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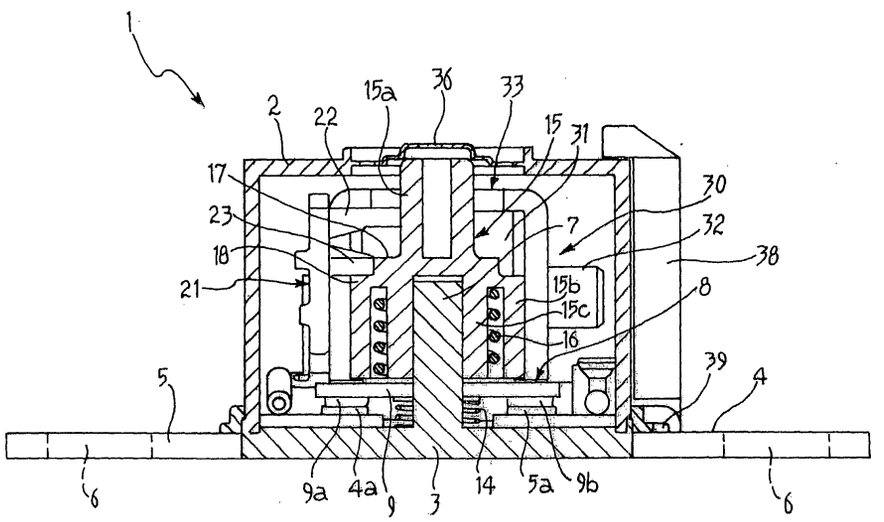
(54) Load disconnecting switch, in particular for the load circuit of a motor vehicle battery

(57) The device (1) includes

an insulating support structure (3),
two electrical connection terminals (4,5) fixed in spaced relation to this support structure (3),
a guide stem (7) fixed orthogonally to the said structure (3) in a region intermediate between the terminals (4,5),
a movable electrical connection bridge (8) displaceable along the stem (7) between a rest position and a working position in which it connects or respectively disconnects the terminals (4,5);
a spring (14) tending to urge the connection bridge (8) towards its rest position,
a control member (15) which can be operated manually to cause the connection bridge (8) to move from the rest position to the working position;
a spring retaining device (20-24) for maintaining the control member (15) in the position in which it keeps the connection bridge (8) connected to the terminals (4,5); and
a disengagement device (30-33) which can be operated to release the control member (15) from the associated retaining device (20-24) and allow the movable bridge (8) to be disconnected from the terminals (4,5) under the action of the spring (14).

FIG. 5



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Description

[0001] The present invention relates to a device for controlling the connection of one or more loads to a source of DC voltage, in particular to the battery of a motor vehicle.

[0002] One object of the invention is to provide a device which makes it possible to open one or more electrical circuits in a potentially dangerous situation, for example when a motor vehicle collides with an obstacle and the presence of active electrical controls would constitute a fire hazard to the vehicle itself.

[0003] This and other objects are achieved according to the invention by providing a device the principle characteristics of which are defined in the appended Claim 1.

[0004] Further characteristics and advantages will become apparent from the following detailed description, provided purely by way of non-limitative example, with reference to the appended drawings, in which:

Figure 1 is a perspective view of a device according to the invention;

Figure 2 is a partial perspective view showing the device of Figure 1 without its protective casing;

Figure 3 is a further partial perspective view, showing a portion of the device of the preceding drawings;

Figure 4 is a perspective view showing one way of manufacturing a movable-bridge electrical connector element included in the device of the preceding drawings;

Figure 5 is a section substantially taken on the line V-V of Figure 1;

Figure 6 is an exploded perspective view of the device shown in the preceding drawings; and

Figure 7 is a circuit diagram showing the electrical structure of the device according to the invention.

[0005] In the drawings, a device according to the invention is generally indicated 1.

[0006] In the embodiment illustrated by way of example, the device 1 includes a casing 2 of an electrically insulating material, of a generally prismatic shape, in the form of an inverted bowl. The casing 2 is coupled to a base plate 3 of an electrically insulating material (see Figures 2 and 6).

[0007] Two aligned, spaced electrical connection terminals 4 and 5 are fixed to the base plate 2, and, as can be seen in Figures 1 and 5, partially protrude from the casing 2. The ends of these terminals which protrude from the casing have respective formations 6 for enabling connections to be made to them in a manner known per se. In the embodiment shown by way of non-limitative example, these formations are holes enabling a screw connection to be made.

[0008] As can be seen from the electrical diagram of Figure 7, the terminal 4 is intended to be connected to the positive pole of a source of DC voltage, such as the battery B of a motor vehicle (the negative pole being connected to earth GND). The terminal 5 on the other hand is intended to be connected to one or more electrical loads, generally indicated L in Figure 7.

[0009] As can be seen in particular in Figures 5 and 6, a guide stem 7, preferably of a prismatic shape, extends orthogonally of the base plate 3 in the region between the terminals 4 and 5.

[0010] An electrical connection bridge, generally indicated 8, is mounted for guided movement along this stem 7 for cooperation with the facing ends of the terminals 4 and 5. With reference in particular to Figure 4, in a particularly advantageous embodiment the movable connection bridge 8 includes two essentially rectangular plate-like metal elements 9 and 10, arranged alongside each other and connected electrically and mechanically by a flexible metal strip 11. At either end, the connector elements 9 and 10 have respective contact members 9a, 9b and 10a, 10b, for cooperating with corresponding contacts 4a and 5a on the terminals 4 and 5 (see Figure 6).

[0011] As can be seen in particular in Figure 4, the strip 11 which interconnects the elements 9 and 10 of the connection bridge 8 has a central, essentially quadrangular aperture 12, while the adjacent portions of the said elements 9 and 10 have corresponding notches 9c, 10c for enabling the entire bridge 8 to slide along the guide stem 7.

[0012] The middle portions of the longer outer sides of the elements 9 and 10 of the movable bridge 8 have respective notches 9d, 10d (see Figure 4) for sliding along guide pins 13 which extend vertically upwards from the base plate 3 (see Figures 2, 3 and 6).

[0013] The elements 9 and 10 of the movable connection bridge 8 are made in such a way as to allow high electrical voltage to pass through them, for example 150 A or more. The connection of these elements 9 and 10 by means of the flexible strip 11 allows for some relative movement between the said elements, thereby ensuring that they are effectively connected in contact with the terminals 4 and 5, despite any possible tolerances which might arise during manufacture or assembly.

[0014] A first coil spring, indicated 14 in Figures 5 and 6, is arranged around the guide stem 7, between the base plate 3 and the movable connection bridge 8. This spring 14 tends to urge the movable bridge 8 into a rest position (not shown in the drawings) in which it disconnects the terminals 4 and 5.

[0015] A manually operated control member, made of an electrically insulating material, is indicated 15. The top of this member 15 has a tubular shank 15a joining at the bottom with a bell-shaped portion 15b. Inside this bell-shaped portion 15b, the control member 15 forms a sleeve 15c (see Figure 5) which is slidably coupled onto the top portion of the guide stem 7.

[0016] A second coil spring 16 is arranged in the space between the bell-shaped portion 15b and the internal sleeve 15c (see Figures 5 and 6) so as to bear

down on the connection bridge 8.

[0017] The top surface of the bell-shaped portion 15b of the operating member 15 has two flat surfaces 17 and 18 arranged at different levels.

[0018] A pin, indicated 20 in Figures 2, 3 and 6, extends orthogonally from the base plate 3 and has a retaining member, generally indicated 21, mounted for rotation on it. This member has at least one and preferably several extensions 22 and a third extension 23 beneath these.

[0019] A wire spring or torsion spring 24 (see Figures 2 and 6) tends to urge the retaining member 21 towards the operating member 15.

[0020] This arrangement is such that when the operating member 15 is in the lowered or working position shown in Figure 5, the extension 23 of the retaining member 21 engages the top surface portion 18 of the operating member 15 and holds this member in this working position. In this condition, the coil spring 16 (see Figure 5) presses the connection bridge 8 onto the terminals 4 and 5 with a predetermined force and the loads L (see Figure 7) are connected to the voltage source B.

[0021] In the embodiment illustrated by way of example, an uncoupling or disengagement device, generally indicated 30 includes a winding or solenoid 21 and an associated movable core 32 (see Figures 2, 5 and 6). The solenoid 31 has an associated magnetic structure 33 and is fixed to the base plate 3 in such a way that its end spigot 32a (see Figure 6) faces the free end of the rotatable element 21 of the retaining device associated with the operating member 15.

[0022] This arrangement is such that when the solenoid 31 is excited, the magnetic field thus generated causes a displacement of the movable core 32 towards the rotatable member 31, thereby causing this latter to disengage from the operating member 15, against the action of the biasing spring 24. In this condition, the operating member 15 and the associated movable connection bridge 8 are pushed upwards by the spring 14. The connection between the terminals 4 and 5 is interrupted.

[0023] In order to restore the connection, it is necessary to press the operating member 15 manually, after which it is held in its lowered working position by the retaining member 21 urged by the spring 24.

[0024] With reference to Figure 7, one end of the solenoid 31 is connected to the positive pole of the battery B via the terminal 4. The other end of this solenoid 31 is connected to a cable 37 which ends in a connector 38, which can either be connected to earth directly or, as shown in Figure 7, by means of a so-called inertia switch 35, which is normally closed. This second arrangement makes it possibly to disconnect the loads L from the battery B automatically in the event of the motor vehicle colliding with an obstacle. With reference in particular to Figures 1, 5 and 6, it is convenient if the protective casing 2 has an aperture at the top closed by a resilient membrane 36 which makes it possible to operate the control member 15 from the outside. It is convenient if a similar resilient membrane 37 is applied to an additional aperture formed in one side of the casing 2 (see Figure 6) facing the end of the movable core 32 opposite the retaining member 21, thereby making it possible to open the connector device 1 manually as well.

[0025] It is preferable, in order to prevent the connector device 1 from being opened accidentally or inadvertently, if a protective lid 38 is associated with membrane 37, hinged at 39 to the casing 2 (see Figure 5).

[0026] In an alternative embodiment which is not illustrated, the device 1 described above could have no solenoid 31, including simply an additional, manually-operable stem in the manner of a push button for causing the retaining member 21 to disengage from the control member 15, in a similar way to that achieved by acting on the movable core 32 in the embodiment described above.

[0027] Naturally, the principle of the invention remaining unchanged, embodiments and manufacturing details may vary widely from those described and illustrated purely by way of non-limitative example, without departing thereby from the scope of the invention, as claimed in the appended Claims.

Claims

1. A device for controlling the connection of at least one load (L) to a pole (+) of a source (B) of DC voltage, and in particular to the battery (B) of a motor vehicle, including

   a planar, electrically insulating support structure (3),
   first and second electrical connector terminals (4, 5), fixed in spaced relation on the said support structure (3),
   a guide stem (7) fixed orthogonally to the said structure (3) in an intermediate region between the said terminals (4, 5),
   a movable electrical connection bridge (8) displaceable along the said stem (7) between a rest position and a working position in which it either connects or disconnects respectively the said terminals (4, 5),
   first resilient means (14) tending to urge the said connection bridge (8) into the rest position,
   a control member (15) which can be operated manually to move the connection bridge (8) from its rest to its working position,
   a spring retaining device (29-24) for holding the said control member (15) in the position in which it holds the connection bridge (8) coupled to the said terminals (4, 5), and
   a disengagement device (30-33) for releasing the said control member (15) from the associ-

ated retaining device (20-24) and allowing the movable bridge (8) to be uncoupled from the aforesaid terminals (4, 5) through the action of the aforesaid first resilient means (14).

2. A device according to Claim 1, in which the said movable electrical connection bridge (8) includes two plate-like elements (9, 10) connected to each other electrically and mechanically by a resiliently deformable strip (11).

3. A device according to Claim 1 or Claim 2, in which the said first resilient means include a coil spring (14) interposed between the said support structure (3) and the movable electrical connection bridge (8).

4. A device according to any preceding Claim, also including second resilient means (16) interposed between the aforesaid manually-operated control member (15) and the movable electrical connection bridge (8) and operable, when the said connection bridge (8) is connected to the said terminals (4, 5) to apply a predetermined force on the said movable bridge in the direction of the said terminals (4, 5).

5. A device according to Claim 4, in which the said second resilient means include an additional coil spring (16) essentially arranged around the said stem (7).

6. A device according to any preceding Claim, in which the said spring retaining device (20, 24) includes a retaining member (21) mounted for rotation with respect to the said support structure (3) about an axis (20) essentially parallel to the said guide stem (7), and having retaining means (22, 23) for holding the said control member (15) in the position in which it helps maintain the movable electrical connection bridge in connection with the said terminals (4, 5); third resilient means (24) being provided which tend to urge the said rotatable retaining member (21) in the direction of the control member (15).

7. A device according to Claims 4 and 5, in which additional guide stems (13) extend from the support structure (3) for cooperation with the said movable connection bridge (8) so as to guide it between its rest position and its working position.

8. A device according to any preceding claim, in which the said disengagement device includes a movable member (32), which can be operated manually, for causing the spring retaining device (20-24) to be disengaged from the manually operated control member (15).

9. A device according to Claim 8, in which the said movable disengagement device (32) is the core (32) of a stationary solenoid (31) connected to the said support structure (3) and operable, when the solenoid (31) is excited, to cause the retaining device (20-24) to become disengaged from the said manually operated control member (15).

10. A device according to any preceding Claim, further including a protective casing (2) having an aperture therein closed by a membrane (36) which allows the said control member (15) to be operated externally.

11. A device according to Claims 8, 9 and 10, in which the said protective casing (2) has an additional aperture with an associated closure membrane (37) enabling the aforesaid movable disengagement member (32) to be operated manually externally.

12. A device according to Claim 11, in which the said additional membrane (37) is covered by a movable protection member (38) operable to prevent accidental operation of the said movable disengagement member (32).

13. A device according to Claim 8, in which the said solenoid (31) has a terminal (4) for connection to the voltage source (B) and the other end connected to a cable (37) with a terminal connector (38) for connection with the other pole of the said voltage source (B).

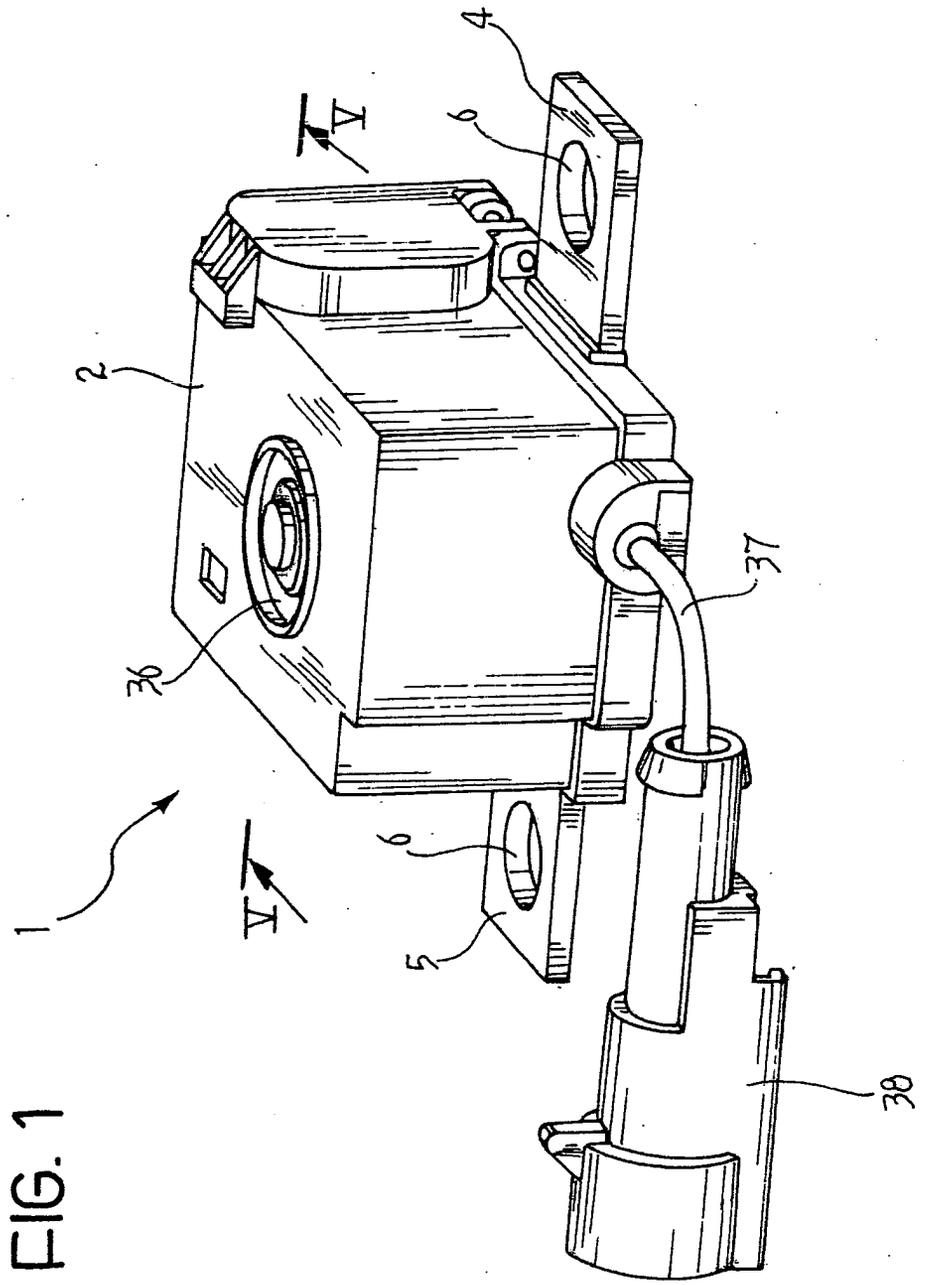

FIG. 1

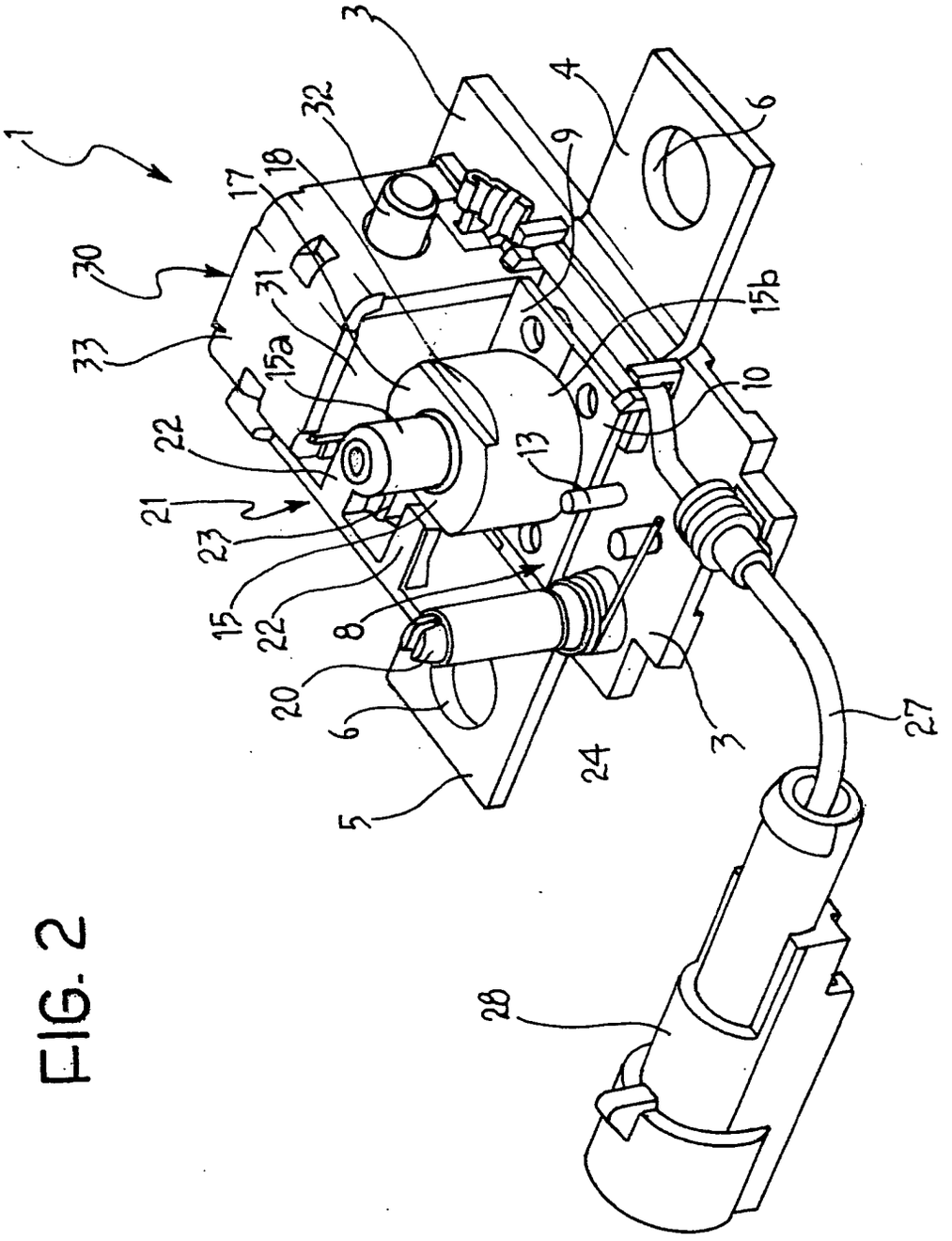

FIG. 2

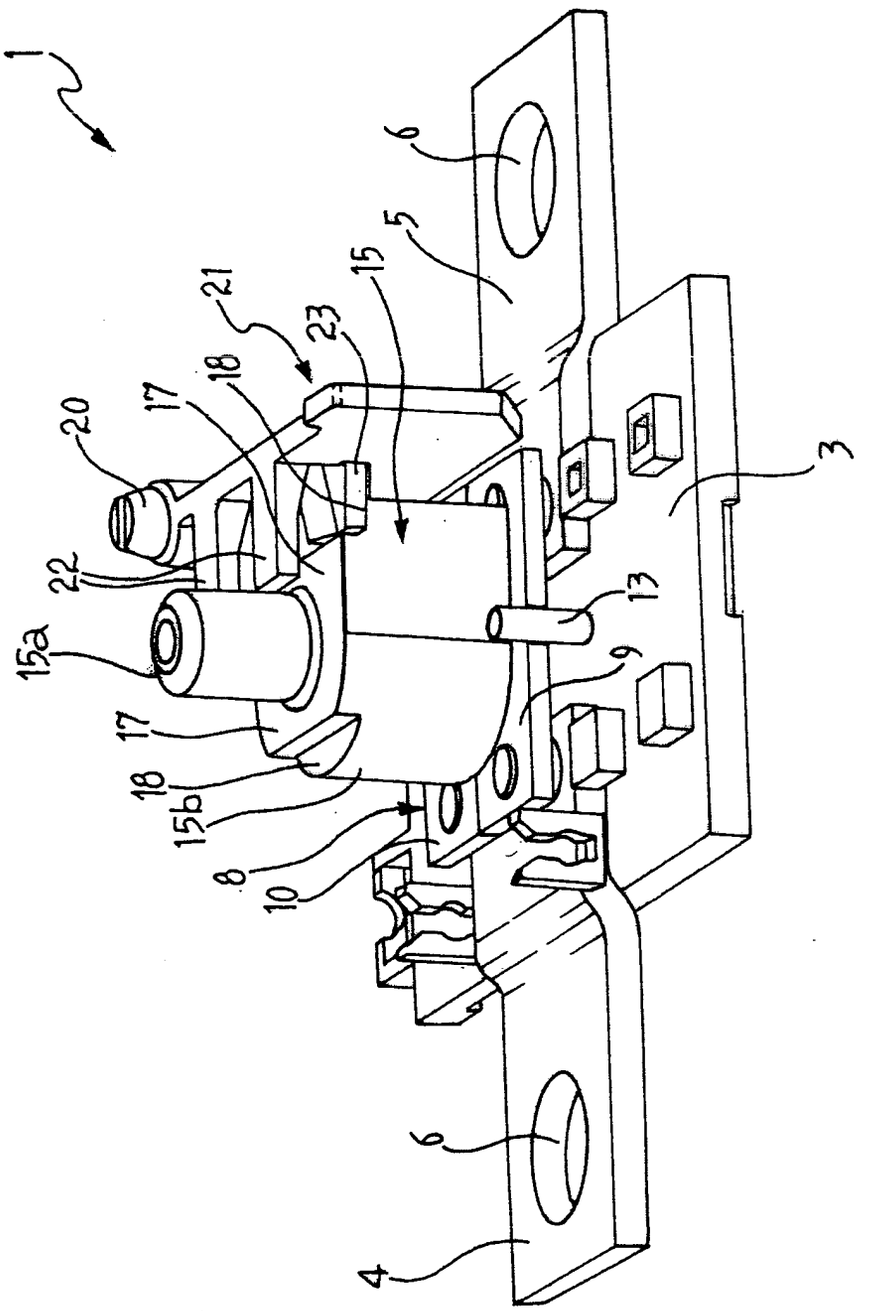

FIG. 3

FIG. 4

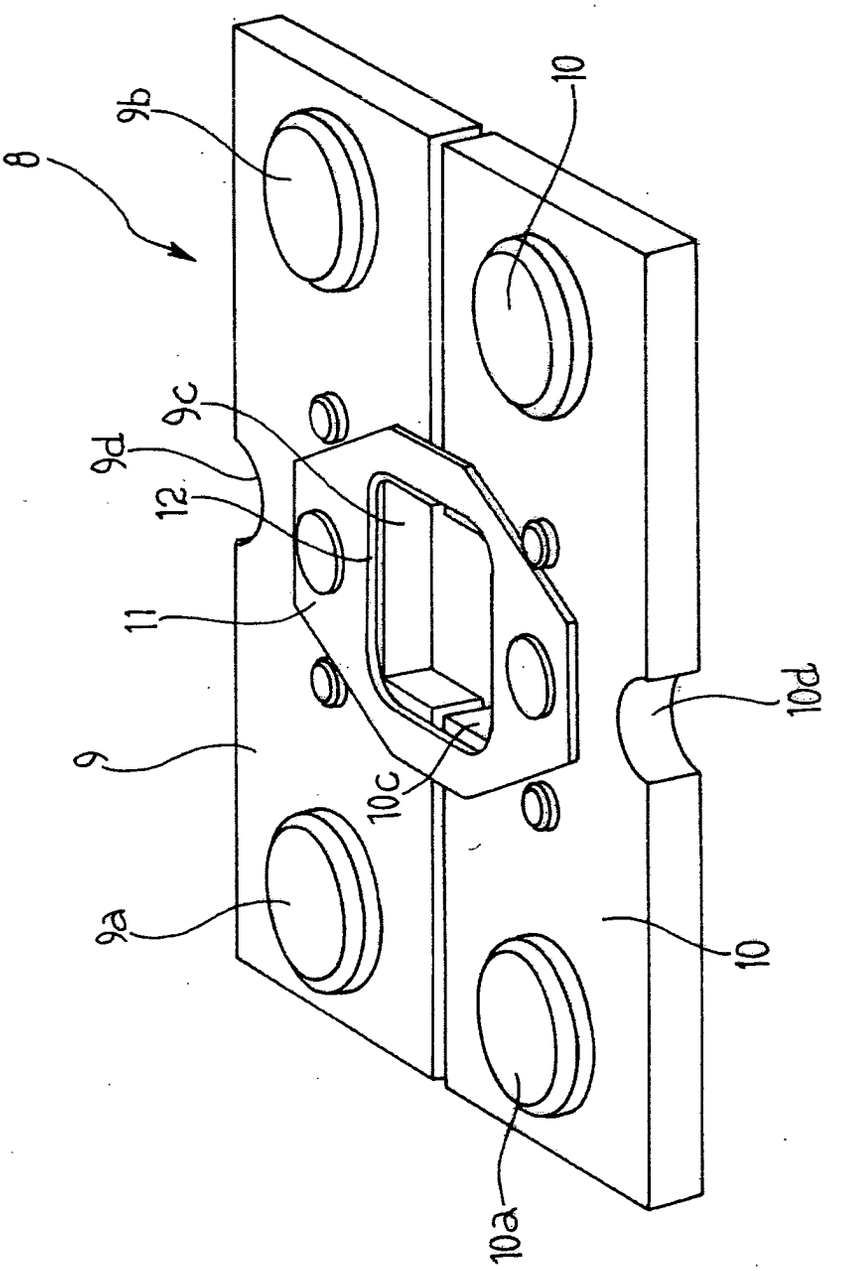

FIG. 5

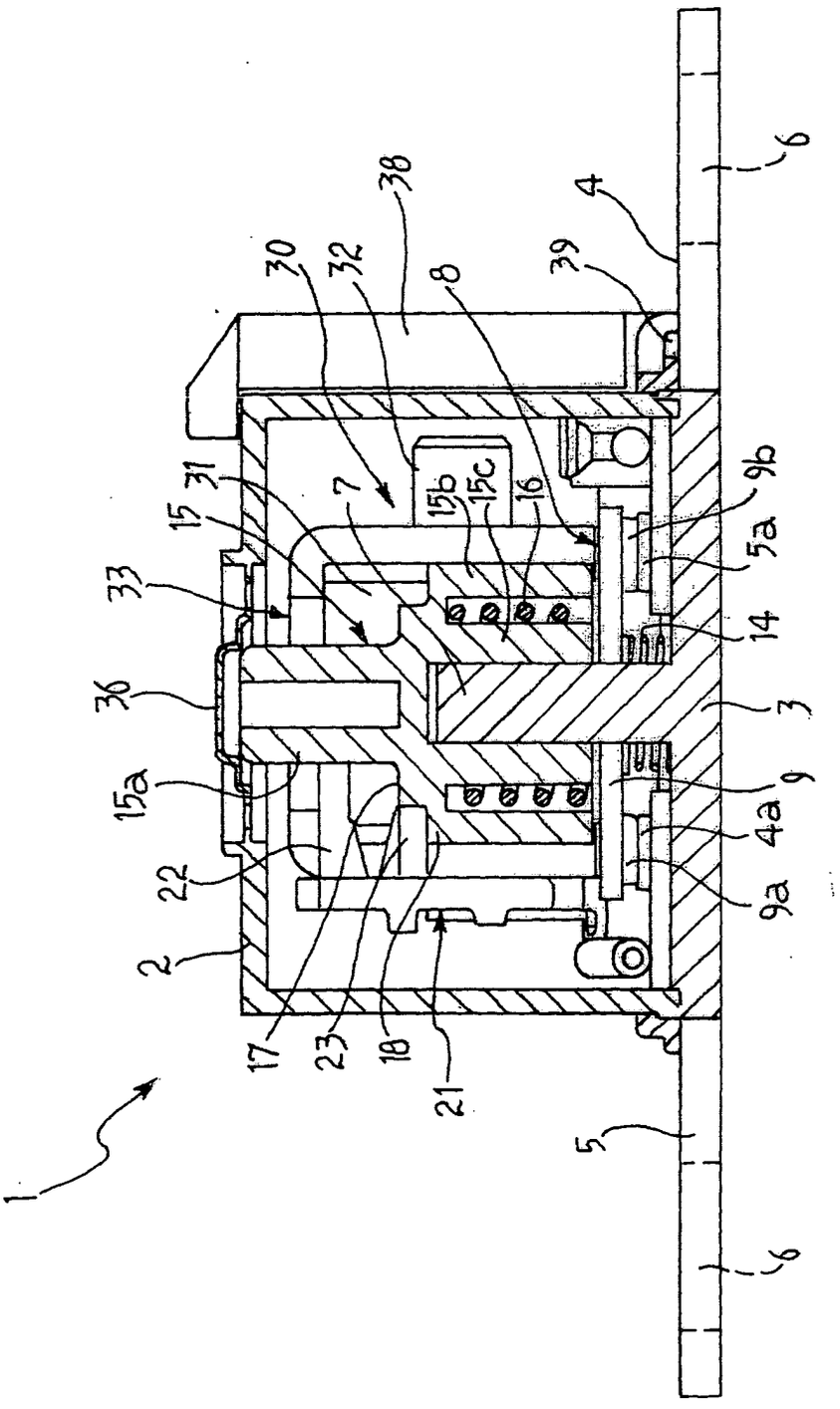
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FIG. 6

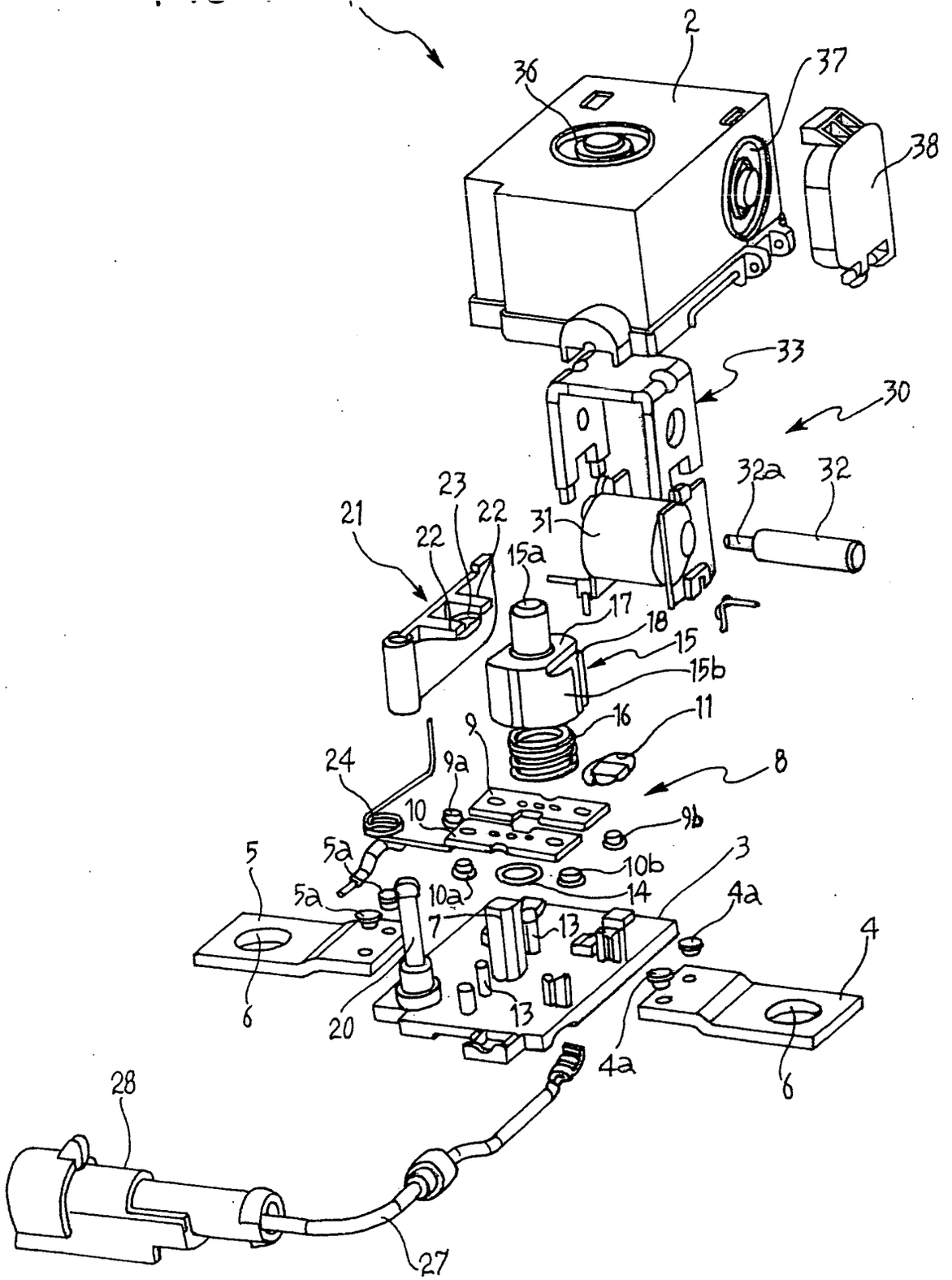
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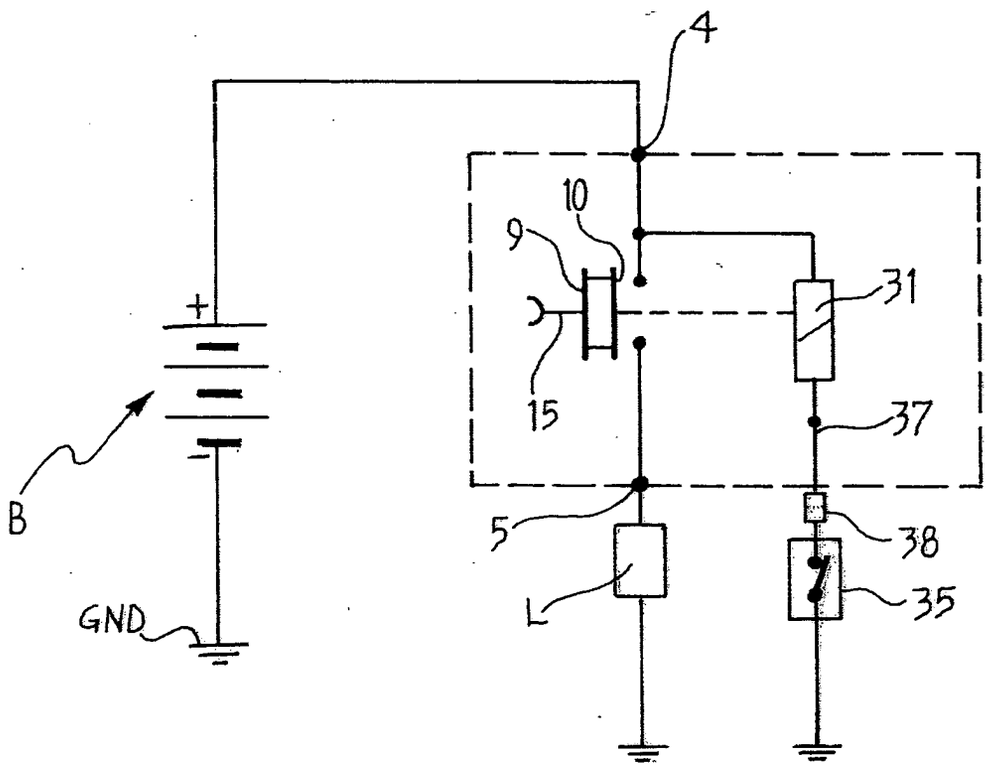
FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 03 01 1667

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	EP 0 938 121 A (GOERLITZ ESG GMBH) 25 August 1999 (1999-08-25) * figure 2 *	3,4	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	11 September 2003	Mäki-Mantila, M

CATEGORY OF CITED DOCUMENTS

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