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(54) **CAM ROTARY SWITCH WITH DOUBLE POSITIVE BREAK CONTACTS SOLDERABLE ON AN ELECTRONIC BOARD**

(57) A cam rotary switch with double positive break contacts comprises a body including at least two components (1, 2) coupled with each other and enclosing fixed electrical contact elements (5, 6), one shaft (13) torsionally connected with a control member projecting from a first (1) of such components (1, 2), said shaft (13) having a widened extremal part (12) internal to the body of the switch and shaped in such a way as to selectively

connect such fixed electrical contacts (5, 6) via the movement of movable contacts (7) internal to said body. Such fixed contacts (5, 6) co-operate with electrical connection members (33, 33K) projecting beyond the second component (2) of said body, said members (33, 33K) being suitable for being soldered on a board carrying a printed circuit (30).

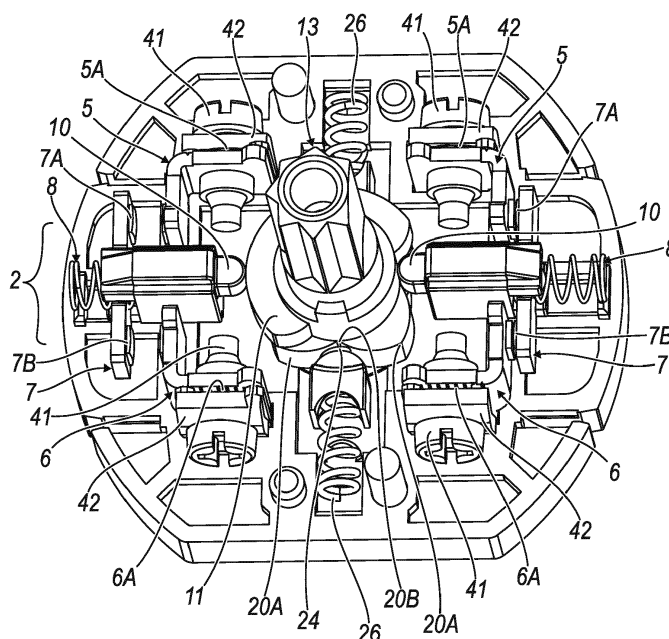


Fig. 6

Description

[0001] The scope of the present invention is a cam rotary switch with double positive break contacts according to the preamble of the main claim. The characteristics of said device mentioned in said preamble can be read in document DE102005019099.

[0002] Cam switches of the type mentioned above are known for a long time. They find application in a variety of technical fields and generally in a control device for one or several electrical users, for instance push-button panels. Specifically, the invention can be used in the components industry in the elevators sector or, in general, in industrial automation.

[0003] Such switch usually comprises a body including at least first and second parts or components, coupled with each other and defining a cavity therebetween. One or more further parts or components, if any, can be superimposed to said first part or first component.

[0004] The latter, in the inner recess or cavity of the switch body supports at least two contact elements spaced away from each other and blocked inside appropriate seats defined in the first part of the body of said switch. Such contacts, suitable for being connected to electrical conductors or cables external to the switch, are suitable for being connected to a movable connector subject to the action of an extremal portion of a shaft projecting from a bore of such first part and on which a handle torsionally integral with the shaft is inserted. Alternatively, another type of control member can be provided in lieu of the handle, for instance a handle servo-assisted or controlled by transmission rods.

[0005] The extremal portion of the shaft, inserted into the recess of the switch, includes a first section having a plurality of projections and corresponding notches which spring-operated movable elements co-operate with, and a second cam-shaped section (superimposed to the first portion toward the above mentioned handle). This second section is suitable for co-operating with a member carrying the movable contact and also subject to the thrust exerted by a spring. Every spring presses the element or member which it co-operates with toward the shaft. The latter can rotate inside the cavity or recess of the switch under the manual action exerted by an operator onto the handle and can assume a number of stable positions inside the recess thanks to the action exerted by the movable elements mentioned above. Upon rotation, the second section actuates the member carrying the movable contact thus connecting or disconnecting the contact elements and thereby generating or breaking an electrical signal which flows through the electrical cables connected to such contact elements and it controls a user which the switch is connected to.

[0006] In this way a control signal can be generated or broken upon rotating the handle or another equivalent control member.

[0007] In the known solutions, electrical cables are connected to the contact elements being bound at their

ends to terminals connected to such contact elements. Consequently, upon setting them to use, an operator shall perform connection operations of the switch to the electrical cables, which entail non negligible times and have a cost in any way. Furthermore, in said operation said terminals shall be clamped, an operation that might even be complicated as a function of the positioning of the connector in the position of use or on the electrical component which it shall be associated with.

[0008] Document US2007/235314 describes a cam rotary switch comprising a case, a rotor rotationally supported inside the case, a movable contact mounted onto the rotor and rotating therewith, and four fixed contacts situated on the sides of the rotor. Every fixed contact comprises two parts separated from each other, i.e. a first contact body placed in the case to co-operate with the movable contact and a second body, elastically in contact with the first body, but physically separated therefrom. Such second body projects from the case for being inserted into a circuit board and suitable for being soldered to such board for a mechanical and electrical connection.

[0009] An object of the present invention is to offer a cam rotary switch with double break contacts that is enhanced with respect to the similar switches according to the present state of the art.

[0010] Specifically, an object of the invention is to offer a switch of the above mentioned type that is quickly connectable to an electrical board on which there are also present other components to be connected or disconnected during their use, and which allows to keep the so obtained assembly within reduced dimensions.

[0011] Another object is to offer a switch of the mentioned type that can be quickly associated with a complex control device of a user, for instance a device used in the elevators field, while reducing the costs of such operation.

[0012] Another object is to offer a switch of the mentioned type that allows to complete an electrical/electronic board complex control device, as mentioned above, before its positioning in a position of use.

[0013] These objects and others that will be apparent to those skilled in this section are achieved by a switch of the mentioned type according to the attached claims. A user control device using such switch is also claimed.

[0014] The following drawings are attached for merely explanatory, but not limiting, purposes for a better understanding of the present invention, wherein:

figure 1 shows a perspective side view of a switch according to the invention;

figure 2 shows a perspective view similar to that of figure 1, the switch being in an assembling step;

figure 3 shows a cross-sectional view according to the trace 3-3 in figure 1;

figure 4 shows a side view of the switch of figure 1;

figure 5 shows a cross-sectional view as with figure 3, but overturned by 180° and without a part of the

switch according to the invention;

figure 6 shows a perspective top view of a part of the switch of figure 1 and of the internal components thereof;

figure 7 shows an exploded perspective view of the switch according to the invention;

figures 8 and 9 show perspective views of two parts of a variant of the switch of figure 1;

figure 10 shows a perspective side view of the complete variant of the switch according to figures 8 and 9;

figure 11 shows a perspective view as seen from another side of the variant of the switch of figure 10;

figure 12 shows a further perspective view of the switch shown in figures 8-11 while it is assembled, some parts being exploded;

figure 13 shows an enlarged view of an internal detail of a part of the switch of figures 8-12; and

figure 14 shows a view of a printed circuit board or PCB which a switch according to figures 1-7 is fixed to by soldering.

[0015] With reference to figures 1-7, they show a cam rotary switch with double positive break contacts with two contacts comprising a body including a first part or component 1 and a second part or component 2 enclosed one over the other and defining an inner cavity 4 (or cell) of the switch. In the latter there are located usual components of the switch including a pair of fixed contact elements 5 and 6 suitable for co-operating with corresponding movable contacts 7 subject to the action of springs 8. Every movable contact comprises contact portions 7A, 7B suitable for co-operating with the fixed contact elements 5 and 6 of their respective pair of the fixed contacts and a projecting member 10 suitable for co-operating with a cam portion 11, located at an extremal part 12 of a shaft 13 suitable for coming out of the first part or component 1, via a bore 15, so as to co-operate with a handle 17 (see figure 14) or with another equivalent control member (servomechanism, transmission or similar). In the example, the shaft 13 is longitudinally grooved so as to form-coupling co-operate with the handle and to be torsionally integral therewith. However, other known ways are provided to render the handle torsionally integral with the shaft 13.

[0016] The electrical components are assembled in seats delimited by usual diaphragms of the first component 1.

[0017] The shaft 13 can be integral with the extremal part 12 or the latter can be a part separate from the shaft and associated therewith in any way. The shaft 13 and the one-piece part 12 make it possible to reduce the longitudinal dimensions (i.e. along the axis of the shaft) of the switch as well as to reduce the number of the components, with obvious advantages resulting therefrom.

[0018] The extremal part 12 also includes a petaled portion 20 comprising a plurality of projecting parts 20A separated by notches 20B and suitable for co-operating

with retention elements 23 defined by a movable, usually spherical, portion 24, associated with a support 25 and operated by a spring 26. The co-operation between such petaled portion 20 with the retention elements (usually two and located in opposed positions with respect to such portion 20) defines, in a way that is known by itself, locking positions for the shaft 13 and for the handle 17 corresponding to different operating positions of the switch 1.

[0019] According to the invention, the cam rotary switch with double positive break contacts is suitable for being soldered onto a board 30 carrying a printed circuit (Printed Circuit Board or PCB 30), a plurality of components 300 being placed on said printed circuit suitable for allowing the operation of a controlled device, in at least one functionality thereof, by said switch. For instance, such device is an elevator and the PCB 30 carries components suitable for making it possible a selective operation of said elevator, for instance during a maintenance operation. Such PCB 30 can be placed inside a push-button panel or an equivalent control device.

[0020] Binding to said printed circuit board by soldering reduces the times (and costs) for the actuation of the devices that such PCBs 30 and the switch are part of as well as to reduce the dimensions of the assembly. Furthermore, the cam switch with double positive break contacts can be used in this way. Finally, obtaining the assembly is easier.

[0021] For this purpose, the cam switch includes a plurality of pins 33 projecting from slits 34 cut in a side 31 thereof (or inside the second component 2) opposed to the side 32 having a bore 15 from which the shaft 13 comes out. The number of such pins 33 corresponds to that of the fixed contact elements 5 and 6.

[0022] In the form here described and illustrated, every pin 33 comprises a first substantially U-shaped part 35 from which a second rectilinear part 36 projects. The latter is suitable for projecting, in an embodiment shown in figures 1-7, from a corresponding through slit 34 realized in the second part or component 2 of the switch and is suitable for being soldered onto the PCB 30. Conversely, the first part 35 of the pin 33, is suitable for being brought in contact with a corresponding contact element 5 or 6. In the embodiment here illustrated, the latter presents a part 5A or 6A having a bore 40 suitable for co-operating with a screw 41 associated with a body 42 which, with such part 5A or 6A, operates as a screw terminal to clamp the first part 35 of the pin 33 onto said contact element. The screw 41 is reachable from a through hole 47 cut in a side 1K of the first component 1 of the switch. Obviously, the first part 35 can be a one-piece integral with the contact element 5 or 6.

[0023] Upon assembling, the switch having the components 1 and 2 coupled together in a way that is known by itself, it is possible to associate the pins 33 (if separate from the elements 5 and 6) by inserting them into the cavity 4 in correspondence with their respective slits 34 directly from outside of the switch i.e. of the side 31 of the second component 2. Insertion takes place by bring-

ing the first part 35 of the pin into the cavity 4 of the switch; since every slit 34 is substantially cut in correspondence with the part 5A or 6A of its corresponding contact element 5 or 6, such insertion makes said part of the pin 33 rest on or get strictly close to such part 5A or 6A of said contact element. Being the part 35 U-shaped, it positions around the above mentioned screw 41. Now, tightening the latter in its corresponding bore 40 results in closing such part 35 between the part 5A or 6A of the contact element and the body 42.

[0024] This having been made, the switch is brought in contact with the "tracks" of the printed circuit of the board 30 and the pins 33 are soldered thereto. Note that the side 31 of the switch presents projecting centering pivots 50 (fixed in corresponding seats 51 of the second component 2) suitable for guiding a correct positioning of the switch onto the PCB 30 so as to achieve the desired functionality of such switch.

[0025] A solution has been described wherein the pins 33 are inserted into the cavity 4 of the switch and project, with their rectilinear part 36, from the side 31 of the latter. Obviously every pin 33 can be fixed within the switch in different ways (for instance, can be integral with its respective element 5 or 6, while still projecting from the switch with its rectilinear part 36) or it can be arranged externally to the switch, while obviously being electrically fixed and connected (by contact) to the fixed contact elements 5 or 6. In any way, irrespective of whether the solution taken is that shown in the figures or one of those mentioned here above, every pin is fixed to its respective fixed contact by a screw 41 or thanks to it being one-piece therewith. This guarantees that an electrical contact always exists between the pin and the fixed contact, even after soldering the pin to the circuit of the board 30, an operation that, on the contrary, could separate the pin from its corresponding contact if said fixing were not provided (as, for instance, in the case of document US 2007/0235314 mentioned above).

[0026] A different embodiment of the invention is shown in figures 8-13, where parts corresponding to those already described are identified by the same reference numerals. In the figures under examination, the switch here shown comprises two cells (but it might comprise even more cells, for instance three or five), all suitable for being connected to the PCB 30 by soldering. If necessary, the cells are superimposed to each other and contain each at least two fixed contact elements 5 and 6 suitable for being connected to or separated from a corresponding movable contact 7.

[0027] In the variant under examination, in order to connect the fixed contacts of the cell allocated most far away from the PCB 30 to the latter, provisions are made in order for the corresponding pins 33K to be external to the cell located below and closer to the PCB 30 or, as in the case under examination, suitable for resting on the PCB 30. Such pins 33K are L-shaped and present a first part 35 90-degree bent with respect to the rectilinear part 36. The latter has an end 36K suitable for being soldered

onto the PCB 30 and a rectilinear part 36W suitable for being inserted into a side slit 70 of the first and second components 1 and 2 of the cell closest to the PCB 30.

[0028] Note that the most distant cell from the PCB does not have a second component 2, but the first component 1 only, in that the latter rests on and is fixed to the first component 1 of the cell underneath, in a known way.

[0029] Additionally, in order to prevent undesired contacts between the pins 33 and 33K, the component 1 of the most distant cell from the PCB 30 includes, in proximity to every fixed contact 5 and 6, an internal diaphragm 80 shaped in such a way as to isolate said pins.

[0030] The pins 33K can also be bound to their corresponding fixed contacts 5 and 6 by means of "screw terminals" as with the pins 33. Obviously, in this case too, provisions can be made in order for the coupling with such elements to be implemented in a different manner, without using the screws 41, for instance by making them integral with the elements or fixed contacts 5 or 6.

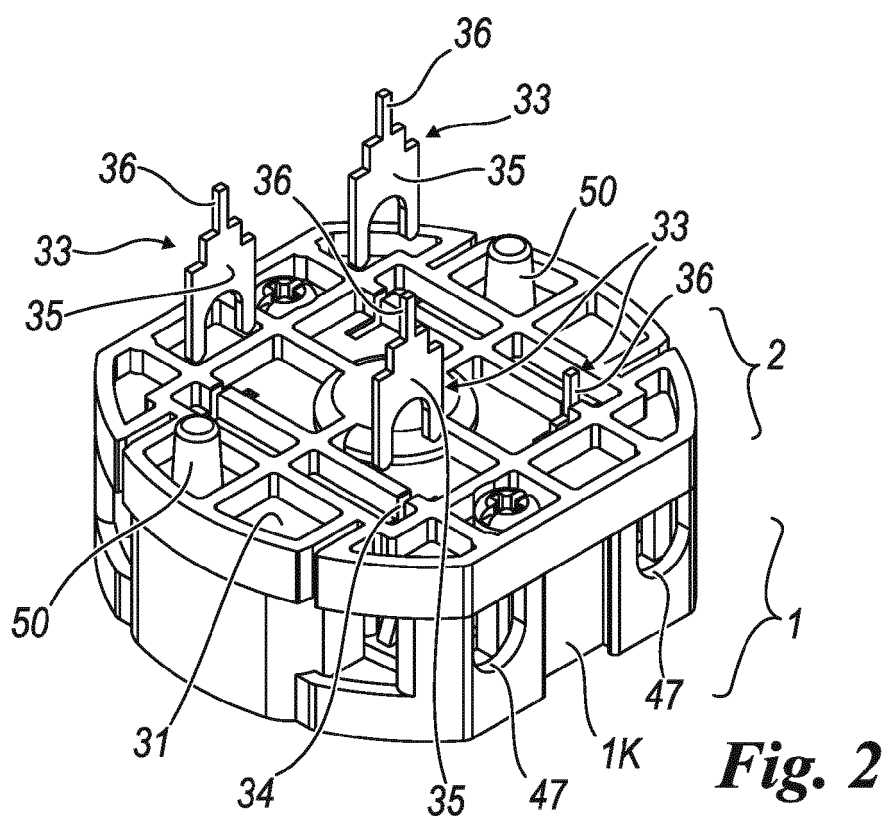
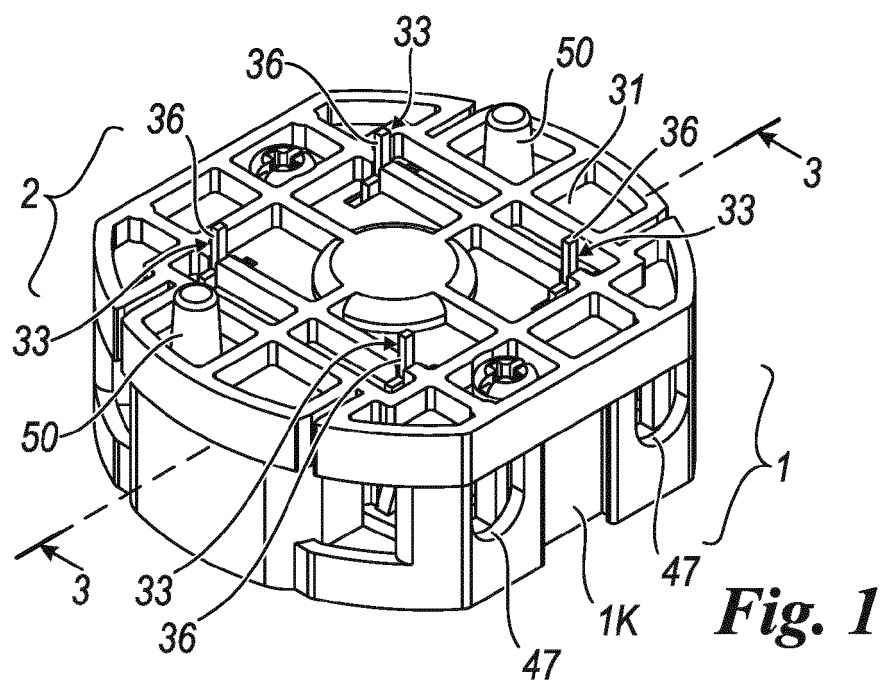
[0031] The described solution makes it possible a direct connection of a cam rotary switch to tracks of a PCB, thus reducing the time necessary to assemble a control device, for instance a push-button panel used in the elevators sector, and reducing the costs thereof.

[0032] A number of embodiments of the invention have been here described and mentioned. However, further embodiments are possible in the light of the previous description, while remaining in the scope of the following claims.

Claims

1. A cam rotary switch with double positive break contacts comprising a body including at least two components (1, 2) coupled with each other and enclosing fixed electrical contact elements (5, 6), one shaft (13) torsionally integral with a control device projecting from a first (1) of such components (1, 2), said shaft (13) having a widened extremal part (12) internal to the body of the switch and shaped in such a way as to selectively connect such fixed electrical contacts (5, 6) via a movement of movable contacts (7) internal to said body, said fixed contacts (5, 6) co-operating with electrical connection members (33, 33K) projecting beyond the second component (2) of said body, said members (33, 33K) being suitable for being soldered on a board carrying a printed circuit (30), **characterized in that** every electrical connection member (33, 33K) is fixed by way of a terminal to its corresponding fixed electrical contact element (5, 6).
2. A switch according to claim 1, **characterized in that** every electrical connection member (33, 33K) is one-piece with its corresponding fixed contact element (5, 6).

3. A switch according to claim 1, **characterized in that** a body (42) is provided suitable for being closed onto a part (5A, 6A) of its corresponding fixed contact element (5, 6) by way of a screw (41) suitable for being inserted into a bore (40) of such part (5A, 5A) of the fixed element contact, a corresponding first U-shaped part (35) of the electrical connection member (33, 33K) being inserted between said part (5A, 6A) and said body (42), the tightening of said body (42) onto said first part (35) clamping said connection member and fixing such connection member (33, 33K) to its corresponding fixed contact element (5, 6). 5
4. A switch according to claim 1, **characterized in that** at least one second component (2) of the two components (1, 2) defining the body of the switch and suitable for resting on the printed circuit board (30) includes through slits (34) suitable for receiving the electrical connection members (33, 33K), said slits (34) being realized in correspondence with the fixed contact elements (5, 6). 10
5. A switch according to claim 1, **characterized in that** the electrical connection members (33, 33K) are arranged at a sideways of a second component (2) of the body of the switch suitable for resting on the printed circuit board (30). 15
6. A switch according to claim 3, **characterized in that** there is provided a bore (47) inside the body of the connector to reach the screw (41) used to tighten said body (42) onto its corresponding fixed contact element (5, 6). 20
7. A switch according to claim 1, **characterized in that** it comprises further fixed contact elements (5, 6) located inside a further component (1) placed far away from the printed circuit board (30), and superimposed to a first component of the body of said switch, said further fixed contact elements (5, 6) being connected to said board (30) via electrical connection members (33K) located on the side of said first and second components (1, 2) of said body of the switch and inserted into slits (70) of said first and second components (1, 2), said further component (1) comprising insulating means to isolate every connection member located on the side of the body of the switch. 25
8. A switch according to claim 1, **characterized in that** every electrical connection member (33, 33K) includes a first part (35) fixed to a corresponding fixed contact element (5, 6) and a second rectilinear part (36), suitable for projecting beyond the second component (2) of the body of the switch, such second part being suitable for being soldered onto the board carrying the printed circuit board (30). 30
9. A switch according to claim 1, **characterized in that** said second component (2) suitable for getting in contact with the board carrying the printed circuit board (30) includes projecting centering members (50) for a correct positioning of the switch on the printed circuit of said board (30). 35
10. A control device comprising a cam rotary switch with double positive break contacts, said device being a control device or a push-button panel used in the elevators field, said device comprising a printed circuit board (30) carrying a plurality of electrical/electronic components associated with such circuit, **characterized in that** said cam rotary switch is in accordance with claim 1 and presents projecting electrical connection members (33, 33K) suitable for connecting said circuit to fixed contact elements internal to the switch, said members being soldered to said printed circuit, the electrical connection members (33, 33K) being fixed to the contact elements internal to the switch. 40



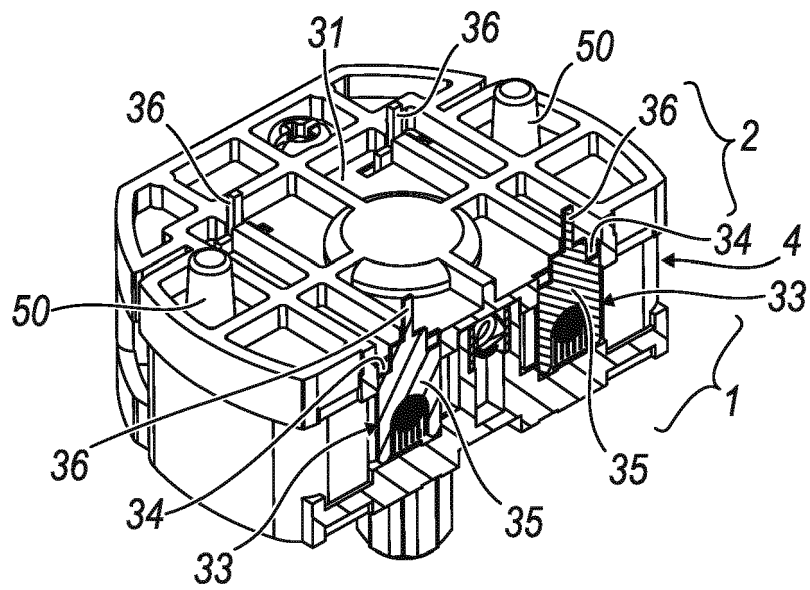


Fig. 3

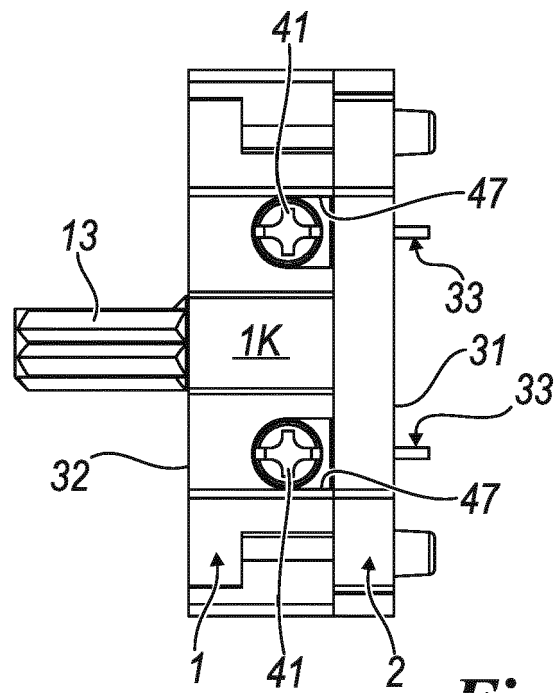


Fig. 4

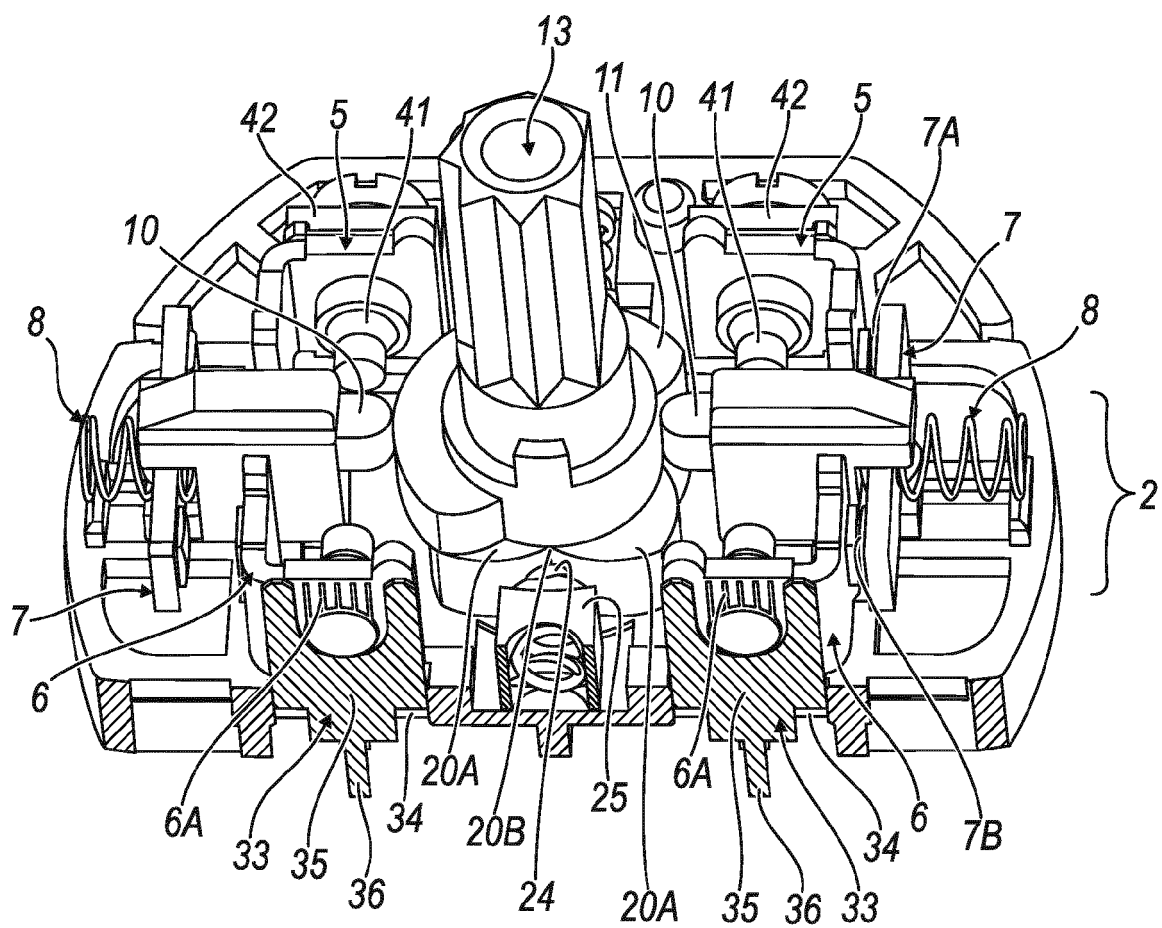


Fig. 5

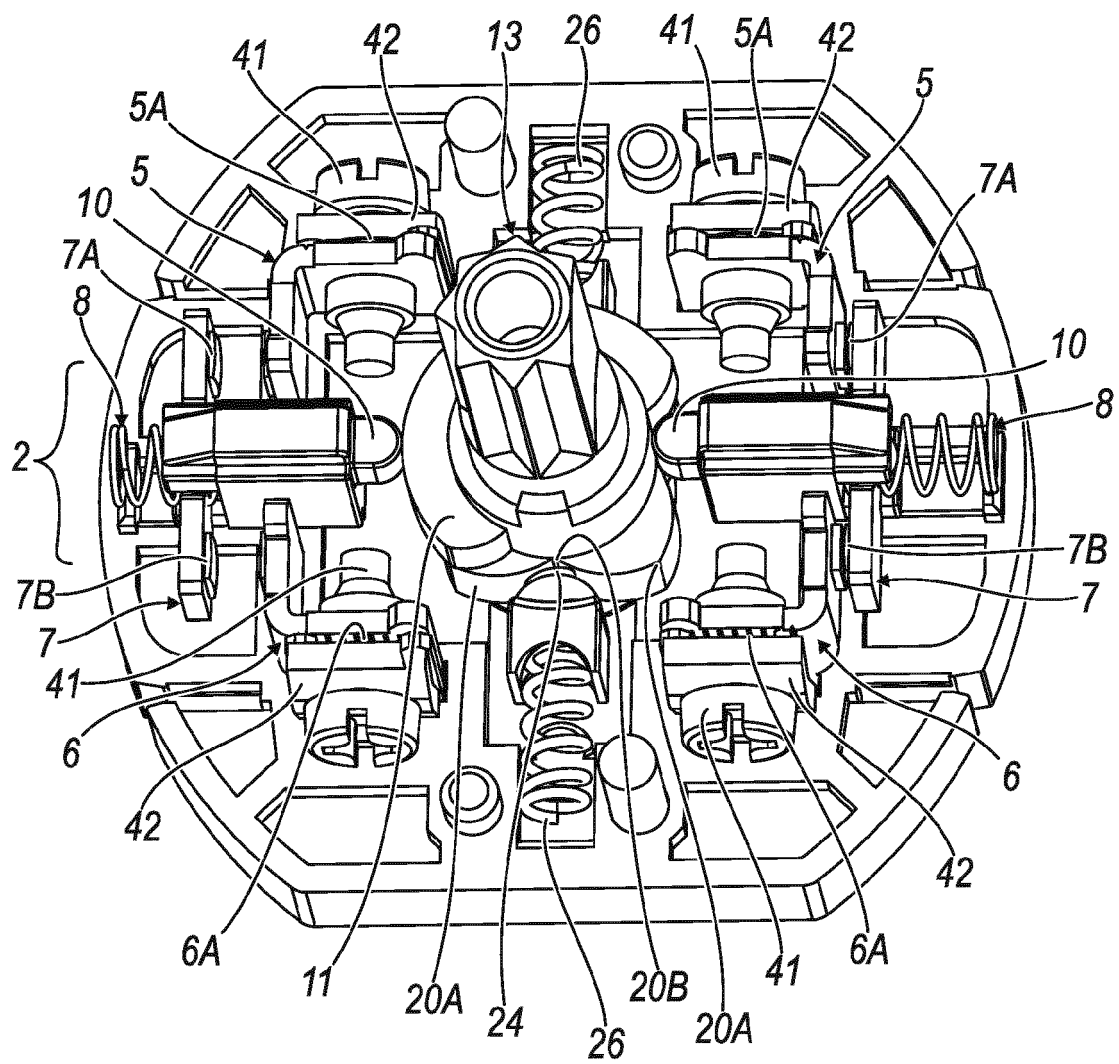


Fig. 6

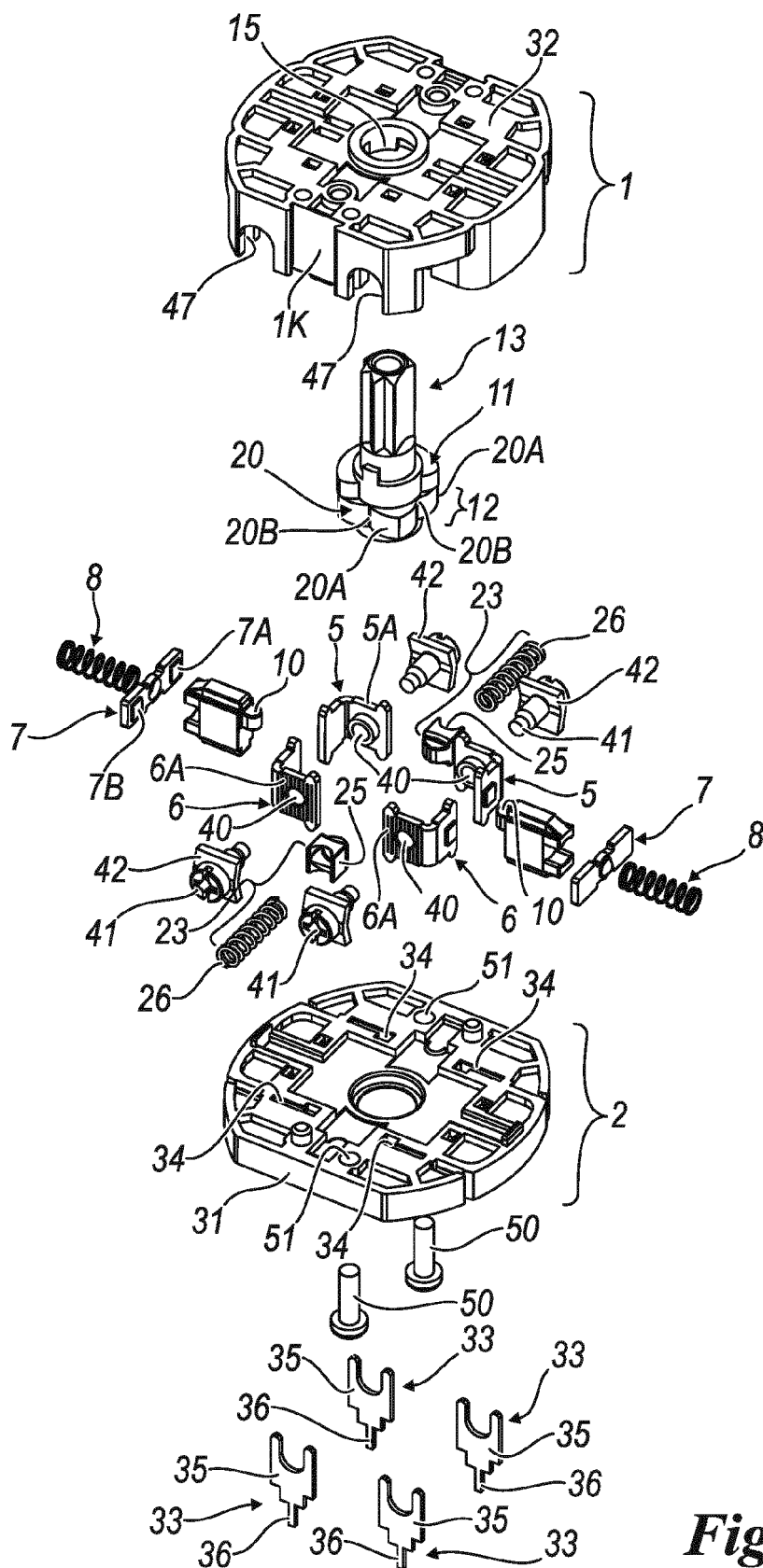


Fig. 7

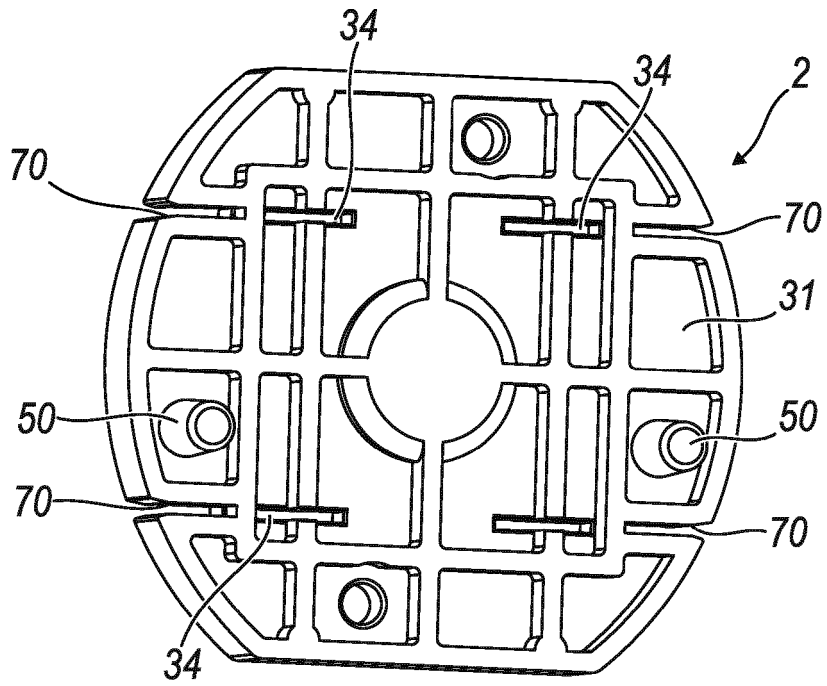


Fig. 8

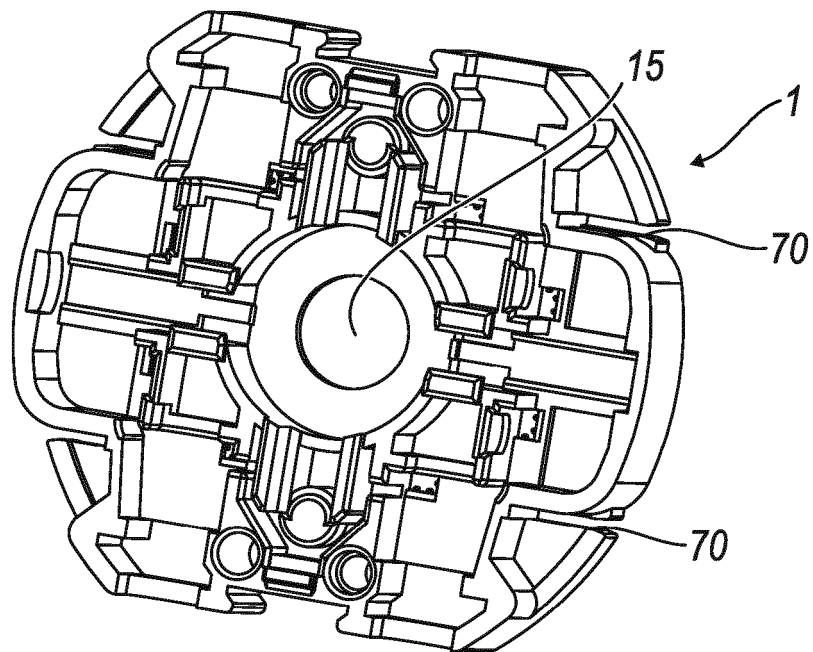


Fig. 9

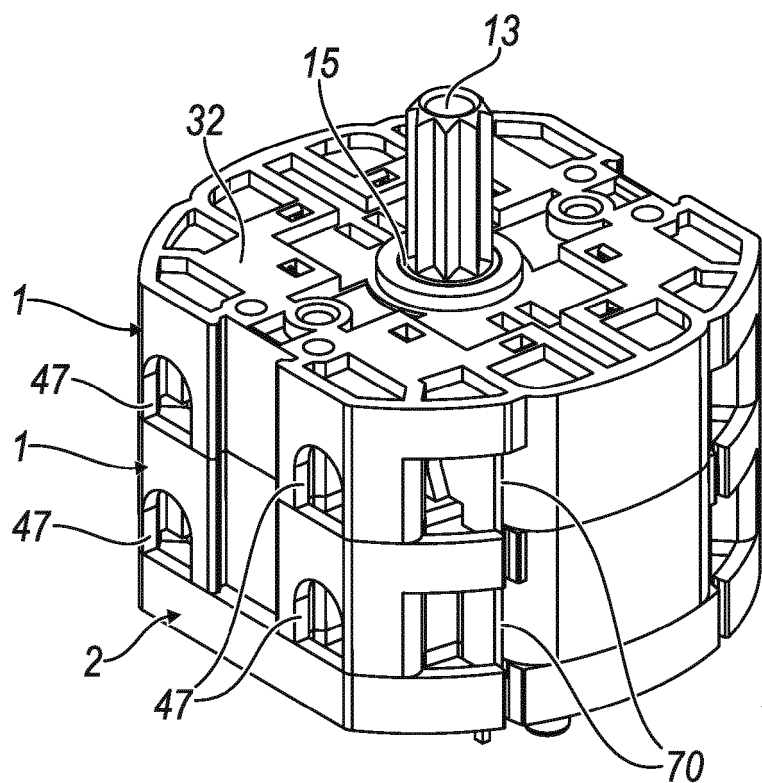


Fig. 10

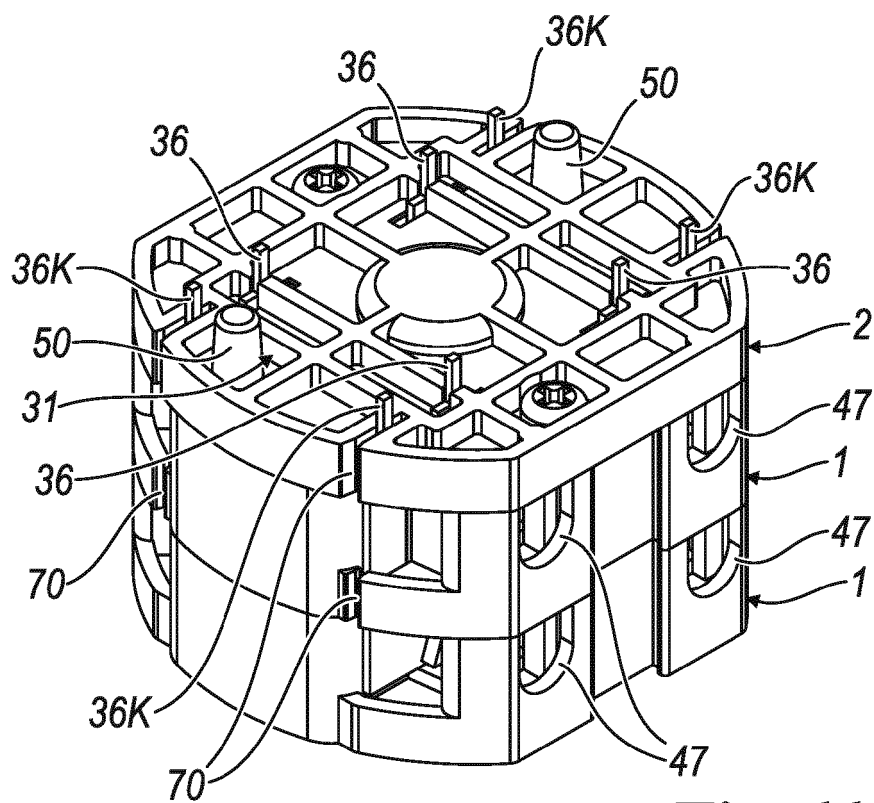


Fig. 11

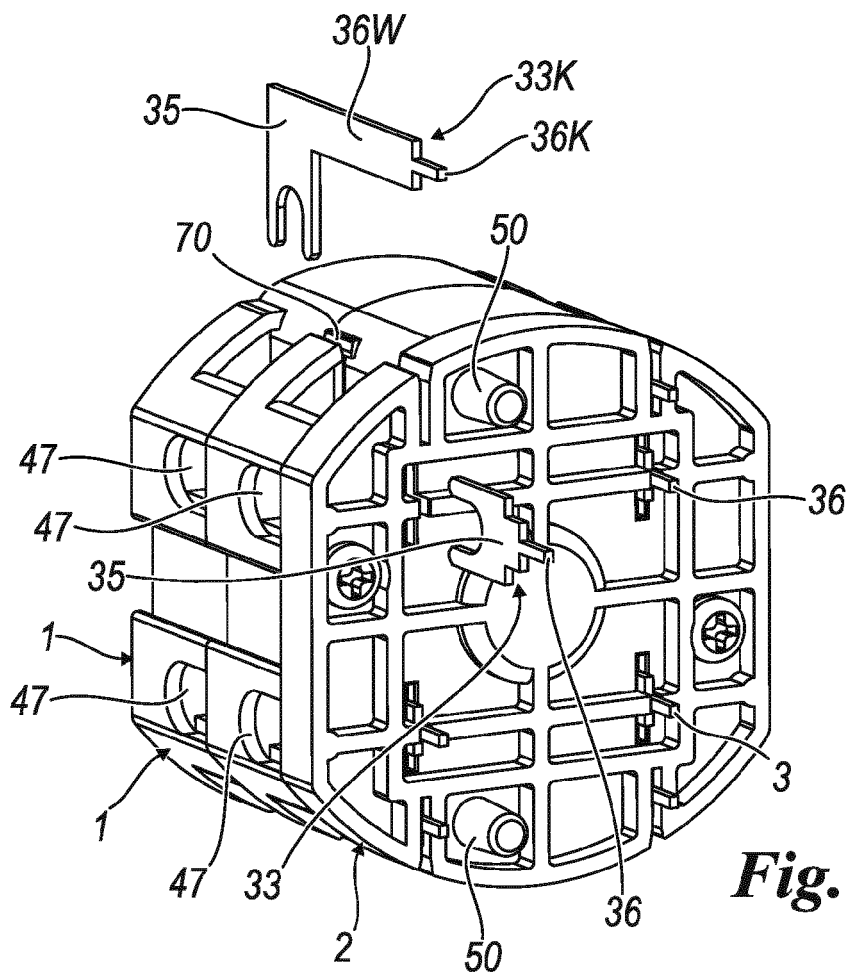


Fig. 12

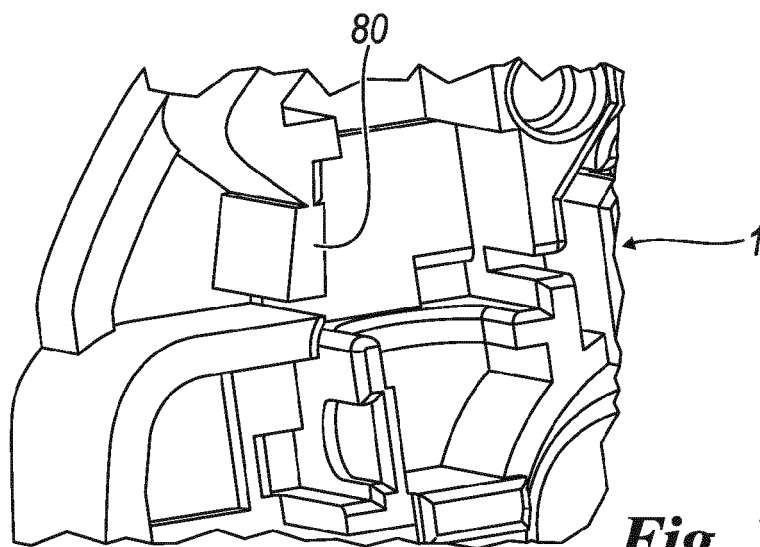


Fig. 13

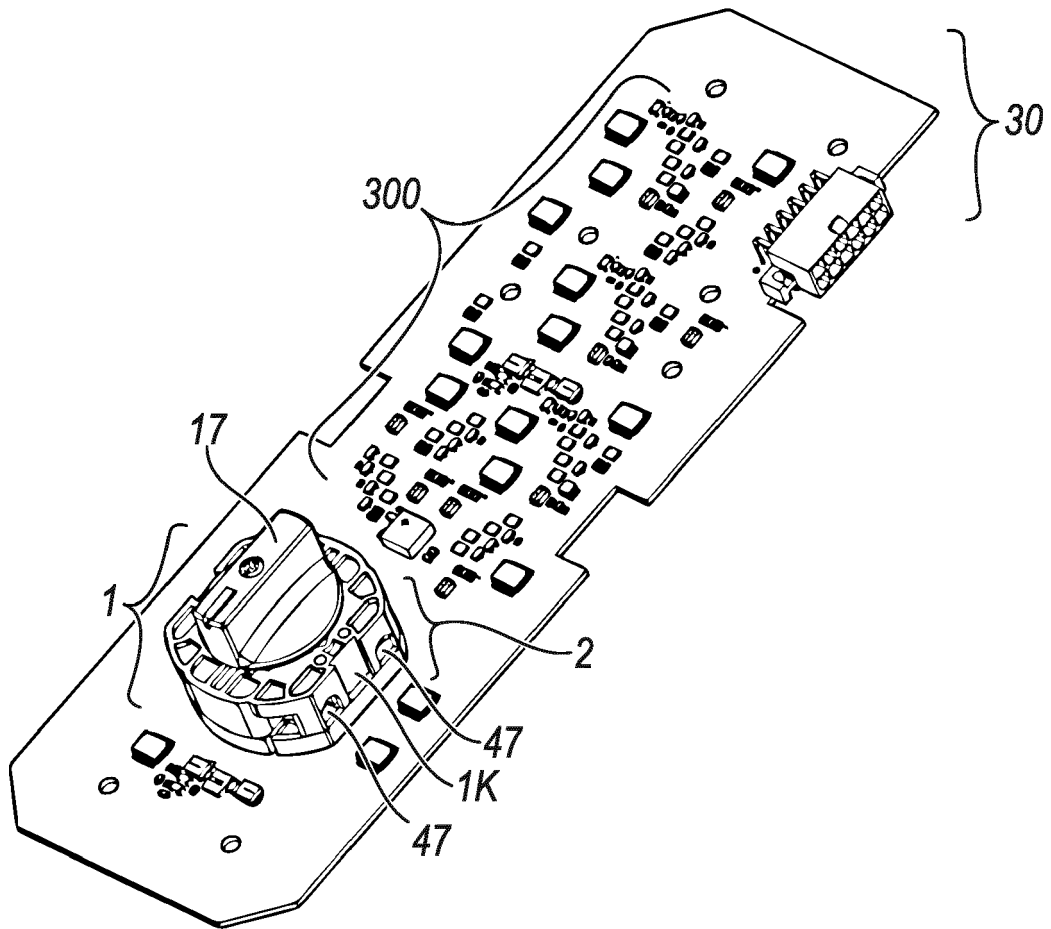


Fig. 14



EUROPEAN SEARCH REPORT

Application Number
EP 16 17 2365

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 10 2005 019099 A1 (TEND TECHNOLOGY CO LTD [TW]) 26 October 2006 (2006-10-26) * paragraph [0015] - paragraph [0022]; figures 1-4,7,8 *	1-10	INV. H01H1/58 H01H19/62 H01H19/64 H01R12/58
A	US 2007/235314 A1 (WONG MEMIE M M [HK] ET AL) 11 October 2007 (2007-10-11) * figures 1-3,6 *	1-10	
A	GB 2 084 404 A (INT STANDARD ELECTRIC CORP) 7 April 1982 (1982-04-07) * figures 1,2 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H H01R
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 September 2016	Examiner Ernst, Uwe
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102005019099 A1	26-10-2006	NONE	

US 2007235314 A1	11-10-2007	CN 101047074 A	03-10-2007
		HK 1105482 A1	07-01-2011
		US 2007235314 A1	11-10-2007

GB 2084404 A	07-04-1982	BE 890400 A1	18-03-1982
		DE 3136471 A1	15-04-1982
		FR 2490868 A1	26-03-1982
		GB 2084404 A	07-04-1982

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Patent documents cited in the description

- DE 102005019099 [0001]
- US 2007235314 A [0008]
- US 20070235314 A [0025]