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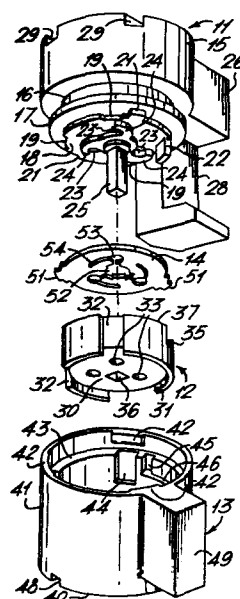
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⑤④ **Electrical connectors and the combination of a series of these connectors and a wire-connecting apparatus.**

⑤⑦ First and second housing parts (11 and 12) are fixed together in spaced relation with a disc-like contact member (14) having wire gripping slots (54) rotatably mounted between them. The slots have mouths (53) aligned with wire receiving passageways (23, 33) in the first and second housing parts. Tabs (51) on the contact member (14) are locked in recesses (44) in a third housing part (13) rotatably mounted on the first housing part (11) by cooperating ribs (42) and groove (16) and defining a cavity enclosing the second housing part (12) and contact member in a reservoir of sealant. The connector is adapted for operation by a hand tool which rotates the third housing part (13) relative to the first housing part (11) to drive wires inserted in the passageways (23, 33) into the slots.



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Electrical Connector Assemblies

The invention relates to electrical connector assemblies and particularly to environmentally sealed electrical connector assemblies.

5 A known connector assembly comprises first and second insulating housing parts having wire receiving openings and being fixed adjacent one another in spaced apart relation with the wire receiving openings in alignment and a contact member having a plurality of slots extending from wire
10 receiving mouths, the contact member being mounted between the first and second housing parts for movement between a first position in which the slot mouths are aligned with the wire receiving openings and a second position in which wires received in the openings and slot mouths when
15 in the first position are forced into the slots so that the slot edges effect electrical contact with the wire cores.

A disadvantage of such assembly is that any sealant located between the first and second housing parts is disturbed by a pumping action produced by the translational
20 movement of the contact member between first and second positions to effect connection to the wires which may result in sealant being expelled from the contact area or air being entrained in the sealant with consequent risk of corrosion and loss of reliability of the connector.

25 According to the invention, a third housing part is provided, rotatable relative to the first and second housing parts and defining with them a sealant reservoir, the contact member being of substantially circular profile, having arcuate slots and mounted in the reservoir for
30 axial rotation relative to the first and second housing

parts between the first and second positions by rotation of the third housing part.

5 The relative rotation of the contact member from the first to the second rotary position forces wires received in respective openings and the mouths into the slots so that the slot edges effect electrical connection to the wire cores. Disturbance of the sealant is minimal with a consequent decrease in risk of corrosion.

10 The invention includes the combination of a series of environmentally sealed connector assemblies as described above and an apparatus for connecting wires in the connector.

An example of the invention will now be described with reference to the accompanying drawings in which:

15 Figure 1 is a perspective view of an electrical connector;

Figure 2 is an exploded perspective view of the connector;

20 Figure 3 is an axial cross-sectional view of the connector prior to connection to wires;

Figure 4 is a similar view to Figure 3 but after connection to wires;

Figure 5 is a cross-sectional view taken along line 5-5 of Figure 3;

25 Figure 6 is a cross-sectional view taken along line 6-6 of Figure 4;

Figure 7 is a cross-sectional view taken along line 7-7 of Figure 3;

30 Figure 8 is a perspective view of an apparatus for connecting wires in the connector;

Figures 9 and 10 are fragmentary longitudinal cross-sectional views of the apparatus before and after an operating stroke; and,

35 Figure 11 is a fragmentary transverse cross-sectional view of the apparatus.

The connector 10 comprises first, second and third insulating housing members 11, 12 and 13, respectively, each moulded from polyvinylchloride material and a contact member 14 stamped from sheet metal.

5 The first housing part comprises a generally cylindrical body 15 formed with an annular groove 16 one side of which is defined by a locking flange 17 adjacent a lower face 18 which is of generally reduced diameter and formed at its periphery with three angularly spaced
10 recesses 19 and a pair of diametrically opposed radially extending locking tabs 21. A key 22 extends in an axial direction from the periphery of face 18 at a location between the locking tabs 21. Three equally spaced wire-receiving passageways 23 extend axially through member 11
15 and have mouths bounded by arcuate wire stuffers 24. A rectangular post 25 extends axially from the centre of face 18. An arm 26 extends radially from body 15 and has an axially extending portion formed with a recess 28. A pair of parallel guiding channels 29 extend across an
20 upper face of the body.

 The second insulating housing member 12 is also cylindrical and is formed with three wire-receiving passageways 33 extending axially therethrough at locations corresponding with passageways 33 in housing
25 member 11 and have mouths bounded at an upper face 37 by arcuate wire stuffers 34, similar to stuffers 24. A skirt 31 surrounds and depends from a body part 30 of housing member 12 and is formed with three axially extending angularly spaced recesses 32 and a socket 35
30 to receive key 22. A rectangular section socket 36 is located centrally of body 30 to receive post 25 in a close fit.

 The third housing member 13 comprises a pot having a base 40 and a cylindrical sidewall 41 upstanding from
35 the base. Three angularly spaced protuberances 42 extend

inwardly from a free edge of the wall axially spaced from a shoulder 43. A pair of locking recesses 44 are formed at substantially diametrically opposite locations in the sidewalls and extend axially towards the base from the shoulder 43. Two further pairs of locking recesses 45 are formed at substantially diametrically opposite locations in the sidewalls, the recesses of each pair being linked by a guideway defined by shoulders 46. An operating arm 49 extends radially outwards from the wall 41. A groove 48 extends diametrically across the outside of base 40.

The contact member 14 is an annular disc having radially outwardly extending locking tabs 51 in substantially diametrically opposite locations. Three angularly spaced arcuate slots 54 extend from respective wire-receiving mouths 53 at relative locations corresponding to the wire-receiving passageways 23 and 33.

In the assembled connector, the first and second housing members are fixed together against relative angular rotation by the post 25 being received in socket 36 and the key 22 being received in socket 35 with the contact member interposed between the opposed faces 18 and 37 of the housing members. The subassembly is inserted into the third housing member cavity with the locking tabs 51 received in locking recesses 44 and the locking tabs 21 received in a first of the locking recesses 45. In this position, corresponding wire-receiving passageways 23 and 33 and slot mouths 53 are aligned. During assembly protuberances 42 snap into groove 16 and flange 17 seats on shoulder 43.

A viscous sealant 57 comprising a moisture-proof substance having a polybutene base is injected into the assembly through the wire-receiving passageways and spreads throughout the cavity providing a sealant reservoir completely surrounding the contact member 14 and sealing

locations adjacent flange 17. The volume of the reservoir is effectively increased by the recess 56 defined by depending portions of the skirt 31 and recess 56 together with recesses 32 assist in enabling flow of the sealant throughout the cavity.

In use of the connector, wires 2 to be spliced together are inserted through passageways 23, slot mouths 53 and passageways 33 (Figs 5 and 7). Arm 49 is then urged into recess 28 of arm 26 rotating the contact member and third housing member relative to the first and second housing members driving the wires into the respective slots 54 so that the slot edges effect electrical connection with the wire cores. The relative rotation forces the locking tabs 21 on the first housing member from recesses 45 (Fig 7) in the first position of rotation along the guideways defined by shoulders 46 into the second recess 45 locking the housing members in the second position of rotation with a detent action.

It should be noted that connection is therefore effected with minimum disturbance of the sealant. Substantially no volumetric change occurs and displacement of the sealant is minimal during rotation as a result of the circular profile of the contact member and the support of the wires on both sides of the contact member by the stuffers 24.

The wire connecting apparatus comprises a head 61 comprising a framework 62 defining a passageway providing a connector feed path 63 extending to an operating station 64. A plate member 66 defining an upper wall of the passageway is formed with two spaced parallel ribs 67 extending longitudinally and laterally offset from the centre line of the passageway for engagement in the complementary grooves 29 on the connectors to guide the connectors along the passageway in a constant rotational position. A spigot 68 upstands from a bottom wall 69 of

the passageway at an exit end of the operating station to provide a connector stop.

A trigger 71 is pivotally mounted at 72 in a clevis 73 provided in the head on one side of the connector feed path for movement relatively towards a handle 70 against the action of a compression spring 81. A bell crank lever 74 is pivotally mounted intermediate its ends on a frame extension 75. The short arm of the bell crank lever is formed with a slot 93 in which a pin 76 fixed to trigger 71 is freely located and the long arm of the bell crank lever arm extends under the connector feed path 62 into a cavity 77 provided in the head on the other side of the passageway. A pawl 78 is pivotally mounted on the free end of the long arm and biased by spring 80 against a spigot 79 fixed in the arm defining with the bell crank lever an escapement mechanism. A flat coil spring 81 is mounted in a housing 82 mounted on the head and is adapted to provide a substantially constant biasing force irrespective of extended length. The handle 70 defines a through-passageway adapted releasably to receive a connector magazine 83. The magazine is of rectangular cross-section and defines a connector-receiving passageway 84 having a pair of connector guiding ribs 85 aligned with the ribs 67 in the operating head and laterally offset from the longitudinal centre line of the passageway to provide a clearance for connector arms 26,49. The magazine has a longitudinally extending slot 86 in a lower wall receiving a hooked end 87 of the spring 81.

In operation of the apparatus, a loaded magazine is inserted into handle 70 and a hooked end 87 of the spring 81 engaged with the rearmost connector 10, urging the connectors in tandem relation along the feed path to the operating station retained in a constant rotational position by guiding ribs 67 and 85. The leading connector is restrained from movement beyond the exit end of the

operating station by engagement with spigot 68. The wires are then inserted through slot 87 in plate member 66 into the connector. Operation of the trigger in the position shown in Figure 8 causes the pawl to engage arm 49 rotating the lower housing part relative to the upper housing part urging the slotted contact member against the wires to splice them electrically together. The rotation of the lower housing part brings groove 48 into alignment with spigot 68 permitting ejection of the leading connector from the exit end of the operating station. Release of the trigger permits return of the pawl which rides over the arm 49 as a result of flexure of spring 80 permitting advancement of the next leading connector by the spring 81 along the feed path to the operating position.

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Claims

1. A connector assembly comprising first and second insulating housing parts having wire receiving openings and being fixed adjacent one another in spaced apart
5 relation with the wire receiving openings in alignment and a contact member having a plurality of slots extending from wire receiving mouths, the contact member being mounted between the first and second housing parts for movement between a first position in which the slot
10 mouths are aligned with the wire receiving openings and a second position in which wires received in the openings and slot mouths when in the first position are forced into the slots so that the slot edges effect electrical contact with the wire cores characterised by a third
15 housing part (13) rotatable relative to the first and second housing parts (11 and 12) and defining with them a sealant reservoir, the contact member (14) being of substantially circular profile, having arcuate slots (54) and mounted in the reservoir for axial rotation relative
20 to the first and second housing parts (11 and 12) between the first and second positions by rotation of the third housing part (13).

2. An environmentally sealed connector assembly according to claim 1 characterised in that, the contact
25 member (14) is an annular disc and is fixed in the third housing part (13) by a radially extending tab (51) engaged in a complementary recess (44) in the third housing part (13), the first and second housing parts (11 and 12) comprising separate members fixed together
30 by a post (25) extending through the annular disc (14).

3. An environmentally sealed connector assembly according to claim 1 or claim 2, characterised in that, the third housing part (13) defines a cavity containing the second housing part (12) and is mounted for rotation
35 on the first housing part (11).

4. An environmentally sealed connector assembly according to claim 2 or claim 3 characterised in that, arms (26,49) extend radially outwardly from the first and third housing parts (11 and 13), respectively.

5 5. The combination of a series of environmentally sealed connector assemblies according to any one of the preceding claims and an apparatus for connecting wires in the connector comprising frame means defining a connector feed path extending to an operating station, means to
10 feed a series of connectors in tandem relation sequentially along the path to the terminating station, guide means on the frame means adapted to engage complementary guide means on one housing part to maintain the one housing part in a predetermined rotational position at the
15 operating station and a force applying member at the operating station operable to move the other housing part relative to the one housing part thereby to effect connection to the wires characterised in that, the force
20 applying member (74,76) is arranged to rotate the other housing part (13) relative to the one housing part (12).

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FIG.2.

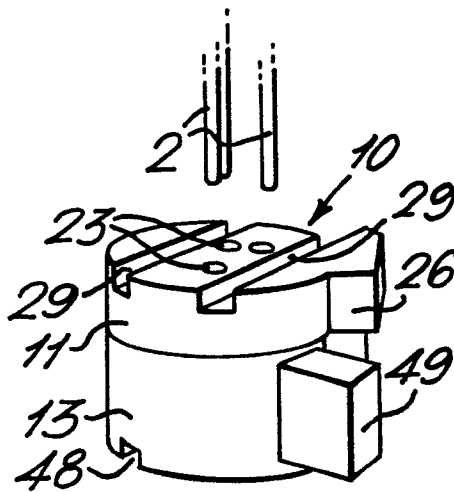
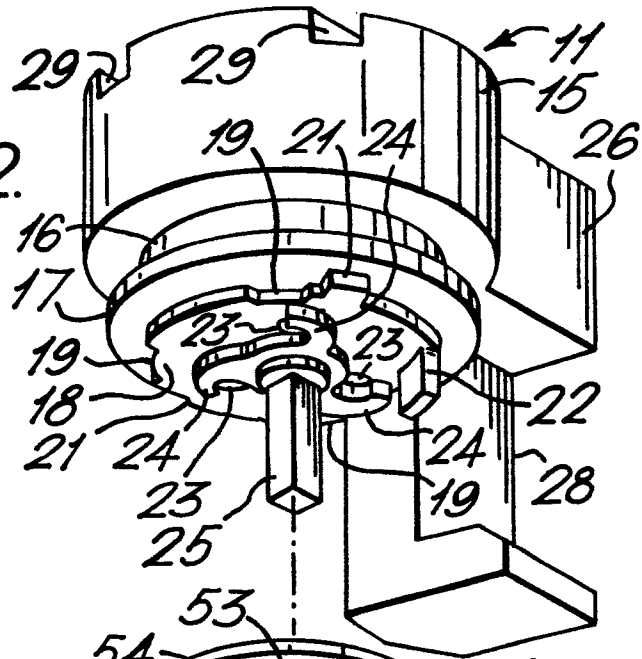
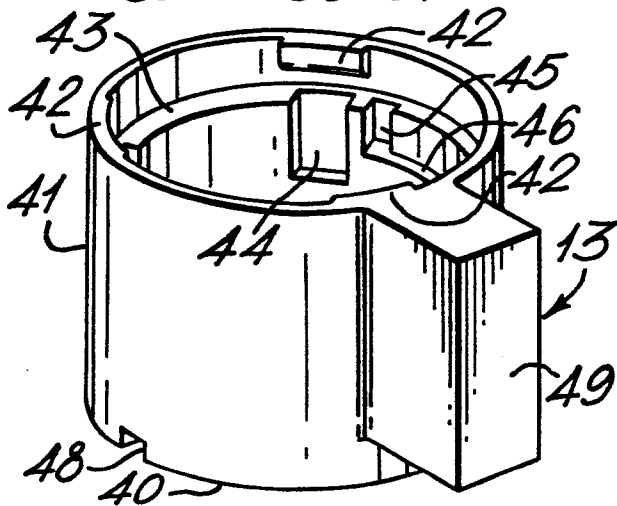
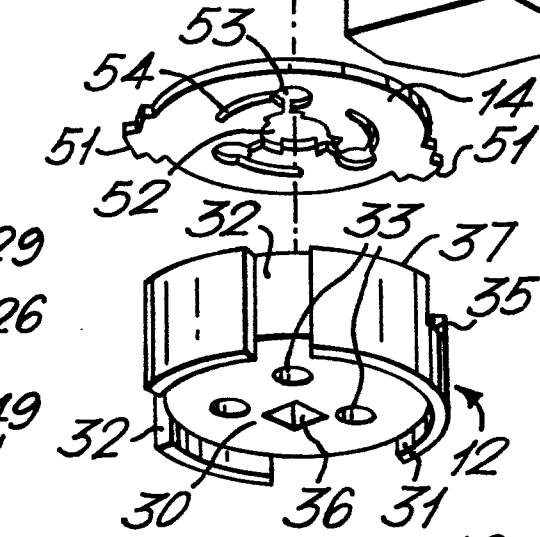
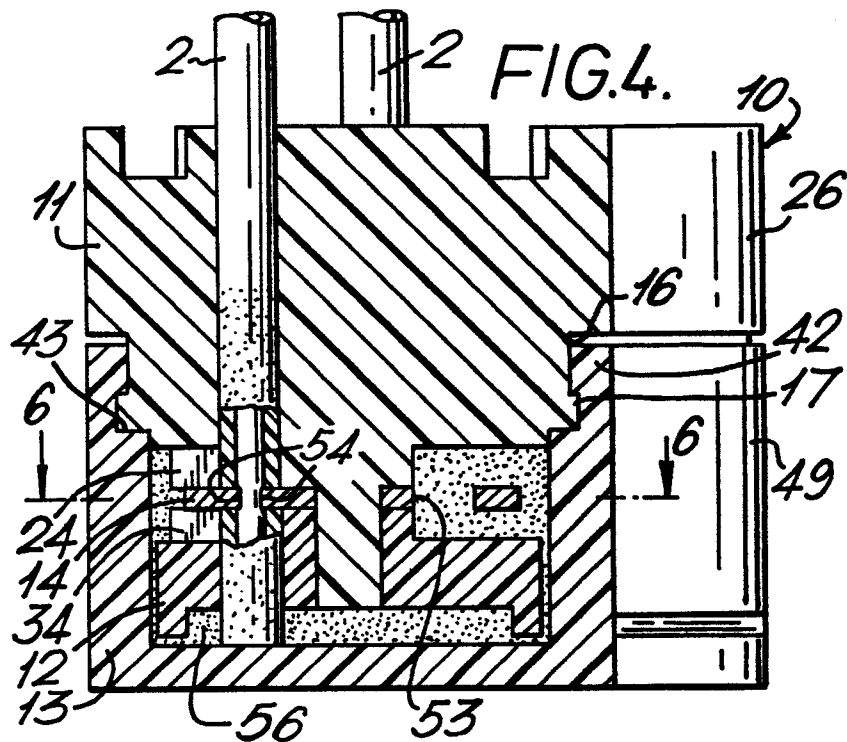
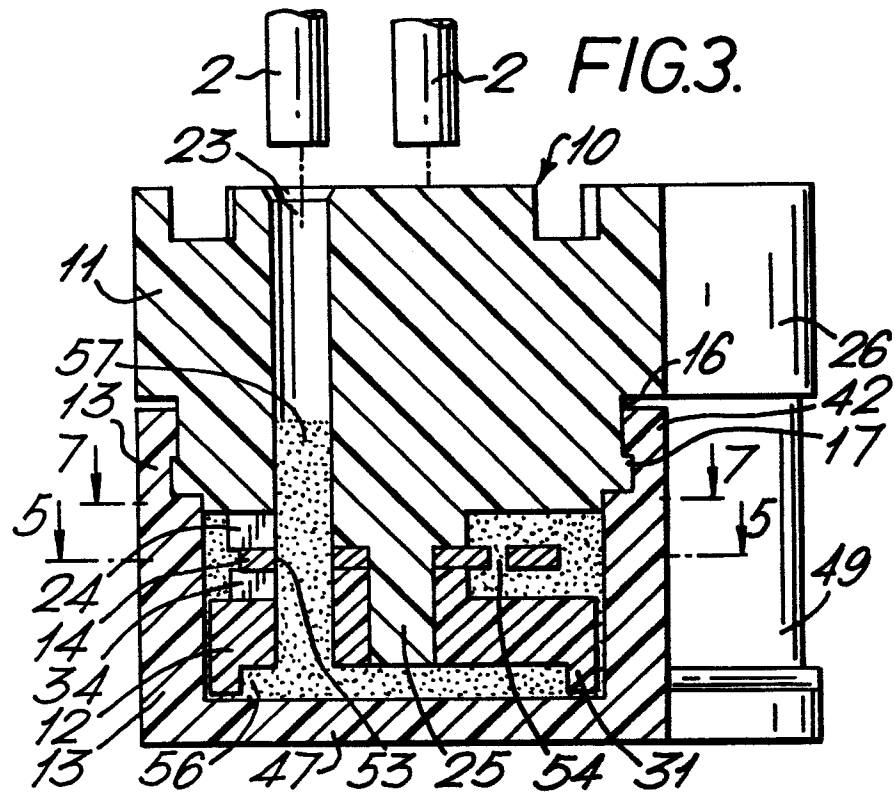


FIG.1.



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FIG.5.

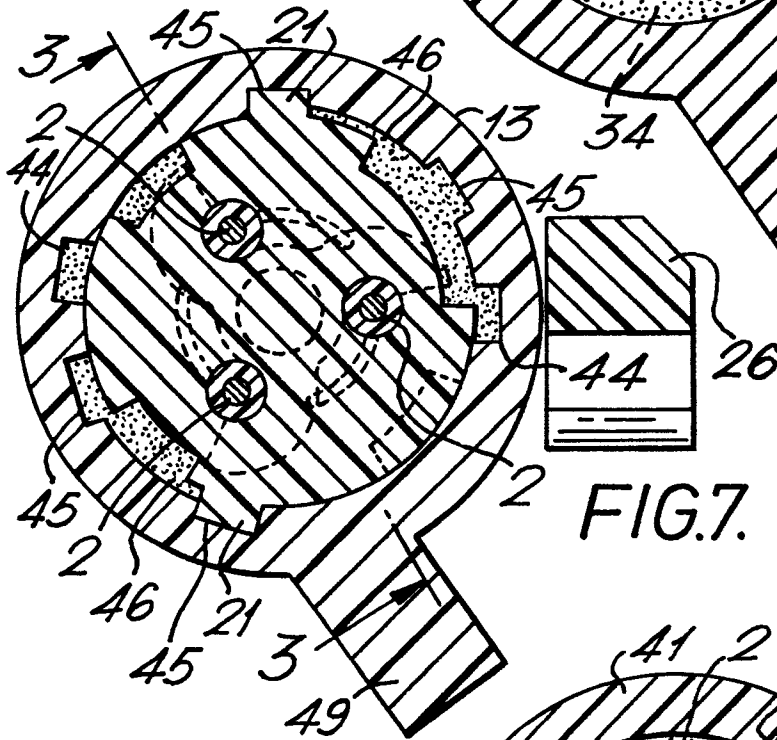
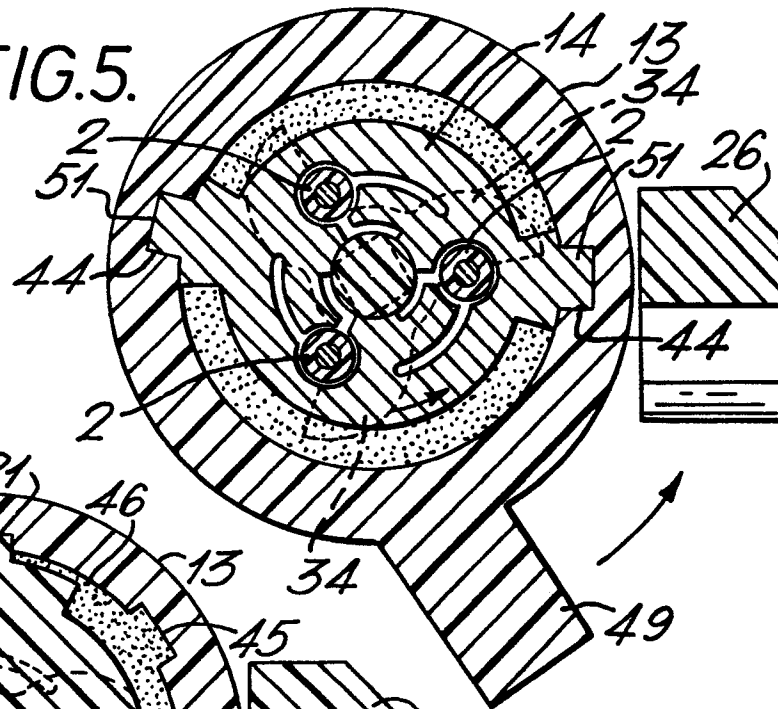
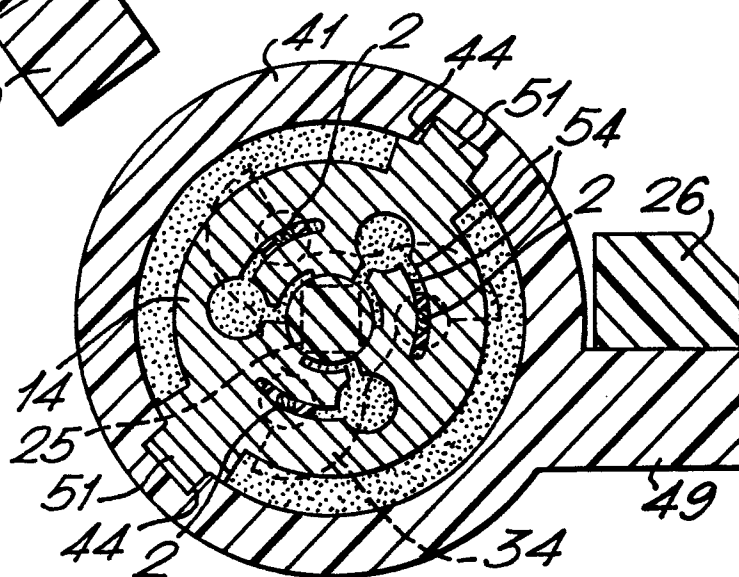
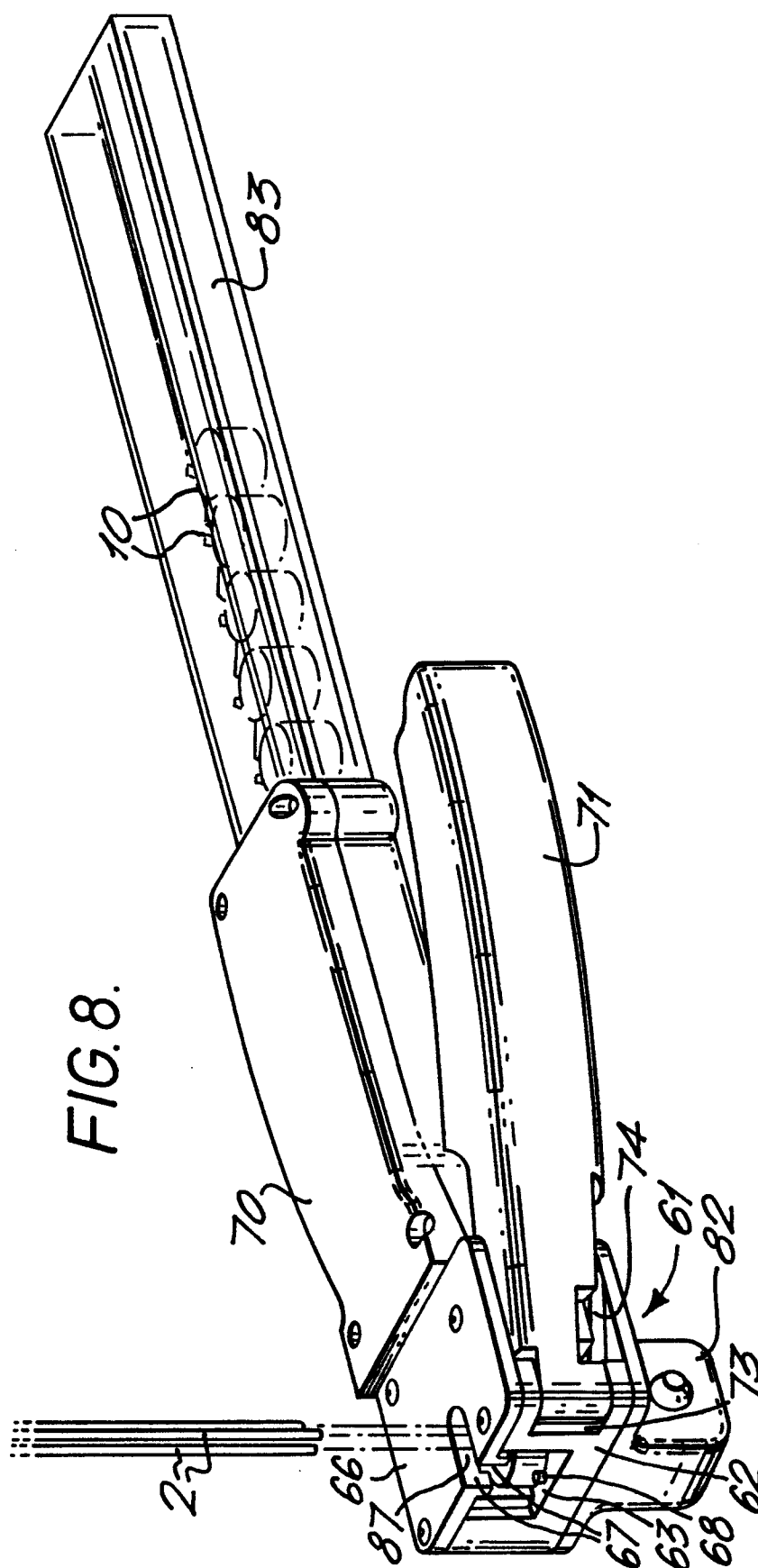


FIG.7.

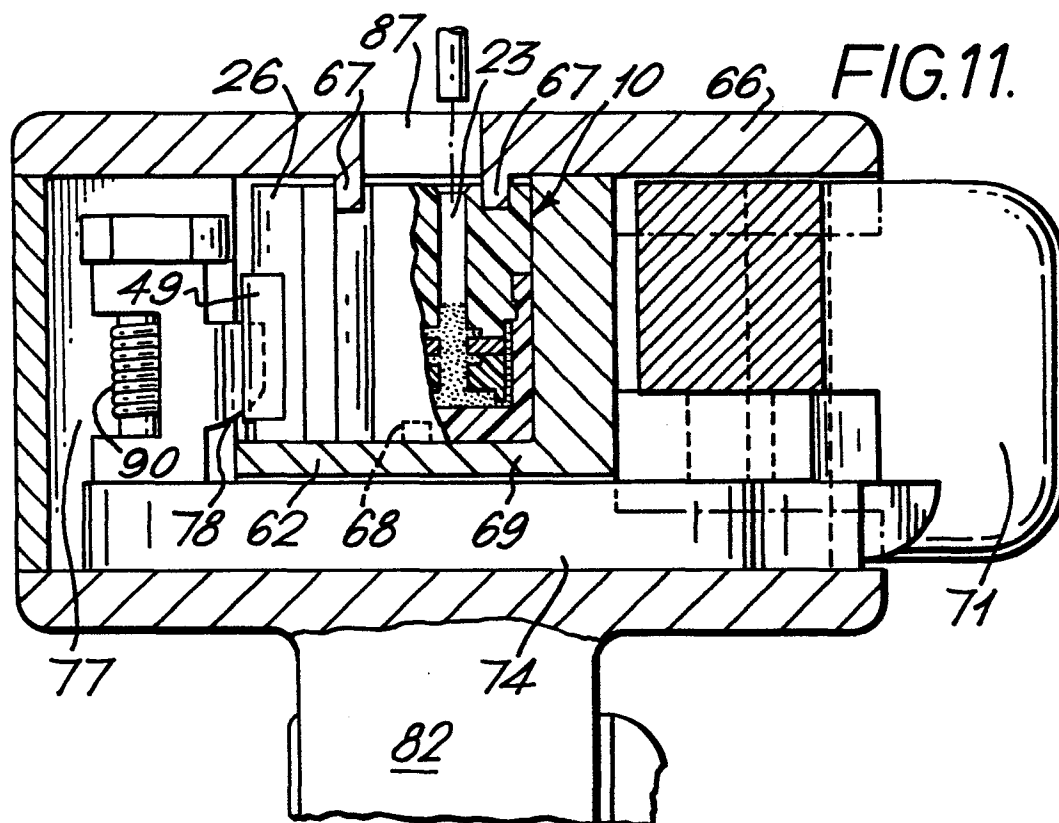
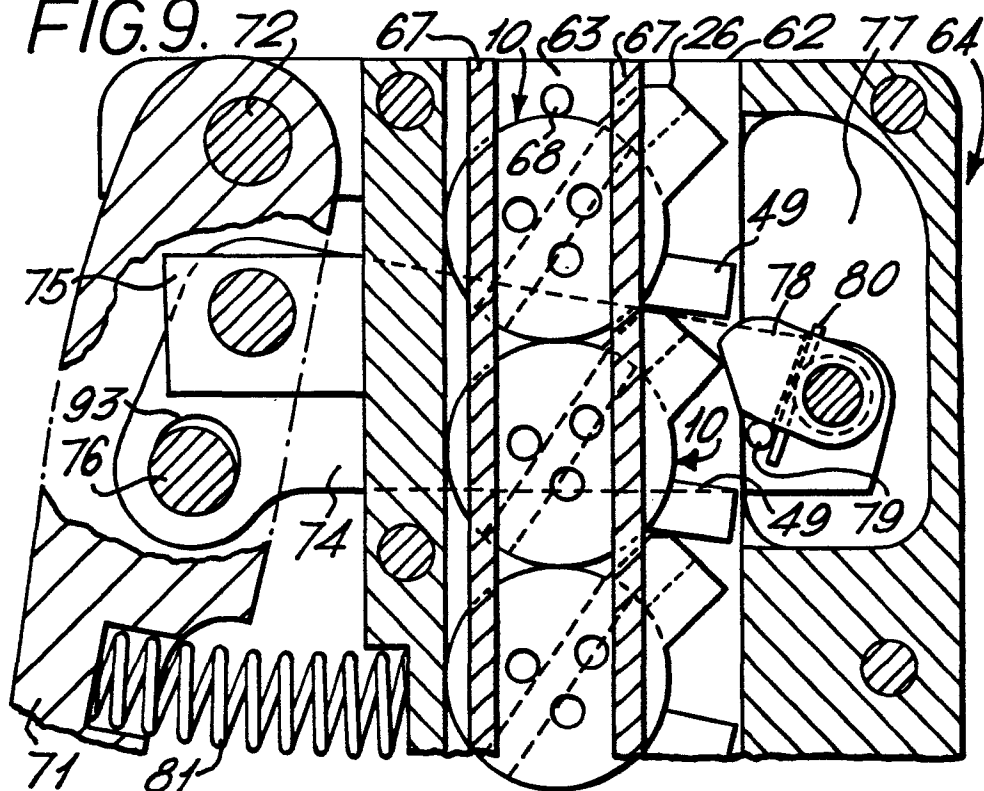
FIG.6.





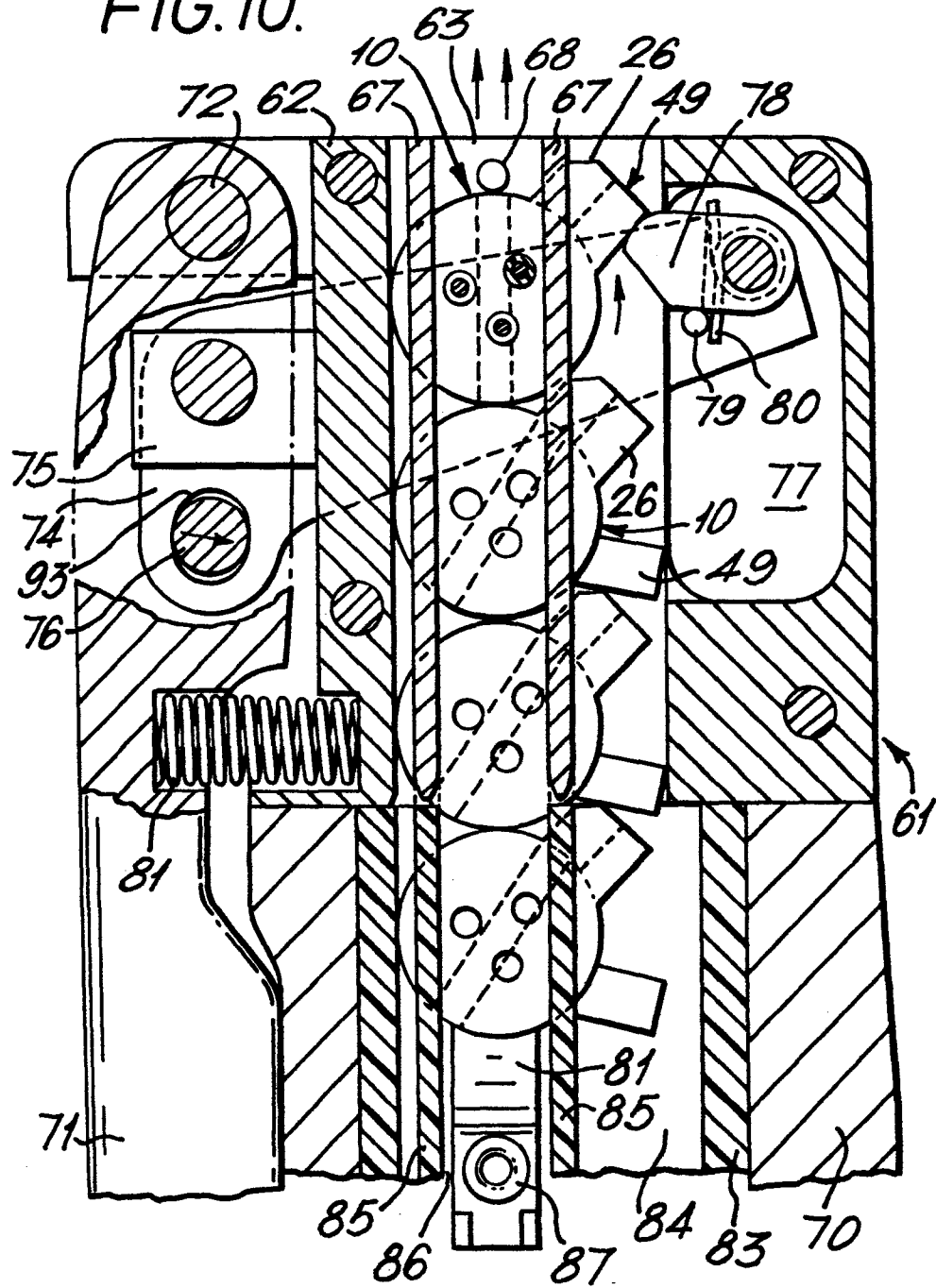
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FIG. 9. 72



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FIG. 10.





European Patent
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EUROPEAN SEARCH REPORT

0002113
Application number

EP 78 30 0556

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	<u>US - A - 3 980 380</u> (BUNKER RAMO) * Column 10, lines 5-70; column 11; column 12, lines 1-27 *	1	H 01 R 7/04 5/12
A	<u>FR - A - 2 338 592</u> (AMP) * Complete document *	5	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ²)
			H 01 R 7/04 9/08 5/12 43/00
			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	14-02-1979	MOBOUCK	