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(54) Electrical connector assembly

(57) An electrical connector assembly having a first connector (1) provided with an insulating housing (2) and a cavity block (3) having at least one cavity (41). A second connector (14) having at least one terminal (9) that is received in the cavity (41). A retainer (8) that enables the first connector (1) to be mated with the second connector (14) in a first position and provides retention

of the terminal (9) in the cavity (41) in a second position. A lever (7) mounted on the insulated housing (2) that pivots between an assembly position and a coupled position. The lever (2) having a locking lug (10) that supports the retainer (8) in the first position when the lever (7) is in the assembly position such that the retainer (8) is accurately positioned for receipt in the insulated housing (2).

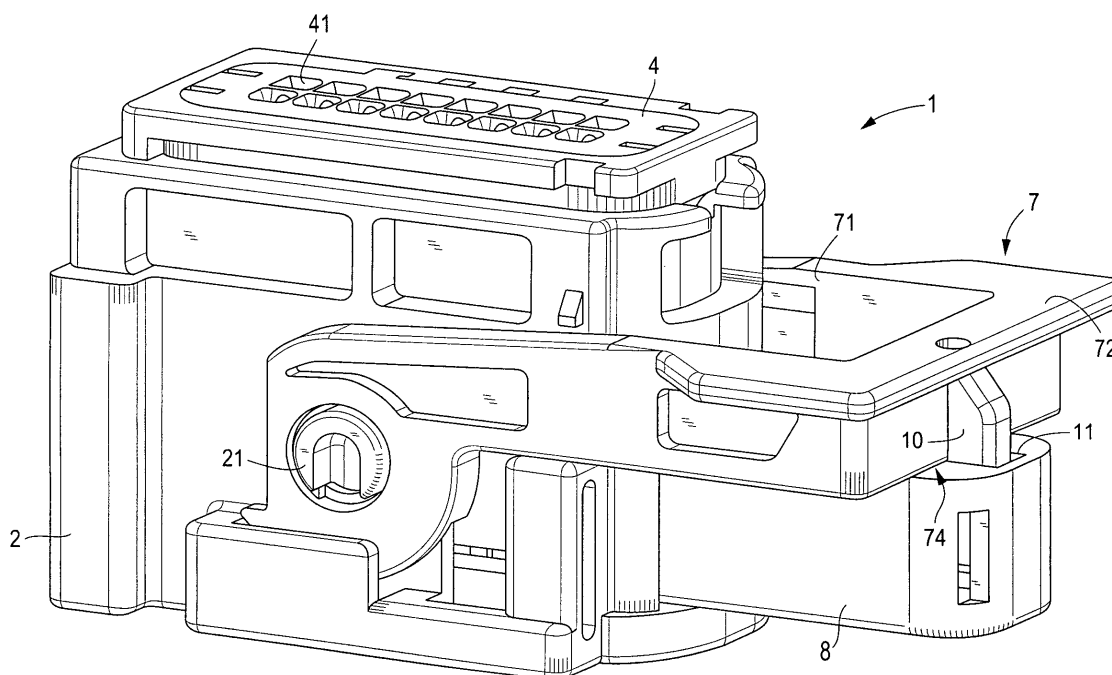


FIG. 1

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Description

[0001] The present invention is related to electrical connectors and, more specifically, to an electrical connector assembly having a lever and a retainer operable to secure the mating of a first and a second connector.

[0002] Conventional electrical connector assemblies include a first connector and a second connector that can be mated together to provide one or more electrical connections. Because the mating force increases with the number of the electrical connections, the size of the first and second connectors and/or the size of terminal pins included therein, means to support the mating of the first and second connectors are often introduced. For example, typical electrical connector assemblies have a first connector with a cavity block provided with cavities, and a second connector provided with terminal pins. The cavities and the terminal pins are positioned to provide a mating engagement. A retainer is provided that secures the terminal pins in the cavities. The retainer is often a separate or movable part and is introduced into the terminal pins and/or the cavity block after the mating of the first and second connectors. A lever then secures the first and second connectors in a mated position.

[0003] Such an electrical connector assembly is disclosed in International Patent Application WO 98/47204. The connector assembly disclosed therein has an insulative housing with a plurality of electrical terminals. The terminals are locked with a first retention means such as resilient locking lances that extend from the housing and engage in cavities of the terminals. The housing is further provided with a retainer that allows assembly of the terminals within the housing when the retainer is in a pre-assembly position. The retainer is then moved to a locked position to secure the terminals in the housing. A camming slide engages with complementary members of a second connector for coupling the connectors. The coupling members reduce the forces required for mating. The coupling members further cooperate with the retainer such that the coupling members are not movable until the retainer is in the locked position to ensure that the first and second connectors can not be coupled unless the terminals are correctly mounted within the respective cavities and securely locked.

[0004] Because the retainer is often a separate or moveable part, the retainer may be easily lost or damaged during delivery of the connector. It is therefore desirable to provide an electrical connector assembly that prevents the retainer from being lost or damaged to ensure that the first and second connector may be properly mated to provide an electrical connection.

[0005] This and other objects are solved by an electrical connector assembly having a first connector provided with an insulating housing and a cavity block having at least one cavity. A second connector having at least one terminal that is received in the cavity. A retainer that enables the first connector to be mated with the

second connector in a first position and provides retention of the terminal in the cavity in a second position. A lever mounted on the insulated housing that pivots between an assembly position and a coupled position. The lever having a locking lug that supports the retainer in the first position when the lever is in the assembly position such that the retainer is accurately positioned for receipt in the insulated housing.

[0006] A preferred embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of an electrical connector assembly shown without a harness cover in an assembly position;

Fig. 2 is an exploded view of the electrical connector assembly in a coupled position;

Fig. 3 is a perspective view of a retainer;

Fig. 4a is a perspective view of a second connector;

Fig. 4b is a cross-sectional view of the second connector of Fig. 4a along line A-B;

Fig. 5 is a first cross-sectional view of the electrical connector assembly of Fig. 1;

Fig. 6 is a second cross-sectional view of the electrical connector assembly of Fig. 1;

Fig. 7 is a perspective view of the electrical connector assembly in the coupled position; and

Fig. 8 is a cross-sectional view of the electrical connector assembly of Fig. 7 prior to insertion of the retainer.

[0007] The invention will first be described generally with reference to Figs. 4a and 7 which show an electrical connector assembly having a first connector 1 and a second connector 14. The first connector 1 has an insulated housing 2, a retainer 8, a harness cover 12, and a lever 7. The second connector 14 has terminals 9 that are received in the first connector 1.

[0008] The main components of the electrical connector assembly will now be described in greater detail. Shown in Figs. 1 and 2, the first connector 1 has an insulated housing 2. The insulated housing 2 has a front cavity block 3 and a rear grid 4. The front cavity block 3 and the rear grid 4 are insulated from the insulated housing 2 by a peripheral seal 5 and a rear seal 6, respectively. The rear grid 4 positions and protects the rear seal 6. The front cavity block 3 and the rear grid 4 are provided with cavities 41 positioned substantially opposite to each other. The cavities 41 receive terminal pins 9 of a second connector 14, shown in Figs. 4a and 4b, to provide an electrical contact. A sidewall of the insulated housing 2 has an opening 22 for insertion of a retainer 8. The opening 22 is arranged in the sidewall of the insulated housing 2 so that the retainer 8 may engage with the front cavity block 3.

[0009] The retainer 8 has sidewalls provided with lips 81 that form an aperture 11. The lips 81 and the aperture 11 serve to guide the retainer 8 onto the front cavity

block 3. As shown in Fig. 3, a projection 82 is arranged close to an inner end of the retainer 8. The projection 82 locks the retainer 8 into position. The retainer 8 is preferably arranged adjacent to or is attached to the front cavity block 3 in order to facilitate receipt of the retainer 8 into the front cavity block 3, as shown in Fig. 1. The retainer 8 secures the terminal 9 of the second connector 14 in the cavities 41 of the cavity block 3.

[0010] A lever 7 is pivotally mounted on a protrusion 21 on an outer side of the insulated housing 2 such that the lever 7 may be pivoted between an assembly position and a coupled position. The lever 7 has two legs 71 connected by a bow portion 72. The bow portion 72 has a surface 74 positioned adjacent to the retainer 8 when the lever 7 is in the assembly position. The bow portion 72 is formed to allow easy movement of the lever 7. At a first end of each leg 71 is a lever pinion 75 and an axle opening 73. The axle openings 73 are received on protrusions 21 on the insulated housing 2 to provide a rotational axis for the lever 7.

[0011] The bow portion 72 of the lever 7 has a locking lug 10. The locking lug 10 is mounted substantially in the center of the bow portion 72 between the legs 71. The locking lug 10 is operable to engage with the aperture 11 in the retainer 8. The locking lug 10 has substantially the same width as the aperture 11 such that the locking lug 10 fits into the aperture 11 to hold the retainer 8 in an external position when the lever 7 is in the assembly position. The locking lug 10 also blocks the retainer 8 from being inserted or removed from the insulated housing when the lever 7 is in the assembly position. Preferably, the locking lug 10 clamps with the aperture 11 to give the retainer 8 support such that the retainer 8 may be prevented from being lost or tilted in regard to the front cavity block 3.

[0012] A harness cover 12 may be arranged to cover the rear grid 4 of the first connector 1. The harness cover 12 has a resilient lever beam latch 13 and is preferably slid over the second connector 14 by a guidance means.

[0013] As shown in Figs. 4a and 4b, the second connector 14 has a second connector housing 15. The second connector housing 15 has the terminals 9 provided with indentations 16 that engage with the lips 81 of the retainer 8. Openings 17 are provided on one side of the second connector housing 15 to enable the retainer 8 to engage with the indentations 16 of the terminal pins 9, as shown in Fig. 5. A rack 20 is provided on both sides of the second connector housing 15 that engages with the pinions 75 provided at the ends of the lever arms 71.

[0014] The method of mating the first connector 1 and the second connector 14 will now be described in greater detail. The lever 7 is positioned in the assembly position shown in Figs. 1 and 6. In the assembly position, the retainer 8 is engaged with the front cavity block 3, but positioned outside of the insulated housing 2 such that the retainer 8 will not block the terminal pins 9 from being inserted into the front cavity block 3. The lever 7 assists in positioning the retainer 8 and supports the re-

tainer 8 in the assembly position. The surface 74 of the bow portion 72 of the lever 7 is positioned adjacent to the retainer 8 when the lever 7 is in the assembly position. The locking lug 10 is engaged with the aperture 11 to ensure the retainer 8 is not damaged, dis-associated from the first connector 1, or displaced during delivery such that the retainer 8 will be easily received in the front cavity block 3. For example, if the retainer 8 is damaged causing the retainer 8 to be tilted, the front cavity block 3 may be damaged when the retainer 8 is inserted and/or the retainer 8 may not be able to be properly received in the insulated housing 2.

[0015] In the assembly position, the terminal pins 9 of the second connector 14 may be plugged into the first connector 1. The terminal pins 9 are introduced through the cavities 41 of the front cavity block 3 and the rear grid 4. The pinions 75 of the lever 7 engage with the rack 20 of the second connector 14 when the second connector 14 is inserted into the first connector 1.

[0016] The lever 7 is then pivoted out of the assembly position and into the coupled position shown in Figs. 7 and 8. As the lever 7 pivots the pinions 75 engage with the rack 20 to force the terminal pins 9 of the second connector 14 into the cavities of the rear grid 4. In the coupled position, the lever 7 holds the second connector 14 in mated engagement with the first connector 1. The lever 7 retains the second connector 14 such that the terminal pins 9 of the second connector 14 can not be pulled out of the front cavity block 3 and the rear grid 4 of the first connector 1.

[0017] As shown in Fig. 8, when the lever 7 is pivoted to the coupled position, the locking lug 10 releases the retainer 8 so that the retainer 8 can be freely moved onto the front cavity block 3 such that the lips 81 engage with the indentations 16 of the terminals 9. The length of the retainer 8 is preferably adapted so that it engages with all the terminal pins 9 in the cavities 41. Once the retainer 8 is fully inserted into the insulated housing 2 and locked in position by the projection 82, the terminal pins 9 are secured in the cavities 41.

[0018] In the coupled position, the resilient latch 13 of the harness cover 13 engages with the locking lug 10 to prevent the lever 7 from being pivoted to another position. The harness cover 12 is also secured onto the insulated housing 2 by the lever 7 and the resilient latch 13. The harness cover 13 provides additional protection of the second connector 14 without deteriorating from the reliability of the first connector 1. By pushing the resilient latch 13 down the lever 7 can be released and pivoted into another position, i.e., the assembly position.

[0019] As shown in Fig. 5, the front cavity block 3 may also comprise termination locking projections 18 having one or more cavities to provide an additional retention mechanism for the terminal pins 9. The terminal pins 9, therefore, may be provided with a further indentation 19.

[0020] Further, if a retainer 8 is provided that is removable from the insulated housing 2, especially from the front cavity block 3, the lever 7 can still assist the posi-

tioning of the retainer 8. The retainer 8 is guided by the surface 74 of the bow portion 72 to ensure that the lips 81 of the retainer 8 are received in the front cavity block 3. It is therefore preferred that the retainer 8 also includes a substantially flat surface that enables the retainer 8 to slide on the surface 74 of the bow portion 72.

Claims

1. An electrical connector assembly comprising a first connector (1) having an insulated housing (2) with a cavity block (3) having at least one cavity (41), a second connector (14) having at least one terminal (9) that is received in the cavity (41), a retainer (8) that enables the first connector to be mated with the second connector (14) in a first position and provides retention of the terminal (9) in the cavity (41) in a second position, and a lever (7) mounted on the insulated housing (2) that pivots between an assembly position and a coupled position, **characterized in that:**
 - the lever (7) has a locking lug (10) that secures the retainer (8) in the first position when the lever (7) is in the assembly position.
2. The electrical connector assembly of claim 1, **characterized in that** the lever (7) secures the first connector (1) and the second connector (14) in a mated position in the coupled position.
3. The electrical connector assembly of claim 1 or 2, **characterized in that** the insulated housing (2) has a retaining means (13) that secures the lever (7) in the coupled position.
4. The electrical connector assembly of claim 3, **characterized in that** the retaining means (13) is a resilient latch.
5. The electrical connector assembly of one of claims 1 through 4, **characterized in that** the insulated housing (2) has a harness cover (12).
6. The electrical connector assembly of one of claims 1 through 5, **characterized in that** the terminal (9) has an indentation for engaging with the retainer (8) when the retainer (8) is in the second position.
7. The electrical connector assembly of one of claims 1 through 6, **characterized in that** the retainer (8) is positioned outside of the insulated housing (2) and is engaged with the cavity block (3) in the first position.
8. The electrical connector assembly of one of claims 1 through 7, **characterized in that** the locking lug

(10) supports the retainer (8) in the assembly position such that the retainer (8) is accurately positioned for receipt in the cavity block (3).

9. The electrical connector assembly of one of claims 1 through 8, **characterized in that** the lever (7) has a surface (74) that guides the retainer (8) into the cavity block (3).

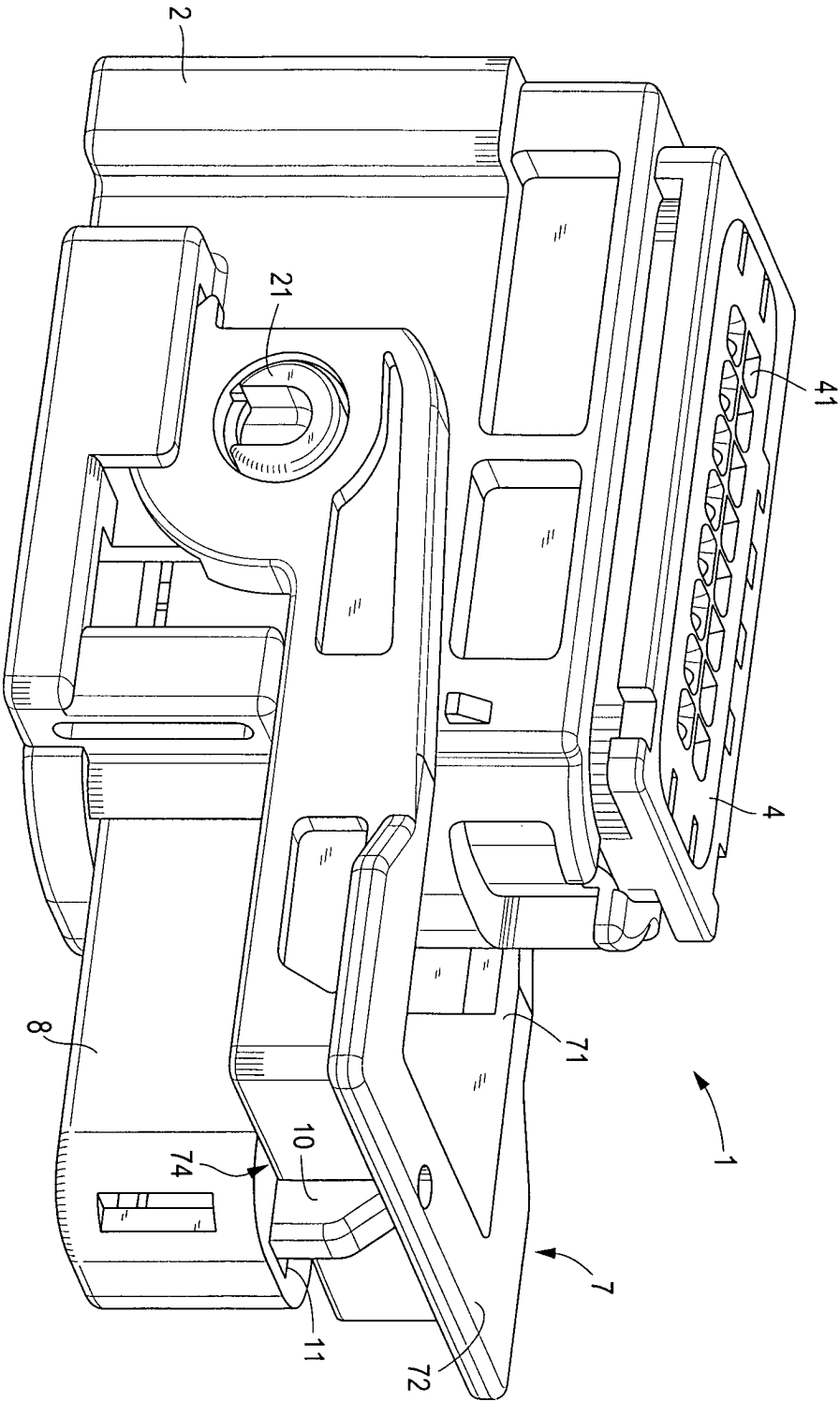


FIG. 1

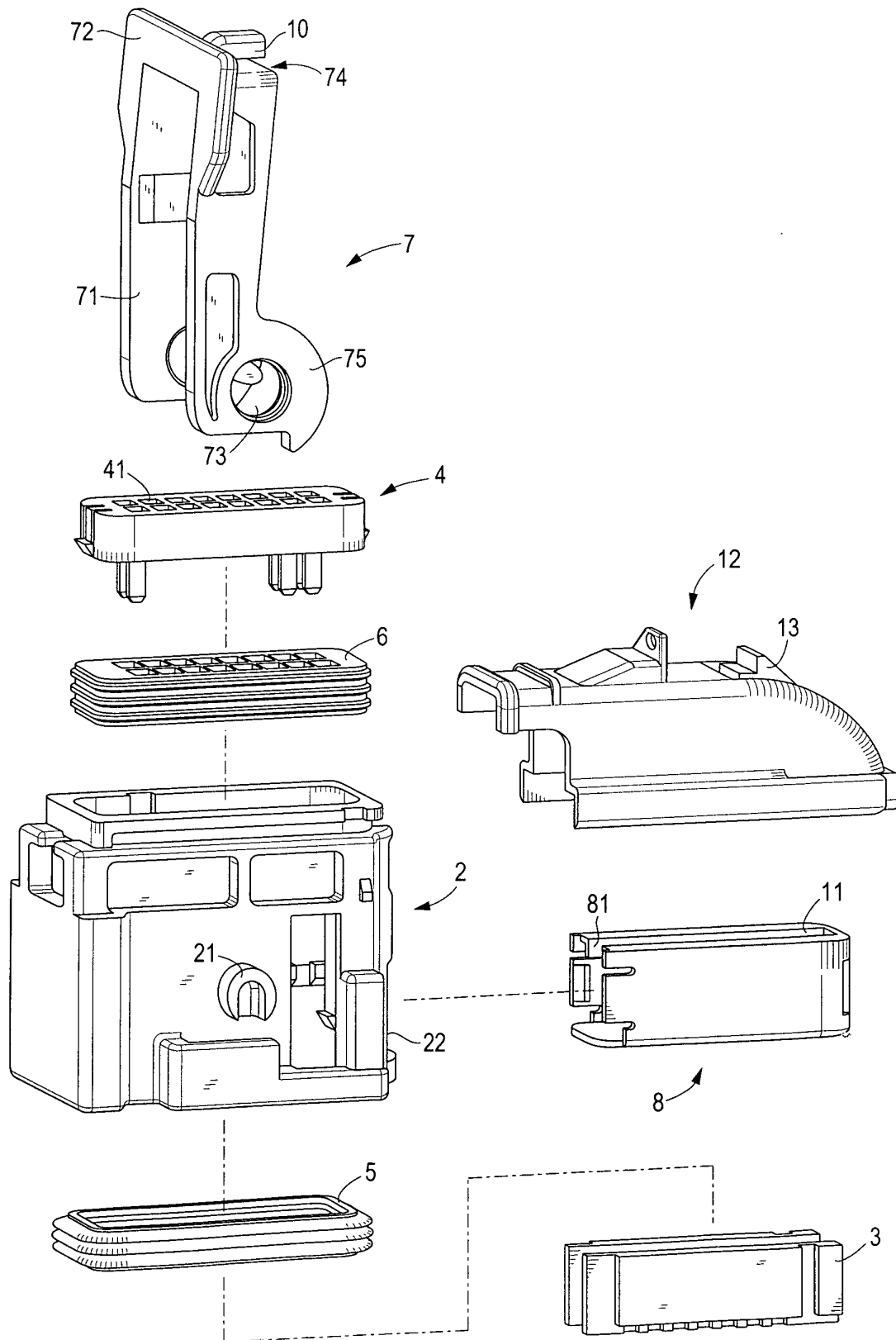


FIG. 2

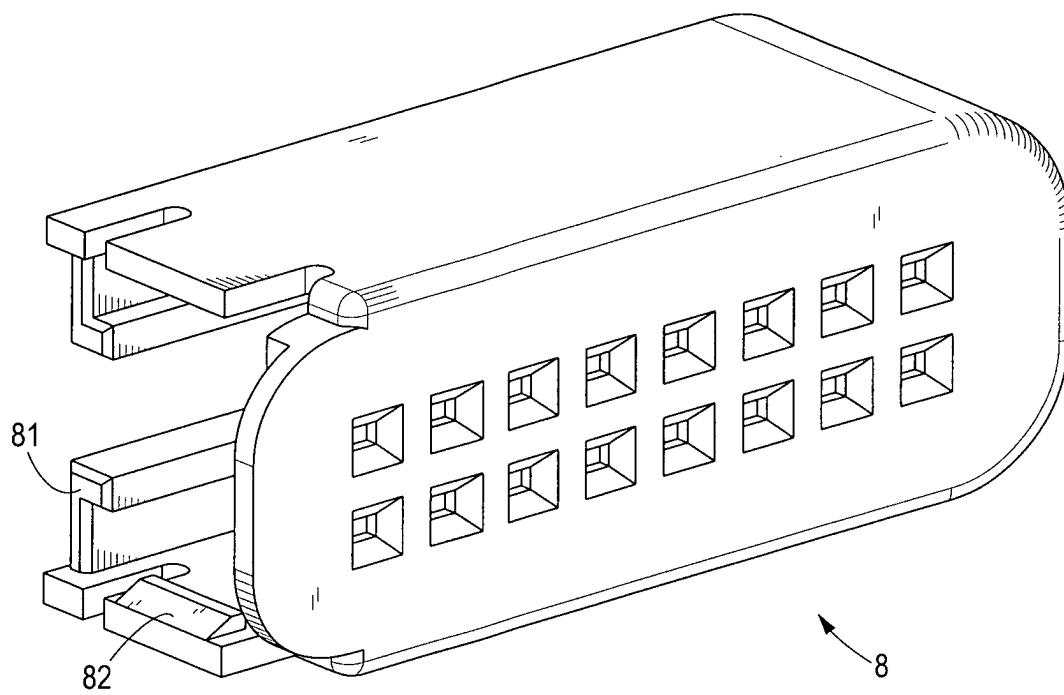


FIG. 3

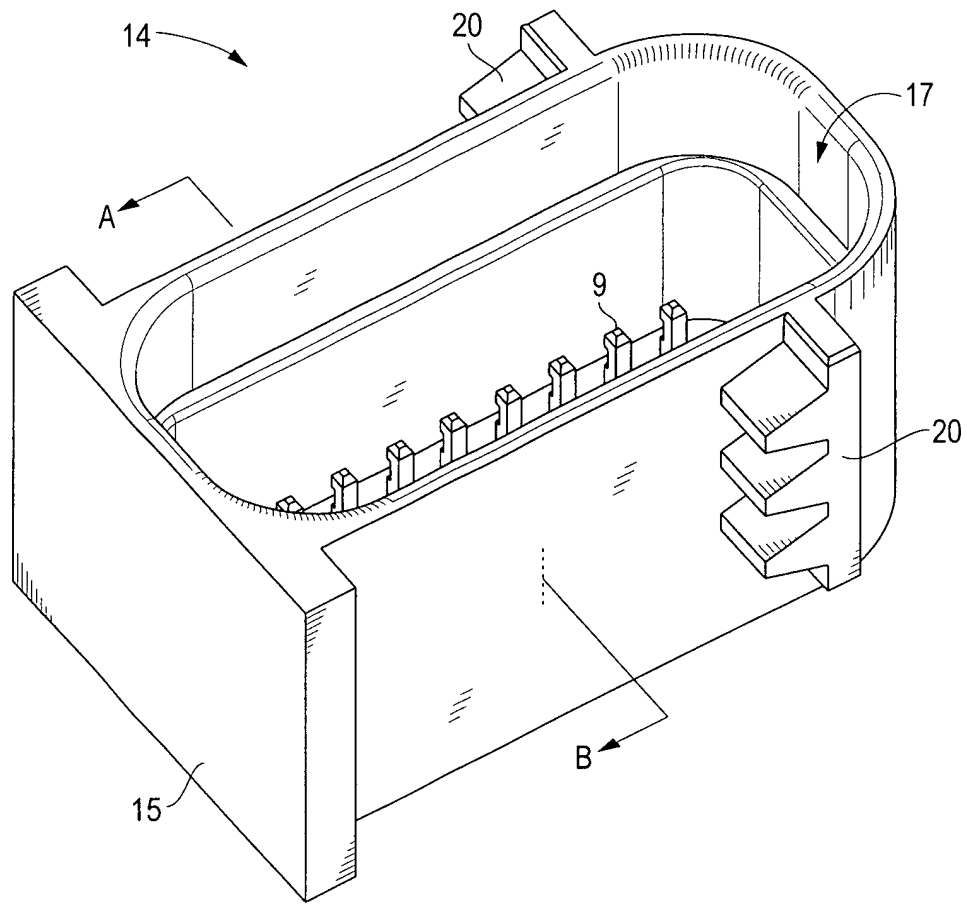


FIG. 4a

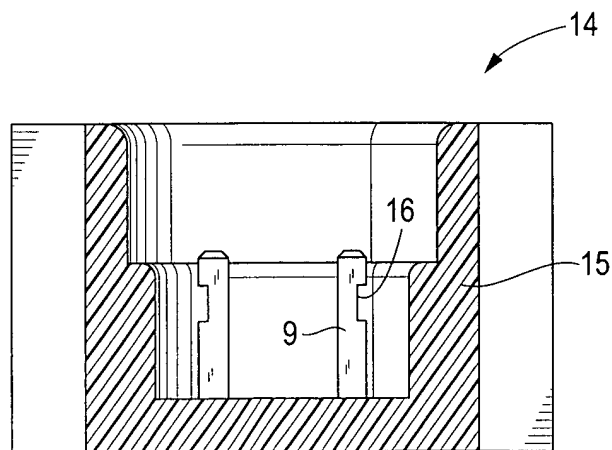


FIG. 4b

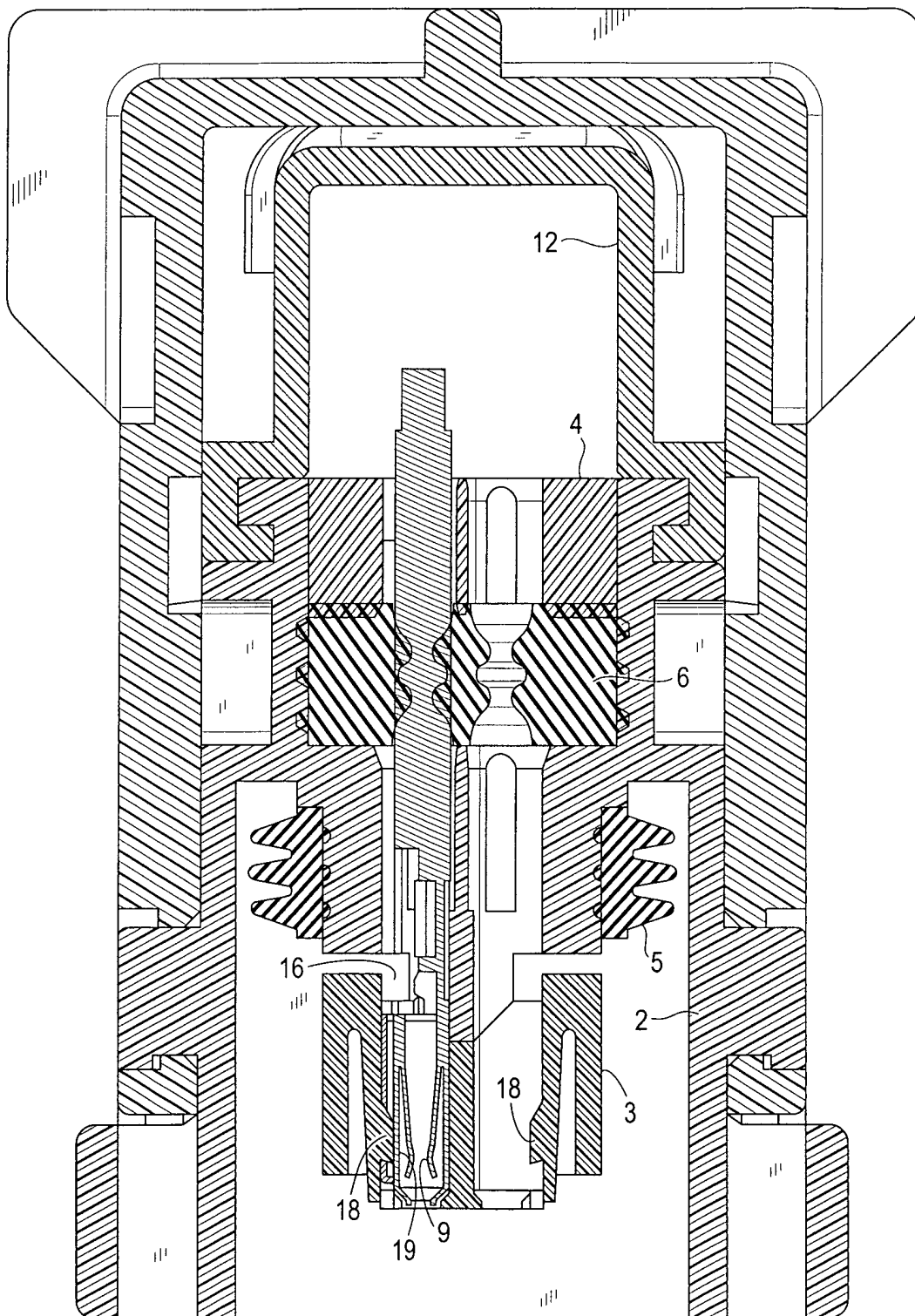


FIG. 5

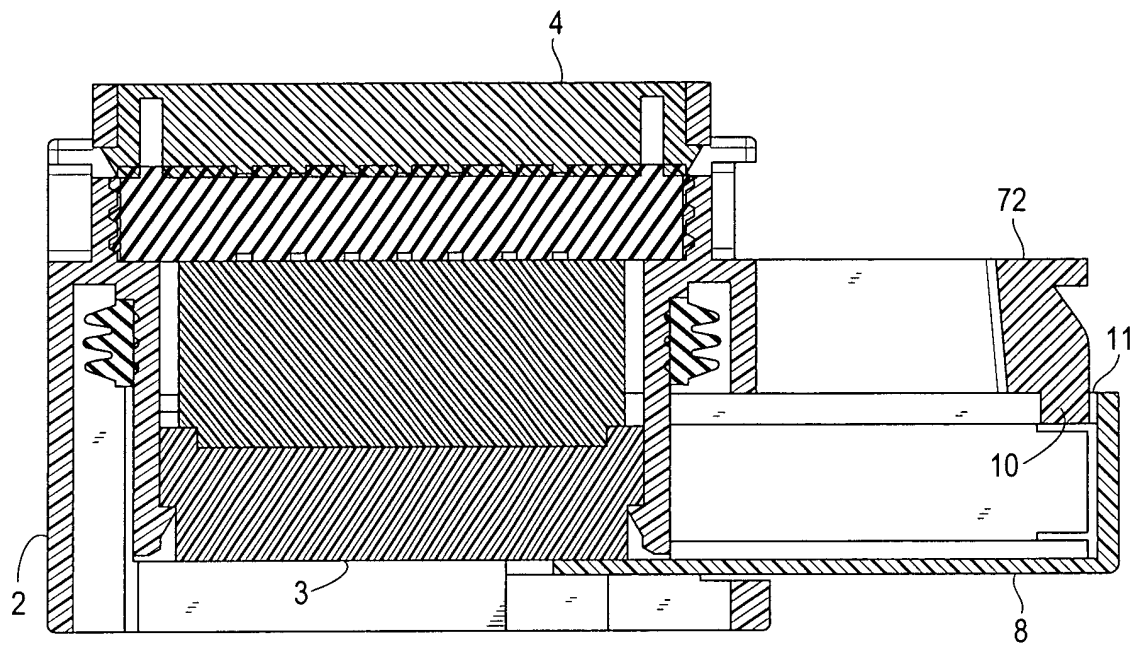


FIG. 6

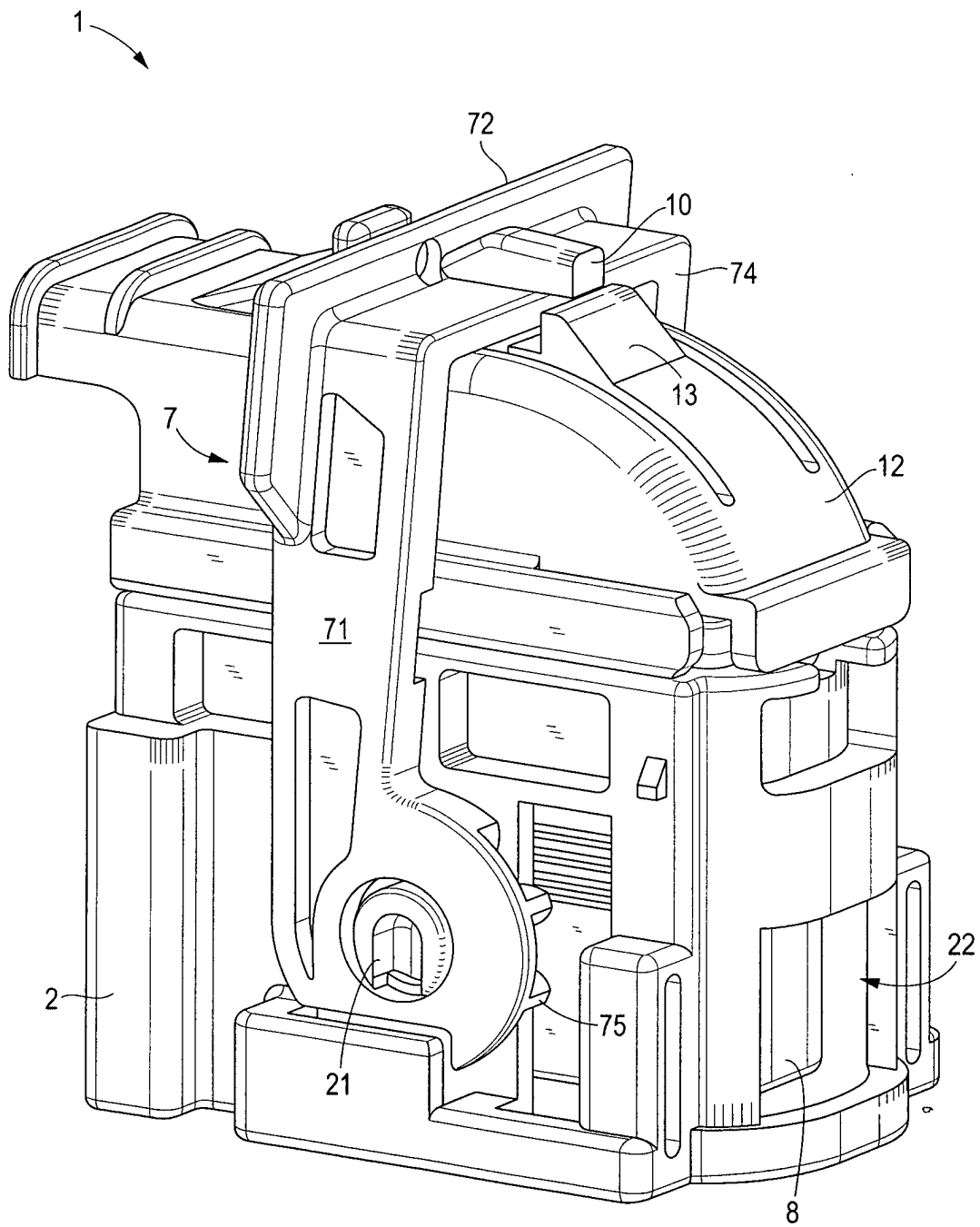


FIG. 7

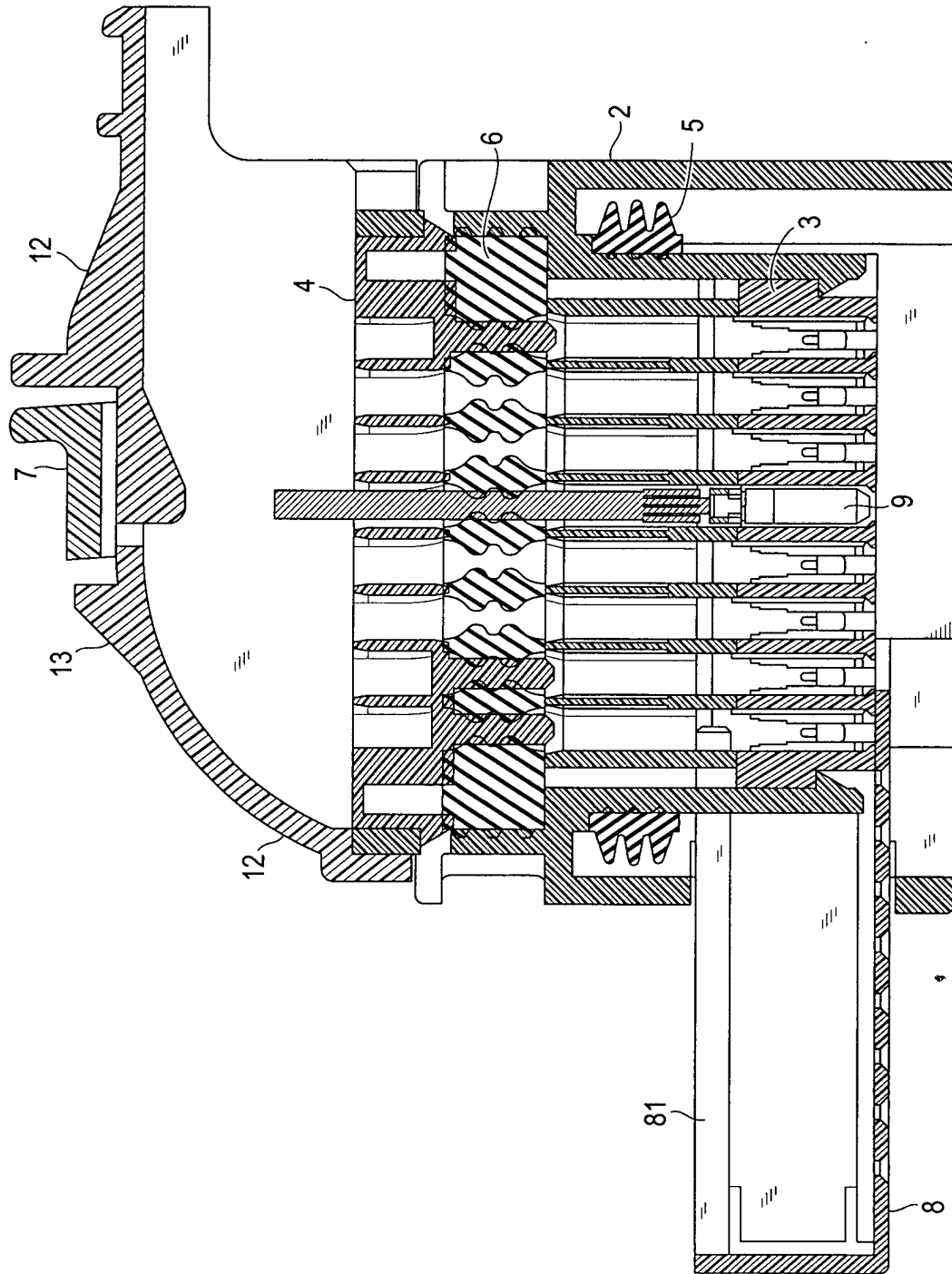


FIG. 8



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Application Number
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 9 December 2002	Examiner Chelbosu, L
CATEGORY OF CITED DOCUMENTS		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	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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