

## Description

This invention relates to wire processing apparatus, in particular to such apparatus which is intended for use in producing electrical harnesses comprising wires of different lengths, and concerns the improved positioning and measurement of wires, in such apparatus.

There is disclosed in US-A-4,380,117, wire processing apparatus comprising a base, first and second wire treatment stations arranged in spaced relationship on the base, a wire delivery shuttle for conveying a plurality of wires in juxtaposed relationship along a wire feed path, through the second to the first station, means for then securing the wires at the first station, means for driving the shuttle in reciprocating motion along said path to deliver the wires to the stations, means for feeding the wires from a wire source for delivery by the shuttle and wire lengthening means disposed upstream of the second station and being actuable axially to advance the wires relative to the shuttle when the wires have been secured at the first station and the shuttle has been retracted from the first station, so that the wires form loops of different lengths between the first and second stations, the wire lengthening means also being deactuable so as to cease advancing the wires.

It has been found that since the wires must be fed from the wire lengthening means, for a considerable distance through the apparatus before the loops are formed, especially where the wires are thin, the wires tend to buckle between the wire lengthening means and the position at which the loops are formed, whereby the accuracy of the wire lengthening operation is impaired.

According to one aspect of the invention, wire tensioning roller means are disposed downstream of the second station, for paying out the wires as they are advanced by the wire lengthening means so as to tension the wires between the wire tensioning roller means and the wire lengthening means, said roller means comprising a first set of idle rollers disposed on one side of the wire feed path and a second set of driven rollers disposed on the opposite side of the wire feed path, drive means for the rollers of the second set, slip clutch means interposed between the rollers of the second set and the drive means, to cause the rollers of the second set to slip as soon as the wire lengthening means has been deactuated, and means for opening the sets of rollers to allow the shuttle to pass therebetween and for closing said sets about the wires, simultaneously with the actuation of the wire lengthening means.

The wires cannot therefore buckle between the wire lengthening means and the position at which the loops are formed by virtue of said slip means and accurate measurement of the wires is achieved.

Wire processing apparatus are described in EP-A-22637, US-A-3,353,571, US-A-4,253,222, US-A-

4,235,015 and US-A-4,367,575, in which the wires are lengthened by means of wire lengthening arms which are driven against the wires in a direction perpendicular to their length, and which thereby serve to tension the wires. The wire lengthening operation can less accurately be performed by such means than by the tensioning roll structure of the present invention.

According to another aspect of the invention, a wire processing apparatus comprising a base, first and second wire treatment stations arranged in spaced relationship on the base, a wire delivery shuttle for conveying a plurality of wires in juxtaposed relationship along a wire feed path, through the second station to the first station, means for then securing the wires at the first station, means for driving the shuttle in reciprocating motion along said path to deliver the wires to said stations, means for feeding the wires from a wire source for delivery by the shuttle and wire lengthening means disposed upstream of the second station and being actuable axially to advance the wires relative to the shuttle when the wires have been secured at the first station and the shuttle has been retracted from the first station, so that the wires form loops of different lengths between the first and the second stations, the wire tensioning means also being deactuable so as to cease advancing the wires, is characterized by wire tensioning roller means disposed downstream of the second station, for paying out the wires as they are advanced by the wire lengthening means so as to tension the wires between the wire tensioning roller means and the wire lengthening means; and in that the shuttle comprises a wire clamp and a header connected to the wire clamp by springs receiving the wires so that leading ends thereof extend through passages in the header, an abutment at the first wire treatment station disposed in the path of the header serving to compress the springs by engagement with the header to cause the leading end portions of the wires to project from the header into the first station.

The structure recited above has the further advantage that the shuttle automatically positions the wires at the treatment stations, in both an axial and a lateral sense.

The apparatus may be constructed to produce harnesses comprising leads which are terminated at both ends to electrical connectors and may have means for automatically ejecting the finished harnesses from the apparatus.

For a better understanding of the present invention, an embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view, with parts removed, of wire processing apparatus for making a wiring harness having a plurality of wires of different lengths;

FIGURE 1A is a perspective view of an electrical connector to which wires have been terminated;

Figure 2 is an enlarged perspective view of part of the apparatus;

Figure 3 is a side view, shown partly in section, of a shuttle of the apparatus;

Figures 4A and 4B are enlarged side views of details of the apparatus, illustrating the operation of the shuttle in relation to first and second wire treatment stations of the apparatus;

Figures 5A and 5B are enlarged side views of details of the apparatus illustrating the operation of the shuttle in relation to a wire template of the apparatus;

Figure 6 is a view shown partly in section, illustrating the operation of pre-feed rollers and idle rollers of the apparatus;

Figure 7 is a side view, shown partly in section, illustrating the structure of one of the pre-feed rollers;

Figures 8A to 8F are diagrams illustrating respective stages in a cycle of operation of the apparatus; and

Figures 9A and 9B are schematic perspective views illustrating examples of electrical harnesses manufactured by means of the apparatus.

Figure 1A shows an electrical connector 2, for example, as described in US-A-4,159,158 comprising an insulating housing containing electrical terminals 2x having wire slots into which insulated wires 1 can be forced so that the edges of the slots pierce the insulation of the wires to make electrical contact with the electrical conductive cores of the wires. The wires are inserted into the wire slots in a direction perpendicular to the longitudinal axes of the wires. The harness shown in Figure 9A comprises two identical connectors 2 and 2', to which the respective ends of the leads 1' have been terminated. In the harness shown in Figure 9B, the leads 1' are terminated to a common connector 2' at one end and to a plurality of smaller connectors 2a through 2d at their other ends. These smaller connectors are of the same construction as the connector 2.

The harness making apparatus will now be described mainly with reference to Figures 1 through 5, when set up to manufacture the harness of Figure 9A.

As shown in Figure 1, the apparatus comprises a first wire treatment station 60, a second wire treatment station 80, both mounted on a base 50, and a wire shuttle 10 arranged to be driven horizontally in reciprocating motion between the stations 60 and 80.

At the station 60, the leading ends of wires 1 delivered thereto by the shuttle 10, which has been advanced from a starting position, are received and are forced into the wire slots of the terminals 2x of a connector 2, located at the station 60. At the station 80, the wires are severed to produce leads 1' and the severed ends of these leads are forced into the wire slots of the terminals 2x of a connector 2' located at the station 80, after the shuttle 10 has been returned from the station 60 to its starting position and after the wires have been paid out, by means described below, to predetermined lengths.

The shuttle 10 comprises a pair of frame plates 11 (one of which is shown in Figure 1), each of

which is slideable along a horizontal guide rod 12, the rods 12 extending in parallel relationship over the base 50. An elongate wire clamp 13 is secured at each end, to the free end 11a of one of the frame plates 11, as best seen in Figure 2. The shuttle also comprises an elongate header 14 each end of which is secured to a respective shaft 15, the shafts 15 which are parallel, each extending slidably through a respective hole in an oscillatory block 16 fitted into the wire clamp 13. The blocks 16 are movably mounted in the wire clamp 13 to permit the header 14 to be swung to a small extent vertically with respect to the clamp 13. The other ends of the shafts 15, which project from the rear side (as seen in Figure 2) of the clamp 13, are enlarged so that the shafts 15 cannot be withdrawn from the blocks 16, compression springs 17 on the shafts 15 urging the header 14 away from the wire clamp 13. The header 14 and the wire clamp 13 are each formed with a row of holes 18 and 19, respectively, each receiving an insulated wire 1 extending from a wire source WS (Figure 8A), the holes of each row being equidistant and extending parallel to one another and each hole 18 being in alignment with a corresponding hole 19. Lodged in each pair of aligned holes 18 and 19, is a tension coil spring 20, the tensile force generated by the springs 20 being smaller than the compressive force generated by the springs 17.

As shown in Figure 3, the wire clamp 13 contains a leaf spring 21. A first lever 22 pivoted to the wire clamp 13 on a pin 23 bears a roller 25 engageable with a plate 26 to which the spring 21 is secured, the plate 26 being urged upwardly (as seen in Figure 3) by a spring 26a. When the lever 22 is in the position in which it is shown in Figure 3, the roller 25 depresses the plate 26 so that the spring 21 urges the wires 1 down into a longitudinal groove 24 in the wire clamp 13 whereby they are firmly secured thereto. The lever 22 can be rotated in a clockwise (as seen in Figure 3) sense to cause the roller 25 to release the plate 26, thereby to release the spring 21 from the wires 1. The spring 21 can again be caused to clamp the wires 1 by urging a second lever 27 projecting from the lever 22, in a anticlockwise (as seen in Figure 3) sense.

In Figures 1 and 2, the shuttle 10 is shown in a retracted position near the second wire treatment station 80. The shuttle 10 can be advanced to the first wire treatment station 60 and returned to its retracted position, along the guide rods 12 by actuating a shuttle drive mechanism 27. The shuttle 10 is shown in its advanced position in broken lines in Figure 4A. Just before the shuttle 10 reaches its advanced position, the header 14 thereof is biased downwardly by a cam plate 65 on a template 64 at the station 60, so as to engage a forward face of the template 64 as shown in Figure 4A, whereby the shafts 15 are retracted through the blocks 16 against the action of the springs 17. The free end portions of the wires 1 are thereby advanced into the template 64 as will be described below.

The stations 60 and 80 are provided with presses 61 and 81, respectively, having wire insertion blades 63 and 83, respectively, as shown in Figure 4A and 4B, secured to rams 62 and 82, respectively, of the presses 61 and 81. The rams are arranged to be driven in vertical reciprocating motion by conventional drive means not shown, to insert the wires into the wire receiving slots of the terminals 2x of connectors positioned below the blades 63 and 83, as described below, thereby to terminate the wires to the terminals. Beneath each set of blades 63 and 83 is a connector locating guide channel member 51 (best seen in Figure 2) defining a connector guide channel 51a extending in a direction perpendicularly to the path of movement of the shuttle 10 and being fed with connectors 2 or 2' from a vertical connector magazine 52 by means of a piston and cylinder unit 52a. Each connector supplied to the channel 51a is fed there along by means of a further piston and cylinder unit 52b having a piston rod 52d to a position beneath the blades 63 or 83, as the case may be, prior to each wire terminating operation. After such operation, each wired connector 2 and 2' is discharged from its channel 51a in the direction of the arrow A in Figure 2, by means of the unit 52b and falls down a chute 52c as shown in Figure 1.

The template 64 carrying the cam plate 65 is mounted as best seen in Figures 4A and 4B on a support 53 so as to extend above the channel 51a at the station 60 and has a plurality of parallel wire guide channels 66, one of which is shown in Figures 5A and 5B, which open forwardly of the template and which are spaced in accordance with the spacing of the terminals 2x of the connectors to which the wires 1 are to be terminated at the station 60. The template 64 is exchangeable to allow for connectors having terminals of different pitch to be connected to wires at the station 60. Each wire guide channel 66 communicates with slots 67 in the top, and slots 67' in bottom, thereof. The slots 67 extend from the forward face 64a of the template 64 substantially up to the center of its width as best seen in Figure 2, the slots 67 in its bottom face, extending throughout its full width. A bottom plate 68 of the template 64 is slideable with respect thereto from the position seen in Figure 5A to that shown in Figure 5B. The plate 68 is normally urged towards the station 80, that is to say leftwardly as seen in Figures 5A and 5B by a spring 68a so as normally to close the slots 67' in the bottom surface of the template 64 as shown in Figure 5A. Thus, when the free end portions of the wires 1 are fed by the shuttle 10 into the channels 66 as shown in Figure 5A, the free end portion of each wire 1 is supported above the connector 2 at the station 60 by means of the plate 68. The plate 68 has, at its rear, or rightward end, as seen in Figures 5A and 5B, a rear wall 69 from opposite sides of which extend posts 70 as best seen in Figure 2. Levers 72 mounted on opposite sides of the press 61, on a shaft 71 engage the respective posts 70. The ram 62 of the press 61 has thereon a

roller 73 which descends and rises therewith. As the ram descends through its working stroke the roller 73 urges the levers 72 in an anticlockwise (as seen in Figures 5A and 5B) sense against the action of springs 74, attached to the press 61, so that the bottom plate 68 is slid rightwardly from its Figure 5A to its Figure 5B position so that the free end portions of the wires 1 resting on the plate 68 drop onto the connector 2 at the station 60 to enter the mouths of the wire receiving slots of the terminals 2x of the connector 2. During the descent of the ram 62 the wire insertion blades 63, each move through a respective opposed pair of the slots 67 and 67' in the template 64 to press the free end portions of the wires 1 fully home into the wire receiving slots (Figure 5B). The ram 62 then rises through a return stroke to its Figure 5A top dead center position and the levers 72 are returned to their Figure 5A positions by the springs 74 whereby the plate 68 is returned to its closure position by the spring 68a. During the descent of the ram 62, a wire clamp releasing lever 75 attached thereto engages the lever 22 of the wire clamp 14, as illustrated in broken lines in Figure 4A so that the latter is swung to release the wires from the wire clamp 13.

As shown in Figure 1, vertical piston and cylinder units having piston rods 87 are attached by a plate 84 to the press 81 at the station 80, these units are enclosed by a cover 86 as shown in Figures 4A and 4B. As best seen in these Figures, the piston rods 87 carry a roller holder 89 which is moved by the units 85 independently of the rod 82 of the press 81. The roller holder 89 carries a plurality of idle rollers 91 on a shaft 90 supported by side walls 88' of the holder 89, as best seen in Figure 6. The rollers 91 are spaced from one another along the shaft 90 at distances corresponding to the pitch of the terminals 2x of the connector 2' to which wires are to be connected at the station 80. Also mounted on the shaft 90, is a pivotable wire guiding comb 93 having a wire guiding tines 92. The comb 93 is urged by a spring 94 (Figure 6) acting between the comb 93 and the holder 89, so that the tines 92 normally extend between the wire insertion blades 83 of the ram 82. When the units 85 are actuated to move the piston rods 87 downwardly, the free end portion of each tine 92 enters between a pair of the wires 1 which extend from the shuttle 10 in its retracted position, that is to say its full line position in Figures 4A and 4B, and through the station 80 to the station 60. Each wire is thereby guided under the corresponding roller 91, between a pair of the tines 92. As the rods 87 reach their lowermost position, the tines 92 engage the connector 2 at the station 80, as shown in broken lines in Figure 4B and are thereby rotated slightly, to assume a horizontal position. An arm 95 fixed to the holder 89 above the comb engages the header 14 of the shuttle 10 as the rods 87 descend, to deflect the header 14 slightly downwardly as illustrated in broken lines in Figure 4B, so that each wire is positioned in the mouth of a wire receiving slot of a terminal 2x of

the connector 2' at the station 80 and is forced into the slot by the blades 83 as the ram 82 completes its working stroke. At the same time, the wires are severed by a severing blade 83a fixed to the insertion blades 83, which passes across the leading face 14a of the header 14.

Below the idle rollers 91, is a pre-feed roller unit 100, (best shown in Figures 2 and 6) which is arranged for vertical reciprocating movement by the piston rod 101 of a piston and cylinder unit, and is guided by guide rods 102 mounted in cylinder block 101a. The unit 100 comprises a frame 103 in which are mounted pre-feed rollers 104 formed integrally with bearing rolls 106 rotatably supported by a shaft 105 in the frame 103. Each roller 104 is of the same thickness as the corresponding idle roller 91 and is arranged opposite thereto. The shaft 105 is driven in rotation through a belt 107 (Figure 2) connected to a drive motor 107a. When the unit 100 is in a raised position, each roller 104 engages a wire 1 between itself and the corresponding roller 91, the wires extending between the tines 92 as shown in Figure 6 and being guided thereby.

As shown in Figure 7, three leaf springs 108, which are curved in the direction of rotation of the shaft 105, are attached to its periphery within each roller 104 and frictionally engage the inner annular surface 109 thereof. When the shaft 105 is driven through the belt 107, each roller 104 rotates with the shaft 105 so long as the roller 104 is unloaded. However, when the roller 104 is loaded, the leaf springs 108 slip on the surface 109 so that the roller 104 no longer rotates with the shaft 105. The idle rollers 91 and the pre-feed rollers 104 are closed towards one another by lowering the former and raising the unit 100 so as to engage the wires 1 between the rollers 91 and 104, when the shuttle 10 has been returned to its retracted position after the wires have been terminated at the station 60. A lever 96 loaded by a spring 96a (Figure 1) and pivoted at one end to the ram 82 and at the other end to the press 81 carries a support 98 at the lower (as seen in Figures 4A and 4B) end of which is a roller 97. As the ram 82 carries out its working stroke, the roller 97 engages the lever 22 of the wire clamp 13, in the retracted position of the shuttle 10, to cause the wires 1 to be clamped.

Wire feed means 54 (which is conventional) shown in Figures 8A to 8F consists of a capstan 55 about which each wire 1 which extends from the wire source WS (Figure 8A), has been wound by a single turn, guide rollers 56, a wire clamp 57, and intermittently driven wire lengthening rollers 58 and cooperating idle rollers 59, a pair of rollers for each wire, which are arranged to pay out the wires to different predetermined lengths. The capstan 55 is continuously rotated, but will not pull a wire from the wire source unless the part of the wire downstream thereof is in a taught condition so that the capstan 55 is loaded. The clamp 57 can be moved towards the rollers 56 to clamp the wires and the rollers 58 can be moved towards the rollers 59 to drive the wires. A set of idle

rollers 91a (Figures 8A to 8F) may be provided for supporting the wires between the rollers 91, 104 and the connector 2 at the station 60.

The means for driving all the parts described in the foregoing are controlled to operate in their correct sequence by means of an electronic control unit 200 (Figure 1).

The operation of the apparatus will now be described mainly with reference to Figures 8A through 8F which illustrate consecutive steps in an operating cycle of the apparatus.

At the beginning of the operating cycle, as shown in Figure 8A, the leading end of each wire 1 which has been fed into the wire clamp 13, is firmly held thereby and extends into the header 14 (also see Figure 3). The shuttle 10 is in its initial retracted position at the station 80, the roller unit 100 being in its lowered position, the idle rollers 91 being raised, the rams 62 and 82 being in their top dead center positions, the clamp 57 being in a retracted position away from the rollers 56 and connectors 2 and 2' being disposed in the channels 51a below and opposite to, their corresponding insertion blades 63 and 83, respectively.

The wire lengthening rollers 58 are in a raised position in which they do not cooperate with the idle rollers 59 to drive the wire and the shuttle 10 is stationary so that the capstan 55 is not loaded so as to pull the wires 1 from the wire source WS.

As shown in Figure 8B, the shuttle 10 has been moved along the wire feed path, indicated by the arrow B, from its retracted position, to the station 60, by the operation of the shuttle drive means 27 (Figure 1) so that the header 14 having engaged the template 64, as described above, the leading end portions of the wires 1 extend from the header 14 and are supported by the plate 68 of the template 64. The ram 62 has performed its working stroke to terminate the leading ends of the wires 1 to the terminals 2x (Figure 1A) of the connector 2 at the station 60. These positions of the shuttle 10 and ram 62 are those shown in broken lines in Figure 4A. Also as shown in that Figure, the lever 22 of the wire clamp 13 has been rotated by the arm 75 so that the wire clamp 13 has released the wires. As the shuttle 10 is moved from its Figure 8A position to its Figure 8B position, the wires downstream of the capstan 55 are tensioned so as to load the latter, so that the capstan 55 feeds wires 1 from the wire source in the downstream direction of the capstan 55 by the length of travel of the shuttle.

As shown in Figure 8C, the shuttle 10 is then returned to its retracted, initial position, along the wires 1, the leading ends of which are fixed, by virtue of their termination to the connector 2 at the station 60; the wires being tensioned between the capstan 55 and the connector 2. The rollers 58 are now depressed towards the rollers 59 so that the wires are engaged between the rollers 58 and 59 and the rollers 91 and 104 are also moved towards one another to engage the wires. The press ram 62 at the station 60 remains in its lowermost position.

The lengthening rollers 58 are now operated as

indicated in Figure 8D to feed each wire by a predetermined length, towards the rollers 91 and 104, each roller 104 being operated at the same time as the rollers 58 and 59, to pull the wire fed thereby and pay out the wire in the form of a loop which is supported between the rollers 104 and 91a, between the stations 60 and 80. The rollers 104 and 91 continue to rotate whilst the rollers 58 and 59 are paying out the wires by predetermined lengths, the rollers 91 and 104 thereby functioning always to maintain tension on each wire as it is paid out by the corresponding rollers 58 and 59. The rollers 58 and 59 are stopped after the wire has been paid out to the predetermined length, each roller 104 being thereby relieved of load so that its rotation ceases and it therefore no longer drives the wire (as described with reference to Figure 7).

As shown in Figure 8E, the clamp 57 is moved towards the rollers 56 so that the wires are firmly clamped there between. The rollers 58 are then raised to their initial position. The press ram 82 at the station 80 is now driven through a working stroke so that the blades 83 thereon insert the wires between the header 14 and the rollers 91 and 104 into their respective terminals 2x of the connector 2' at the station 80, the wires being simultaneously severed between the blade 83a and the leading face 14a of the header 14 so that the leads 1' are left attached to the connectors 2 and 2'. As the ram 82 descends, the lever 96 is swung down so that the roller 97 on the support 98 thereof engages and swings the lever 27 of the wire clamp 13 in an anticlockwise direction (as seen in Figures 4A and 4B) so that the wires are again clamped in the wire clamp 13.

As shown in Figure 8F, the rams 62 and 82 are now returned to their top dead center positions and simultaneously, the rollers 91 and 104 are moved apart and the wire clamp 57 is moved away from the roller 56. The connectors 2 and 2' which are now interconnected by leads, are then discharged from the apparatus via the chutes 52c, as shown in Figure 1.

The apparatus may be provided with a continuity tester arranged automatically to determine whether each lead 1' has been securely electrically connected to its terminals at the stations 60 and 80. A continuity test probe unit 30, which is shown in Figure 2, positioned behind the template 64 at the station 60 comprises a plurality of contact probe pins 31 each adapted to be axially moved through an opening 43 (Figure 1A) in the connector 2 at the station 60 and into contact with a terminal 2x thereof. Each pin 31 is electrically connected to a corresponding pin of a similar continuity test probe unit (not shown) arranged behind the connector 2' at the station 80 and is further connected to the control device 200. If each lead is electrically connected to its corresponding terminals in the connectors, a circuit is closed between the terminals of these two connectors and a success signal is displayed by the control device at 200. In the event that electrical continuity is not achieved, the control device 200 operates to stop the apparatus.

In the manufacture of the harness shown in Figure 9B, connectors 2' are arranged in the magazine 52 of the station 80 and connectors 2a and 2d in the magazine of the station 60.

## Claims

1. Wire processing apparatus comprising a base (50), first and second wire treatment stations (60 and 80) arranged in spaced relationship on the base (50), a wire delivery shuttle (10) for conveying a plurality of wires (1) in juxtaposed relationship along a wire feed path (B), through the second station (80) to the first station (60), means (2, 63) for then securing the wires (1) at the first station (60), means for driving the shuttle (10) in reciprocating motion along said path (B) to deliver the wires to said stations (60 and 80), means (55) for feeding the wires (1) from a wire source (WS) for delivery by the shuttle (10) and wire lengthening means (58, 59) disposed upstream of the second station (80) and being actuable axially to advance the wires relative to the shuttle (10) when the wires (1) have been secured at the first station (60) and the shuttle has been retracted from the first station (60), so that the wires (1) form loops of different lengths between the first and the second stations (60 and 80), the wire lengthening means (58, 59) also being deactuable so as to cease advancing the wires (1); characterized by wire tensioning roller means (91, 104) disposed downstream of the second station (80), for paying out the wires (1) as they are advanced by the wire lengthening means (58, 59) so as to tension the wires (1) between the wire tensioning means (91, 104) and the wire lengthening means (58, 59), said rollers comprising a first set of idle rollers (91) disposed on one side of the wire feed path (B) and a second set of driven rollers (104) disposed on the opposite side of the wire feed path (B), drive means (107, 107a) for the rollers (104) of the second set, slip clutch means (108) interposed between the rollers (104) of the second set and the drive means (107, 107a), to cause the rollers (104) of the second set to slip as soon as the wire lengthening means (58, 59) has been deactivated, and means (85, 101) for opening the sets of rollers (91 and 104), to allow the shuttle (10) to pass therebetween and for closing said sets (91, 104) about the wires (1), simultaneously with the actuation of the wire lengthening means (58, 59).

2. Wire processing apparatus comprising a base (50), first and second wire treatment stations (60 and 80) arranged in spaced relationship on the base (50), a wire delivery shuttle (10) for conveying a plurality of wires (1) in juxtaposed relationship along a wire feed path (B), through the second station (80) to the first station (60), means (2, 63) for then securing the wires (1) at the first station (60), means for driving the shuttle (10) in reciprocating motion along said path (B) to deliver the wires to said stations (60 and 80), means (55) for feeding the wires (1) from a wire source (WS) for delivery by the shuttle (10) and wire lengthening means (58, 59) disposed upstream of the second station

indicated in Figure 8D to feed each wire by a predetermined length, towards the rollers 91 and 104, each roller 104 being operated at the same time as the rollers 58 and 59, to pull the wire fed thereby and pay out the wire in the form of a loop which is supported between the rollers 104 and 91a, between the stations 60 and 80. The rollers 104 and 91 continue to rotate whilst the rollers 58 and 59 are paying out the wires by predetermined lengths, the rollers 91 and 104 thereby functioning always to maintain tension on each wire as it is paid out by the corresponding rollers 58 and 59. The rollers 58 and 59 are stopped after the wire has been paid out to the predetermined length, each roller 104 being thereby relieved of load so that its rotation ceases and it therefore no longer drives the wire (as described with reference to Figure 7).

As shown in Figure 8E, the clamp 57 is moved towards the rollers 56 so that the wires are firmly clamped there between. The rollers 58 are then raised to their initial position. The press ram 82 at the station 80 is now driven through a working stroke so that the blades 83 thereon insert the wires between the header 14 and the rollers 91 and 104 into their respective terminals 2x of the connector 2' at the station 80, the wires being simultaneously severed between the blade 83a and the leading face 14a of the header 14 so that the leads 1' are left attached to the connectors 2 and 2'. As the ram 82 descends, the lever 96 is swung down so that the roller 97 on the support 98 thereof engages and swings the lever 27 of the wire clamp 13 in an anticlockwise direction (as seen in Figures 4A and 4B) so that the wires are again clamped in the wire clamp 13.

As shown in Figure 8F, the rams 62 and 82 are now returned to their top dead center positions and simultaneously, the rollers 91 and 104 are moved apart and the wire clamp 57 is moved away from the roller 56. The connectors 2 and 2' which are now interconnected by leads, are then discharged from the apparatus via the chutes 52c, as shown in Figure 1.

The apparatus may be provided with a continuity tester arranged automatically to determine whether each lead 1' has been securely electrically connected to its terminals at the stations 60 and 80. A continuity test probe unit 30, which is shown in Figure 2, positioned behind the template 64 at the station 60 comprises a plurality of contact probe pins 31 each adapted to be axially moved through an opening 43 (Figure 1A) in the connector 2 at the station 60 and into contact with a terminal 2x thereof. Each pin 31 is electrically connected to a corresponding pin of a similar continuity test probe unit (not shown) arranged behind the connector 2' at the station 80 and is further connected to the control device 200. If each lead is electrically connected to its corresponding terminals in the connectors, a circuit is closed between the terminals of these two connectors and a success signal is displayed by the control device at 200. In the event that electrical continuity is not achieved, the control device 200 operates to stop the apparatus.

In the manufacture of the harness shown in Figure 9B, connectors 2' are arranged in the magazine 52 of the station 80 and connectors 2a and 2d in the magazine of the station 60.

## Claims

1. Wire processing apparatus comprising a base (50), first and second wire treatment stations (60 and 80) arranged in spaced relationship on the base (50), a wire delivery shuttle (10) for conveying a plurality of wires (1) in juxtaposed relationship along a wire feed path (B), through the second station (80) to the first station (60), means (2, 63) for then securing the wires (1) at the first station (60), means for driving the shuttle (10) in reciprocating motion along said path (B) to deliver the wires to said stations (60 and 80), means (55) for feeding the wires (1) from a wire source (WS) for delivery by the shuttle (10) and wire lengthening means (58, 59) disposed upstream of the second station (80) and being actuable axially to advance the wires relative to the shuttle (10) when the wires (1) have been secured at the first station (60) and the shuttle has been retracted from the first station (60), so that the wires (1) form loops of different lengths between the first and the second stations (60 and 80), the wire lengthening means (58, 59) also being deactuable so as to cease advancing the wires (1); characterized by wire tensioning roller means (91, 104) disposed downstream of the second station (80), for paying out the wires (1) as they are advanced by the wire lengthening means (58, 59) so as to tension the wires (1) between the wire tensioning means (91, 104) and the wire lengthening means (58, 59), said rollers comprising a first set of idle rollers (91) disposed on one side of the wire feed path (B) and a second set of driven rollers (104) disposed on the opposite side of the wire feed path (B), drive means (107, 107a) for the rollers (104) of the second set, slip clutch means (108) interposed between the rollers (104) of the second set and the drive means (107, 107a), to cause the rollers (104) of the second set to slip as soon as the wire lengthening means (58, 59) has been deactivated, and means (85, 101) for opening the sets of rollers (91 and 104), to allow the shuttle (10) to pass therebetween and for closing said sets (91, 104) about the wires (1), simultaneously with the actuation of the wire lengthening means (58, 59).

2. Wire processing apparatus comprising a base (50), first and second wire treatment stations (60 and 80) arranged in spaced relationship on the base (50), a wire delivery shuttle (10) for conveying a plurality of wires (1) in juxtaposed relationship along a wire feed path (B), through the second station (80) to the first station (60), means (2, 63) for then securing the wires (1) at the first station (60), means for driving the shuttle (10) in reciprocating motion along said path (B) to deliver the wires to said stations (60 and 80), means (55) for feeding the wires (1) from a wire source (WS) for delivery by the shuttle (10) and wire lengthening means (58, 59) disposed upstream of the second station



(80) and being actuatable axially to advance the wires relative to the shuttle (10) when the wires (1) have been secured at the first station (60) and the shuttle has been retracted from the first station (60), so that the wires (1) form loops of different lengths between the first and the second stations (60 and 80), the wire tensioning means (58, 59) also being deactuatable so as to cease advancing the wires (1); characterized by wire tensioning roller means (91, 104) disposed downstream of the second station (80), for paying out the wires (1) as they are advanced by the wire lengthening means (58, 59) so as to tension the wires (1) between the wire tensioning roller means (91, 104) and the wire lengthening means (58, 59); and in that the shuttle comprises a wire clamp (13) and a header (14) connected to the wire clamp (13) by springs (20) receiving the wires (1) so that leading ends thereof extend through passages (81) in the header (14), an abutment (64a) at the first wire treatment station (60) disposed in the path (B) of the header (14) serving to compress the springs (20) by engagement with the header (14) to cause the leading end portions of the wires (1) to project from the header (14) into the first station (60).

3. Apparatus according to claim 2, characterized in that the springs (20) are supported by rods (17) which are retractable towards the wire clamp (13) against the action of the springs (20) and are deflectable with respect to the wire clamp (13), abutment means (65 and 95) being provided at the wire treatment stations (60 and 80) for deflecting the header (14) with respect to the wire clamp (13) to locate the leading end portions of the wires (1) at said stations (60 and 80).

4. Apparatus according to claim 3, characterized in that the first station (60) comprises a ram (62) for inserting the leading end portions of the wires (1) into terminals (2x) of an electrical connector (2) at the first station (60) and a template (64) for guiding the leading end portions into the terminals (2x), the template (64) having a bottom plate (68) upon which the leading end portions are laid by virtue of the deflection of the header (14), means being provided for displacing the bottom plate (68) to allow the leading end portions to be inserted into the terminals (2x) as the ram (62) moves through its working stroke.

5. Apparatus according to claim 1 or 2, characterized in that the shuttle (10) comprises a wire clamp (13) having a clamping member (21) which is moveable by means of a first lever (22) thereon to clamp the wires (1) to the wire clamp (13) and which is moveable by means of a second lever on the wire clamp (13) to release the wires from the wire clamp (13), means (96) being provided at the second wire treatment station (80) for engaging the first lever (22) to clamp the wire, and means (75) being provided at the first wire treatment station (60) for engaging the second lever (26) to release the wires so as to allow the shuttle (10) to be moved from the first station (60) to the second station (80).

6. Apparatus according to claim 1 or 2, charac-

terized in that each wire treatment station (60 and 80) comprises a wire insertion press (61 and 81) and means (51) for supporting an electrical connector (2 or 2') in operative relation thereto, the press (81) at the second station (80) comprising means (14a, 83a) for severing the wires upstream of the connector (2') at such station (80) when the wires (1) have been terminated by the press (81) thereat.

7. Apparatus according to claim 6, characterized in that each connector supporting means (51) has a connector receiving channel (51a) and means (52b) for driving connectors (2 or 2') along the channel (51a) from a connector storage magazine (52) into said operative relation, the connector driving means (52b) serving to eject the connectors (2 and 2') from the apparatus when the wires (1) have been terminated to the connectors (2 and 2').

8. Apparatus according to claim 6, characterized in that the channels (51a) of the connector supporting means (51) extend parallel to one another and at right angles to the path of movement (B) of the shuttle (10), each magazine (52) being positioned at one end of the corresponding channel (51a) and a connector discharge chute (52c) extending from the opposite end of the channel (51a), the magazines (52) being positioned on the same side of the path of movement (B) of the shuttle (10).

#### Patentansprüche

1. Drahtbearbeitungsgerät mit einer Basis (50), ersten und zweiten Drahtbearbeitungsstationen (60 und 80), die in beabstandeter Beziehung auf der Basis (50) angeordnet sind, einem Drahtlieferungsschlitten (10) zur Förderung einer Vielzahl von Drähten (1) in nebeneinanderliegender Beziehung entlang eines Drahtförderpfades (B), und zwar durch die zweite Station (80) zur ersten Station (60), Einrichtungen (2, 63) zur darauf folgenden Festlegung der Drähte (1) an der ersten Station (60), Einrichtungen zum Antrieb des Schlittens (10) in hin- und hergehender Bewegung entlang des pfades (B), um die Drähte an die Stationen (60 und 80) zu liefern, Einrichtungen (55) zur Zufuhr der Drähte (1) aus einer Drahtquelle (WS) zur Abgabe durch den Schlitten (10), und Drahtablängeinrichtungen (58, 59), die stromaufwärts der zweiten Station (80) angeordnet und axial derart betätigbar sind, daß sie die Drähte relativ zum Schlitten (10) verschieben, wenn die Drähte (1) an der ersten Station (60) festgelegt worden sind und der Schlitten aus der ersten Station (60) zurückgezogen wurde, so daß die Drähte (1) Schleifen mit unterschiedlichen Längen zwischen der ersten und der zweiten Station (60 und 80) bilden, wobei die Drahtablängeinrichtung (58, 59) auch deaktivierbar ist, so daß das Verschieben der Drähte (1) beendet wird, dadurch gekennzeichnet, daß Drahtspannungsrollen-Einrichtungen (91, 104) stromabwärts der zweiten Station (80) angeordnet sind, um die Drähte (1) abzugeben, während sie durch die



Drahtablängeeinrichtung (58, 59) vorgeschoben werden, so daß die Drähte (1) zwischen der Drahtspanneinrichtung (91, 104) und der Drahtablängeeinrichtung (58, 59) gespannt werden, daß die Rollen einen ersten Satz von Leerlaufrollen (91) umfassen, der an einer Seite des Drahtförderpfades (B) angeordnet ist, sowie einen zweiten Satz von angetriebenen Rollen (104), der an der gegenüberliegenden Seite des Drahtförderpfades (B) angeordnet ist, daß Antriebseinrichtungen (107, 107a) für die Rollen (104) des zweiten Satzes vorgesehen sind, daß Rutschkupplungseinrichtungen (108) zwischen den Rollen (104) des zweiten Satzes und der Antriebseinrichtung (107, 107a) vorgesehen sind, um zu bewirken, daß die Rollen (104) des zweiten Satzes rutschen, sobald die Drahtablängeeinrichtung (58, 59) deaktiviert worden ist, und daß Einrichtungen (85, 101) zum Öffnen der Sätze von Rollen (91 und 104) vorgesehen sind, um dem Schlitten (10) zu ermöglichen, dazwischen hindurchzutreten, und um die Sätze (91, 104) um die Drähte (1) zu schließen, und zwar gleichzeitig mit der Betätigung der Drahtablängeeinrichtung (58, 59).

2. Drahtbearbeitungsgerät mit einer Basis (50), ersten und zweiten Drahtbearbeitungsstationen (60 und 80), die im Abstand zueinander auf der Basis (50) angeordnet sind, ferner mit einem Drahtlieferungsschlitten (10) zur Förderung einer Vielzahl von Drähten (1) in nebeneinanderliegender Beziehung entlang eines Drahtförderpfades (B) durch die zweite Station (80) hindurch zur ersten Station (60), Einrichtungen (2, 63) zur nachfolgenden Festlegung der Drähte (1) an der ersten Station (60), Einrichtungen zum Antreiben des Schlittens (10) in hin- und hergehender Bewegung entlang des Pfades (B) zur Abgabe der Drähte an die Stationen (60 und 80), Einrichtungen (55) zur Förderung der Drähte (1) von einer Drahtquelle (WS) zur Abgabe durch den Schlitten (10), und mit Drahtablängeeinrichtungen (58, 59), die stromaufwärts der zweiten Station (80) angeordnet sind und derart axial betätigbar sind, daß sie die Drähte relativ zum Schlitten (10) verschieben, wenn die Drähte (1) an der ersten Station (60) festgelegt worden sind und der Schlitten aus der ersten Station (60) zurückgezogen worden ist, so daß die Drähte (1) Schleifen mit unterschiedlichen Längen zwischen der ersten und zweiten Station (60 und 80) bilden, wobei die Drahtspanneinrichtung (58, 59) auch deaktivierbar ist, so daß der Vorschub der Drähte (1) beendet wird, dadurch gekennzeichnet, daß Drahtspannrollen-Einrichtungen (91, 104) stromabwärts der zweiten Station (80) angeordnet sind, um Drähte (1) abzugeben, während diese durch die Drahtablängeeinrichtungen (58, 59) vorgeschoben werden, um auf diese Weise die Drähte (1) zwischen der Drahtspannrollen-Einrichtung (91, 104) und der Drahtablängeeinrichtung (58, 59) zu spannen, und daß der Schlitten eine Drahtklemme (13) und ein Kopfteil (14) umfaßt, welches mit der Drahtklemme (13) durch Federn (20) verbunden ist und die Drähte (1) derart aufnimmt, daß die voreilenden Enden der Drähte sich durch Durchgänge (81)

in dem Kopfteil (14) erstrecken, daß ein Anschlag (64a) an der ersten Drahtbearbeitungsstation (60) in dem Pfad (B) des Kopfteils (14) angeordnet ist und dazu dient, die Federn (20) durch Eingriff mit dem Kopfteil (14) zusammenzudrücken, um zu bewirken, daß die voreilenden Endabschnitte der Drähte (1) von dem Kopfteil (14) in die erste Station (60) hineinragen.

3. Gerät nach Anspruch 2, dadurch gekennzeichnet, daß die Federn (20) durch Stäbe (17) getragen sind, welche zur Drahtklemme (13) gegen die Wirkung der Federn (20) zurückziehbar und bezüglich der Drahtklemme (13) auslenkbar sind, daß Anschlagvorrichtungen (65 und 95) an den Drahtbearbeitungsstationen (60 und 80) vorgesehen sind, um das Kopfteil (14) bezüglich der Drahtklemme (13) abzulenken, so daß die voreilenden Endabschnitte der Drähte (1) an den Stationen (60 und 80) positioniert werden.

4. Gerät nach Anspruch 3, dadurch gekennzeichnet, daß die erste Station (60) einen Stößel (62) zum Einsetzen der voreilenden Endabschnitte der Drähte (1) in Anschlüsse (2x) eines elektrischen Verbinders (2) an der ersten Station (60) umfaßt, sowie eine Schablone (64) zum Führen der voreilenden Endabschnitte in die Anschlüsse (2X), daß die Schablone (64) eine Bodenplatte (68) besitzt, auf welche die voreilenden Endabschnitte aufgrund der Ablenkung des Kopfteils (14) gelegt werden, und daß Einrichtungen vorgesehen sind, um die Bodenplatte (68) zu versetzen, so daß die voreilenden Endabschnitte in die Anschlüsse (2X) eingeführt werden können, während sich der Stößel (62) durch seinen Arbeitshub bewegt.

5. Gerät nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Schlitten (10) eine Drahtklemme (13) umfaßt, welche ein Klemmelement (21) besitzt, das Mittels eines daran angebrachten ersten Hebels (22) bewegbar ist, um die Drähte (1) an die Drahtklemme (13) zu klemmen, und welches mittels eines zweiten Hebels auf der Drahtklemme (13) bewegbar ist, um die Drähte von der Drahtklemme (13) zu lösen, daß Einrichtungen (96) an der zweiten Drahtbearbeitungsstation (80) vorgesehen sind, um mit dem ersten Hebel (22) in Eingriff zu treten, so daß der Draht eingeklemmt wird, und daß Einrichtungen (75) an der ersten Drahtbearbeitungsstation (60) vorgesehen sind, um mit dem zweiten Hebel (26) in Eingriff zu treten, so daß die Drähte gelöst werden und es dem Schlitten (10) ermöglicht wird, sich aus der ersten Station (60) in die zweite Station (80) zu bewegen.

6. Gerät nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß jede Drahtbearbeitungsstation (60 und 80) eine Drahteinsetzpresse (61 und 81) umfaßt, sowie Einrichtungen (51) zum Haltern eines elektrischen Verbinders (2 oder 2') in wirkungsmäßiger Beziehung hierzu, daß die Presse (81) an der zweiten Station (80) Mittel (14a, 83a) umfaßt, um die Drähte stromaufwärts des Verbinders (2') an dieser Station (80) abzutrennen, wenn die Drähte (1) durch die dort befindliche Presse (81) angeschlossen worden sind.

7. Gerät nach Anspruch 6, dadurch gekennzeichnet,



zeichnet, daß jede Verbinderhalterungseinrichtung (51) einen Verbinderaufnahmekanal (51a) besitzt, sowie Mittel (52b) zum Antreiben der Verbinder (2 oder 2') entlang des Kanals (51a) von einem Verbinderspeichermagazin (52) in die betriebsmäßige Beziehung, und daß die Verbinderantriebseinrichtung (52b) dazu dient, die Verbinder (2 und 2') aus dem Gerät auszustoßen, wenn die Drähte (1) an die Verbinder (2 und 2') angeschlossen worden sind.

8. Gerät nach Anspruch 6, dadurch gekennzeichnet, daß die Kanäle (51a) der Verbinderhalterungseinrichtung (51) sich parallel zueinander und in rechten Winkeln zum Pfad der Bewegung (B) des Schlittens (10) erstrecken, daß jedes Magazin (52) an einem Ende des entsprechenden Kanals (51a) angeordnet ist, und daß eine Verbinderauslaßschute (52c) sich von dem entgegengesetzten Ende des Kanals (51a) wegerstreckt, wobei die Magazine (52) an der gleichen Seite des Bewegungspfad (B) des Schlittens (10) angeordnet sind.

#### Revendications

1. Appareil de traitement de fils comprenant une embase (50), des premier et second postes (60 et 80) de traitement de fils disposés à distance l'un de l'autre sur l'embase (50), une navette (10) de distribution de fils destinés à transporter plusieurs fils (1) dans une disposition juxtaposée le long d'un trajet (B) d'avance des fils, vers le premier poste (60) en passant à travers le second poste (80), des moyens (2, 63) pour fixer ensuite les fils (1) dans le premier poste (60), des moyens destinés à entraîner la navette (10) en un mouvement alternatif le long dudit trajet (B) pour distribuer les fils vers lesdits postes (60 et 80), des moyens (55) destinés à faire avancer les fils (1) à partir d'une source de fils (WS) pour qu'ils soient distribués par la navette (10) et des moyens (58, 59) d'allongement des fils disposés en amont du second poste (80) et pouvant être mis en action axialement pour faire avancer les fils par rapport à la navette (10) lorsque les fils (1) ont été fixés dans le premier poste (60) et que la navette a été rétractée du premier poste (60), afin que les fils (1) forment des boucles de différentes longueurs entre les premier et second postes (60 et 80), les moyens (58, 59) d'allongement des fils pouvant également être mis hors d'action pour cesser de faire avancer les fils (1); caractérisé par des moyens à galets tendeurs de fils (91, 104) disposés en aval du second poste (80), afin de dérouler les fils (1) pendant qu'ils sont avancés par les moyens (58, 59) d'allongement des fils de façon à tendre les fils (1) entre les moyens tendeurs de fils (91, 104) et les moyens (58, 59) d'allongement des fils, lesdits galets comprenant un premier jeu de galets fous (91) disposés sur un premier côté du trajet (B) d'avance des fils et un second jeu de galets menés (104) disposé sur le côté opposé du trajet (B) d'avance des fils, des moyens d'entraînement (107, 107a) des galets (104) du second jeu, des moyens (108) d'accou-

plement à glissement interposés entre les galets (104) du second jeu et les moyens d'entraînement (107, 107a) pour amener les galets (104) du second jeu à glisser dès que les moyens (58, 59) d'allongement des fils ont été mis hors d'action, et des moyens (85, 101) destinés à ouvrir les jeux de galets (91 et 104) pour permettre à la navette (10) de passer entre eux, et à fermer lesdits jeux (91, 104) sur les fils (1), simultanément à la mise en action des moyens (58, 59) d'allongement des fils.

2. Appareil de traitement de fils comprenant une embase (50), des premier et second postes (60 et 80) de traitement de fils disposés à distance l'un de l'autre sur l'embase (50), une navette (10) de distribution de fils destinée à transporter plusieurs fils (1) dans une disposition juxtaposée le long d'un trajet (B) d'avance de fils, vers le premier poste (60) en passant à travers le second poste (80), des moyens (2, 63) pour fixer ensuite les fils (1) dans le premier poste (60), des moyens destinés à entraîner la navette (10) en un mouvement alternatif le long dudit trajet (B) pour distribuer les fils vers lesdits postes (60 et 80), des moyens (55) destinés à faire avancer les fils (1) à partir d'une source de fils (WS) pour qu'ils soient distribués par la navette (10) et des moyens (58, 59) d'allongement de fils disposés en amont du second poste (80) et pouvant être mis en action axialement pour faire avancer les fils par rapport à la navette (10) lorsque les fils (1) ont été fixés dans le premier poste (60) et que la navette a été rétractée du premier poste (60), de manière que les fils (1) forment des boucles de différentes longueurs entre les premier et second postes (60 et 80), les moyens tendeurs de fils (58, 59) pouvant également être mis hors d'action pour cesser de faire avancer les fils (1); caractérisé par des moyens à galets tendeurs de fils (91, 104) disposés en aval du second poste (80), destinés à dérouler les fils (1) pendant qu'ils sont avancés par les moyens d'allongement de fils (58, 59) pour tendre les fils (1) entre les moyens à galets tendeurs de fils (91, 104) et les moyens d'allongement de fils (58, 59); et en ce que la navette comprend une bride (13) à fils et un collecteur (14) relié à la bride (13) à fils par des ressorts (20) et recevant les fils (1) de manière que leurs extrémités avant s'étendent dans des passages (81) du collecteur (14), une butée (64a), située dans le premier poste (60) de traitement de fils, étant disposée sur le trajet (B) du collecteur (14) et servant à comprimer les ressorts (20) en portant contre le collecteur (14) afin d'amener les tronçons extrêmes avant des fils (1) à faire saillie du collecteur (14) pour pénétrer dans le premier poste (60).

3. Appareil selon la revendication 2, caractérisé en ce que les ressorts (20) sont supportés par des tiges (17) qui peuvent être rétractés vers la bride (13) à fils contre l'action des ressorts (20) et peuvent fléchir par rapport à la bride (13) à fils, des moyens de butée (65 et 95) étant prévus dans les postes (60 et 80) de traitement de fils pour dévier le collecteur (14) par rapport à la bride (13)

à fils afin de placer les tronçons extrêmes avant des fils (1) dans lesdits postes (60 et 80).

4. Appareil selon la revendication 3, caractérisée en ce que le premier poste (60) comprend un coulisseau (62) destiné à insérer les tronçons extrêmes avant des fils (1) dans des bornes (2x) d'un connecteur électrique (2) dans le premier poste (60) et un gabarit (64) destiné à guider les tronçons extrêmes avant dans les bornes (2x), le gabarit (64) comportant une plaque inférieure (68) sur laquelle les tronçons extrêmes avant sont posés du fait de la déviation du collecteur (14), des moyens étant prévus pour déplacer la plaque inférieure (68) afin de permettre aux tronçons extrêmes avant d'être insérés dans les bornes (2x) pendant que le coulisseau (62) effectue sa course de travail.

5. Appareil selon la revendication 1 ou 2, caractérisé en ce que la navette (10) comprend une bride (13) à fils comportant un élément de bridage (21) qui peut être déplacé au moyen d'un premier levier (22) qu'il porte pour brider les fils (1) sur la bride (13) à fils, et qui peut être déplacé au moyen d'un second levier situé sur la bride (13) à fils afin de libérer les fils de la bride (13) à fils, des moyens (96) étant prévus dans le second poste (80) de traitement de fils pour entrer en contact avec le premier levier (22) afin de brider le fil, et des moyens (75) étant prévus dans le premier poste (60) de traitement de fils pour entrer en contact avec le second levier (26) afin de libérer les fils pour permettre à la navette (10) d'être déplacée du premier poste (60) vers le second poste (80).

6. Appareil selon la revendication 1 ou 2, caractérisé en ce que chaque poste (60 et 80) de traitement de fils comprend une presse (61 et 81) d'insertion de fils et des moyens (51) destinés à supporter un connecteur électrique (2 ou 2') en position de travail par rapport à elle, la presse (81) du second poste (80) comprenant des moyens (14a, 83a) destinés à sectionner les fils en amont du connecteur (2') dans ce poste (80) lorsque la presse (81) a réalisé la terminaison des fils (1) dans ce poste.

7. Appareil selon la revendication 6, caractérisé en ce que chacun des moyens (51) de support de connecteur présente une rainure (51a) de réception de connecteur et des moyens (52b) pour entraîner des connecteurs (2 ou 2') le long de la rainure (51a) à partir d'un magasin (52) d'emménagement de connecteurs jusque dans ladite disposition de travail, les moyens (52b) d'entraînement de connecteurs servant à éjecter les connecteurs (2 et 2') de l'appareil après la terminaison des fils (1) sur les connecteurs (2 et 2').

8. Appareil selon la revendication 6, caractérisé en ce que les rainures (51a) des moyens (51) de support de connecteur s'étendent parallèlement entre elles et perpendiculairement au trajet du mouvement (B) de la navette (10), chaque magasin (52) étant placé à une extrémité de la rainure correspondante (51a) et une goulotte (52c) de décharge des connecteurs partant de l'extrémité opposée de la rainure (51a), les magasins (52) étant placés sur le même côté du trajet de mouvement (B) de la navette (10).



\* C L M S \*