planar floor, said wall members being movable with respect to one another thereby providing a means for adjusting the width of said track to accommodate different size terminals.

6. In a machine for attaching terminals to the end portion of a wire, the combination comprising a reciprocating terminal crimping ram, a terminal crimping station, a pawl for advancing a terminal to said crimping station for each reciprocating cycle of said ram, a rotary cam which imparts reciprocating motion to said pawl in a direction transverse to the motion of said reciprocating ram, said pawl being pivotally mounted to said rotary cam and including therewith a means for adjusting the pivot center thereof thereby providing a means for adjusting the stroke of said pawl to accommodate different size terminals.

7. The combination of claim 6 wherein said rotary cam contains therein a slot and said pawl is pivotally mounted thereto.

8. The combination of claim 6 wherein said pawl is pivotally mounted on a shaft, said shaft being fixedly attached to said rotary cam on a center line eccentric from the center line of said shaft upon which said pawl is pivotally mounted.

9. The combination of claim 8 wherein said shaft has mounted on one end thereof a dial having a series of graduations located thereon and said pawl contains thereon an indicator for alignment with selected graduations of said series.

10. The combination of claim 6 wherein said terminal crimping station includes a base member having a lift block attached thereto, said lift block having one end thereof tapered to engage said pawl on the return stroke thereof thereby raising said pawl above said terminal to be advanced to said crimping station and provide a guide for returning said pawl into engagement with said terminal to be advanced to said crimping station on the forward stroke of said pawl.

11. The combination of claim 10 wherein said pawl includes a foot mounted on the end thereof, said foot having extending therefrom a means for engaging said lift block.

12. The combination of claim 10 wherein said pawl is downwardly biased into engagement with said terminal by means of a spring mounted thereto.

13. The combination of claim 10 wherein said lift block is coupled to a spring loaded adjusting screw which is adapted to move said lift block in a direction parallel to the stroke of said pawl, said base member has a series of graduation located thereon and said lift block provides an indicator for alignment with selected graduations of said series.

14. In a machine for attaching terminals to the end portion of a wire, the combination comprising a reciprocating terminal crimping ram, a terminal crimping station, a strip of terminals to be crimped, a means for advancing a terminal to said crimping station for each reciprocating cycle of said ram, a track through which said strip of terminals are fed into said terminal crimping station, said track having a pair of parallel wall members extending upwardly from opposing ends of a planar floor, said wall members being movable with respect to one another thereby providing a means for adjusting the width of said track to accommodate different size terminals.

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15. The combination of claim 14 wherein said wall members are moved with respect to one another by means of a spring loaded adjusting screw attached thereto.

16. The combination of claim 14 wherein said terminal crimping station has a base member with a channel on the upper surface thereof and a non-circular bore therethrough transverse to said channel, said channel providing a housing into which said wall members are placed, each of said wall members being fixedly attached to a slidable member housed in said non-circular bore, and each slidable member is engaged with an adjusting means.

17. The combination of claim 16 wherein said adjusting means comprises a screw member having a right hand thread on one end thereof and a left hand thread on the other end thereof for engagement with said slidable members, a spring loaded screw mounted to one end of said screw member, said spring loaded screw having the end thereof engaging the side wall of said base member.

18. In a machine having means for attaching a terminal to the end portion of a wire adjacent thereto, the combination comprising means for receiving said end portion of said wire to which said terminal is to be attached, an adjustable abutment means for engaging said end por-

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tion of said wire and terminating the feeding thereof when said end portion is at a predetermined position with respect to said means for attaching said terminal thereto.

19. The combination of claim 18 wherein said adjustable abutment means includes a bracket having one leg thereof extending into the path through which said end portion of said wire is fed, said bracket being slideably attached to the base member of said means for attaching said terminal to said wire.

20. The combination of claim 19 wherein said base member has a series of graduations located thereon and said bracket contains thereon an indicator for alignment with selected graduations of said series.

References Cited

UNITED STATES PATENTS

3,245,135 4/1966 Netta et al. ----- 140—147X

THOMAS H. EAGER, Primary Examiner

U.S. Cl. X.R.

140—147