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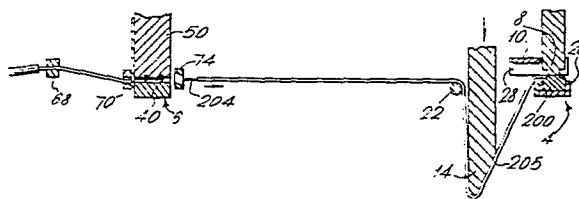
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Method of, and apparatus for, making electrical harnesses.

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For making an electrical harness comprising an electrical connector to each of a plurality of terminals of which an individual insulated wire is connected, wires (202) are fed through a wire stripping station (6) with its stripper ram (50) raised, to a wire connecting station (4), with wire lengthening blades (14) and wire stuffers (8) also raised. The wire stuffers (8) are first lowered to connect the wires (202) to terminals in a connector (200) at the connecting station (4), the lengthening blades (14) are then lowered to form loops in the wires (202) to lengthen them differentially, the ram (50) is then lowered to sever the wires (202), and the insulation thereof back from the ends of the wires. The blades (14) are finally further lowered to cause the severed ends (204) of the wires (202) to be stripped of insulation.



EP 0 000 428 A1

Method of, and apparatus for, making electrical harnesses

5 This invention relates to a method of, and apparatus for, making line connections in the form of electrical harnesses.

 We have described in our United States Patent Specification No. 3,939,552, a method of making an electrical harness comprising an electrical connector provided with a plurality of electrical terminals having
10 wire receiving members electrically connected to individual insulated wires, the method comprising the steps of; positioning the connector at a first station. feeding one end portion of each wire to the first station in a single pass, by way of a second station
15 which is spaced from the first station by a distance not exceeding the length of any of the wires; forming a loop in a wire between the first and second stations; applying to each wire, at the second station, an insulation severing blade to sever the insulation of
20 the wire at a position upstream of the loops and a wire severing blade to sever the wire at a position upstream of the severed end of the insulation of the wire; and imparting an axial force to the wire to cause the insulation to be stripped therefrom by the insulation
25 severing blade, between the insulation severing blade and the severed end of the wire.

 There is also described in the above mentioned United States Patent Specification, apparatus for making an electrical harness comprising an electrical connector
30 provided with a plurality of electrical terminals having

wire receiving members electrically connected to individual insulated wires, the apparatus comprising a shuttle; means on the shuttle for gripping end portions of a plurality of insulated wires in juxtaposed relationship; a track along which the shuttle is movable; 5 a first station having a support for positioning the connector; a second station spaced from the first station and having a blade for severing each wire and a blade for severing the insulation of each wire at a position 10 between the wire severing blade and the first station; a wire lengthening assembly movable to engage a wire to form a loop therein, means for imparting an axial force to each wire when it has been severed, to cause the insulation to be stripped therefrom between the insulation 15 severing blade and the severed end of the wire, and a mechanism for moving the shuttle along the track to the first station by way of the second station, whereby each wire is connected to a terminal of the connector and the severed end portions of the wire are stripped of 20 insulation.

The present invention is intended to provide a simplified method and apparatus of the kind defined above and which is especially suitable for the manufacture of harnesses incorporating a multiplicity of different length 25 wires and a connector having terminals of the slotted plate type.

According to one aspect of the invention, a method as defined in the second paragraph of the present specification is characterised in that the wires are 30 formed with loops of different lengths and the one end portion of each wire is secured at the first station by engaging it with the wire receiving member of a terminal of the connector prior to the formation of the loops which formation is carried out at a third station.

35 According to another aspect of the invention,

apparatus as defined in the third paragraph of the present specification is characterised in that the wire lengthening assembly co-operates with a third station positioned between the first and second stations, the
5 shuttle moving mechanism being arranged to move the shuttle, through the second station to the first station in a single pass, and by a wire stuffer assembly
arranged to engage the end portions of the wires with the wire receiving members of the terminals prior to the
10 wire lengthening assembly engaging the wires.

There is also disclosed in United States Patent Specification No. 3,353,571, a mechanism for feeding to an electrical connector, wires of different lengths, but which differs substantially from the apparatus defined
15 above.

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

20 Figure 1 is a perspective view, with part omitted, of apparatus for making electrical harnesses;

Figure 2 is an enlarged perspective view showing a wire shuttle and a wire insertion station of the apparatus;

25 Figure 3 is an enlarged elevation showing a wire lengthening blade assembly of the apparatus;

Figure 4 is an enlarged plan view of a wire lengthening blade pulley mechanism of the apparatus;

Figure 5 is an elevation of the pulley mechanism shown in Figure 4;

30 Figure 6 is an enlarged exploded perspective view showing a wire stripping assembly of the apparatus with parts omitted;

Figure 6A is a fragmentary elevation of a wire stripping blade of the assembly, in the course of
35 manufacture;

Figure 7 is a more greatly enlarged, fragmentary perspective view of the wire stripping assembly, illustrating the operation thereof;

Figure 7A is a cross-section taken on the lines
5 VIIa - VIIa in Figure 7; and

Figures 8 to 15 are fragmentary, diagrammatic, sectional views illustrating successive stages in manufacture of an electrical harness by means of the apparatus.

10 The apparatus is for the manufacture of electrical harnesses (an example of which is best seen, diagrammatically, in Figure 2). Each harness comprises an electrical connector 200, an insulating housing of which contains a plurality of electrical terminals (not
15 shown) into a slot of a wire receiving portion of each of which, one end of an insulated wire 202 has been forced in a direction transverse to the longitudinal axis of the wire, to make secure electrical contact between the terminal and the wire which is thus firmly
20 mechanically coupled at its one end to the connector 200. A connector of this kind is disclosed, for example, in our United States Patent Specification No. 3,760,335.

Usually, approximately twenty separate wires
25 202 are each coupled to the connector 200, the wires 202 being of different lengths and portions 204 of the other ends of the wires 202 having been stripped of insulation so that individual electrical connecting means (not shown) can be crimped or soldered to the stripped
30 end portions 204 of the wires 202. The lengths of insulation stripped from end portions 204 will not be the same in the case of each wire, if the end portions 204 are not all to be terminated in the same way.

The apparatus will now be described with reference to Figures 1 to 7a.

35 The apparatus comprises, as shown in Figure 1,

a wire insertion first station 4 and a wire stripping second station 6, provided on a frame 114. A wire shuttle 60 mounted for horizontal reciprocating movement on the frame 114 is shown in Figure 1 as being

5 positioned at the wire stripping station 6. The shuttle 60 can be moved by means of a handle 62, through a working stroke up to the station 4, and through a return stroke back to the station 6.

10 The wire insertion station 4 comprises an elongate, horizontal connector positioning jig 26 (Figure 2) along which connectors 200 are slidable. A vertically reciprocating wire stuffer ram (not shown) is actuatable by means of a push button switch 24 (Figure 1) to drive an assembly of wire stuffers 8 through a working stroke
15 towards the jig 26 and through a return stroke away therefrom. The jig 26 has a working portion below a template 10 positioned in the path of movement of the stuffers 8, a connector 200 when positioned on the working portion of the jig 26, lying immediately below
20 the template 10 and being located by a guide plate 196 (Figure 2). The template 10 comprises a horizontal top plate having a row of slots 12 (Figures 1 and 2) through each of which one of the wire stuffers 8 penetrates during the working stroke of the wire stuffers 8. The
25 template 10 further comprises a front plate having a row of wire end receiving slots 28 each aligned with one of the slots 12. When a connector 200 is on the working portion of the jig 26 each terminal of the connector 200 is aligned with a single stuffer 8, with a single slot
30 12 and with a single slot 28. We have described a similar template in our United States Patent Specification No. 4,043,017.

A plurality of wire lengthening blades 14, some or all of which are of different lengths, on a support
35 block 13 (Figure 3) extend immediately in front of (as

seen in Figure 2) the wire stuffers 8 and are movable along a vertical path generally parallel to that of the wire stuffers 8 into and out of a channel 15 formed in the frame 114 adjacent to the jig 26 and in alignment with the blades 14. A circular cross-section, cylindrical wire lengthening bar 22 is positioned immediately alongside the channel 15 for co-operation with the blades 14, and extends at right angles to the paths of movement of the stuffers 8 and blades 14. The channel 15 and bar 22 constitute a fixed, wire lengthening third station.

A hand lever 20 pivoted at 190 to a clevis 191 fixedly supported by a vertical rod 100 has a spring loaded bifurcated arm 16 the lower (as seen in Figure 3) end of which has notches 18 in which pins 112 on the block 13 can engage. A slide 99 is secured at 104 to a cable 102 extending about a pulley wheel 106. The block 13 is coupled through a pin and slot connection (not shown) to the slide 99 which receives the rod 100, the slide 99 being shown in a lowered position in full lines and in a raised position in broken lines, in Figure 3. The pins 112 displace the arm 16 against the action of its loading spring and engage in the notches 18 as the slide 99 reaches its lowered position. The handle 20 can then be depressed to drive the block 13 down relative to the slide 99 to a position 13' shown in broken lines in Figure 3.

A cable 108 secured to the block 13 and running on pulley wheels 192 carries a counter-weight (not shown).

The wire stripping station 6 comprises a vertically movable wire stripping ram assembly 50 (Figure 1) and a wire stripping block assembly 40 having a plurality of wire stripping blades 42 therein, as shown in Figures 6 and 7. The assembly 40, which has secured to its left hand (as seen in Figure 7) end, a

fixed wire shear blade 115 having a wire shearing edge 116, comprises a plurality of rectangular, wire stripping blade spacer blocks 44 which have been secured together to complete the assembly, by fasteners (not shown), wire stripping blades 42 being secured between the blocks 44. The ram assembly 50 has thereon cam pins 52 and cam members 54, for engaging respective wire guides as explained below, and a movable wire shear blade 56 (see Figure 7). Parallel channels 46 defined by ribs 45 on the blocks 44 extend inwardly from a top, wire receiving surface of each block 44, each channel 46 being of greater width than the diameter of the respective wire 202 that it is to receive. Each blade 42, which consists of a tempered carbon steel plate having a width of approximately 0.02 cm, has one or more upstanding wire stripping members 48 extending from its upper (as seen in Figures 6 and 7) longitudinal edge, each member 48 having a wire receiving slot 49. One plate 42 is illustrated in Figure 6 with three such wire stripping members, referenced 48a, 48b, and 48c, respectively. A blade 42 can readily be manufactured by providing a stamping of thin metal stock with a plurality of slots 49 extending inwardly from one edge thereof, as shown in Figure 6A. A suitable tool can then be used to remove portions of the stamping along such edge, to leave a required number of members 48. The ribs 45 provide lateral support for the members 48.

The shuttle 60 is attached to a shuttle linkage 64 (shown only schematically) for movement by means of the handle 62 along a track 92.

As best seen in Figure 2, the shuttle 60 comprises wire clamp 68, a first wire guide 70 and a second wire guide 74. The clamp 68 is fixed to a clamp support 82, which is in turn attached to the linkage 64. The clamp 68 comprises a base 69 and a clamping bar 88 pivoted

at 90 to one end of the base 69. A latch 84 engaging the free other end of the bar 88 is pivotally mounted adjacent to the support 82. As shown in Figure 2 a plurality of wires extend through the base 69 and are clamped between the base 69 and the clamping bar 88. The latch 84 is rotatable for the purpose of clamping or freeing the wires as required.

The first wire guide 70 comprises an "L" shaped plate comprising a base 80 and a perpendicular flange 73 having a plurality of individual wire receiving through holes 72. The base 80 of the wire guide 70 is attached to the clamp 68, by means of a projection (not shown) engaging in an elongate slot 71 in the base 80 such that the wire guide 70 can slide up to the clamp 68.

The second wire guide 74 which is attached to the clamp 68 and to the first wire guide 72, comprises a vertical plate 75 attached at one end to a guide rod 78 and at the other to a guide rod 78'. The rods 78 and 78' are in turn attached to the first wire guide 70 and to the clamp 68 in such a way that the second wire guide 74 is slidable relatively towards and away from first wire guide 70 and the clamp 68. The entire wire guide and clamping assembly can thus be collapsed until the plate 75 abuts the flange 73 and the flange 73 abuts the clamp 68. A plurality of oval through holes 76, with their major axes extending vertically, are formed in the plate 75, for precisely aligning the leading ends of wires 202.

As the handle 62 is advanced to the right (as seen in Figure 1) a lever 66 is moved, through the linkage 64, in an anti-clockwise direction (as seen in Figure 2) about a shaft 67 to which the lever 66 is keyed. This movement of the handle 62 also causes the support 82 to be advanced along its guide rod 199. A pulley wheel 94 is free to rotate about the

shaft 67, not being keyed thereto. Anti-clockwise
(as seen in Figures 2 and 4) rotation of the lever 66
causes concurrent anti-clockwise rotation of the shaft
67. A lever 98, is also keyed to the shaft 67 below
5 the pulley wheel 94, a rotary camming member 96 being
fixed to the lower (as seen in Figure 5) surface of
the pulley wheel 94, and having steps 97 in its
circumferential edge. During the anti-clockwise rotation
of the levers 66 and 98 about the axis of the shaft
10 67, the rotary cam 96 and the first pulley 94 each remain
stationary. An "L" shaped pawl 99 attached to the outer
end of the lever 98 is spring loaded to engage a step
97 after sufficient rotation of the lever 98, as shown
in broken lines in Figure 4. Upon completion of the
15 rightward (as seen in Figure 1) movement of the handle
62 and thus of the shuttle 60, the pawl 99 engages the
step 97. As the handle 62 is returned to the position
of Figure 1, the pulley wheel 94 rotates in a clockwise
(as seen in Figure 4) direction so that a cable 102,
20 attached to the pulley wheel 94, is drawn in the
direction of the arrow A in Figure 4 during the return
of the shuttle 60 towards the wire stripping station 6,
since the cable 102 is attached to the block 99, the
return movement of the handle 62 towards the wire
25 stripping station 6 causes the wire lengthening blades
14 to descend into the channel 15.

In its fully clockwise position, the lever 98
strikes a limit switch 100 to actuate the ram assembly
50 to descend through a working stroke and to carry out
30 a return stroke.

The operation of the apparatus will now be
described with particular reference to Figures 8 to
15, which illustrate sequentially a single cycle of
operation of the apparatus in which a single harness is
35 produced.

As shown in Figure 8, the insulated wires 202 initially firmly gripped in the clamp 68 extend through the holes 72 of the first wire guide 70. The shuttle 60 is located at the wire stripping station 6 with the first and second wire guides 70 and 74 on opposite sides of the stripping block 40, the ram 50 is in its top dead centre position (Figure 1), the blades 14 and the wire stuffers 8, also being in their uppermost positions at the wire insertion station 4.

As shown in Figure 9, the clamp 68 has been moved, by advancing the handle 62, drawing the wires 202 with it, in a single pass, so that the second wire guide 74 abuts the template 10. The clamp 68 and the first wire guide 70 continue to move after second wire guide 74 has been stopped by the template 10, so that first wire guide 70 moves relatively towards the second wire guide 74, the holes 76 of second wire guide 74 being in precise alignment with wire slots 28 of template 10. The leading end of a wire 202 is shown in Figure 9 just prior its entry into a hole 76. At this stage in the operating cycle of the apparatus, the initial positions of the blades 14 and the wire stuffers 8 remain unchanged.

As shown in Figure 10, the advance of the wire clamp 68 continues until the wire clamp 68 and the first and second wire guides 70 and 74 are all in abutting relationship, so that the leading ends of the wires 202 are passed through the template 10 to position end portions of the wires in alignment between the wire stuffers 8 and the connector 200 in the portion of the jig 26 within the template 10. The shuttle 60 has now completed its advance stroke.

As shown in Figure 11 the stuffers 8 have been moved downwards as the ram thereof descends upon activation of the switch 24, so that the stuffers 8 force the wire portions above the connector 200 laterally

of their axes, down into the slots of the wire receiving members of the terminals of the connector 200, whereby the leading ends of the wires 202 are secured at the station 4, this wire insertion operation being
5 accomplished after the operator has moved the handle 62 to the limit of its rightward (as seen in Figure 1) travel, after which the operator pushes switch 24 to activate the wire stuffer ram.

Figure 12 shows the components 68, 70 and 74 of
10 the shuttle 60 at the beginning of their return stroke with the stuffers 8 remaining in their bottomed position, securing the end portions of wires 202 in the connector 200. The pressure exerted by the clamp 68 on the wires 202 has been released by means of the latch
15 84 so that the wires can move relative to the clamp 68. At the stage shown in Figure 12, the wire lengthening blades 14 are moved downwards, by virtue of the return movement of the handle 62, to enter the channel 15 so that each blade 14 engages one of the wires 202 so that
20 additional wire is drawn from each supply reel and loops 205 of wire are formed between the stations 4 and 6 by co-operation between the blades 14 and the bar 22.

As shown in Figure 13, the clamp 68 and the first wire guide 70 have been retracted past the wire stripping
25 block assembly 40, the second wire guide 74 remaining on the right hand (as seen in Figure 13) side of stripping block assembly 40. The clamp 68 and the guides 70 and 74 have now each returned to their initial positions of Figure 8, the return movement of the handle
30 62 having been completed. The blades 14 complete their downward travel i.e. their working stroke, from their Figure 12 positions, drawing further lengths of wire from the wire supply sources. The length of each loop will of course depend upon the length of the blade 14
35 by which it was formed, as will be apparent from Figure

2. Unequal wire lengths therefore extend between the wire insertion station 4 and the wire stripping station 6. The continued movement of blades 14 is effected by the return movement of handle 62 which generates clockwise (as seen in Figure 4) movement of the pulley 94 so that the cable 102 pulls the blades 14 down as shown in Figure 3 and as described above. At this time, the pins 112, having slightly rightwardly (as seen in Figure 3) displaced the arm 16 on the handle 20, engage in the notches 18 as shown in Figure 3.

As will be apparent from Figure 14, the guides 70 and 74, on opposite sides of stripping block 40 serve to align the wires 202 with respective channels 46 of the stripping block assembly 40. When the lever 98 strikes the limit switch 100, the stripping ram assembly 50 descends through a working stroke towards the assembly 40 forcing down the guides 70 and 74 by means of the cam pins 52 and the cam members 54, respectively, and forcing each wire 202 into a respective one of the channels 46 (as best seen in Figure 7A) so that the walls of the corresponding slot 49 cut through the insulation of the wire. The wire shearing blade 56 of the ram assembly 50 has now moved past the fixed shearing edge 116 of the blade 115 on the block assembly 40, to sever each wire 202, as best seen in Figure 7.

As will appear from Figure 7A, the bottom surface of the ram assembly 50 abuts the top of each wire 202 and the top of the stripping block assembly 40, in the bottom dead centre position of the assembly 50. The depth of each slot 49 is greater than the sum of the insulation thickness of a wire 202 plus the diameter of the electrically conductive core 203 of the wire 202 so that the insulation is effectively severed on three sides of core 203. Figure 7 shows the relative positions of the first and second wire guides 70 and 74 on either

side of the assembly 40. The wire guides precisely align the wires with the channels 46 prior to the insertion of each wire into its appropriate channel by the ram assembly 50; as mentioned above.

5 As shown in Figure 15, the blades 14 are finally driven through a further increment of downward travel. This is effected by the operator depressing the handle 20, as indicated in broken lines in Figure 3, to thrust the block 13 down, through the arm 16. This last
10 increment of movement of the blades 14 pulls the severed end portions of the wires 202 through the channels 46 as best seen (in phantom form) in Figure 7, to strip the severed portions of insulation from the end portions 204 of the wire cores 203. The length of each stripped
15 end portion 204 is dependent upon the spacing between corresponding stripping blade slot 49 and the wire shearing edge 116. The length of insulation to be stripped from each wire core can be predetermined by appropriately choosing the positions of the slotted
20 members 48 on the plates 42 and the positions of the plates 42 in the stripper block assembly 40. As mentioned above new plates 42 can very easily be produced. The wire stuffers 8, the wire lengthening blades 14 and the stripping ram assembly 50 are now returned to their
25 retracted positions of Figure 8.

 The finished harness is pushed rightwardly, as seen in Figure 2, along the jig 26 and thus out of the template 10, a further connector 200 being then positioned
30 on the portion of the jig 26 beneath the template, in preparation for a further cycle of operation of the apparatus.

Claims:

1. A method of making an electrical harness comprising an electrical connector provided with a plurality of electrical terminals having wire receiving members electrically connected to individual insulated wires, the method comprising the steps of; positioning the connector at a first station; feeding one end portion of each wire to the first station in a single pass, by way of a second station which is spaced from the first station by a distance not exceeding the length of any of the wires; forming a loop in a wire between the first and second stations, applying to each wire, at the second station, an insulation severing blade to sever the insulation of the wire at a position upstream of the loops and a wire severing blade to sever the wire at a position upstream of the severed end of the insulation of the wire; and imparting an axial force to the wire to cause the insulation to be stripped therefrom by the insulation severing blade, between the insulation severing blade and the severed end of the wire; characterised in that the wires (202) are formed with loops (205) of different lengths and the one end portion of each wire (202) is secured at the first station (4) by engaging it with the wire receiving member of a terminal of the connector (200), prior to the formation of the loops (205) which formation is carried out at a third station (15, 22).

2. A method according to Claim 1, characterised in that the axial force is imparted to the wire (202) by carrying out an increment of the working stroke of a wire lengthening assembly (14) by means of which the loops (205) are formed.

3. A method according to Claim 1 or 2, characterised in that the position at which the insulation of the wire is severed, varies from wire to wire, in the axial direction of the wire, the wires being

severed in a common plane perpendicular to the longitudinal axes of the wires.

4. A method according to Claim 1, 2 or 3, characterised in that the one end portion (206) of each
5 wire is fed axially into a template (10) at the first station (4), the one end portion (206) being moved into engagement with the wire receiving member of the terminal by means of a wire stuffer (8) moved through an opening (12) in the template laterally of the longitudinal
10 axis of the wire (202).

5. Apparatus for making an electrical harness comprising an electrical connector provided with a plurality of electrical terminals having wire receiving members electrically connected to individual insulated
15 wires, the apparatus comprising a shuttle; means on the shuttle for gripping end portions of a plurality of insulated wires in juxtaposed relationship; a track along which the shuttle is movable; a first station having a support for positioning the connector; a
20 second station spaced from the first station and having a blade for severing each wire and a blade for severing the insulation of each wire at a position between the wire severing blade and the first station; a wire lengthening assembly movable to engage a wire to form a
25 loop therein, means for imparting an axial force to each wire when it has been severed, to cause the insulation to be stripped therefrom between the insulation severing blade and the severed end of the wire, and a mechanism for moving the shuttle along the track, whereby each
30 wire is connected to a terminal of the connector and the severed end portions of the wires are stripped of insulation; characterised in that the wire lengthening assembly (14) co-operates with a third station (15, 22) positioned between the first (4) and second (6) stations,
35 the shuttle moving mechanism (62, 64) being arranged to

move the shuttle (60), through the second station (6) to the first station (4) in a single pass; and by a wire stuffer assembly (8) arranged to engage the end portions (206) of the wires (202) with the wire receiving members of the terminals prior to the wire lengthening assembly (14) engaging the wires (202).

6. Apparatus according to Claim 5, characterised in that the wire lengthening assembly (14) is driven by predetermined distance into engagement with the wires (202) by a first mechanism (94, 100, 102) operated by the shuttle moving mechanism (62, 64), the wire lengthening assembly (14) being moved through a further increment by means of a manually operated second mechanism (16, 18, 20) to impart the axial force to the wires (202).

7. Apparatus according to Claim 5 or 6, characterised in that the insulation severing blades (42) are positioned at different distances from the first station (4).

8. Apparatus according to any one of Claims 5 to 7, characterised in that the shuttle (60) comprises a wire clamp (68) and a pair of wire guides (70 and 74) slidably connected to the wire clamp (68) between the wire clamp (68) and the connector support (26), the wire guides (70 and 74) abutting one another, and one (70) of the wire guides (70 and 74) abutting the clamp (68) when the shuttle (60) is at the first station (4), the wire guides (70 and 74) being spaced from one another in a retracted position of the shuttle (60) to guide the wires in relation to the insulation severing, and wire severing, blades (42 and 115).

9. Apparatus according to any one of Claims 5 to 8, characterised by a template (10) at the first station (4), the template (10) being arranged to guide the end portions (206) of the wires (202) to position

them in alignment with the wire receiving members of the terminals and to guide each of a plurality of wire stuffers of the wire stuffer assembly (8) into engagement with one of the end portions (206) of the wires (202).

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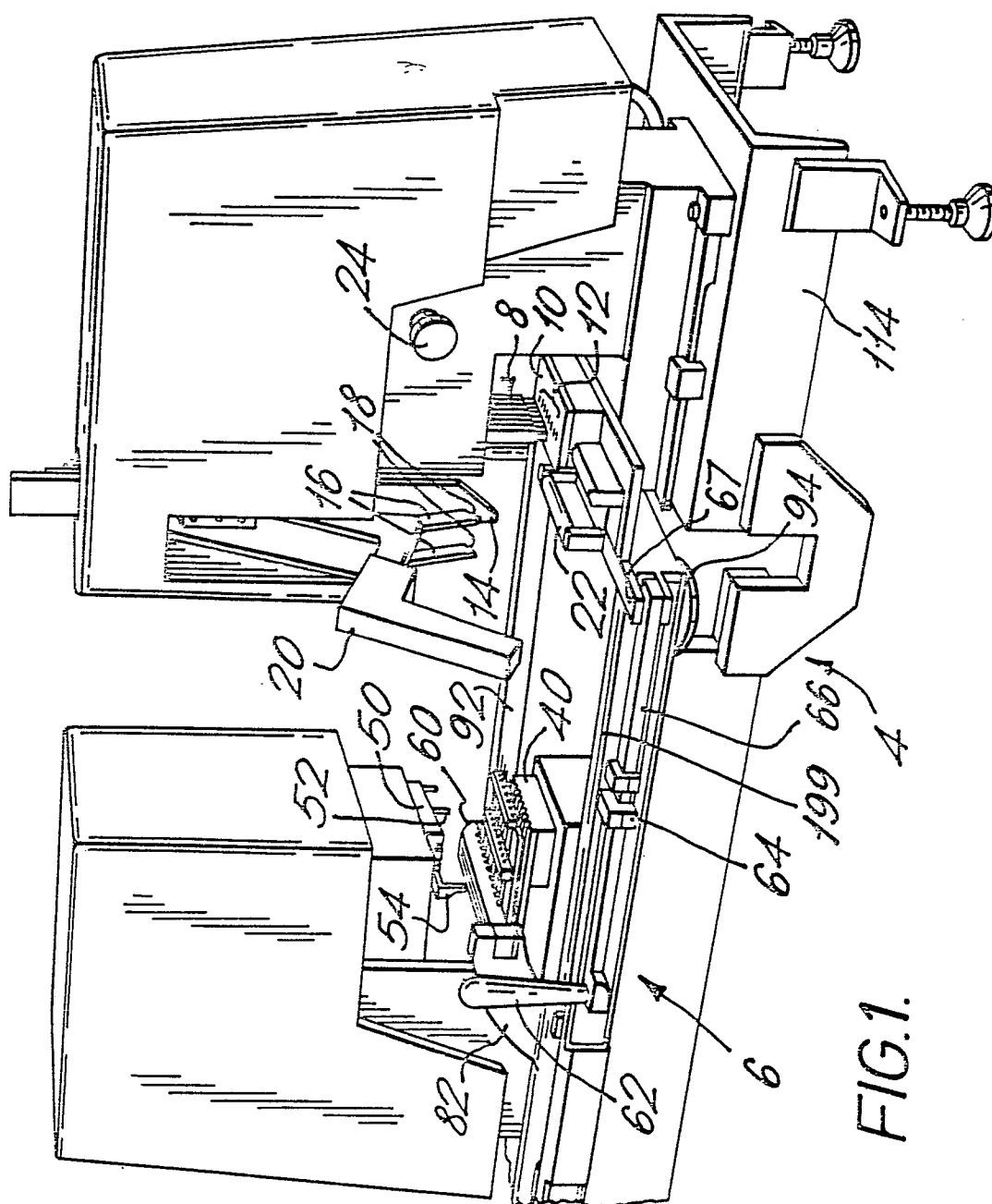
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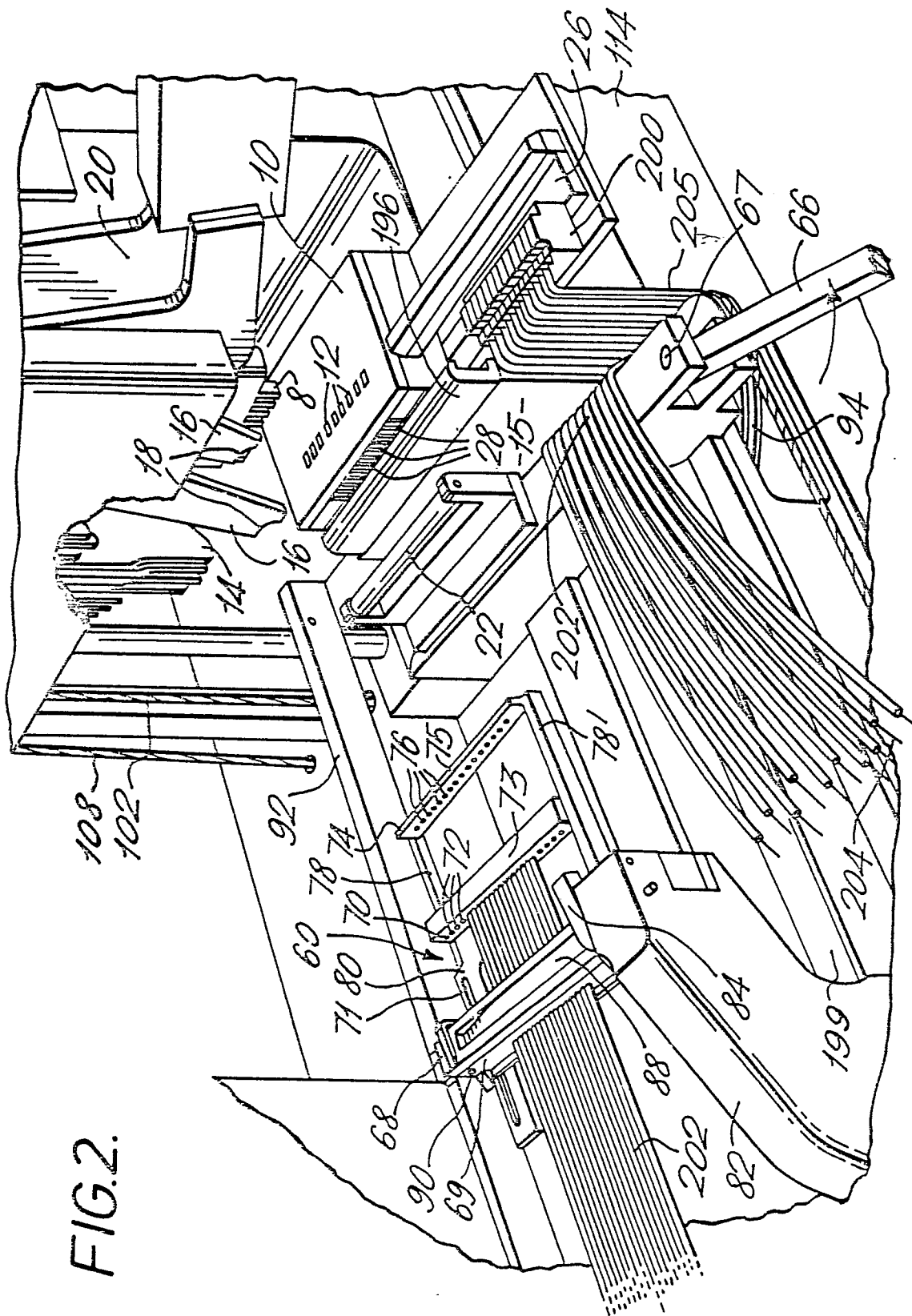
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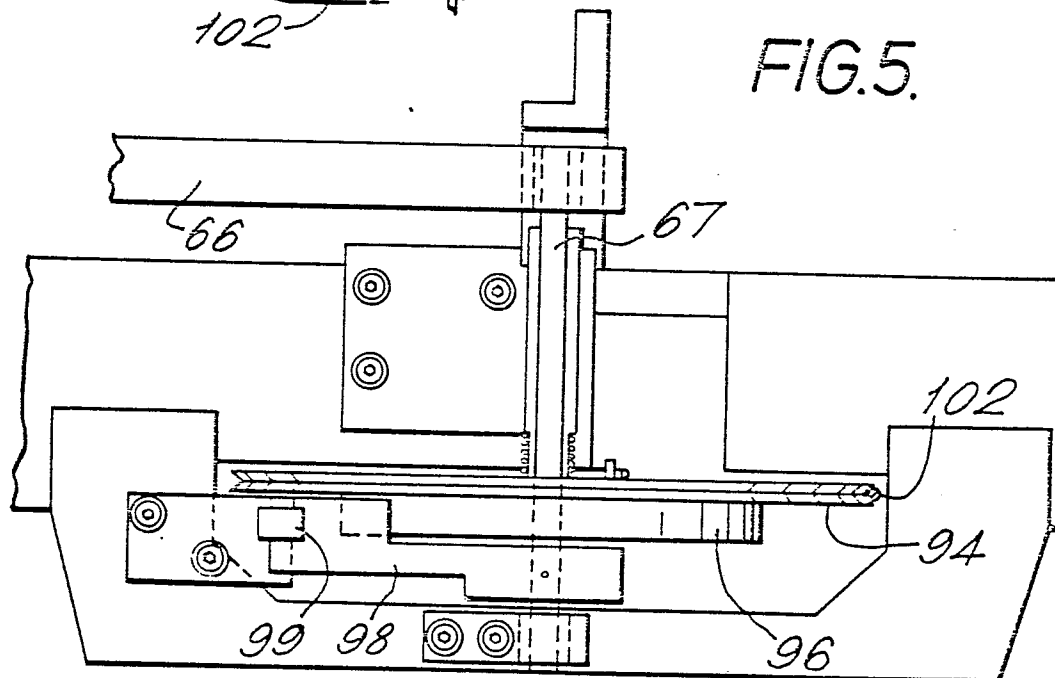
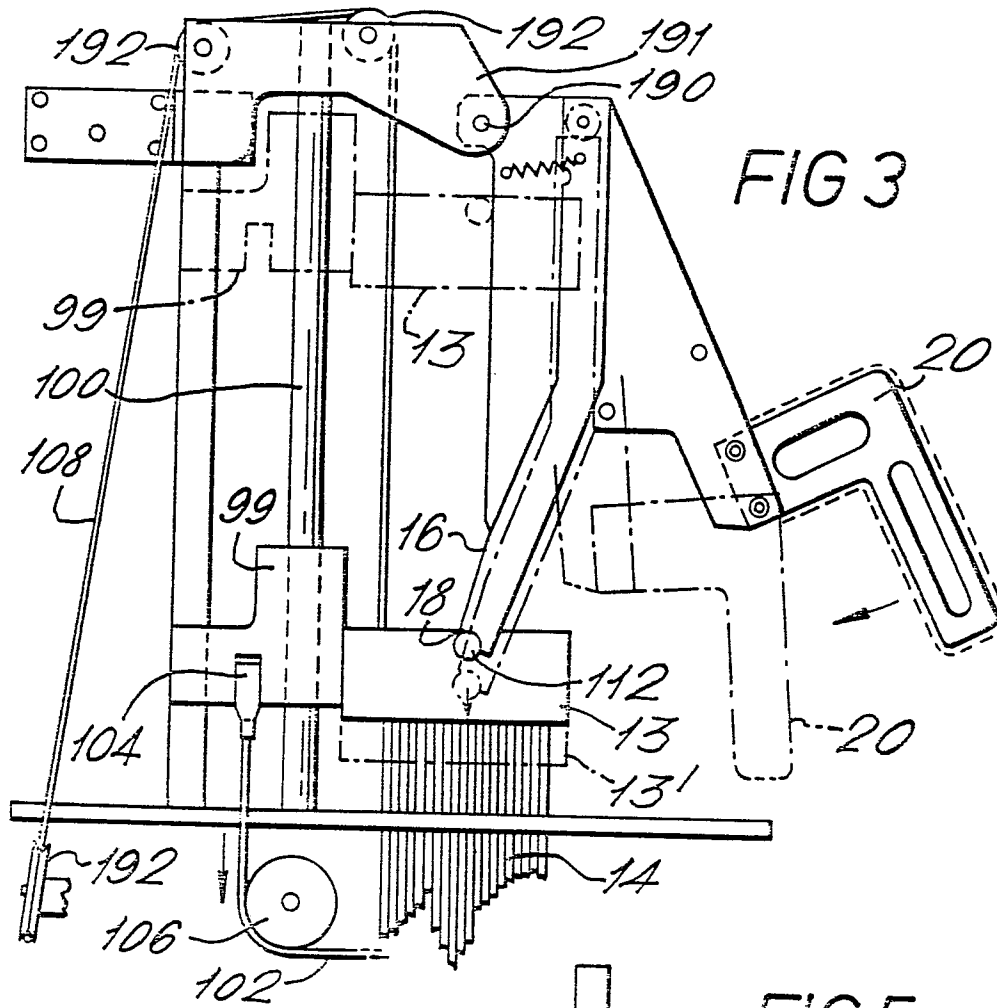
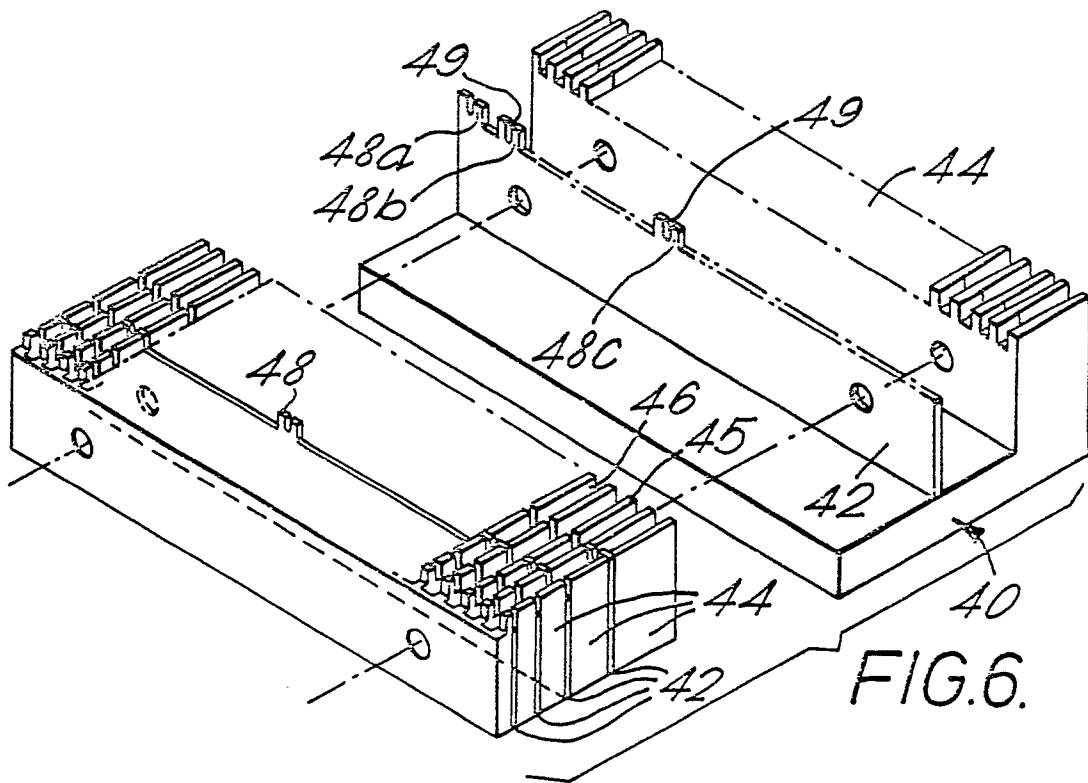
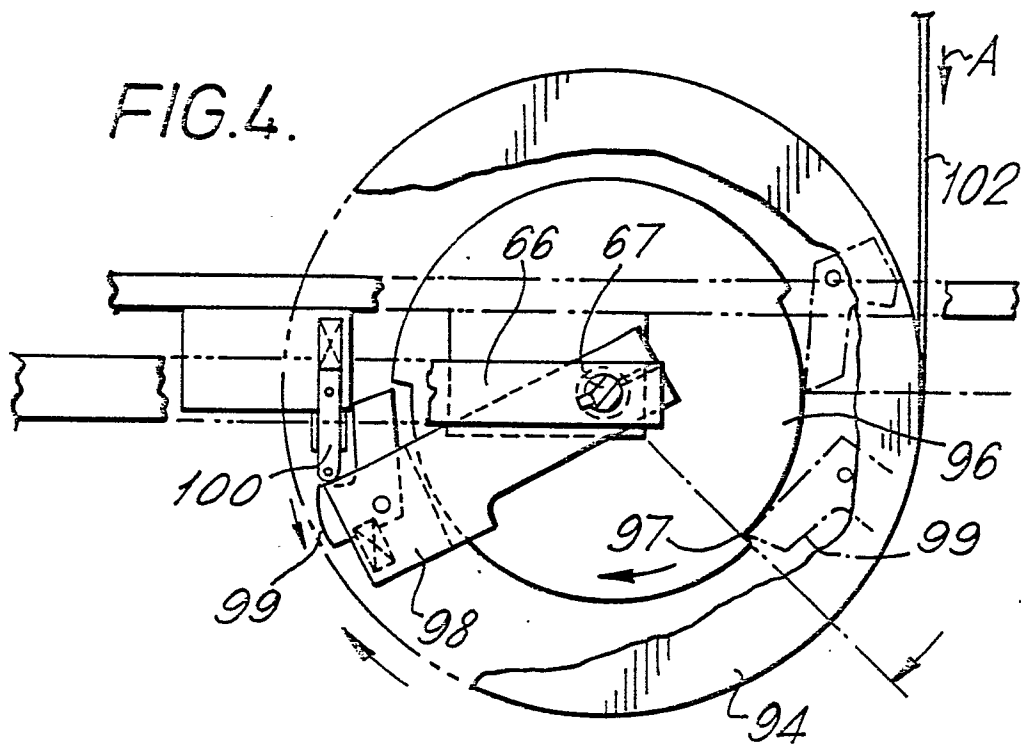


FIG. 4.



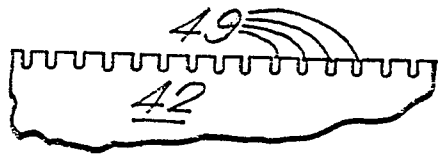


FIG. 6A.

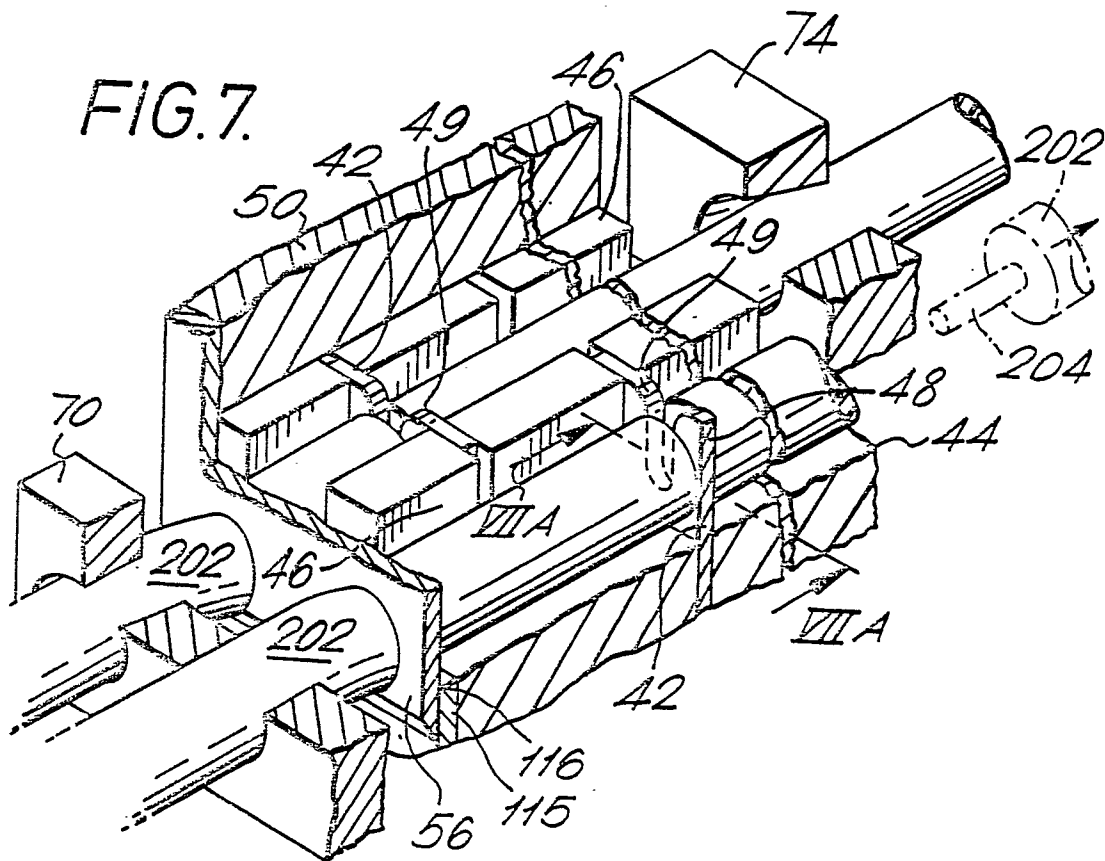
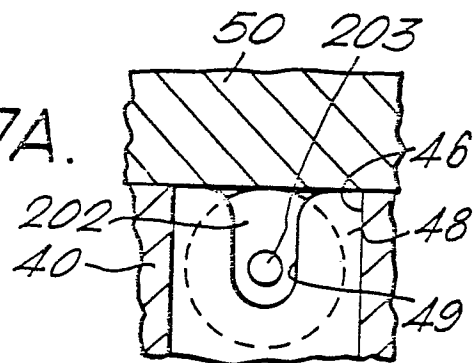


FIG. 7A.



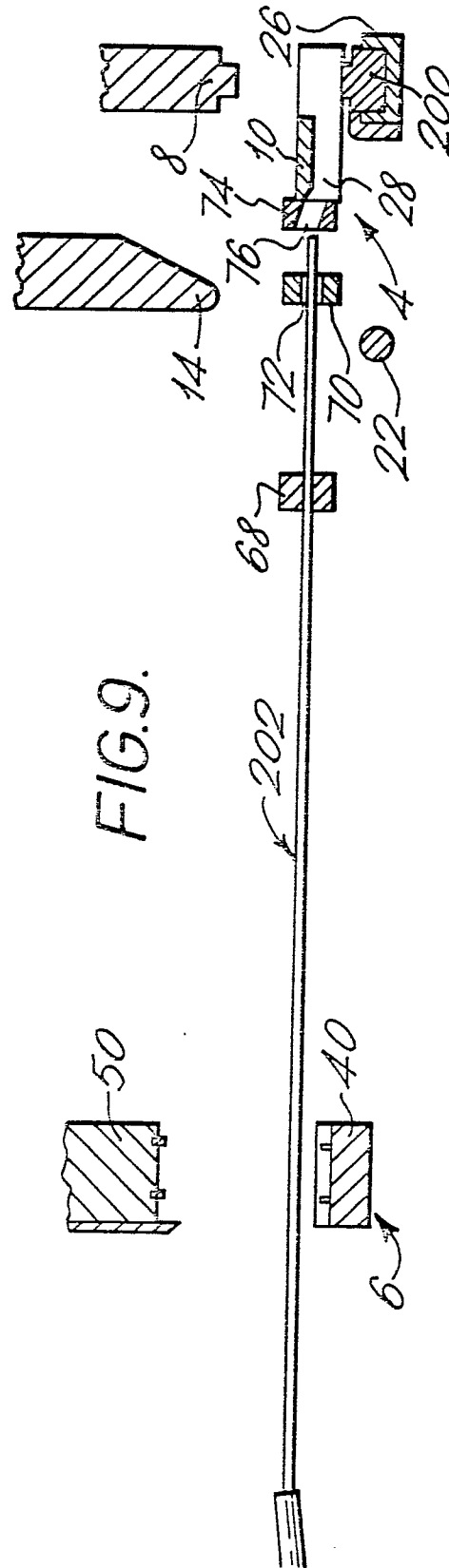
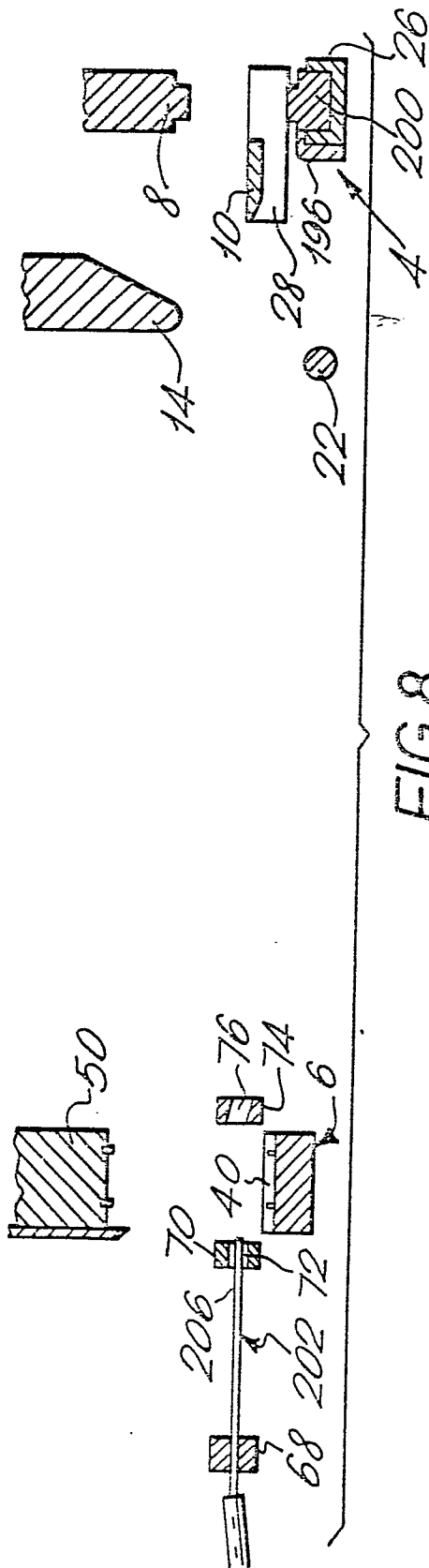


FIG.10.

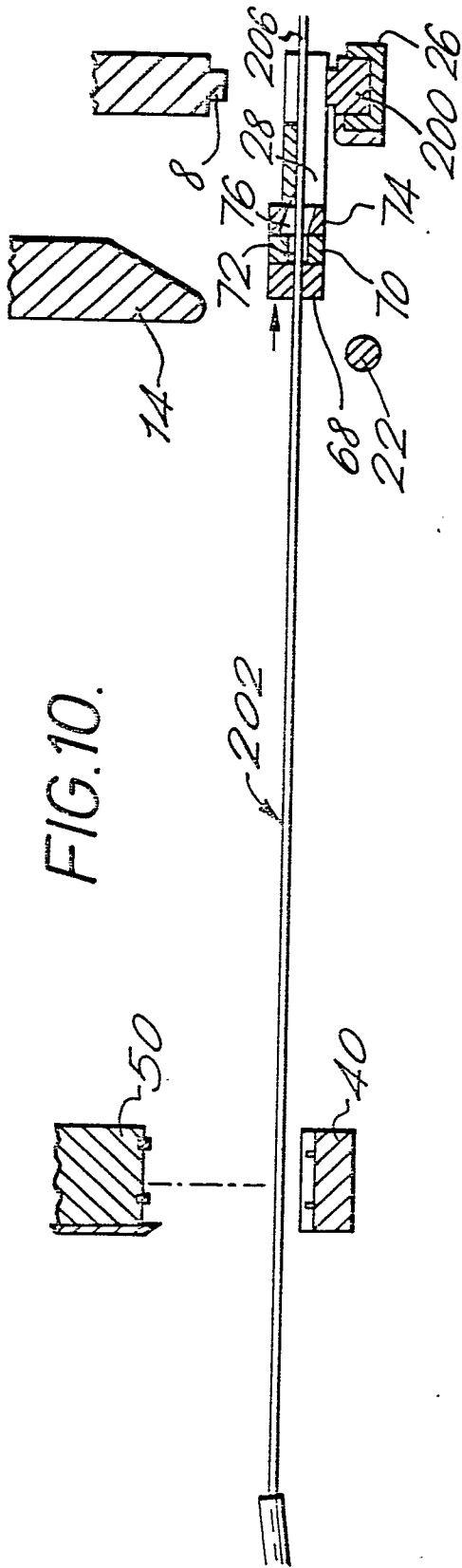
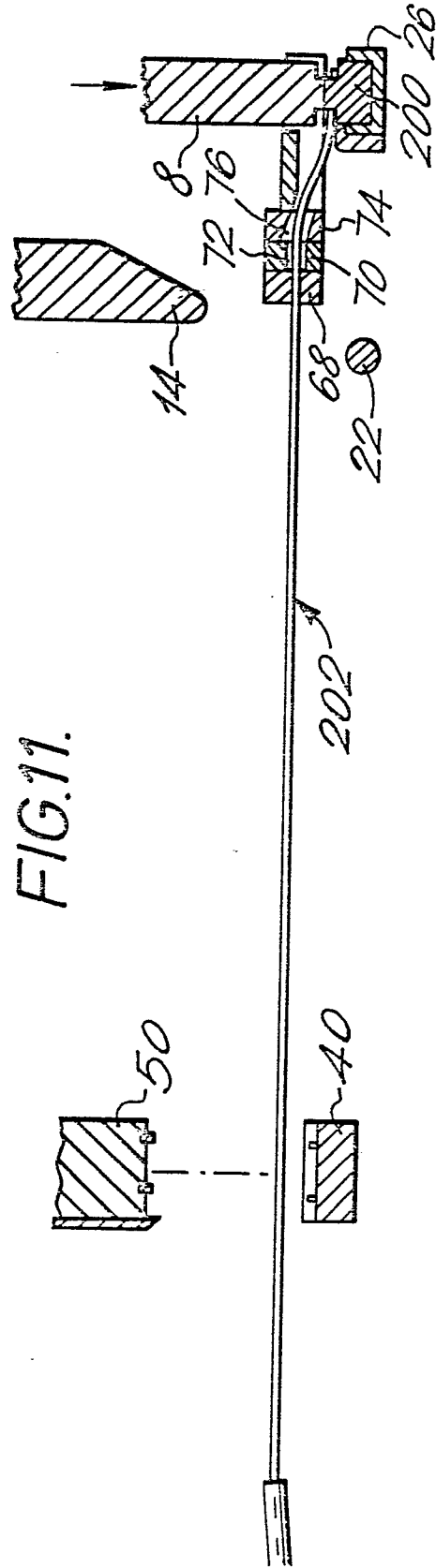
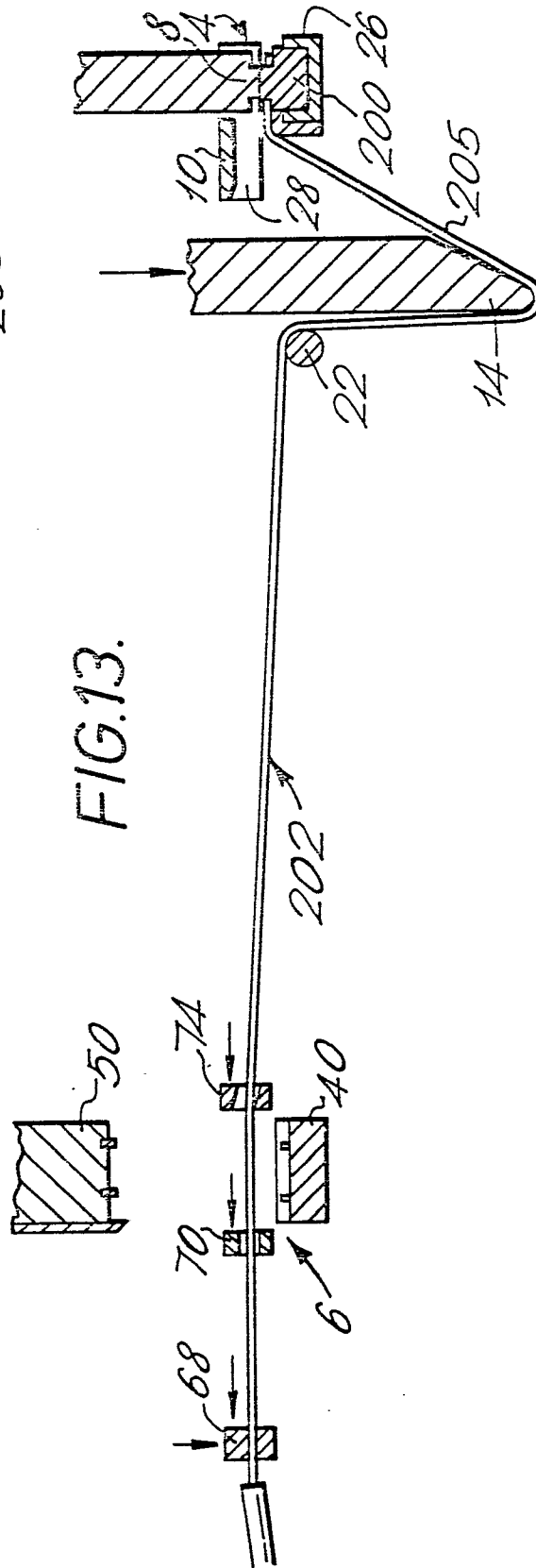
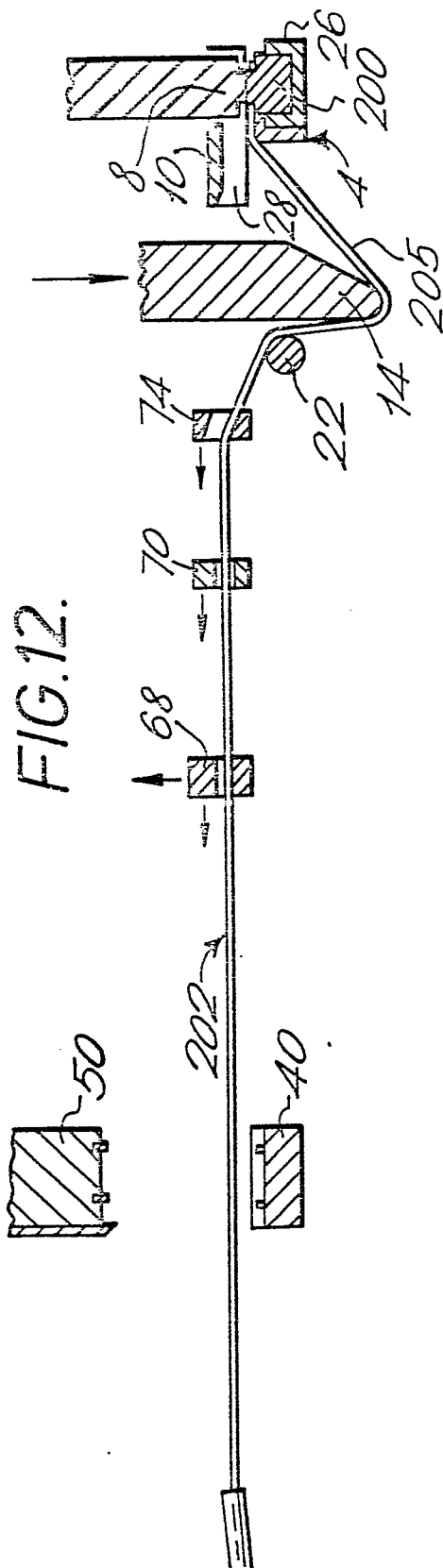


FIG.11.







DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ²)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A,D	<u>US - A - 3 939 552 (AMP)</u> * Column 4, lines 1-68; column 5, lines 1-50; column 6, lines 45-70; column 7, lines 1-64 * --	1-3	H 01 R 43/00
A,D	<u>US - A - 3 353 571 (WESTERN ELECTRIC)</u> * Entire application * --	1,5	
A,D	<u>US - A - 4 043 017 (AMP)</u> * Entire application * ----	1,4,5,8,9.	TECHNICAL FIELDS SEARCHED (Int.Cl. ²) H 01 R 43/00 H 01 R 43/04 H 05 K 13/02 H 01 B 13/00 H 05 K 13/06
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
☒ The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		06-09- 1978	MOBOUCK

