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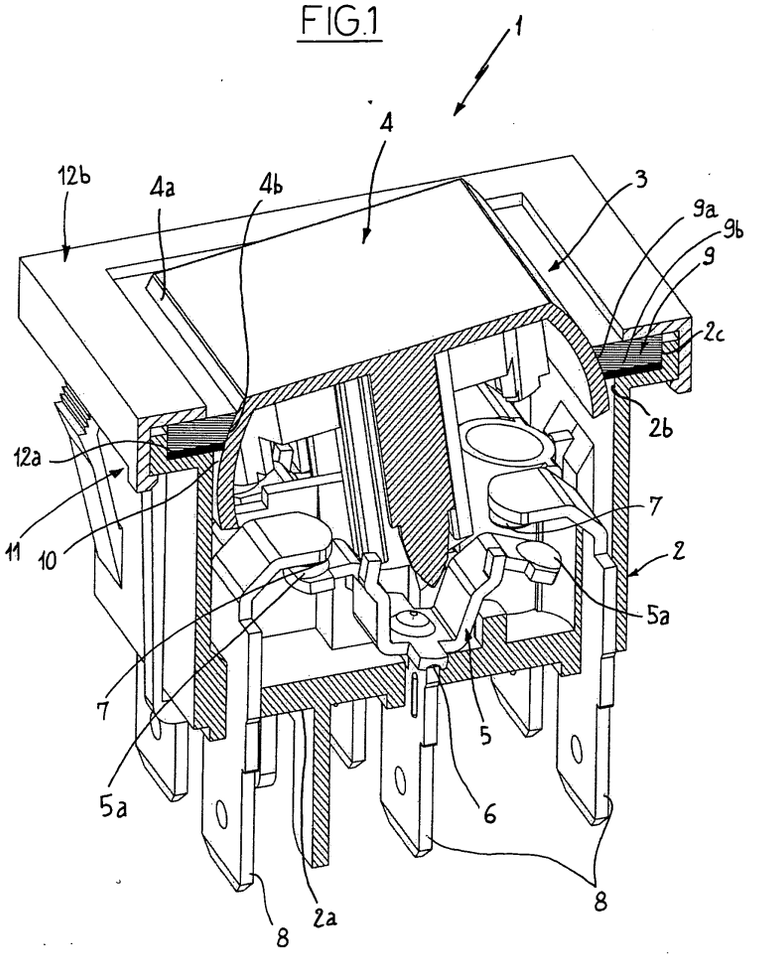
(54) Hermetically-sealed electric switch

(57) It is disclosed a hermetically sealed electric switch comprising a holding box-shaped body (2), at least one operating key (4) housed at an opening (3) of the box-shaped body (2), at least one seal (9) disposed at an edge (2b) of the opening (3) of the box-shaped body (2) and externally surrounding a strip (4a) of the side surface (4b) of the operating key (4) and engagement means (11) between the seal (9) and the box-shaped body (2).

FIG.1



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Description

[0001] The present invention relates to a hermetically sealed electric switch.

[0002] It is known that generally an electric switch comprises a holding box-shaped body having an opening at which an operating key or button is housed that can be of the depression or toggle type, for example.

[0003] The operating key is operatively connected with at least one movable contact carrier disposed internally of said box-shaped body and capable of shifting between two working positions corresponding to breaking or opening and completing or closing of the switch itself.

[0004] The movable contact carrier is usually of the type oscillating about a fulcrum and the electric-contact points with which it is provided can be alternately moved close to or away from other fixed contact points present on electric terminals partly projecting from the box-shaped body and suitable for connection with an electric circuit.

[0005] To promote passage of the movable contact carrier between the working positions at which it can alternately remain depending on how the operating key has been pressed and prevent said contact carrier from stopping at an intermediate position, the presence of grease within the box-shaped body of the switch is generally provided for the purpose of reducing friction in the oscillatory motion of the movable contact carrier to a minimum degree.

[0006] In the electric switches of the above mentioned type there is often the technical problem of avoiding polluting particles such as those consisting of dust, sand, earth, sawdust or powders from other materials, being introduced through the gap or clearance defined between the edge of said opening of the box-shaped body and a strip of the side surface of the operating key. In fact, if pollution of the grease contained within the box-shaped body is caused by foreign particles, very serious drawbacks may occur.

[0007] A first drawback consists in the lubricating grease properties being modified so that the movable contact carrier capability of freely oscillating between the provided working positions is impaired: practically, said movable contact carrier can stop in a completely unforeseeable manner at an intermediate position causing formation of voltaic arcs or flashings between the contact points of said contact carrier and the fixed contact points of the electric terminals.

[0008] The above described situation is very dangerous because if for example the particles mixed with grease are of a combustible material it may happen that a flame is produced and therefore the whole switch may suddenly burn without any warning signal, since initially the apparatus with which the switch is connected appears to be switched off as both contact points of the oscillating contact carrier disposed at an intermediate position are spaced apart from the fixed contacts.

[0009] In addition, if the polluting particles are not of a material capable of burning, they may in any case give rise, together with the grease, to solid clots depositing on the contacts and preventing the provided contact approaching, thereby hindering normal operation of the switch.

[0010] In order to solve the mentioned technical drawback, in the known art an outer protection is provided for the operating key and the region around the opening edge of the box-shaped body of the switch which consists of a cover that is externally made up of a frame of rigid material and internally of a transparent sheet of flexible plastic material covering the operating key.

[0011] The known art briefly described above however has many limits and drawbacks.

[0012] In fact, first of all, the transparent sheet of flexible plastic material of the protecting cover associated with the switch can be easily damaged and is liable to deteriorate until breakage as a result of use, above all when the operating key is not manually pressed, as in the case of electrically-operated toy-vehicles for example, but is operated by the pressure exerted by lever elements moved by appropriate kinematic mechanisms.

[0013] In addition, the protecting cover added to the electric switch makes the switch more bulky and causes a more difficult operation of the operating key, for example in the previously mentioned case of electrically operated toy-vehicles in which the operating key is provided to be pressed by mechanical elements.

[0014] Finally, the known art involves an important increase in the manufacturing costs of the electric switches because an additional expensive production process is required for co-moulding the frame and the transparent sheet that together form the protecting cover.

[0015] Under this situation, the technical task underlying the present invention is to devise a hermetically sealed electric switch capable of substantially obviating the mentioned drawbacks.

[0016] Within the scope of this technical task, it is an important aim of the invention to devise a hermetically sealed electric switch that, in addition to being reliable and safe in operation, is adapted to be also actuated without risks of wear and deterioration, by mechanical elements exerting direct pressure on the operating key associated therewith.

[0017] Another important aim of the invention is to devise a hermetically sealed electric switch having very reduced additional production costs as compared with normal switches that are unable to inhibit internal penetration of particles of foreign materials.

[0018] A further aim of the invention is to devise an electric switch in which the particular feature of being hermetically sealed does not give rise to important modifications in the outer bulkiness.

[0019] The technical task mentioned and the aims specified are substantially achieved by a hermetically sealed electric switch that is characterised in that it comprises one or more of the technical solutions hereinafter

claimed.

[0020] The description of some preferred but not exclusive embodiments of an electric switch in accordance with the invention is now reproduced hereinafter by way of nonlimiting example, with the aid of the accompanying drawings, in which:

- Fig. 1 is a perspective view in section of a first embodiment of the electric switch in accordance with the invention;
- Fig. 2 shows the switch in Fig. 1 with a frame for locking of the seal provided therein, that is separated from the box-shaped body; and
- Fig. 3 is a second embodiment of an electric switch in accordance with the invention.

[0021] With reference to the drawings, the hermetically sealed electric switch in accordance with the invention is generally identified by reference numeral 1.

[0022] It comprises a box-shaped holding body 2 having an opening 3 at which an operating key 4 preferably of the toggle type is housed.

[0023] The operating key 4 drives a movable contact carrier 5 disposed internally of the box-shaped body 2 and oscillating round a fulcrum 6 in a manner adapted to carry out selective shifting between two working positions corresponding to opening or closing of the switch itself in which practically electric contact points 5a associated with the movable contact carrier 5 itself are spaced apart from or disposed close to fixed contact points 7 in turn in engagement with electric terminals 8. Said electric terminals 8 partly project from a bottom wall 2a of the box-shaped body 2 and are adapted for connection with an electric circuit.

[0024] In an original manner, the switch 1 comprises a seal 9 disposed at an edge 2b of the opening 3 of the box-shaped body 2 and externally surrounding a strip 4a of the side surface 4b of the operating key 4, so as to hermetically close the gap 10 between said edge 2b of opening 3 and the side surface 4b of the operating key 4.

[0025] Advantageously, seal 9 has a contact face 9a the shape of which substantially matches that of the strip 4a of the side surface 4b of the operating key 4 and is made of yieldable material, rubbery material for example, capable of perfectly adhering to said side surface 4b sliding against the seal during the working steps of the operating key 4.

[0026] Also provided is engagement means 11 capable of keeping the seal 9 steadily and irremovably joined to the box-shaped body 2. This engagement means 11 can be differently embodied.

[0027] In a first embodiment it merely consists of adhesive material 12a, a layer of glue or a bilaterally-adhesive film adapted to fasten an attachment portion 9b of the seal 9 to the edge 2b of the opening 3 of the box-shaped body 2.

[0028] In a second embodiment the engagement means 11 between the seal 9 and the box-shaped body 2 is mechanical retaining means 12b.

[0029] In a third embodiment, the engagement means 11 between the seal 9 and the box-shaped body 2 comprises both the adhesive material 12a and the mechanical retaining means 12b.

[0030] By way of example, the mechanical retaining means 12b shown in the accompanying figures comprises a seat 2c formed close to the edge 2b of the box-shaped body 2 and adapted to house the attachment portion 9b of seal 9. In this case the adhesive material 12a is interposed between said seal and the seat 2c.

[0031] In particular, in the embodiment shown in Figs. 1 and 2, in addition to seat 2c, a frame-shaped element 13 is provided that can be snap-fitted through hooked portions 13a (Fig. 2) on the box-shaped body 2 and is adapted to lock the attachment portion 9b of seal 9 against the seat 2c itself.

[0032] In the embodiment shown in Fig. 3, the seat 2c has a peripheral rib 2d adapted to be fitted into a corresponding hollow 9c formed in the attachment portion 9b of seal 9.

[0033] Practically, the engagement means 11 is susceptible of many modifications and variations, all directed to obtain a steady and safe union between seal 9 and the box-shaped body 2.

[0034] For example, said box-shaped body and seal may also be manufactured by co-moulding so as to constitute a unitary body.

[0035] The invention achieves important advantages.

[0036] In fact, first of all, the seal in accordance with the invention completely solves the technical problem of inhibiting penetration of particles of any material into the electric switch because it ensures a perfect and tight closure of the gap of said switch.

[0037] In addition, the hermetically sealed switch in accordance with the invention is very reliable in operation since there are no parts prone to unforeseeable deteriorations as in the known art in which, on the contrary, protections made of yielding material are provided that are superposed on the operating key portion designed to be pressed by hand or by mechanical elements.

[0038] It will be finally recognised that the technical solution made available by the invention is of cheap manufacture and does not substantially modify the outer bulkiness of the already known electric switches that are not hermetically sealed.

Claims

1. A hermetically sealed electric switch comprising:

- a box-shaped holding body (2),
- electric terminals (8) projecting from said box-shaped body (2) and suitable for connection with an electric circuit,
- at least one operating key (4) housed at an

opening (3) of the box-shaped body (2),

and at least one movable contact carrier (5) disposed internally of the box-shaped body (2) and operable by the operating key (4) to carry out shifting between two working positions corresponding to opening or closing of the switch itself,
characterised in that it comprises:

- at least one seal (9) disposed at an edge (2b) of said opening (3) of the box-shaped body (2) and externally surrounding a strip (4a) of the side surface (4b) of said operating key (4) so as to hermetically close the gap (10) between said edge (2b) and the side surface (4b) of the operating key (4) itself; and
- engagement means (11) between said seal (9) and box-shaped body (2).

2. A switch as claimed in claim 1, **characterised in that** said seal (9) has a face (9a) for contact with said operating key (4) conforming in shape to said strip (4a) of the side surface (4b) of the operating key (4) itself.

3. A switch as claimed in claim 1, **characterised in that** said engagement means (11) between the seal (9) and the box-shaped body (2) consists of adhesive material (12a) adapted to fasten an attachment portion (9b) of the seal (9) itself to the edge (2b) of said opening (3) of the box-shaped body (2).

4. A switch as claimed in claim 1, **characterised in that** said engagement means (11) between the seal (9) and the box-shaped body (2) is mechanical retaining means (12b).

5. A switch as claimed in claim 4, **characterised in that** said mechanical means (12b) for retention of the seal (9) to the box-shaped body (2) comprises a seat (2c) formed close to said edge (2b) of the box-shaped body itself (2) and adapted to house an attachment portion (9b) of the seal (9).

6. A switch as claimed in claim 4, **characterised in that** said mechanical means (12b) for retention of the seal (9) to the box-shaped body (2) comprises:

- at least one seat (2c) formed close to said edge (2b) of the box-shaped body itself (2) and adapted to house an attachment portion (9b) of the seat (9); and
- a frame-shaped element (13) to be snap-fitted to the box-shaped body (2) and adapted to lock the attachment portion (9b) of the seal (9) against said seat (2c).

7. A switch as claimed in claim 4, **characterised in that** said mechanical means (12b) for retention of the seal (9) to the box-shaped body (2) comprises at least one seat (2c) formed close to said edge (2b) of the box-shaped body itself (2) and adapted to house an attachment portion (9b) of the seal (9), and **in that** said seat (2c) has at least one peripheral rib (2d) adapted to penetrate into a corresponding hollow (9c) formed in the attachment portion (9b) of the seal (9).

8. A switch as claimed in claim 4, **characterised in that** said engagement means (11) between the seal (9) and the box-shaped body (2) is obtained by co-moulding of said box-shaped body with the seal.

9. A switch as claimed in claim 1, **characterized in that** said engagement means (11) between the seal (9) and the box-shaped body (2) consists both of adhesive material (12a) and mechanical retaining means (12b).

FIG.1

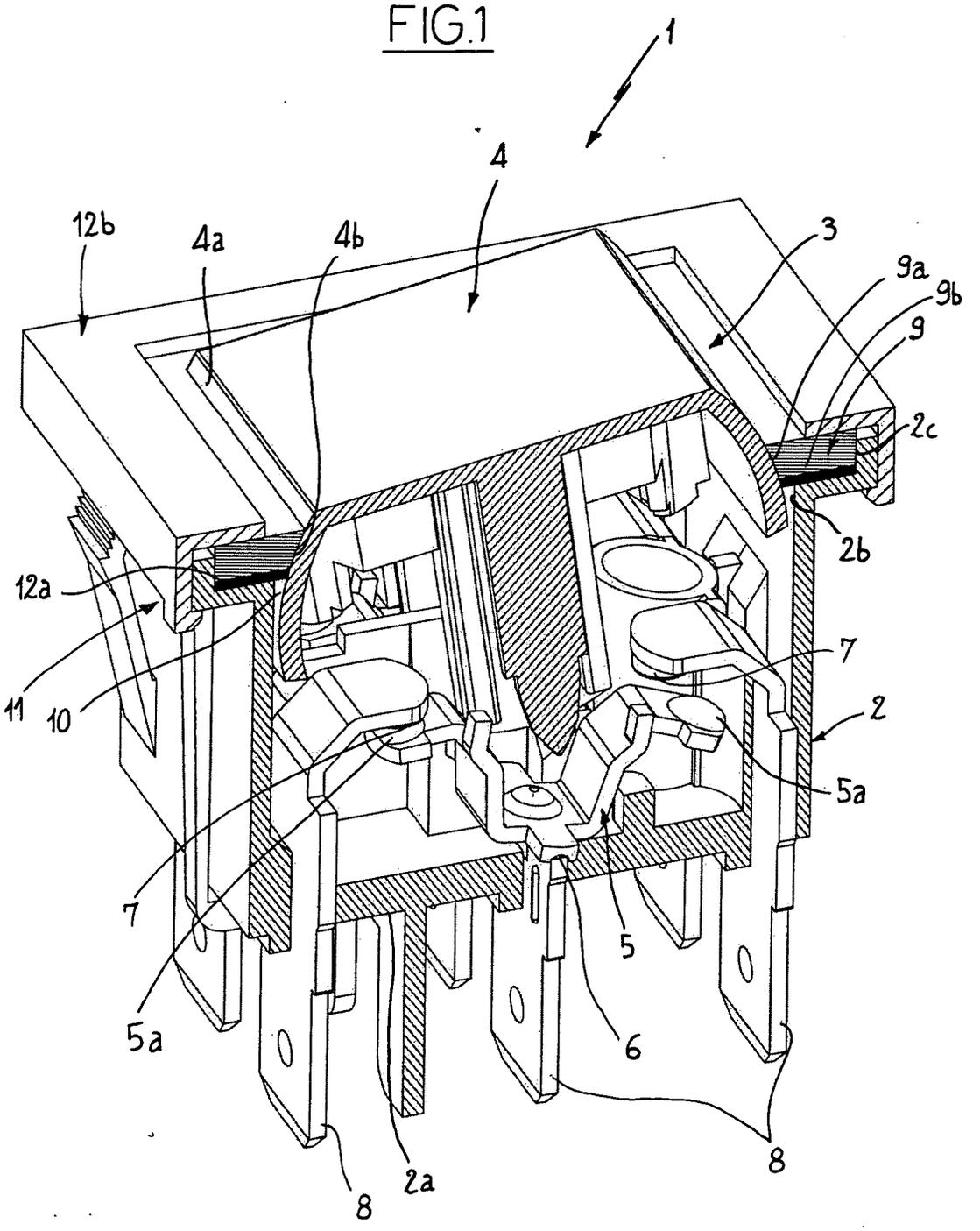


FIG. 2

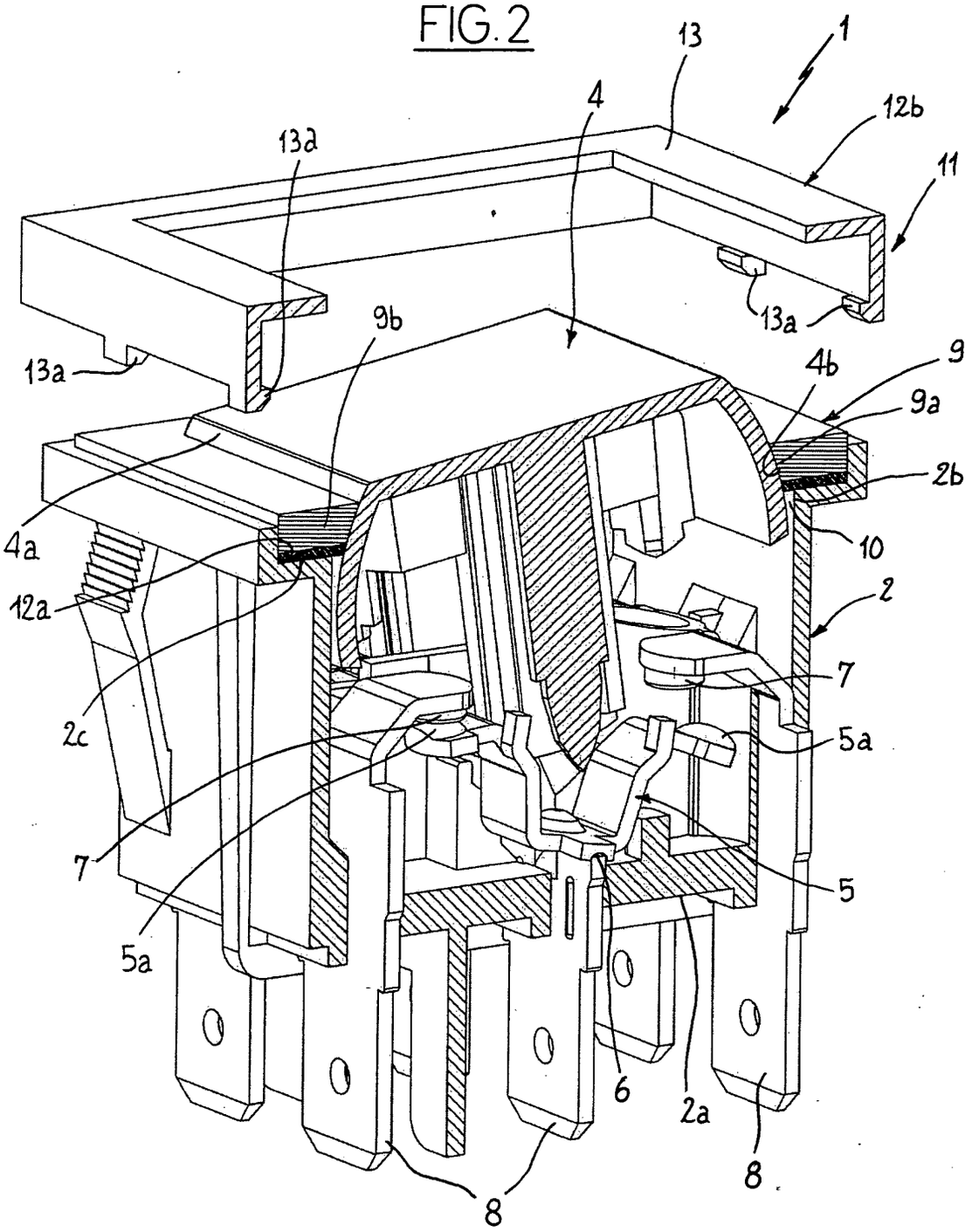
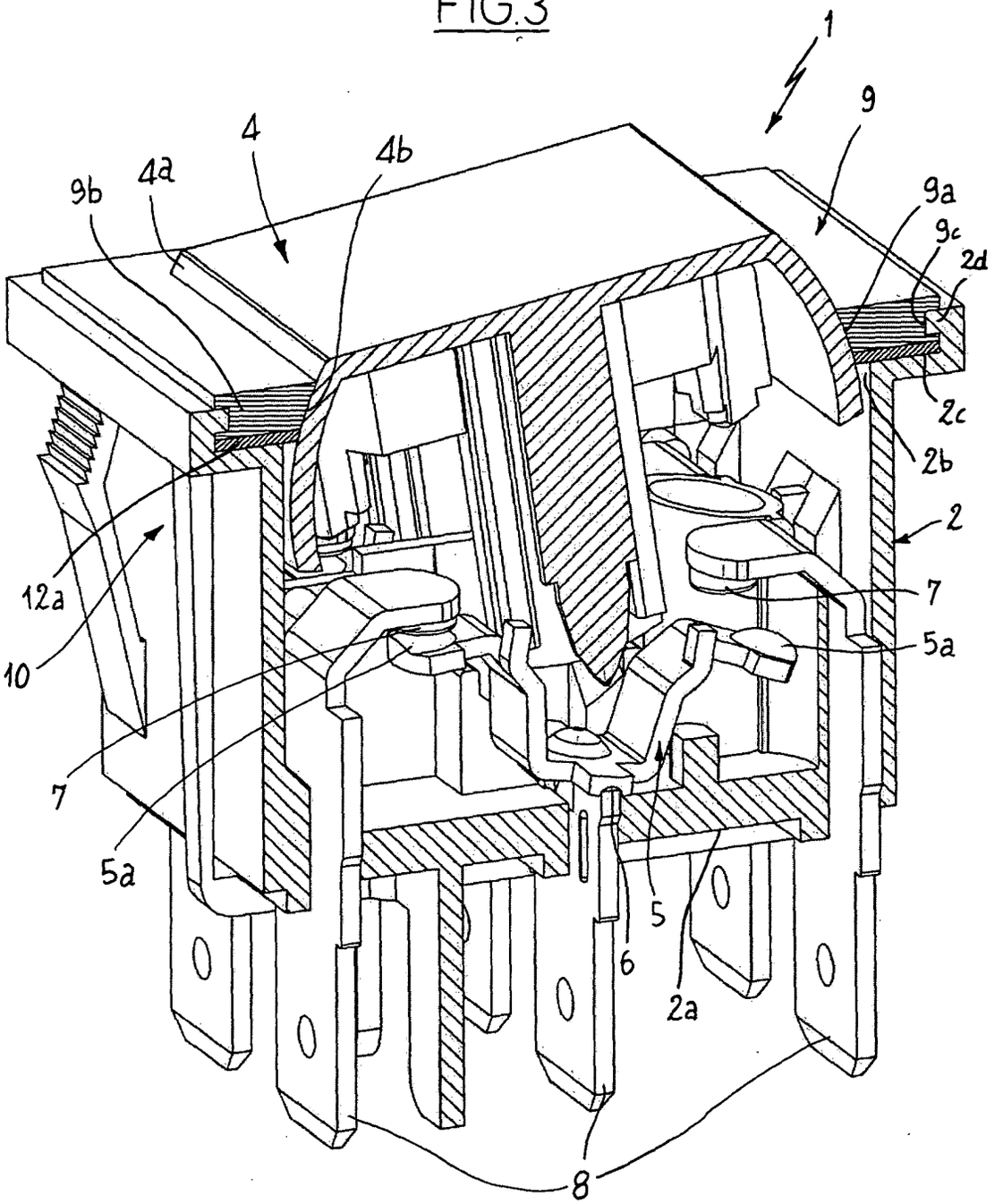


FIG.3



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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5059

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.7)
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A	* page 1 - page 4; figure 1 *	3-9	
X	US 3 828 148 A (ROESER J) 6 August 1974 (1974-08-06)	1	
A	* column 2, line 45 - column 9, line 5; figures 1,12 *	2-9	
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A	GB 1 450 723 A (AIRPAX ELECTRONICS) 29 September 1976 (1976-09-29) * page 1 - page 3; figure 2 *	1-9	

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	17 June 2004	Nieto, J.M.

CATEGORY OF CITED DOCUMENTS

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