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[54] **METHOD AND APPARATUS FOR CONNECTING WIRES**

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[52] **U.S. Cl.** ..... **29/203 DT**; 29/630 F

[51] **Int. Cl.** **H01r 43/04**

[58] **Field of Search**..... 140/113; 29/203 DT, 630 F

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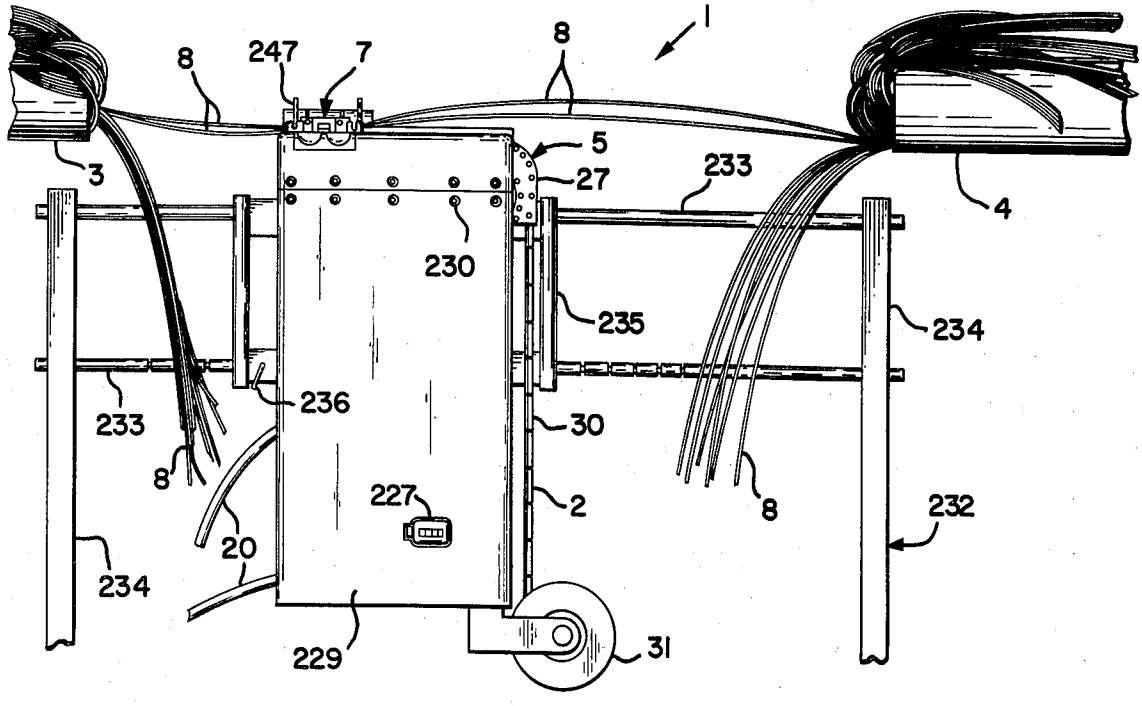
Primary Examiner—Lowell A. Larson

Attorney, Agent, or Firm—Fishburn, Gold & Litman

[57] **ABSTRACT**

A method and apparatus for splicing wires by crimping an open side connector sleeve on two wires to electrically connect same. The apparatus includes feed means which sequentially moves a connector sleeve into a crimping station and which is held in position therein. The connector sleeve is one of an elongate chain of connector sleeves in end to end relation with the connector sleeve fed into the crimping station being the leading one and separated from the chain by cutting means. The wires to be spliced are held and controlled in loading means and moved from a cutting station, which trims the wire ends, to the crimping station where the loading means deposits the wires in a connector sleeve and holds them therein until a pre-crimp is applied to the connector sleeve. The loading means are retracted after the pre-crimp and the connector sleeve is then crimped onto the wires. Ejectors are positioned adjacent the crimping station and eject the crimped connector sleeve and spliced wires from the crimping station.

21 Claims, 16 Drawing Figures



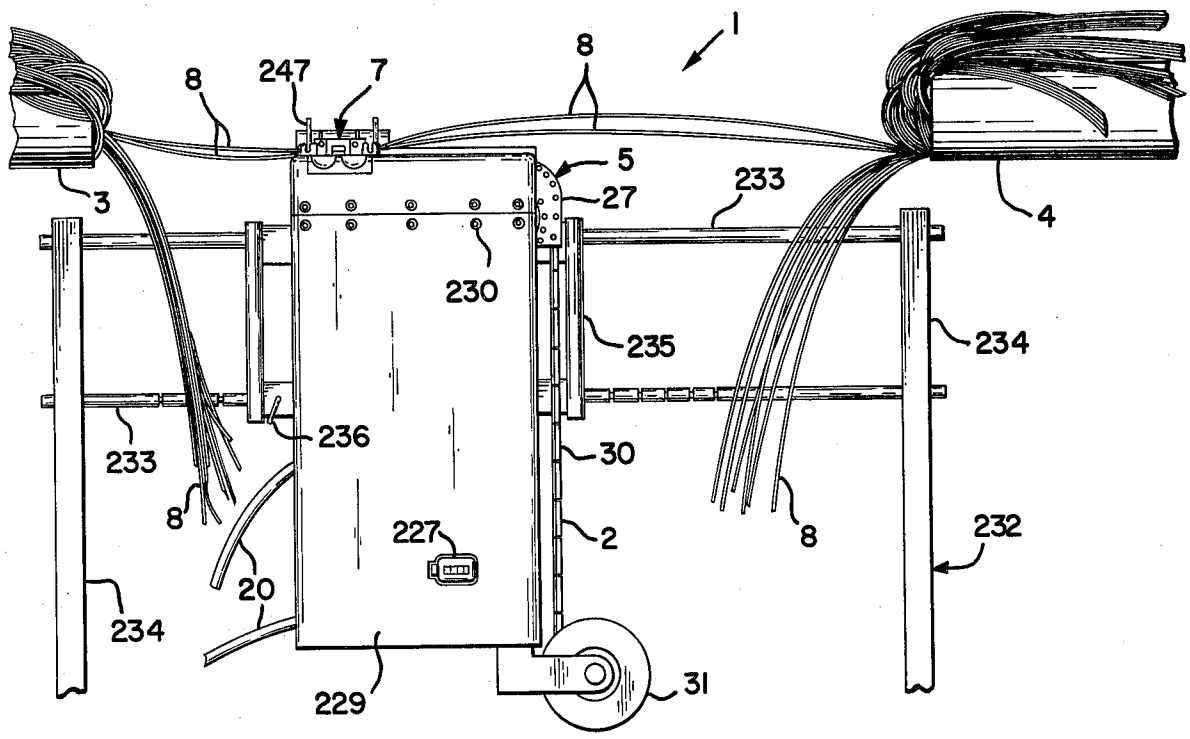


Fig. 1.

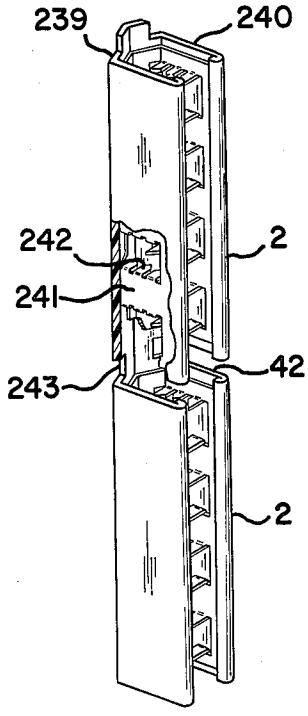


Fig. 2.

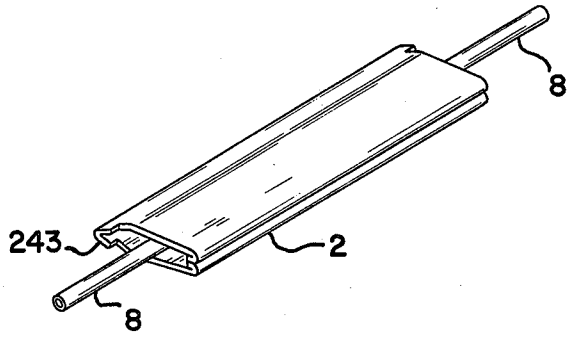


Fig. 3.

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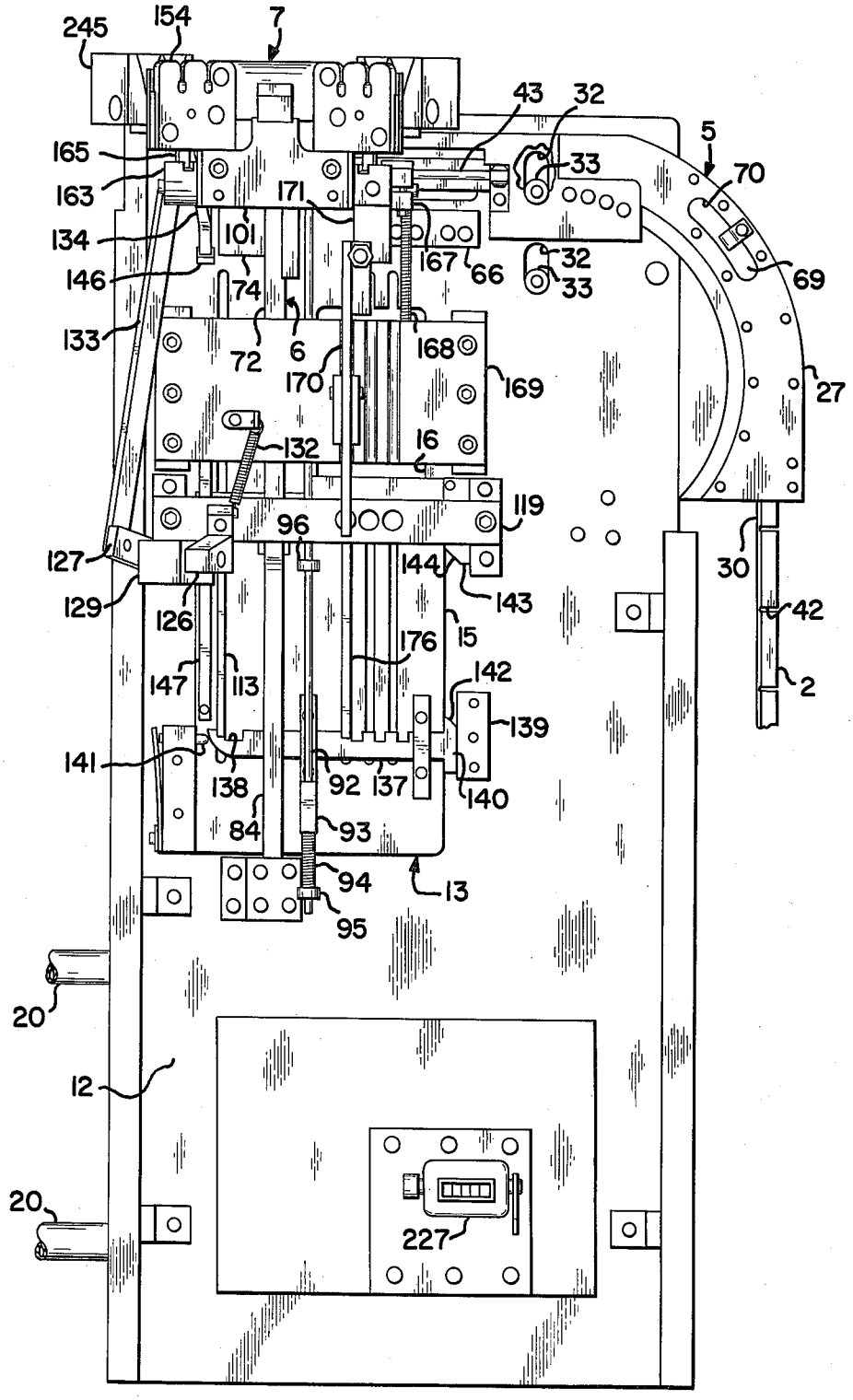
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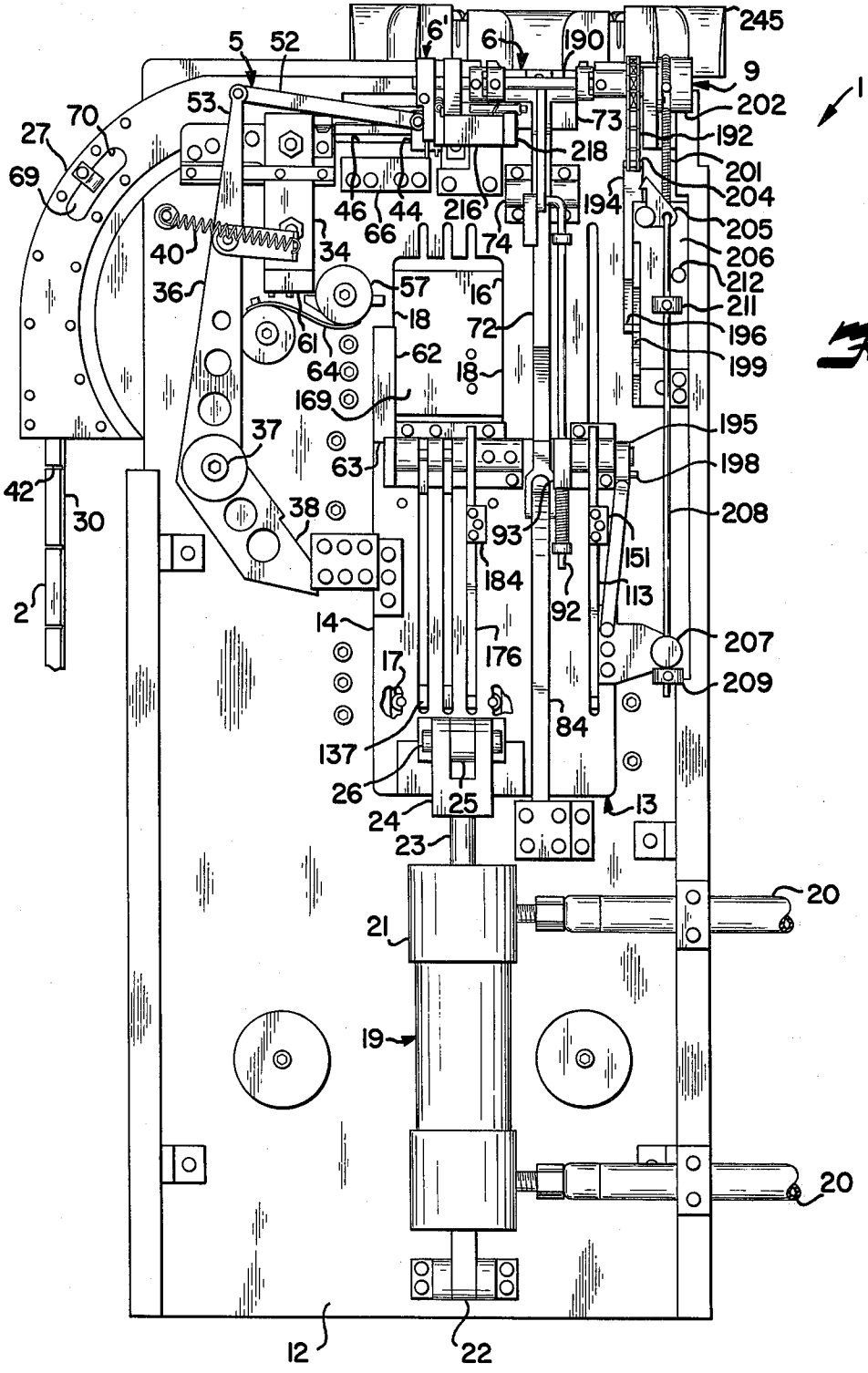
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Fig. 5.

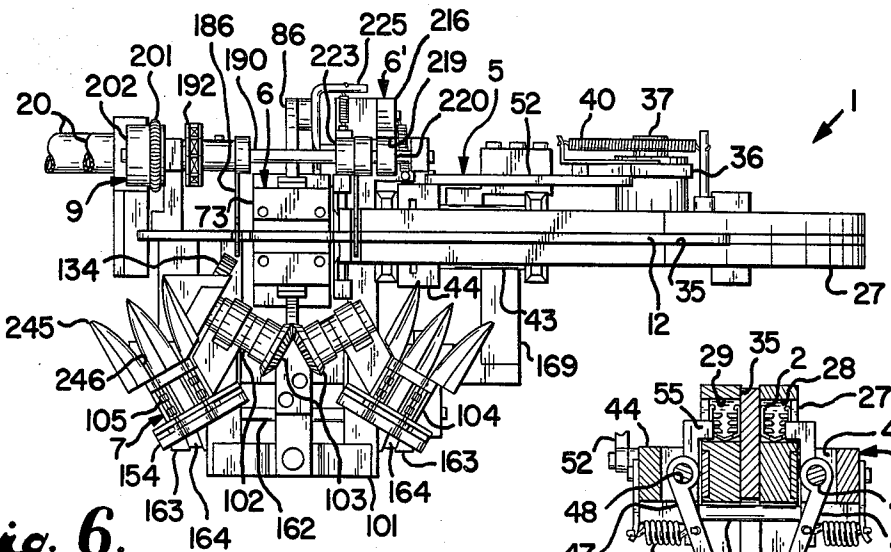


Fig. 6.

Fig. 7.

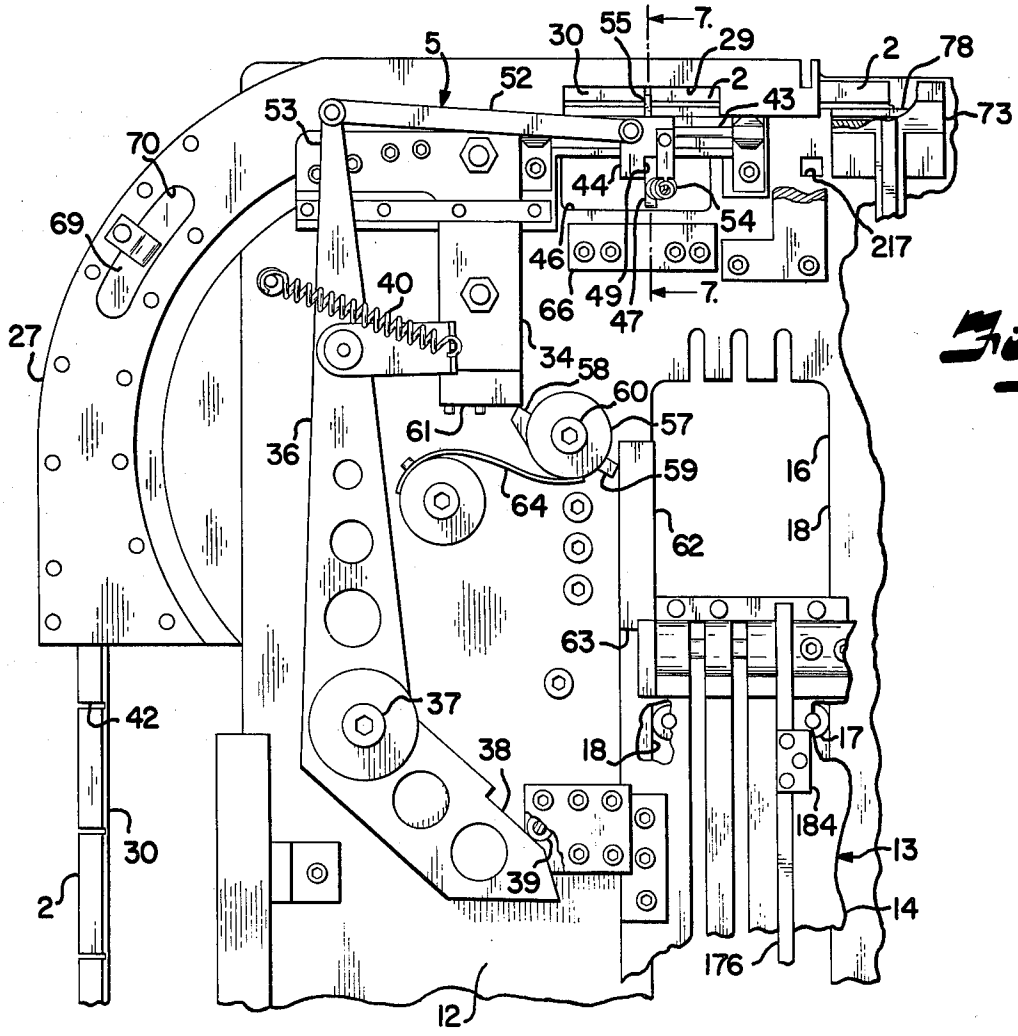
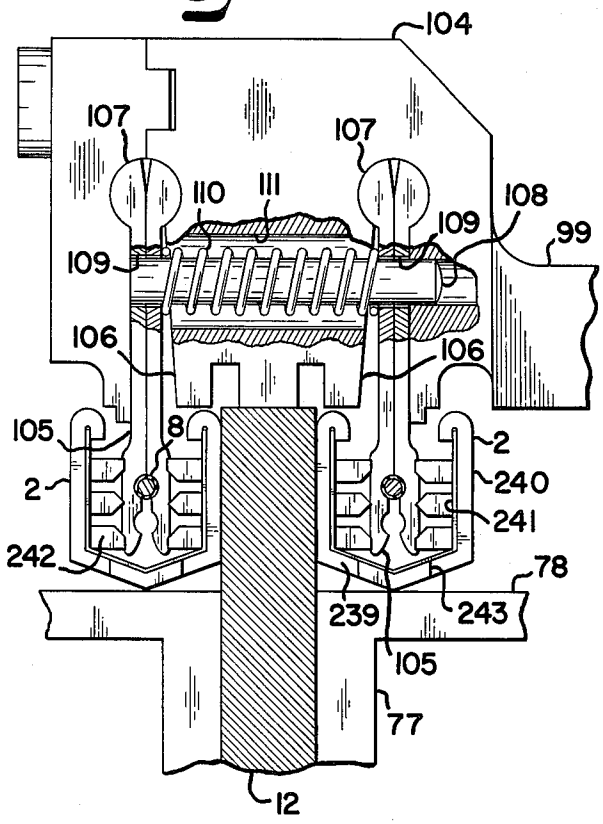


Fig. 8.

Fig. 9.



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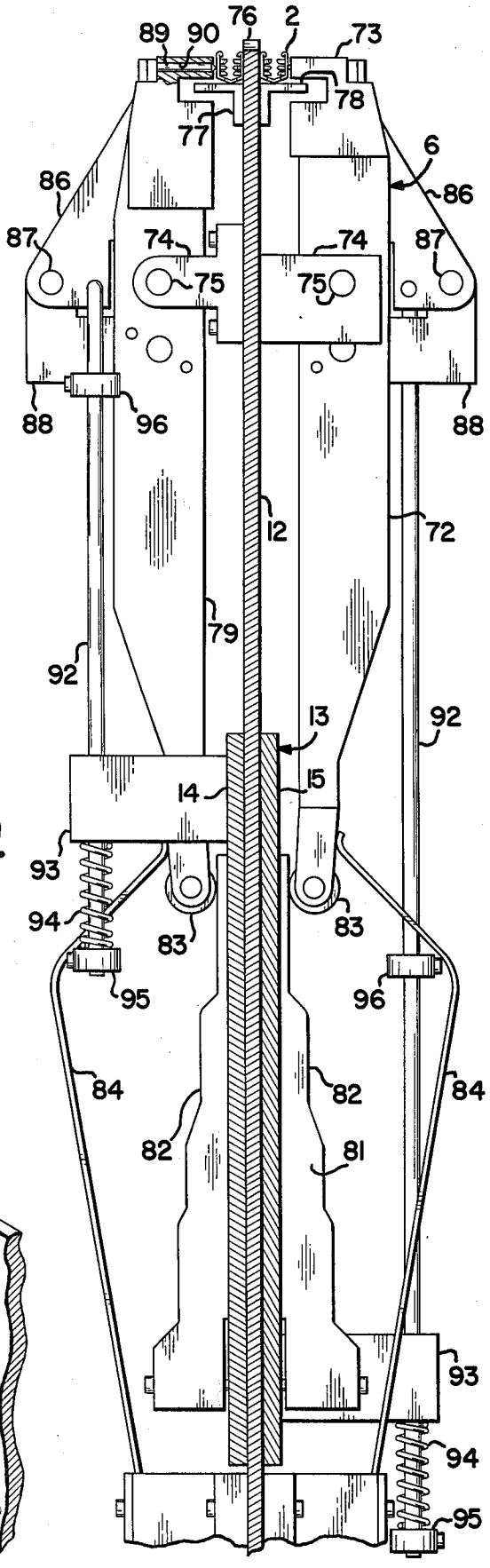

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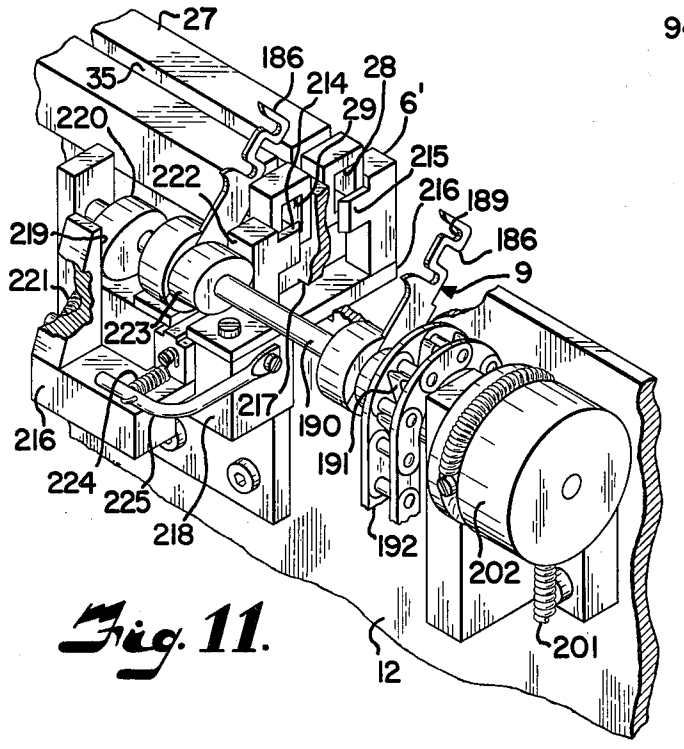

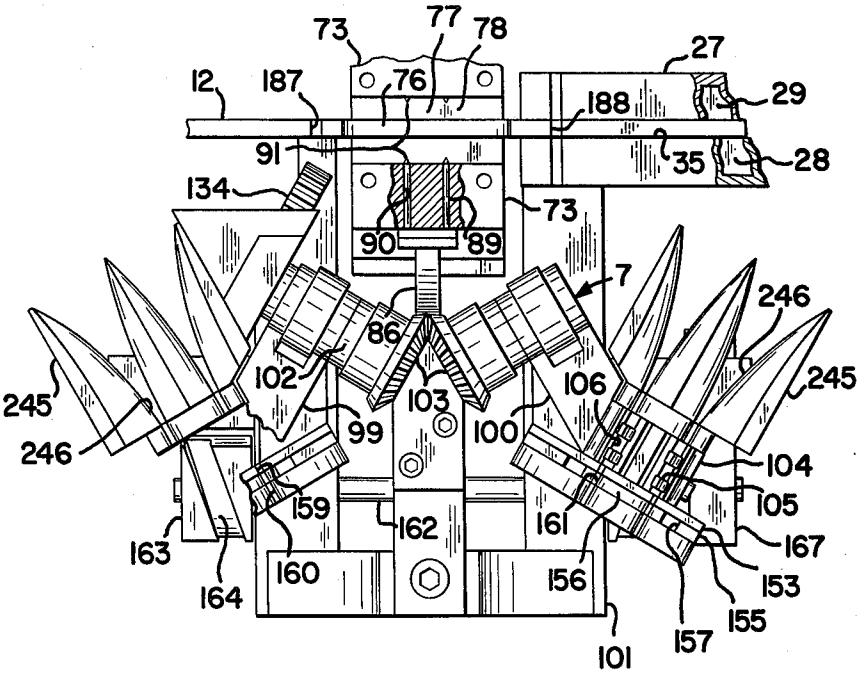

Fig. 12.

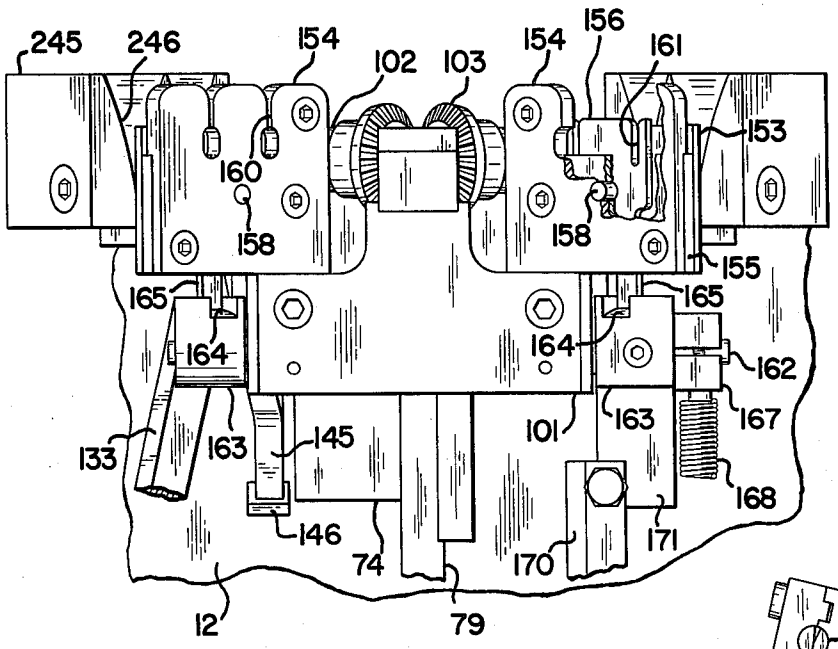

Fig. 13.

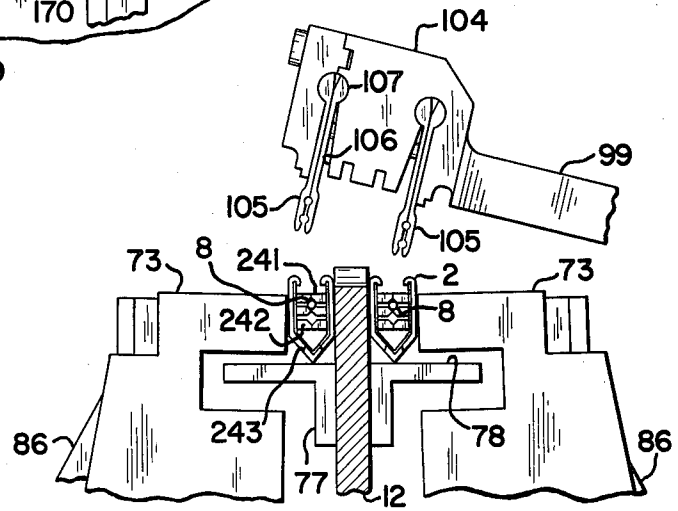

Fig. 14.

Fig. 16.

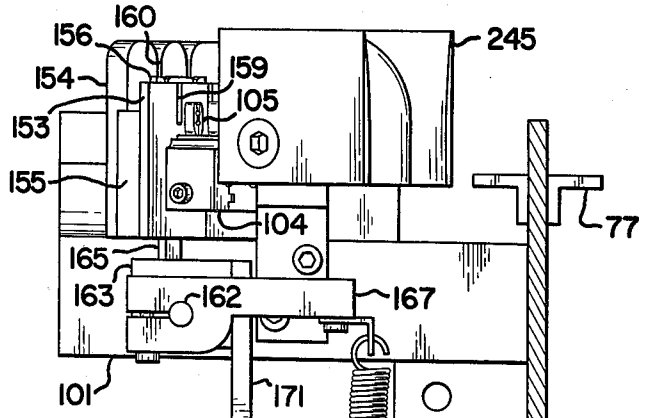
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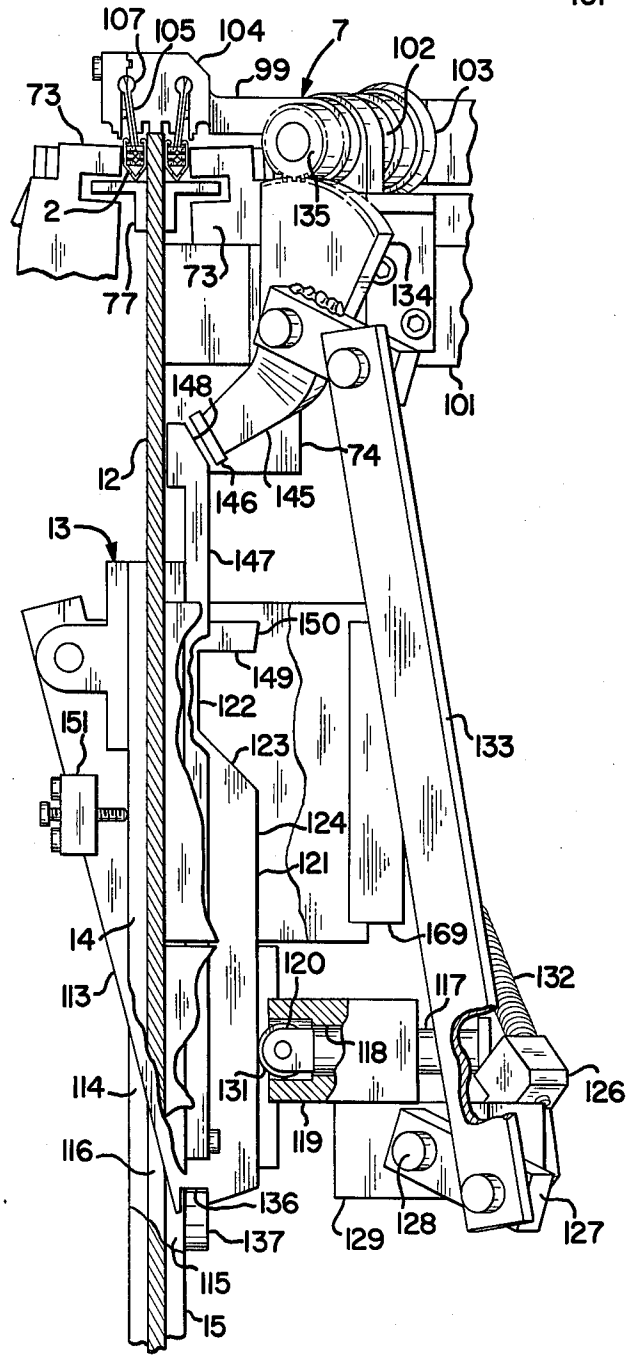
Fig. 15.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METHOD AND APPARATUS FOR CONNECTING WIRES

In the telephone industry it is often necessary to electrically connect or splice a telephone cable which can have several hundred individual wires. The wires in one cable portion must be matched with corresponding wires in the other cable portion and spliced together. This work is normally done at in-field locations, such as in a manhole, where a minimum of work space is available. The splice of each pair of matched wires must be such as to insure good and consistent electrical continuity and yet be quick and easy to make. Also, the spliced wires must be insulated from other wires to prevent interruption of service.

The principal objects of the present invention are: to provide a wire splicing apparatus which effects electrical connection between two wires by crimping a connector sleeve onto the wires to splice same; to provide such an apparatus which operates at high speed so that same can be used to efficiently splice cables such as communication cables having a plurality of wires in each cable; to provide such an apparatus with wire trimming means which trim the ends of the wires evenly so that the wire ends will be properly positioned within the connector sleeve when same is crimped onto the wires; to provide such an apparatus with wire loading means which hold and control the wires to be spliced during trimming, movement to a sleeve and in position in a connector sleeve until a pre-crimp is applied to the connector sleeve; to provide such an apparatus which feeds a chain of end to end relation connector sleeves in a defined path into a crimping station wherein the leading connector sleeve is separated from the chain before crimping; to provide such an apparatus with means that hold the leading connector sleeve in a wire receiving position in the crimping station during wire loading; to provide such an apparatus with a power operated actuator which effects operation of the component parts of the apparatus in proper sequence for each splicing operation; to provide such an apparatus which is operable to simultaneously splice two pairs of wires at one time by crimping a pair of connector sleeves onto respective wires; to provide such an apparatus which is automatic in operation and requires only a minimum of handwork by an operator; to provide such an apparatus which effects uniform splicing of the wires by consistent crimping of the connector sleeves onto respective wires; to provide such an apparatus with a housing and guard means so that same is safe to use and trouble free; to provide such an apparatus which is compact and portable and useable at infield locations for the splicing of multiple wire cables; and to provide such an apparatus which is well adapted for its intended use, economical to operate, sturdy in construction and simple and efficient to use.

Other objects and advantages of the present invention will become apparent from the following detailed description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of the present invention.

FIG. 1 is an elevation view of a wire splicing apparatus shown mounted adjacent to cable ends which are to be spliced.

FIG. 2 is an enlarged perspective view of a portion of a chain of connector sleeves.

FIG. 3 is an enlarged perspective view of a connector sleeve shown crimped onto a pair of wires.

FIG. 4 is an elevation view of the front of the splicing apparatus with the protective housing removed.

FIG. 5 is an elevation view of the back side of the splicing apparatus with the protective housing removed.

FIG. 6 is a plan view of the splicing apparatus with the protective housing removed.

FIG. 7 is an enlarged section view of portions of the splicing apparatus taken along the line 7—7, FIG. 8, and showing portions of connector sleeve feed means.

FIG. 8 is an enlarged fragmentary view of the splicing apparatus showing details of the connector sleeve feed means.

FIG. 9 is an enlarged fragmentary view of the splicing apparatus showing a loading arm thereof holding wires to be spliced in position in connector sleeves.

FIG. 10 is an enlarged fragmentary view of the wire splicing apparatus showing details of the crimping means and the means actuating same.

FIG. 11 is an enlarged perspective fragmentary view of the wire splicing apparatus showing details of ejecting and connector sleeve cutting means.

FIG. 12 is an enlarged fragmentary plan view of the wire splicing apparatus showing details of wire loading means.

FIG. 13 is an enlarged elevation view of the wire splicing apparatus showing details of wire loading and cutting means.

FIG. 14 is an enlarged fragmentary view of the splicing apparatus showing details of the wire loading and crimping means with a loading arm shown in a partially retracted position.

FIG. 15 is an enlarged fragmentary view of the splicing apparatus showing details of the drive means which effects movement of the loading arms with the loading arms shown in a position inserting the wires into connector sleeves.

FIG. 16 is an enlarged fragmentary view of the splicing apparatus showing details of the drive means effecting operation of the wire cutting means.

Referring more in detail to the drawings:

As required, detailed embodiments of the present invention are disclosed herein, however, it is to be understood that the disclosed embodiments are merely exemplary of the invention which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriate detailed structure.

The reference numeral 1 designates generally an apparatus adapted for splicing wires by crimping an open sided connector sleeve 2 onto the ends of two wires that are preferably one wire each from cable portions 3 and 4 of a communication cable with the cable portions each containing a plurality of wires. It is sometimes necessary to splice communication cables such as those used in the telephone industry either after repair work on the cable or when joining two cables together. Normally the splicing work is done at in-field locations such as in a manhole where working area is at a minimum. For splicing, an operator must separate and match wires from each of the cable portions 3 and 4 and effect a splice therebetween and because of the

large number of wires generally contained within a communication cable, the splicing process is time consuming and results in operator fatigue. It is also necessary to effect consistent electrical continuity between the spliced wires so as to prevent later interruption of service which would require resplicing of the wires.

The apparatus **1** preferably is compact, portable and adapted for easy operation requiring a minimum of operator performed steps. In the form of the apparatus shown, feeding means **5** are provided to sequentially feed a connector sleeve **2** into a crimping station or means **6** where it is held in a wire receiving position. Preferably, the connector sleeves **2** are in an elongate chain in end to end relation with the leading or end connector sleeve **2** being cut or otherwise separated from the remainder of the chain by cutting means **6'** after it is in the receiving position. Loading means **7** are mounted on the apparatus **1** and are operable to hold and control a pair of wires **8** and deposit same into a connector sleeve **2** at the receiving position and hold them therein until a precrimp is applied to the connector sleeve **2.** The final crimp is applied to the connector sleeve **2** after partial retraction of the loading means **7,** to effect the electrical connection between the wires **8.** Ejector means **9** are actuated after crimping and eject the crimped connector sleeve **2** and the spliced wires **8** from the apparatus **1.** Preferably the apparatus **1** is adapted for crimping two connector sleeves **2** simultaneously in splicing two pairs of matched wires with each pair of wires being spliced by a respective connector sleeve.

The apparatus **1** includes a support **12** having means thereon operable to actuate the various parts of the apparatus in sequential order. In the illustrated structure, the actuating means uses a reciprocating movement with cams, arms and parts actuated in response thereto and includes an operator or slide member **13** moveably mounted on the support **12.** The slide **13** shown includes two plates **14** and **15** each positioned on an opposite side of the support **12** and suitably secured together. Guide means are provided for the slide **13** which, as shown, includes an opening **16** through the support member **12** and spaced apart bearings **17,** such as rollers, secured between the plates **14** and **15** and engaged with ways **18** which in the structure shown are parallel side edges defining the opening **16.** The guide means permits the slide **13** to reciprocably move up and down with a minimum of play. Means are provided for effecting reciprocating movement of the slide **13** and preferably include an extendable ram **19** mounted on the support **12** and operatively connected to the slide **13.** The ram **19** can be either hydraulic or pneumatic and connected to a pressurized fluid supply system (not shown) by lines **20.** The cylinder **21** of the ram **19** is mounted on the support **12** as by a bottom pivot mount **22** and the piston rod **23** is connected to the slide **13** preferably with a U-shaped member or clevis **24** pivotally connected to a bracket **25** by a pivot pin **26** with the bracket **25** being secured to the slide **13.**

The connector sleeve means, in the illustrated structure, includes a feed housing **27** mounted on the support **12** and having channels **28** and **29** therein, defining a path of movement and receiving elongate chains **30** of connector sleeves **2** in end to end relation from a pair of rolls **31** containing the chains **30.** The channels **28** and **29** are in side by side relation on opposite sides of the support member **12.** Preferably the housing **27** is movable, for a purpose later described, and in this regard the support **12** has a pair of slots **32** therethrough each receiving a respective bearing **33,** such as a roller bearing, therein which are secured to a bracket **34** of the housing **27.** The bearings **33** guide the housing **27** during movement as does a portion of the support **12** which extends through a slot **35** in a portion of the housing **27.**

The feed means **5** includes apparatus to sequentially and incrementally move the chains **30** of connector sleeve **2** into the crimping means **6,** preferably, with the sleeves **2** being moved forward one sleeve at a time. An arm **36** is pivotally mounted on the support member **12** with a pivot pin **37,** said arm **36** is spaced to one side of the slide and preferably has a generally upstanding portion and a portion extending from the pivot pin **37** toward the slide **13.** An end **38** of the arm is adapted to engage a roller **39** mounted on the slide **13** and moveable therewith whereby engagement between the roller **39** and the end **38** will urge the arm **36** to pivot clockwise, as illustrated in FIG. **5,** upon downward movement of the slide **13.** A spring **40** is connected to the arm **36** and the support **12** and biases the arm so as to pivot counter clockwise when the slide **13** moves upwardly and the spring **40** retains the arm in its counter clockwise position when the roller **39** is out of engagement with the end **38.** The end **38** is shaped and positioned to be engaged in the lower portion of the downward stroke of the slide **13** and provide the necessary movement of the upper end of the upstanding portion of the arm **38** to advance a sleeve in to the wire receiving position.

Adjacent connector sleeves **2** in each of the chains **30** have a slot **42** therebetween adapted to receive portions of the feeding means therein to facilitate movement of the connector sleeve **2** into the crimping means **6.** Guide members shown as a pair of parallel guide rods **43** are secured to portions of the housing **27** and positioned on opposite sides of the support **12.** A support block **44** has a pair of guide bores (not shown) therethrough each having a respective guide rod **43** extending therethrough for slideably mounting the support block on the guide rods. The support block **44** has a portion **45** extending through an opening **46** through the support **12** which has sufficient height to permit up and down movement of the support block **44.** A pair of fingers **47** are each pivotally and slidably mounted on a respective guide rod **43** by same extending through a guide bore **48** with the fingers **47** being contained between two walls defining a respective slot **49** whereby the fingers **47** are moveable with the support block **44** along the guide rods **43.** A link **52** has opposite ends with one end pivotally connected to an upper end **53** of the arm **36** and the other end pivotally connected to the support block **44,** whereby movement of the arm **37** reciprocably moves the support block **44** and the fingers **47** along the guide rods **43.** In the illustrated structure, clockwise movement of the arm **36** effects movement of the support block **44** toward the wire receiving position and counter clockwise movement of the arm **36** effects movement of the support block **44** away from the wire receiving position. Springs **54** are secured to portions of the fingers **47** and the support block **44** and bias connector sleeve engaging detent portions or ends **55** to move toward the support **12** and into the slots **42** (FIG. **7.**)

The housing 27 is operably connected to the slide 13 for selectively effecting the movement thereof. As illustrated (FIG. 8) a lift member 57 having ears 58 and 59 projecting from opposite sides thereof is rotatably secured to the support 12 by a pivot pin 60. The ear 58 is adapted to engage a shoulder 61 on the bracket 34 and the ear 59 is adapted to engage reciprocal cam means 62, movable with the slide member 13, to position and time movement of the housing 27 at a predetermined point of down movement of the slide 13. Preferably, the cam means 62 has a shoulder 63 which engages the ear 59 and urges the lift member 57 to pivot about the pivot pin 60 and move the ear 58 into engagement with the shoulder 61 to effect upward movement of the housing 27. As shown the cam means 62 is elongate and retains the feed housing in the up or feeding position for a predetermined length of downstroke of the slide. When the cam means 62 moves out of engagement with the ear 59 the lift member 57 is released and is allowed to pivot back to its normal position to allow the housing 27 to move to its down position under the influence of gravity. A spring member 64 is mounted on the support member 12 and is operable to engage the lift member 57 in such a manner as to bias the lift member to maintain the ears 58 and 59 in a position for engagement of the ear 59 with the shoulder 63 on the downstroke of the slide 13.

Feeding of the connector sleeves 2 is effected with the housing 27 in the up position with each stroke of the arm 36 moving the chains 30 forward the length of one connector sleeve and feeding connector sleeves to the wire receiving position. Cam blocks 66 are secured to opposite sides of the support member 12 and positioned beneath the support block 44 and have a length slightly greater than the length of the stroke of movement of the support block 44. The cams 66 each have an upwardly facing cam surface 67 which are inclined downwardly toward the support 12 and are engageable with the lower disposed ends 68 of the fingers 47 on downward movement of the feed housing 27. Engagement between the fingers 47 and the cam surfaces 67 moves the lower ends 68 of the fingers 47 inwardly and pivots the fingers to move the detent portions 55 out of the slots 42 and out of engagement with the connector sleeves 2, the retracted position allowing movement of the block 44 and fingers 47 to a feed start position on the backstroke of the arm 36 by the spring 40 when the slide movement disengages the roller 39 from the lower end of the arm 36. The fingers 47 will be maintained in their open or retracted position until the housing 27 moves upwardly to disengage the cam surface 67 and the fingers 47, wherein same are returned by springs 54 to a position in slots 42 of the next two adjacent connector sleeves in the chains 30. Means are provided in the feed housing 27 to prevent the chains 30 from sliding out of their respective channels 28 and 29 under the influence of gravity. It is preferred to have the means hold the chains with a light force that will not interfere with feeding movement effected by the fingers 47, and in the illustrated structure the engagement is frictional by a pair of retaining members 69 mounted on the feed housing and extending into openings 70 therein and engaging the respective chain 30 of connector sleeves to retain same within their respective channels 28 and 29.

The crimping means 6 includes means which will preferably simultaneously crimp two connector sleeves 2 onto wires 8 loaded therein. In the illustrated structure the crimping means 6 includes a pair of crimping members 72 each having a crimping jaw portion 73 with the crimping members 72 being pivotally mounted on the support member 12 such as by bearing blocks 74 secured to the support 12 and having pivot pins 75 extending therethrough and through a portion of the respective crimping member 72. One of the crimping jaws 73 is positioned on each side of the support member 12 and are in opposed relation with an anvil member 76 positioned therebetween whereby connector sleeves 2 which are to be crimped are each positioned in the wire receiving position between a respective crimping jaw 73 and one side of the anvil 76. Shoulder forming members 77 are secured to the support 12 extending therefrom toward respective crimping jaws 73 with each having an upwardly facing shoulder 78 for engaging the bottom surface of the connector sleeve 2 to support same between the crimping jaw 73 and the anvil 76. Preferably the anvil 76 is a portion of the support member 12. The crimping members 73 are substantially identical and have a depending arm portion 79 extending downwardly therefrom and spaced from the support member 12 and the slide member 13.

Means are provided for effecting crimping movement of the crimping jaws 73 and in the illustrated structure (FIG. 10), cam members 81 are secured to the slide 13 and movable therewith. The cams each have a multi step cam surface portion 82 extending outwardly from the respective plate 14 and 15 and are engageable with respective arm portions 79. Preferably each of the arm portions 79 has a roller 83 mounted adjacent to the bottom end thereof for engagement with the respective cam surface portions 82. Movement of the cams 81 effects pivoting movement of the crimping members 72. The cam surfaces 82 each preferably have at least two steps thereon so that the jaws 73 will move to a partially closed position and then a fully closed position providing a precrimp and a final crimp respectively to the connector sleeve 2. When the slide 13 is in the down position the jaws 73 are open and as the slide 13 moves upwardly the cam surface 82 urges the jaws 73 to move toward one another to effect the crimping of the connector sleeves. Spring members 84 are secured to the support 12 and engage the arms 79 to bias same to a position where the jaws 73 remain in the open position until closed by upward movement of the slide 13 and to maintain the rollers 83 in engagement with the respective cam surface 82.

The crimping means 6 in the illustrated structure includes means to help hold the connector sleeves 2 in position between the crimping jaws 73 and the anvil 76 when the loading means 7 insert the wires 8 into the respective connector sleeves 2. Gripper means are provided for each of the jaws 73 and are substantially identical. As illustrated the gripper means includes an arm member 86 pivotally mounted on each of the crimping members 72 such as with a pivot pin 87, with the pivot pins 87 each being secured to a respective extension portion 88 of the crimping members 72. Each of the arms 86 has a pair of gripping pins 89 (FIG. 12) thereto and extending through openings 90 through the crimping jaws 73 with the gripping pins 89 having pointed or sharpened end portions 91 selectively engageable with the respective connector sleeve 2 to hold same in the wire receiving position between the crimping jaw 73 and the anvil 76 when the crimping jaws 73 are in their open position. An elongate rod 92 has one end thereof

connected to the respective arm **86** and has the lower portion thereof reciprocably supported by a respective bracket member **93** which is secured to the slide member **13** for movement therewith. A spring **94** is mounted on each of the rods **92** and is retained thereon by a respective collar **95** with the springs **94** being compressible between the respective bracket member **93** and the respective collar **95**. Each of the rods **92** has a stop member **96** secured thereon and positioned between the respective bracket member **93** and arm **86**.

At a predetermined position on the downstroke of the slide **13** the bracket members **93** each engage the respective spring **94** inducing compression therein and causing the arms **86** to pivot and extend the gripping pins **89** outwardly of the jaws **73** toward the anvil **76**. On upward movement of the slide **13** the compression in the springs **94** is released permitting the pins **89** to be released from engagement with the connector sleeve **2**. The stop members **96** are engaged by the bracket members **93** upon further upward movement and force the arms **86** to pivot about the pins **87** and retract the gripping pins **89** from their extended position through the crimping jaws **73**.

The loading means **7** are mounted on the support member **12** and are operably connected to the slide member **13** for operation in response to movement of the slide for loading preselected wires into the respective connector sleeves **2** and hold same in position until a precrimp is applied to the connector sleeves **2**. In the illustrated structure the loading means includes a pair of loading arms **99** and **100** which are swingably mounted on a mounting block **101** which in turn is fixed to the support member **12**. Shafts **102** are rotatably mounted on the mounting block **101** and are disposed in angled relation as are the arms **99** and **100**. The arms **99** and **100** are each mounted on a respective shaft **102** with the adjacent ends of the shaft **102** having a bevel gear **103** thereon and meshing whereby movement of one of the arms effects movement of the other arm simultaneously. Each of the arms **99** and **100** has a loading head **104** with four pairs of fingers **105** thereon, the fingers being adapted to receive wires **8** therebetween, to hold same for loading. The fingers **105** are suitably secured to the loading head **104** and as shown, same are received in slots **106** with the fingers **105** having a head portion **107** receivable in an enlarged portion of slot **106** which is preferably round to allow pivoting movement of the fingers **105**. As shown, the slot **106** diverges from the enlarged portion to provide clearance for pivoting movement of the fingers **105**. A pin **108** extends through openings **109** of the fingers **105** to prevent lateral movement thereof and has a spring **110** thereon positioned in a bore **111** in the loading head **104** to bias the fingers **105** to a loading position as best seen in FIG. **9**. When the precrimp is applied to the connector sleeves **2**, as best seen in FIG. **15**, the fingers **105** pivot so as to prevent deformation or damage thereto. The spring **110** causes the fingers **105** to resiliently grip the wires **8** therebetween. As illustrated, the pairs of fingers **105** for gripping each of the wires **8**, as best seen in FIG. **6**, are in generally parallel relation with the other pairs of fingers on the respective loading head **104** whereby the wires **8** on each of the loading heads **104** are held in generally parallel relation.

Drive means are provided to operably connect the loading arms **99** and **100** to the slide member **13** to effect and time movement thereof. In the illustrated structure (FIG. **15**), a lever arm **113** is pivotally mounted on the plate **14** and extends through slots **114** and **115** in the plates **14** and **15** respectively and through an opening **116** through the support member **12**. A push rod **117** is reciprocably mounted in a guide bore **118** through a bracket **119** which is suitably secured to the support **12**. An end **120** of the push rod **117** is engageable with a cam surface **121** of the lever arm **113** with the cam surface **121** being contoured in such a manner as to urge the push rod **117** to move in response to movement of the slide **13**. The cam surface **121**, as illustrated, is comprised of a straight portion **122** with an inclined portion **123** between the straight portion **122** and a second straight portion **124**. On upward movement of the slide **13** the push rod **117** begins axial movement when the end **120** engages the inclined portion **123** and after passing the incline portion **123** the straight portion **124** will hold the push rod **117** in an extended position during the remainder of the upstroke of the slide **13**.

A lever or crank arrangement is mounted on the bracket **119** and is comprised of a pair of lever arms **126** and **127** each secured to a common shaft **128** at opposite ends thereof with the shaft **128** being rotatably mounted in a support block **129** which is suitably secured to the bracket **119**. As described above, the end **120** is in engagement with the lever arm **113** and can be provided with a roller **131** and the opposite end of the push rod is in engagement with the lever arm **126**, to effect movement of the levers **126** and **127** in response to movement of the slide **13**. A spring member **132** is suitably connected to the lever **126** and biases the lever arrangement to a rest position with the push rod **117** in a non extended position and in engagement with the cam surface **121**. A link **133** is connected to the lever **127** and to a gear segment **134** which is rotatably mounted on the mounting block **101**. A gear **135** is secured to the shaft **102** of the loading arm **99** and meshes with the segment **134**. The link **133** is secured to the gear segment **134** at a distance spaced from the pivot point thereof whereby movement of the push rod **117** causes the lever **127** to pivot on the shaft **128** causing the link **133** to move and thereby effect turning movement of the segment **134** which in turn effects rotation of the gear **135** and swinging movement of the arms **99** and **100**. The arms **99** and **100** move from a rest position as seen in FIG. **6** to a loading or wire depositing position as shown in FIG. **15** and are operable to position the wires **8** in the connector sleeves **2** so the wire free ends are spaced between ends of the connector sleeve and hold the wires therein until the precrimp is applied to the connector sleeves **2**.

The cam **121** of lever arm **113** operates only on a portion of the upstroke of the slide member **13** and then is released to an inactive position to the loading arms are not moved on the down stroke of the slide member. A latch and timed release is provided for this purpose and they control the action of the lever arm **113**. In the illustrated structure (FIG. **15**) the bottom end of the lever arm **113** extends outwardly from the plate **15** and has a slot **136** therethrough for receiving a latch member **137** which holds same in the position extending through the plates **14** and **15** and the support member **12**. The latch **137** is moveable on the slide member **13** and has a notch **138** therethrough adjacent the lever arm **113**. A stop member **139** is secured to the

support member 12 and engages an end 140 of the latch 137 and is held in engagement therewith by a spring loaded pin 141 which holds the latch 137 within the slot 136. The end 140 has an inclined surface portion 142 which engages a member 143 that is secured to the support member 12 and has an inclined surface portion 144 whereupon engagement between the inclined surfaces 142 and 144 urges the latch 137 to move laterally to align the notch 138 with the end of the lever arm 113 and release same to pivot back through the plates 14 and 15 and the support member 12 allowing the arrangement of levers 126 and 127 to return to their normal position under bias of the spring 132. Return to the normal position of the push rod 117 allows the loading arms 99 and 100 to return to their normal position due to the bias of spring 132. It is desirable to provide the apparatus 1 with means to assure that the loading arms 99 and 100 retract sufficiently after the precrimp is applied to the connector sleeves so that the fingers 105 are clear of the connector sleeves before the final crimp is applied. In this regard an arm member 145 extends from the gear segment 134 and has a shoe 146 on the end thereof which is engageable with an elongate member 147 that is secured to the slide 13 and moveable therewith. The member 147 has an end 148 which is inclined and upon completion of the upstroke of the slide 13 the end 148 engages the shoe 146 causing the gear segment 134 to pivot counter clockwise, as viewed in FIG. 15, to effect partial return movement of the arms 99 and 100 to retract the fingers 105 from within the connector sleeves 2.

It is to be noted that the lever arm 113 has a shoulder 149 formed by an extension 150 extending from the straight portion 122. The shoulder 149 is engageable with the push rod 117 on downward movement of the slide 13 to urge the lever arm 113 to pivot back to its normal position and to align the slot 136 with the latch 137. The end of the latch 137 which is in engagement with the spring loaded pin 141 has an inclined portion which urges the latch to return to a latch position upon completion of the downward stroke of the slide 13 so that the latch 137 is received within the slot 136 to retain the lever arm 113 in its latched position with the cam portions in operative position extending through the plate 14 and 15. An adjustable stop 151 is secured to the lever arm 113 and helps align the latch 137 and slot 136.

The apparatus 1 includes means for trimming the wires 8 to even the ends thereof and to insure the proper location of the wire ends within the connector sleeve 2. In the illustrated structure, cutters are secured to the mounting block 101 and positioned adjacent to respective loading arms 99 and 100. Preferably the cutter adjacent to each loading arm is comprised of a first shearing plate 153 and a first plate member 154 with a spacing plate member 155 therebetween all secured to the mounting block 101 with the shearing plate 153 being adjacent to the respective loading head 104 (FIGS. 12 and 13). A movable shearing plate 156 is movably mounted between the shearing plate 153 and the plate 154 within a recess 157 in the spacer plate 155. Preferably, the shearing plate 156 is pivotally mounted as by having a pivot pin 158 extending therethrough and through the plates 153, 154 and 155. The shearing plate 156 shown is in sliding engagement with the shearing plate 153. The shearing plate 153, the plate 154 and the shearing plate 156 each have a pair of wire receiving slots 159, 160 and 161 respectively which are in alignment with a respective pair of fingers 105 for receiving a respective wire 8 therein whereby movement of the shearing plate 156 relative to the shearing plate 153 cuts the wires therein so as to trim the ends thereof evenly.

Drive means operably connect the shearing plates 156 to the slide member 13 so as to effect movement thereof in response to movement of the slide member 13. As illustrated a shaft 162 is rotatably mounted in the mounting block 101 having ends thereof each positioned adjacent to the respective loading head 104. A cam member 163 with a cam slot 164 is secured to each end of the shaft 162 and is adapted to receive a depending ear portion 165 of the shearing plate 156 within a respective slot 164. It is to be noted that the slots 164 have two side edge portions engaging both side edges of the ears 165 whereby rotation of the shaft 162 in either direction will effect pivoting movement of the shearing plates 156. As shown, a lever arm 167 is secured to the shaft 162 and has a spring 168 connected thereto and to a bracket member 169 which is fixed to the support 12. The spring 168 biases the lever arm 167 to the position in which the slots 159, 160 and 161 are in alignment. An arm 170 is pivotally mounted on the bracket member 169 and has one end thereof in engagement with a depending flange portion 171 of the adjacent cam member 163. The lower disposed end of the arm 170 is positioned adjacent to the bracket 119 and is in engagement with a push rod 172 which is reciprocably mounted in a guide bore 173 through the bracket 119. One end of the push rod 172 is engageable with the lower end of the arm 170 and the opposite end of the push rod preferably has a roller bearing member 174 mounted thereon. A lever arm 176 is pivotally mounted on the slide member 13 and is similar in construction and operation to the lever arm 113 having a cam surface 177 similar to the cam surface 121 with two straight portions 178 and 179 and an inclined portion 180 therebetween.

Upward movement of the slide member 13 effects axial movement of the push rod 172 which in turn effects rotation of the shaft 162 and pivotal movement of the shearing plate 156. The spring 168 helps maintain the push rod 172 in engagement with the cam surface 177. The lower disposed end of the lever arm 176 has a slot 181 which is adapted to receive a portion of the latch 137 therein to maintain the lever arm in non-pivoting relation until the latch 137 is moved by engagement between the inclined surfaces 142 and 144 to effect release of the lever arm 176 similar to release of the lever arm 113. It is to be noted that the straight portion 122 of the lever arm 113 is longer than the straight portion 178 of the lever arm 176 whereby the wires 8 are cut before the loading arms move out of their normal position for loading the wires 8. Also, the lever arm 176 has a shoulder 182 formed by an extension 183 similar in construction and operation to the shoulder 149 and extension 150. The lever arm 176 is provided with an adjustable stop 184 so that the slot 181 can be aligned accurately with the latch 137.

The apparatus 1 preferably is provided with ejector means 9 which are operable to eject the crimped connector sleeves 2 and the wires 8 therein after the final crimp has been applied to the connector sleeves 2. In the illustrated structure, a pair of ejector arms 186 are positioned within slots 187 and 188 in the support

member 12 adjacent to opposite ends of the connector sleeves 2 when same are between the crimping jaws 73. Each of the ejector arms is provided with two generally U-shaped upwardly facing openings or notches 189 which receive the wires 8 therein. The ejector arms 186 are each secured to a shaft 190 whereby rotation of the shaft 190 moves the ejector arms from their normal position within the slots 187 and 188 upwardly and away from the loading arms 99 and 100 to eject the crimped connector sleeves with the respective wires therein from the apparatus 1. The shaft 190 is operably connected to the slide 13 which provides motive power thereto. As illustrated, the shaft 190 has a sprocket 191 thereon with a chain 192 in engagement therewith. The chain 192 has one end thereof secured to a sliding catch 194 which is movably mounted on the support member 12 and the plate 14 has a catch or pawl 195 pivotally mounted thereon which is adapted to pivot on the upstroke of the slide 13 when same engages the slide catch 194 preventing any movement of the shaft 190 on the upstroke of the slide 13.

At a predetermined position on the downstroke of the slide 13 the catch 195 engages a shoulder 196 causing the slide catch 194 to move downwardly thereby causing the shaft 190 to rotate and move the ejector arms 186 and at a second predetermined position on the downstroke of the slide 13 a pin 198 secured to the catch 195 engages a cam surface 199 which releases the catch 195 from engagement with the shoulder 196. Releasing of the catch 195 on the downstroke permits the shaft 190 to rotate in a reverse direction allowing the ejector arms 186 to return to their normal position under the influence of a biasing spring 201 which has one end secured to a pulley 202 and is partially wrapped therearound with the pulley being secured to the shaft 190. The slide catch 194 has a second shoulder 204 adjacent the upper end thereof and is engageable with a pawl 205 which is pivotally mounted on a mounting block 206, which in turn is secured to the support member 12. The other end of the spring 201 is suitably secured to the pawl 205 and biases same to move in a counter-clockwise direction about a pivotal mounting of the pawl 205.

At a predetermined position on the downstroke of the slide catch 194, the pawl 205 engages the shoulder 204 before the catch 195 is released by the engagement between the pin 198 and the cam surface 199. The engagement between the pawl 205 and the shoulder 204 prevents upward movement of the slide catch 194. A guide member 207 is secured to the slide 13 and is movable therewith and has a rod 208 extending through a guide bore (not shown) with one end of the rod 208 being secured to the pawl 205. A stop member 209 is secured to the free end of the rod 208 and at a predetermined position on the downstroke of the slide 13 the stop member 209 engages the guide member 207 so as to effect clockwise rotation of the pawl 205 to release the slide catch 194 for upward movement thereof allowing the ejector arms 186 to return to their normal position within the slots 187 and 188. Reverse rotation is effected by the biasing spring 201 as described above. A second stop member 211 is secured to the rod 208 and is operable to engage a stop pin 212 which is secured to the mounting block 206 to limit the counter-clockwise rotation of the pawl 205.

The apparatus 1 includes cutting means which are operable to separate an end connector sleeve 2 from each of the elongate chains 30 after same are fed into the crimping means 6 with the cutting means being operably connected to the slide 13 to effect and time operation thereof. In the illustrated structure the cutting means includes a pair of knives 214 and 215 movably mounted on the support member 12 and positioned between the ends of the channel 28 and 29 and the crimping means 6. The knife 215 is secured to a member 216 which extends through an opening 217 through the support member 12 and is partially supported thereby. The member 216 is slideably mounted on a bracket 218, which is secured to the support member 12 and has a shoulder member 219 thereon engageable with an eccentric cam member 220 which is secured to the shaft 190. A spring 221 is secured to the member 216 and bracket 218 biasing the knife 215 to a position retracted and away from the respective chain 30 and maintains the shoulder member 219 in engagement with the cam member. The knife 214 is movably mounted on the bracket 218 and has a shoulder forming member 222 engageable with an eccentric cam member 223 secured to the shaft 190. A spring 224 is connected to the knife member 214 and to an arm 225 secured to the bracket 218. The spring 224 biases the knife member 214 to a position retracted and away from the respective chain 30, and maintains the shoulder member 222 in engagement with the cam 223. Reverse rotation of the shaft 190 by bias of spring 201 effects movement of the knife 214 and 215 quickly toward one another to cut the end connector sleeves 2 from the remainder of the chains 30. The cutting is accomplished at the very last of the downstroke of the slide 13 when the pawl 205 releases the ejecting arms 186 to return to their normal position.

To keep count of the number of wires spliced, the apparatus 1 is provided with a resettable counter 227 which is mounted on the support member 12 and counts each stroke of the ram 19. The counter 227 is operatively connected to either the ram 19 or the slide 13 by suitable means. The apparatus 1 is enclosed in a housing 229 for preventing accidental contact with moving parts of the apparatus 1 for operator safety. The housing 229 can be of any suitable structure and preferably is easily removable from the apparatus 1 and is secured thereto by suitable fasteners 230. It is to be noted that the only moving parts of the apparatus 1 to be exposed are the loading arms 99 and 100 and the ejector arms 186. The apparatus 1 is mounted on a carriage 232 which in the illustrated structure is comprised of two elongate rod members 233 secured to and extending between two upright structural members 234 for supporting the rods 233. The rods 233 are vertically spaced apart and have slideably mounted thereon brackets 234 which are secured to the housing 229. The apparatus 1 is movable horizontally along the rods 233 and a lock or stop 236 is provided to retain the apparatus 1 in the desired position for use. Movement of the apparatus 1 permits positioning of the connector sleeves 2 along the length of the splice between the cables 3 and 4 so as to reduce the size of the finished splice.

In the illustrated structure the connector sleeves 2 are in end to end relation in the form of an elongate chain. The connector sleeves 2 have a bottom wall 239 with upstanding side walls 240 in spaced apart relation with a conductive member 241 secured therein. Insulation penetrating teeth 242 extend inwardly from each

of the side walls **240** and when the connector sleeve **2** is crimped as shown in FIG. 3 the teeth **242** penetrate the insulation and effect electrical contact with the conductor in the wire **8.** Adjacent connector sleeves **2** in the chain **30** are connected by a tab **243** preferably integral with and extending between the adjacent connector sleeves and which is cut to separate the connector sleeves. It is to be noted, as best seen in FIG. 3, the connector sleeve is crimped onto two wires **8** with the wires **8** therein being in generally parallel and end to end relation.

The present invention is more fully understood by a description of the operation thereof. When the slide **13** is at the bottom of the downstroke and connector sleeves **2** are in the wire receiving position, the apparatus **1** is ready for loading wires **8** into the loading arms **99** and **100** wherein the fingers **105** securely hold the wires **8** in place. The operator of the apparatus **1** selects two wires from each of the cables **3** and **4** matching one wire from each cable with a corresponding wire from the other cable by the color coding on the insulation thereof. It is to be noted that wire guides **245** are provided and preferably are secured to the mounting block **101** with the wire guides each having two wire receiving slots **246** therein with each being in alignment with the respective pair of fingers **105.** The wire guides **245** facilitate loading of the wires **8** within the respective fingers **105.** Pins **247** are secured to the apparatus **1** and extend generally upwardly from the upper disposed edge thereof and are adapted to help separate the wires to be spliced from the remainder of the wires within the cables **3** and **4.**

The selected wires **8** are inserted between their respective fingers **105** with a portion of the wires extending outwardly from the plate **154.** One pair of wires to be spliced is placed within the respective fingers **105** nearest the support member **12** and the other pair of wires being placed in the respective fingers furthest from the support member **12.** The connector sleeves **2** are held in the wire receiving position before actuation of the ram **19** by the gripping pins **89.** After the wires are inserted between the respective fingers **105,** the operator actuates the ram **19** starting the upstroke of the slide **13.** At a predetermined position on the upstroke, the lever arm **176** effects and times movement of the plate **156** relative to the plate **153** and trims the ends of the wires **8.** Upon further upward movement of the slide **13,** the lever arm **113** effects and times movement of the loading arms **99** and **100** whereby same simultaneously move to a wire depositing position, as illustrated in FIG. **15,** with the fingers **105** holding and controlling the wires **8** within the respective connector sleeves **2.** With the arms **99** and **100** in the wire depositing position, the slide **13** continues upward movement whereby the cams **81** move the crimping jaws **73** toward the anvil **76** to partially crimp the connector sleeves **2.** Toward the completion of the upstroke of the slide **13,** the latch **137** is moved by engagement between the surfaces **142** and **144** whereby the lever arms **113** and **176** move to an inactive position with movement of the lever arm **113** allowing the loading arms **99** and **100** to begin retraction from the connector sleeves **2** and movement of the lever arm **176** allowing the shear plates **156** to return to their normal position. Still during the upstroke of the slide **13** and after the loading arms **99** and **100** have begun retraction, the cams **81** effect and time final crimping of the connector sleeves **2** onto the wires **8.**

The slide **13** completes the upstroke and then begins to move on the downstroke. At a predetermined position on the downstroke, the jaws **73** retract from crimping engagement with and release the connector sleeves **2.** Upon further downward movement of the slide **13,** at a predetermined position, the catch **195** engages the shoulder **196** to effect and time movement of the ejector arms **186** to eject the crimped connector sleeves **2** and wires **8.** After the ejector arms **186** have ejected the connector sleeves **2** and wires **8,** they are retained in the eject position by engagement of the pawl **205** and shoulder **204.** During ejection, downward movement of the slide **13** effects and times upward movement of the housing **27** through the lift member **57** engaging the reciprocal cam means **62.** After the housing **27** is raised, the arm **36** begins feeding movement through the engagement of the roller **39** and end **38** to feed the leading connector sleeves **2** into the wire receiving position between the crimping jaws **73** and anvil **76.** With the feed housing in the up position and the connector sleeves being positioned in the wire receiving position, further downward movement of the slide **13** releases the pawl **205** from engagement with the shoulder **204** allowing the shaft **190** to reverse rotate under bias of the spring **201** with the ejector arms **186** returning to their normal position and the cutters **214** and **215** being moved as described above to separate the leading connector sleeves from the chains **30.** Toward completion of the downstroke of the slide **13,** and after separating the connector sleeves, the reciprocal cam means **62** moves out of engagement with the lift member **57** allowing the feed housing to return to its down position where engagement between the fingers **47** and cams **66** retracts the detent **55** from the slots **42.** With the slide **13** in its down position the apparatus is ready to splice four more wires. The arm **36** returns to its counterclockwise position during upward movement of the slide **13.** It is to be noted that at a predetermined position on the downstroke of the slide **13** near the completion thereof and after the connector sleeves **2** are in the wire receiving positions, the springs **94** are compressed urging the gripping pins **89** to extend through the jaws **73** and hold the connector sleeves **2** in their wire receiving position. Splicing continues until all pairs of wires are spliced.

It is to be understood that while I have illustrated and described certain forms of my invention, it is not to be limited to the specific form or arrangement of parts herein described and shown.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for trimming the end portions of wires and crimping an open sided electrical connecting device onto the trimmed wire ends to splice same, said apparatus comprising:

a. a support member;

b. wire receiving members movably mounted relative to said support member and each adapted to grip a wire of a matched pair adjacent free ends of said wires;

c. cutting means on the support adjacent the wire receiving member when in a wire receiving position and operable to trim each wire free end to a predetermined point relative the respective wire receiving member;

d. means on the support defining a connector sleeve receiving position;

e. connector sleeve moving means moving and indexing an open sided connector sleeve to said connector sleeve receiving position;

f. crimping members mounted on the support and having portions relatively movable toward and away from each other at said connector sleeve receiving position for crimping a connector sleeve about wires therein to splice same;

g. actuator means on said support and operative to in sequence move the cutting means to trim the wires, move the wire receiving members to deposit the trimmed wire end portions in the connector sleeve and move the crimping member portions to crimp the wire end portions in the connector sleeve and electrically connect same, retract the crimping member portions to release the sleeve and connected wires.

2. The apparatus as set forth in claim **1** wherein said actuator means includes:

a. a slide member movably mounted on said support member;

b. a cam member secured to said slide member and movable therewith, said cam member having a cam surface engageable with at least one of said crimping members to effect and time relative movement between said crimping members in response to movement of said slide member.

3. The apparatus as set forth in claim **2** including:

a. power means mounted on said support member and connected to said slide member to selectively effect movement thereof with said slide member being reciprocably movable; and wherein

b. said cam surface having a plurality of steps to effect relative movement of said crimping members and crimp said connector sleeve in steps including a pre-crimp and a final crimp.

4. The apparatus as set forth in claim **3** including:

a. an elongate chain of said connector sleeves in end to end relation with said moving means moving and indexing said chain wherein a leading connector sleeve is moved to said connector sleeve receiving position; and

b. separating means mounted on said support member and having a selectively movable cutter adjacent said chain of connector sleeves and operably connected to said slide member to effect and time movement thereof for separating said leading connector sleeve from said chain.

5. The apparatus as set forth in claim **4** wherein:

a. said chain of connector sleeves including a pair of chains each positioned on an opposite side of said support member with said moving means moving a pair of leading connector sleeves into a respective said connector sleeve receiving position;

b. said crimping members being a pair with each having a jaw portion positioned adjacent the connector sleeve receiving position and in opposed relation, said jaw portions being relatively movable toward and away from one another; and

c. said wire receiving members having gripper portions adjacent said cutting means for holding a plurality of said pairs of wires for depositing a pair of wires in a respective said connector sleeve.

6. The apparatus as set forth in claim **5** wherein:

a. said crimping members includes an anvil on said support and positioned between said jaw portions with said jaw portions being movable toward and away from the anvil for crimping a respective connector sleeve therebetween.

7. The apparatus as set forth in claim **6** wherein said connector sleeve moving means includes:

a. a feed housing movably mounted on said support member and having feed channels therein each defining a path of movement for a respective said chain of connector sleeves to move through, said feed channels terminating adjacent a respective wire receiving position;

b. second means cooperating with said feed housing and said slide member operably connecting same to effect and time movement of said feed housing in response to movement of said slide member;

c. finger members reciprocably movably mounted on said housing and operably connected to said slide member to effect and time movement thereof, said fingers having portions selectively movable into engagement with portions of the respective leading connector sleeve to move and index same to said connector sleeve receiving position; and

d. third means on said support member adjacent said finger members and selectively engageable with portions thereof in response to movement of said feed housing to move the finger members out of engagement with the connector sleeves.

8. The apparatus as set forth in claim **6** wherein said wire receiving members includes:

a. a pair of arm members swingably mounted on said support member and selectively movable between a first position adjacent the cutting means and a second position wherein the trimmed wire end portions are deposited in the respective connector sleeve;

b. drive means operably connecting said arm members to said slide member to effect and time simultaneous movement thereof; and wherein

c. said wire receiving member gripper portions including gripping fingers mounted on each of said arm members for holding the wires with the gripping fingers on each arm holding a pair of wires, said gripping fingers being adjacent said cutting means when said arm members are in their first position.

9. The apparatus as set forth in claim **8** wherein:

a. said gripping fingers being pivotally mounted on said arms and being movable from a first position to a second position when the pre-crimp is applied to said connector sleeves; and

b. means on said arm members cooperating with said gripping fingers and biasing same to their first position.

10. The apparatus as set forth in claim **9** wherein:

a. said arm members being disposed angularly relative to one another when in said first position;

b. said drive means including a pair of meshed bevel gears each mounted on a respective said arm member.

11. The apparatus as set forth in claim **10** wherein said drive means includes:

a. a cam member mounted on said slide member and movable therewith and operably connected to said arm member; and

b. a member secured to said slide member and movable therewith having a portion engageable with a portion of said drive means at a predetermined point of movement of the slide member to positively urge the arm members to begin movement from their said second position to their said first position.

12. The apparatus as set forth in claim **6** including:

a. at least one connector sleeve gripping member movably mounted on said jaw portions and selectively movable independently thereof into engagement with a respective said connector sleeve and retaining same in said connector sleeve receiving position;

b. means operably connecting said gripping members to said slide member to effect and time the movement thereof.

13. The apparatus as set forth in claim **6** including:

a. a third cam member mounted on said slide member and movable therewith;

b. means operably connecting said third cam member to said cutting means to effect and time operation of said cutting means to trim the wire free ends.

14. The apparatus as set forth in claim **13** wherein said cutting means includes:

a. first plate members each mounted on said support member adjacent a respective said wire receiving member and having wire receiving slots in substantial alignment with respective said wire receiving member gripper portions;

b. second plate members each movably mounted on said support member adjacent a respective said first plate member and having wire receiving slots in substantial alignment with respective said wire receiving member gripper portions and operably connected to said third cam member by said connecting means to effect and time movement thereof relative to said respective first plate member to trim wires positioned in said wire receiving slots.

15. The apparatus as set forth in claim **6** including:

a. a protective housing secured to said support member;

b. a carriage having said support member mounted thereon for movement relative to said wires; and wherein

c. said actuator means including a ram selectively extendable and retractable to effect movement of said slide member.

16. Apparatus for trimming the end portions of wires and crimping an open sided electrical connecting device onto the trimmed wire ends to splice same, said apparatus comprising:

a. a support member having an anvil forming portion;

b. loading arms swingably mounted on said support in relative angular relation and movable between first and second positions, said arms each having a head portion on an end thereof;

c. fingers pivotally mounted on each of said head portions and adapted to grip a wire of a matched pair adjacent free ends of said wire;

d. wire cutting means mounted on said support adjacent a respective head portion when in said first position, said cutting means including relatively movable plate members each having wire receiving slots therein in substantial alignment with respective said fingers whereby relative movement between said plate members trims each wire free end to a predetermined point relative to the respective fingers;

e. members secured to said support member on opposite sides thereof and partially defining connector sleeve receiving positions, each on an opposite side of said support member;

f. connector sleeve feed means mounted on said support member and having reciprocably movable fingers each engageable with a respective open sided connector sleeve for moving and indexing a connector sleeve into the respective connector sleeve receiving position with said connector sleeves being in side by side relation, said feed means includes a housing movably mounted on said support member and having channels therein positioned on opposite sides of the support member and defining a path of movement for said connector sleeves, said connector sleeves each being a leading one of an elongate chain of end-to-end relation connector sleeves;

g. crimping members each pivotally mounted on an opposite side of said support member and having a jaw portion positioned adjacent said connector sleeve receiving position and movable toward and away from said anvil forming portion for simultaneously crimping a pair of connector sleeves therebetween onto respective wires, said crimping members each having an arm portion;

h. ejector arms mounted on said support member and movable relative thereto, said ejector arms each having portions adjacent said connector sleeve receiving position with wire receiving recesss for engaging and moving a spliced wire and respective connector sleeve therefrom, said ejector arms each being positioned adjacent a respective connector sleeve end when same is in the connector sleeve receiving position;

i. a slide member reciprocably movably mounted on said support member;

j. an extendable ram operably connected to said slide member to effect movement thereof;

k. multi-step cams secured to said slide member and movable therewith, said cams each engageable with a respective crimping member arm to effect and time movement of the jaw portions toward and away from said anvil forming portion to apply a pre-crimp and a final crimp in steps to the connector sleeves;

l. first cam means mounted on said slide member and operably connected to wire cutting means to effect and time relative movement of said plate members for cutting said wire;

m. second cam means mounted on said slide member and operably connected to said loading arms to effect and time movement thereof between said first and second positions;

n. sleeve separating means having cutter members movably mounted on said support member and operably connected to said slide member to effect and time movement of said cutter members to separate the leading connector sleeves from the respective chain; and

o. gripping members movably mounted on said crimping members and having portions thereof selectively engageable with a respective connector sleeve when in the connector sleeve receiving posi-

tion to retain same thereat, said gripping members being operably connected to said slide member to effect and time movement thereof.

17. The method of splicing two communication cables comprising the steps of:

a. moving an open sided electrical connector sleeve to a receiving position between crimping members;

b. selecting matched wires from each cable and holding same in a trimming position;

c. trimming the wires by cutting the ends in a predetermined relation;

d. moving the trimmed wires to said receiving position and depositing end portions thereof in said connector sleeve with the free ends within and spaced from ends of said sleeve;

e. moving at least one of the crimping members to partially compress said connector sleeve to engage said trimmed wire end portions while holding same n the connector sleeve then releasing said wire end portions and further moving at least one of the crimping members to crimp the sleeve onto the wire end portions and electrically connect same;

f. retracting the crimping members and moving the connector sleeve and connected wires from the receiving position.

18. The method as defined in claim **17** wherein:

a. two of said connector sleeves are moved to respective receiving positions in substantially side by side relation with each positioned between respective crimping members; and

b. four wires which are matched pairs from each cable are selected, held and trimmed and matched pairs are moved to and deposited in a respective connector sleeve and the crimping members moved to simultaneously crimp the connector sleeves and electrically connect the respective matched pairs of wires.

19. The method as defined in claim **17** wherein:

a. said connector sleeves being in an elongate chain in end-to-end relation with a leading connector sleeve being separated from the chain after the leading connector sleeve is moved to the receiving position.

20. The method as defined in claim **19** including:

a. holding the leading connector sleeve in the receiving position during the depositing of the trimmed wires therein; and

b. repeating the steps of the method until all pairs of wires of the cables are electrically connected.

21. The apparatus as set forth in claim **1** and including:

a. ejecting members movable relative to the support member and having portions adjacent said receiving position for engaging and moving a spliced wire and connector sleeve therefrom;

b. said actuator means on said support being operative after retraction of the crimping member portions to release the sleeve and connected wires to move the connector sleeve ejecting members to remove the connector sleeve and connected wires from the connector sleeve receiving portion.

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