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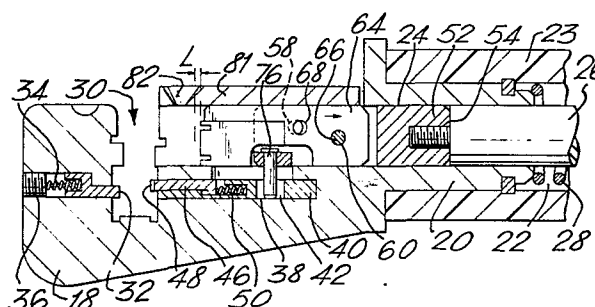
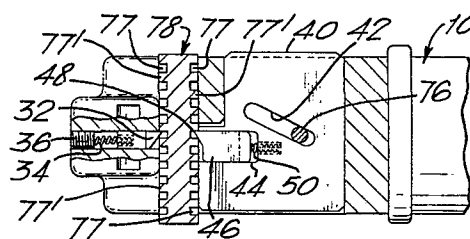
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A hand tool for connecting wires to electrical terminals of an electrical connector.

A hand tool for connecting wires to electrical terminals of an electrical connector (78) comprises a wire insertion head (18) defining a guideway (30) for the connector (78) and a ram (64) for driving wires successively into terminals of the connector (78), which are arranged in a row therealong.

For advancing the connector by a step along the guideway after each wire has been inserted into a terminal, the ram (64) has a depending pin (76) engaging in a transverse slot (42) in a cam plate (40) carrying a spring loaded connector advancing pawl (46) for engaging teeth (77) on the connector (78).



A hand tool for connecting wires to electrical terminals of an electrical connector.

There is disclosed in EP-A1-0,032,616, a hand tool for successively connecting wires to respective
5 electrical terminals arranged in a row extending along a housing of an electrical connector, the tool comprising a wire insertion head, defining a connector guideway, a wire insertion ram, means for driving the ram towards and away from the guideway
10 transversely of the length thereof, and means connected to the ram for advancing the connector step by step along the guideway to bring each terminal in turn into alignment with the ram to allow the ram to connect a wire to the terminal.

15 In this known tool, the connector advancing means comprises a wheel, the periphery of which engages the connector and which is driven by the ram through a link extending beneath the guideway.

The invention is intended to provide a hand
20 tool, in which the actuation of the connector advancing means can be more positively felt by the operator than is the case with the known tool, which is of more compact construction than the known tool, and which can readily be provided with means for adjusting the
25 connector advancing means to comply with the spacing between the terminals of the row.

According to the invention, a hand tool as defined in the first paragraph of this specification is characterised in that the connector advancing means
30 comprises a cam plate formed with a cam slot extending

transversely of the path of movement of the ram and receiving a camming pin which is fixed with respect to the ram, the cam plate carrying a connector advancing pawl arranged to be spring biased into engagement with the connector, the cam plate being drivable by the ram transversely of the path of movement thereof.

The pawl can be arranged to engage teeth on the connector with a snap action during the operation of the connector advancing means, so that the operator is immediately aware that the tool is ready for further operation after a wire has been connected to a terminal of the connector.

The connector advancing means can be substantially completely enclosed in a channel formed in the insertion head and covered by a cover plate.

Advantageously, the ram is received in a yoke member connected to a ram drive shaft, the camming pin extending from the yoke member, a connecting pin being insertable into first bores or alternatively into second bores, in the yoke member and ram, to connect the ram to the yoke member, the first bores being spaced from the second bores lengthwise of the path of movement of the ram, the connector advancing means being thereby adjustable to comply with the spring between the terminals of the row.

For a better understanding of the invention reference will now be made by way of example to the accompanying drawings, in which:-

Figure 1 is a perspective view of a hand tool, according to a first embodiment of the invention, for use in successively connecting wires to respective electrical terminals arranged in a row extending along a housing of an electrical connector;

Figure 2 is a fragmentary section taken on

the lines II - II of Figure 1 showing part of the tool in a first position;

Figure 3 is a view similar to that of Figure 2 but showing the parts in a second and subsequent position;

Figure 4 is a fragmentary section taken on the lines IV - IV of Figure 1 showing the tool when adjusted for use where the terminals of the row have a first centre-to-centre spacing;

Figure 5 is a view similar to that of Figure 4 but showing the tool when adjusted for use where the terminals have a second centre-to-centre spacing;

Figure 6 is an exploded perspective view of an adjustment mechanism of the tool;

Figure 7 is a fragmentary sectional view illustrating a modification of the tool by means of an insert;

Figure 8 is a fragmentary sectional view of a hand tool according to a second embodiment of the invention, for use in successively connecting wires to respective electrical terminals arranged in a row along a housing of an electrical connector; and

Figure 9 is a plan view of the tool of Figure 8 with parts omitted.

As shown in Figure 1, the tool 10 according to the first embodiment comprises hand grip 12 having an actuating lever 14, a full stroke ratchet mechanism constructed according to the teaching of US-A-3,039,337, spanning the free ends of the hand grip 12 and the lever 14.

As its forward end, the tool 10 has an insertion head 18 having a tubular portion 20 (Figures 4 and 5) received in an axial bore 22 of a tool barrel 23 on the hand grip 12. The portion 20 has an axial bore 24 receiving an actuation rod 26. The rod 26 is biased

by a compression spring 28 and is driven by the lever 14 according to the teaching of US-A-3,742,571.

5 The head 18 has a transverse groove 30, as best seen in Figures 4 and 5, to receive an electrical connector 78 of the kind disclosed in US-A-4,243,288. The insulating housing of the connector 78 has on each side thereof a row of pockets 79 (Figure 1) each containing a wire-receiving portion of an electrical terminal (not shown), each wire receiving portion
10 having a wire-receiving slot. The housing of the connector 78 also has on each side thereof a row of indexing slots 77 each of which is aligned with one of the pockets 79, the slots 77 being defined by barriers 77' (Figures 2 and 3) formed on the connector
15 housing. Opening into one wall of the groove 30 is a spring loaded ratchet stop comprising a pawl 32, a loading spring 34, and a screw threaded plug 36. In the opposite wall of the groove 30 is a horizontal slot 38 receiving a cam plate 40 having an oblique
20 slot 42 therein. The forward part of the plate 40 has a recess 44 containing a driving pawl 46 having a connector engaging tooth 48 and being loaded by a compression spring 50, the pawl 46 being parallel with the plate 40.

25 The rod 26 has at its forward end, a yoke member 52 (Figures 4 to 6) with an axial threaded bore 54 receiving a screw threaded end portion of the rod 26. The yoke member 52 has a longitudinally extending channel 56 (Figure 6) with which communicate a first
30 pair of horizontal lateral bores 58 and a second pair of horizontal lateral bores 60 (one shown), and a vertical bore 62 in the base of the channel 56. A wire insertion ram 64 received in the slot 56, is joined to the yoke member 52 by means of a removable
35 pin 66 which can be passed through either of the bores

58 or 60 and through the appropriate bore 68 or 70 in the ram 64. The bottom of the ram 64 is formed with a recess 72, the leading end 74 of the ram 64 being shaped for engaging a wire to drive it into the wire-receiving slot of a terminal of the connector 78. The yoke member 52 also has a pin 76 which depends through the bore 62 into the slot 42 of the plate 40. A ram and wire guide plate 81 secured to the head 18 is provided with a vertical wire slot 82 at its forward end.

In operation, a connector 78 is inserted into the slot 30, as shown in Figure 1, so that the tooth 48 of the pawl 46 engages in a desired one of the slots 77 in the housing of the connector 78, and a wire 80 is inserted into the slot 82. The actuating lever 14 is squeezed against the hand grip 12 driving the actuation rod 26 forward against the restraining action of the spring 28, whereby, the yoke member 52 moves forwardly so that the leading end 74 of the insertion ram 64 engages the wire 80 and drives it into the wire-receiving slot of the terminal of the connector 78, which slot has been aligned with the ram 64, by virtue of the engagement of the pawl 46 in the slot 77. At the same time the forward movement of the yoke member 52 causes a lateral movement of the plate 40 (downward as seen in Figures 2 and 3) by virtue of the engagement of the pin 76 in bore 62 and in the oblique slot 42. At the end of the forward motion of the yoke member 52, the tooth 48 of the pawl 46 slides over the next adjacent barrier 77 on the connector housing (as shown in Figure 3) and engages in the next successive slot 77 with a snap action to index the connector through the tool (upwards as seen in Figures 2 and 3) by one step. The pawl 32 secures the connector 78 against

return movement. Repeated actuation of the lever 14 causes the connector to be indexed step-by-step through the tool so that wires inserted sequentially into the slot 82 can each be connected to one of the
5 terminals on that side of the connector which faces the ram 64.

Since the connector 78 has two opposite rows of terminals it must be passed through the tool twice in order to connect wires to the terminals of each row.

10 The tool can also be adapted for use with a narrower connector (not shown) having only a single row of terminals, by placing an insert 84, Figure 7, in the groove 30 to reduce the width thereof sufficiently to cause the narrower connector to fit
15 snugly in the groove 30. In this case the pawl 32 is replaced by a pawl 32' of a greater length than the pawl 32 and which extends through an opening 85 in the insert 84. In order to adjust the tool to accommodate an electrical connector having a different
20 centre-to-centre spacing between the terminals of the or each row, it is only necessary to remove the pin 66 and realign it with the appropriate bore 58 or 60 in the yoke member 52 and the appropriate bore 68 or 70 in the insertion member 64.

25 According to Figure 4, the pin 66 is positioned in the bores 58 and 68, and according to Figure 5, the pin 66 is positioned in the bores 60 and 70 whereby the travel of ram 64 and thus of the pin 36 is increased by a length L.

30 The second embodiment of the invention will now be described with reference to Figures 8 and 9.

The hand tool of the second embodiment includes an insertion head 112 fixed at one end to a tubular tool barrel 113 receiving a wire insertion ram 114.

35 The head 112 comprises a removable connector guide

member 115.

A channel 118 formed in the head 112 receives a connector indexing mechanism 119 comprising a slidable cam plate 121 mounted on roller bearings 122 located in a track 123 constituted by a recess in the base of the channel 118, and the rotational axes of which extend at right angles to the path of movement of the ram 114. A mounting plate 124 fixed to one end of the cam plate 121 carries a spring biased connector indexing pawl 125. A transversely inclined cam slot 126 is provided adjacent to the other end of the cam plate 121.

A cover plate 127 extending across the channel 118 defines in co-operation with the guide member 115, a guideway 116 for an electrical connector (not shown) of similar type to the connector 78 but having a row of teeth along its base. The cover plate 127 is formed with a slot 128 extending lengthwise of the guideway 116 at a position remote from the ram 114, through which slot 128 the pawl 125 protrudes. A further slot 129 in the plate 127 extends transversely of the slot 128 near that end of the plate 127 which is remote from the slot 128. A camming pin 131 screw threaded into the ram 114, projects through the slot 129 into the slot 126.

The rotational axes of the bearings 122 also extend at right angles to the length of the guideway 116.

The ram 114 and barrel 113 are respectively connected to an actuating lever (not shown) and to a hand grip (not shown), which may be similar to those described above with reference to the first embodiment.

In operation, with a connector (not shown) received in the guideway 116, forward movement of

the ram 114 upon the actuating lever being squeezed,
causes the pin 131 to move along the cam slot 126
so that the cam plate 121 is moved transversely of
the direction of advance of the ram 114, as indicated
5 by the arrow in Figure 9, the pawl 125 being depressed
by a tooth on the base of the connector against the
action of the spring of the pawl 125 and subsequently
rising with a snap action. As the ram 114 returns,
the movement of the cam plate 121 is reversed so that
10 the pawl 125 engages the tooth, to advance the connector
by one step along the guideway 116 to bring the next
successive terminal into alignment with the ram 114.

The plates 121 and 127 and their associated
parts can readily be assembled to the insertion head
15 prior to the assembly of the connector guide member
115, the ram 114 and the pin 131.

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Claims:

1. A hand tool for successively connecting wires to respective electrical terminals arranged in a row extending along a housing of an electrical connector, the tool comprising a wire insertion head (18 or 112), defining a connector guideway (30 or 116), a wire insertion ram (64 or 114), means (14, 28) for driving the ram (64 or 114) towards and away from the guideway (30 or 116) transversely of the length thereof, and means (46 or 125) connected to the ram (64 or 114) for advancing the connector step by step along the guideway (30 or 116) to bring each terminal in turn into alignment with the ram (64 or 114) to allow the ram (64 or 114) to connect a wire to the terminal, characterised in that the connector advancing means comprises a cam plate (40 or 121) formed with a cam slot (42 or 126) extending transversely of the path of movement of the ram (64 or 114) and receiving a camming pin (76 or 131) which is fixed with respect to the ram (64 or 114), the cam plate (40 or 121) carrying a connector advancing pawl (46 or 125) arranged to be spring biased into engagement with the connector, the cam plate (40 or 121) being drivable by the ram (64 or 114) transversely of the path of movement thereof.

2. A tool according to Claim 1, characterised in that the cam plate (40 or 121) is slidably mounted in a recess in the insertion head (18 or 112), the cam slot (42 or 126) being remote from the pawl (46 or 125) and the pin (76 or 131) projecting into the recess through an opening in the insertion head (18 or 112).

3. A tool according to Claim 1 or 2, characterised in that the ram (64) is received in a yoke member (52) connected to a ram drive shaft (26),

the camming pin (76 or 131) extending from the yoke member (52), a connecting pin (66) being insertable into first bores (58 and 68) or alternatively into second bores (60 and 70), in the yoke member (52) and ram (64), to connect the ram (64) to the yoke member (52), the first bores (58 and 68) being spaced from the second bores (60 and 70) lengthwise of the path of movement of the ram (64).

4. A tool according to Claim 3, characterised in that the ram (64) is received in an axial channel (56) in the yoke member (52), the camming pin (76) being slidably received in an opening (62) in the bore of the channel (56), the first and second bores (58 and 68) and (60 and 70) comprising bores (58 and 60) formed in the walls of the channel (56) and through bores (68 and 70) in the ram (64).

5. A tool according to any one of the preceding claims, characterised in that the pawl (46) is mounted in a recess (44) in the cam plate (40) and is parallel therewith, a biasing spring (50) for the pawl (46) also being mounted in the recess (44).

6. A tool according to any one of the preceding claims, characterised in that a spring loaded ratchet stop (32) projects from a side wall of the guideway (30), which is remote from the ram (64), in substantial alignment with the pawl (46).

7. A tool according to Claim 6, characterised by an insert (84) positioned in the guideway (30) against that said remote side wall thereof to reduce the width of the guideway (30), the ratchet stop (32) protruding through an opening (85) in the insert (84).

8. A tool according to Claim 1 or 2, characterised in that the pawl (125) projects perpendicularly from the cam plate (121) through an opening (128) in a cover plate (127) provided between

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the cam plate (121) and the ram (114).

9. A tool according to Claim 8,
characterised in that the guideway (116) is defined by
the cover plate (127) and by a guideway member (125),
5 detachably connected to the insertion head (112).

10. A tool according to Claim 1, 2, 8 or 9,
characterised in that the cam plate (121) is mounted
upon roller bearings (122) having axes of rotation
which extend at right angles to the length of the
10 guideway (116) and to the path of movement of the
ram (114).

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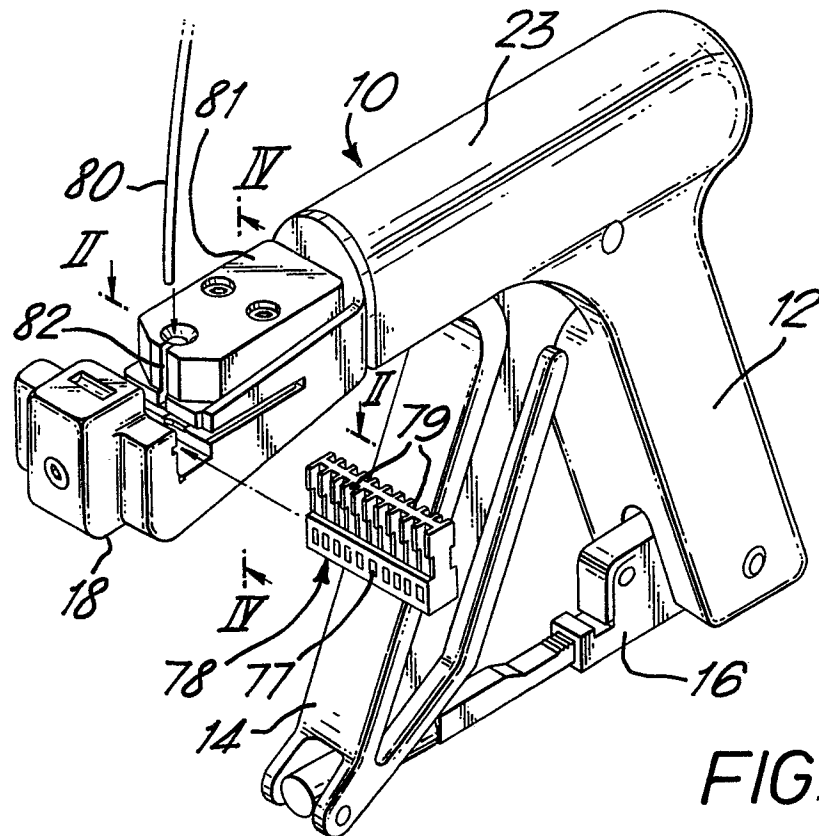


FIG. 1.

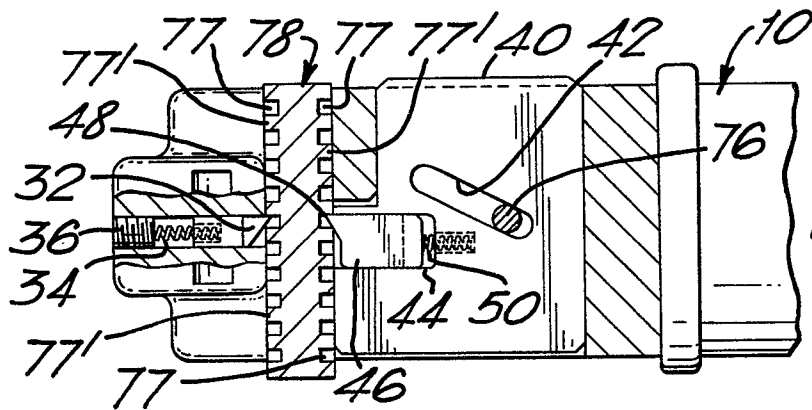


FIG. 2.

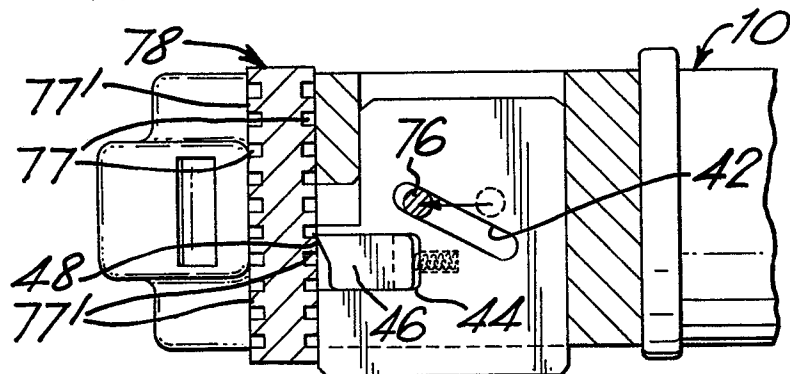


FIG. 3.

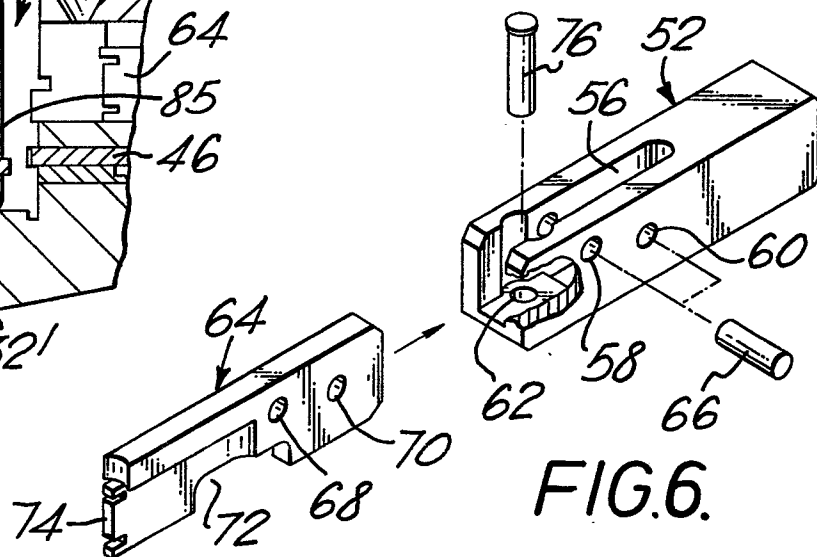
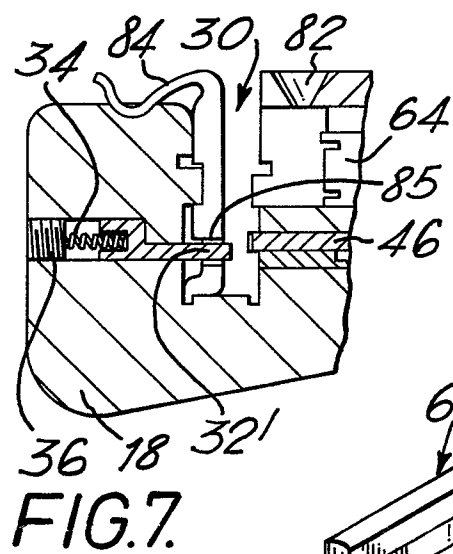
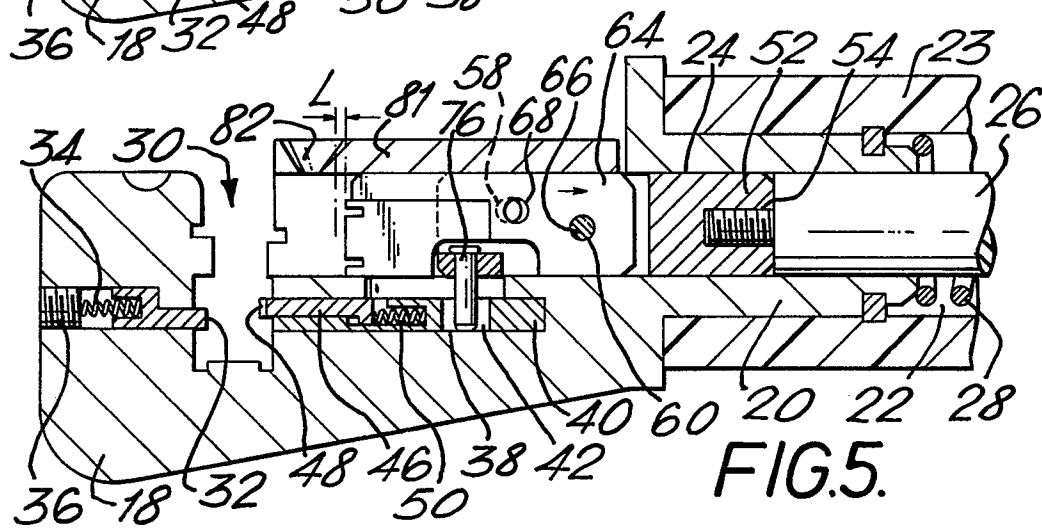
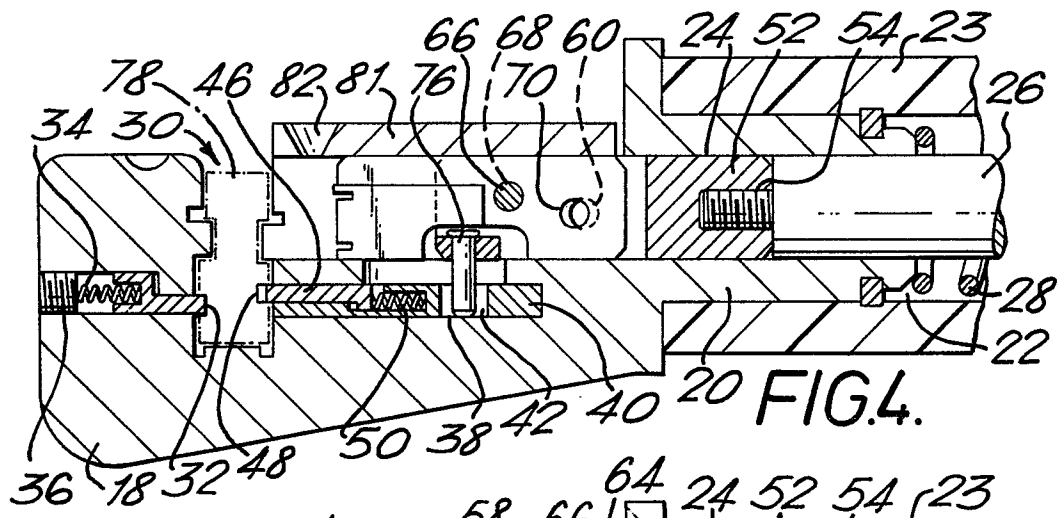


FIG. 8.

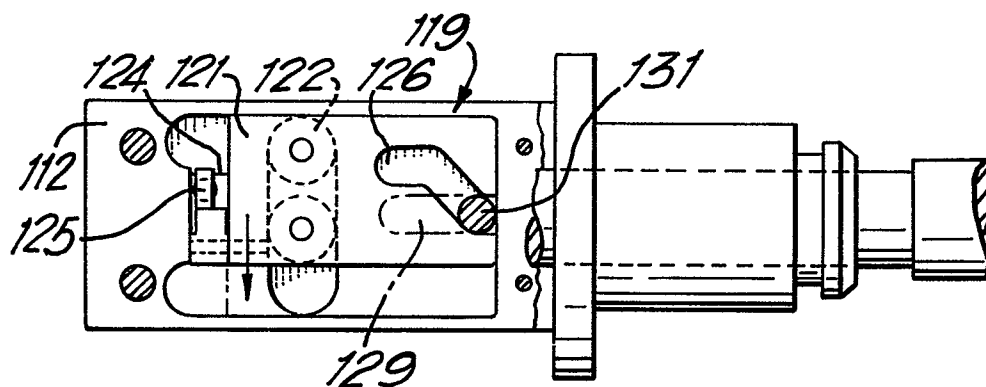
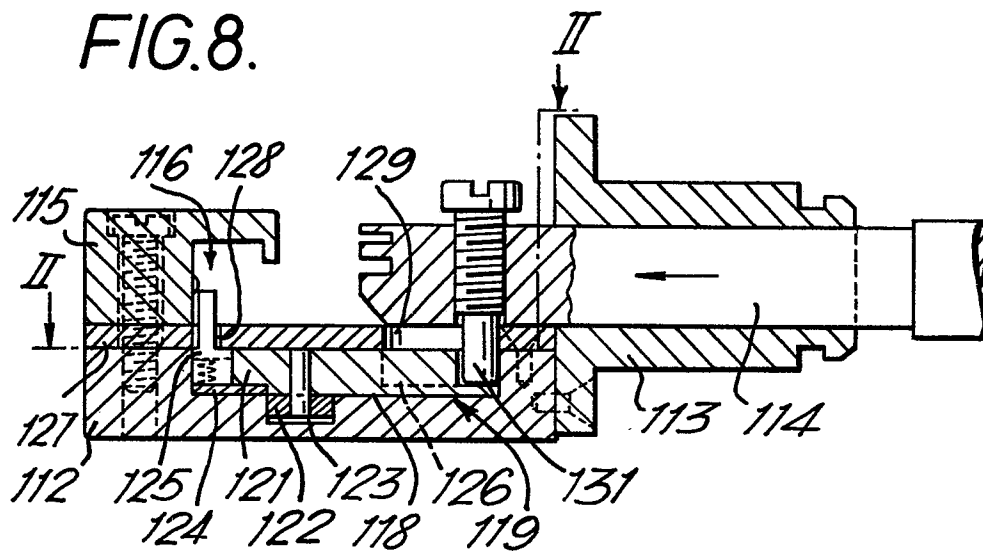


FIG.9.



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EUROPEAN SEARCH REPORT

0062415
Application number

EP 82 30 1227

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A, D	US-A-3 742 571 (AMP) * Complete document *	1	H 01 R 43/00

A, T	EP-A-0 032 616 (AMP) * Complete document *	1	

			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			H 01 R 43/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10-08-1982	Examiner MOBOUCK G.C.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	