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(54) **Integrated control panel for household appliances**

(57) Control panel, especially for household appliances, comprising a printed circuit board (PCB), a plurality of switches arranged on said PCB, and activated by respective buttons oriented outwards, an essentially rigid support placed above said PCB on the outer side of said control panel, and provided with a plurality of through apertures arranged in correspondence to respective said buttons and lodging them, and a flexible

continuous preferably transparent membrane laid on the outer face of said rigid support. Said buttons are connected to the edges of respective said through-apertures by respective thin elastic appendixes, and are provided with protruding elements which stretch towards respective said switches, so as to activate them only when the outer portions of said membrane, corresponding to respective said buttons, are properly pushed.

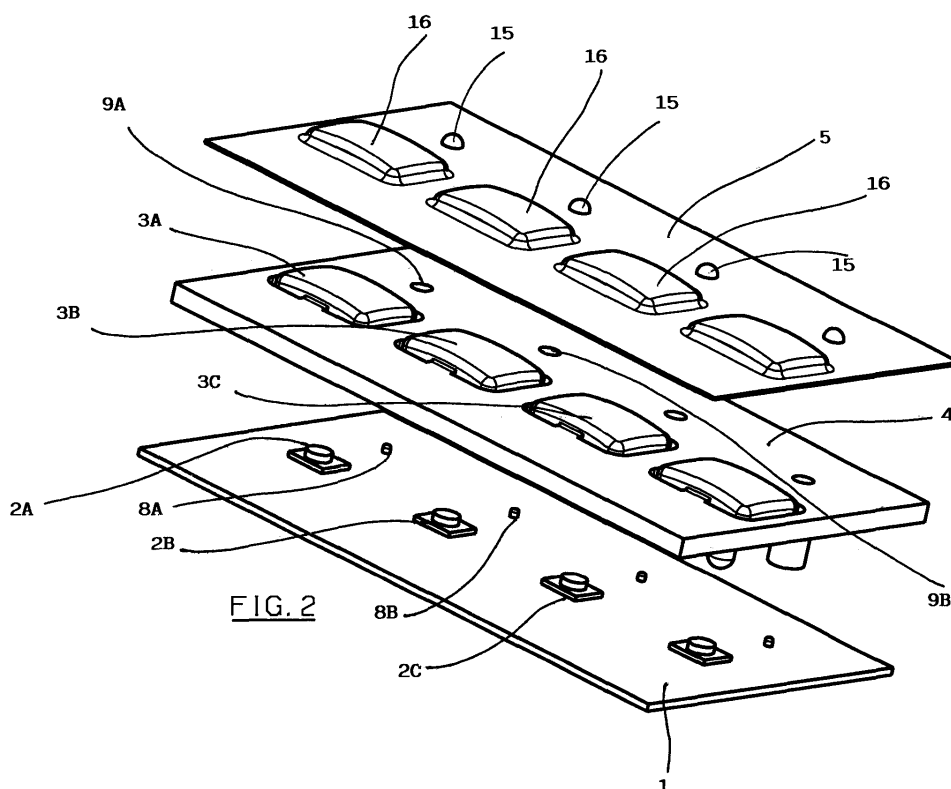


FIG. 2

Description

[0001] The present invention relates to an integrated control panel, particularly of the type normally used to control and survey the working of household appliances as laundry washing or dishwashing machines, refrigerators, etc.

[0002] However this invention is applicable in general to control panels of the type for general purposes, provided they are associated to a printed circuit boards (PCB) with micro-switches that can be operated by the outside; obviously the aesthetical and constructive adjustments, which take care of the functional constraints, are easily imaginable and can be implemented by any man skilled in the art.

[0003] Control panels are widely known, which are provided with outer elastic membranes on which surface portions are defined which constitute the operating area, by their pushing, of the activation devices, which usually are buttons, switches, etc., placed under respective said surface portions.

[0004] Such a technology, even if widely used, however shows the well known constraints that the switches, lying under said outer membrane, are common electric switches implemented as micro-switches, and therefore they keep on requiring constructional costs that are not negligible, and moreover they maintain the typical drawbacks of said components, i. e. they require additional buttons, respective reaction springs which maintain said buttons in protruding position, and specifically dedicated control boards on which said buttons and said springs have to be mounted on.

[0005] From EP 0 858 087 A2 it is known a type of assembled control panel wherein the reaction spring is obtained enbloc with the component (13) acting on the micro-switch; however the outer button is not provided with an own protection membrane, and this fact causes wearing problems in the long run, which are well known.

[0006] From WO 2006/067438 A1 it is known a buttons assembly provided with a common outer protection membrane, and acting on respective PCB's underlying it; a similar solution is shown and discussed even in EP 1 199 736 A1 (WO 01/80263); however said solutions generally cannot employ some micro-switches, which are instead employed in the control panels for household appliances, and mainly the PCB's are firmly connected to said membrane.

[0007] Such circumstance therefore doesn't allow the autonomous production of said PCB's, and moreover the additional operation is required to make said membrane to adhere to said PCB's.

[0008] It would therefore be desirable, and is actually a main purpose of the present invention, to provide a type of control panel, particularly for household appliances, which is able of associating a PCB, on which some known micro-switches are mounted, to a plurality of control buttons, provided with respective springs, and mounted on a supporting board, externally protected by a waterproof

membrane; according to the instant invention, said springs, said buttons and said board are produced in an absolutely integrated way.

[0009] According to the present invention, these aims are reached through a special type of control panel incorporating the characteristics as recited in the appended claims as described below by mere way of non-limiting example with reference to the accompanying drawings, in which:

- Fig.1 is a symbolical perspective front view of a control panel according to the invention,
- Fig. 2 is a partially exploded view of the same assembly of fig. 1,
- Fig. 3 shows, in a simplified way, the plan top view of a first and important component of the assembly in fig. 2,
- Fig. 4 shows a transversal sectional view of the first component of fig. 3, taken according the section A - A of it,
- Fig. 5 is a transversal section of the first component of fig. 3, taken according section B - B of it 3,
- Fig. 6 is a transversal section of the first component of fig. 3, taken according section C - C of it,
- Fig. 7 shows the first component of fig. 3, but from the opposite side with respect of the fig. 3 view,
- Fig. 8 shows a perspective view of the same component as represented in fig. 7.

[0010] With reference to the figures, a control panel according to the invention comprises, from the rear side to the front side, i.e. on user's sight, :

- a printed circuit board (PCB) 1,
- a plurality of switches 2A, 2B, 2C... applied on said PCB, oriented outwards and obviously electrically interconnected to the electrical connexions therein arranged,
- a respective plurality of buttons 3A, 3B, 3C exactly placed in correspondence to said switches, and above them,
- a rigid support 4, showing a basically superficial extension,
- a flexible and continuous membrane 5, arranged by known means on the outer surface of said rigid support.

[0011] According to the invention, said buttons are obtained as follows: the portions of said rigid support 4, which are arranged in correspondence to respective said switches and which therefore cover them, but at a certain distance, are simply removed, leaving to their place through apertures 6A, 6B, 6C...; in these apertures said buttons 3A, 3B, 3C... are introduced.

[0012] At this point two main requirements for said buttons have to be accomplished:

- the first requirement consists in backing up them in-

side the respective through apertures, and to allow them to slide up and down in such a way that, in the down position, each of said buttons gets in touch and pushes on a respective of said switches, activating it;

- the second requirement consist in the implementation of said sliding movement in such a way that the button comes elastically back to a respective resting position,

wherein the button itself would not activate the respective switch.

[0013] To this purpose, and with ref. to the figures 3, 4 and 7, one of the main invention features consists in that: said buttons are implemented by defining respective limited portions of said rigid support, and which show sizes and positions such to construct relevant leaning appendixes, which stretch and are oriented in such a way that each of these portions is contained into a respective said through-aperture, without interfering with the relevant walls; and yet each portion is partially movable without touching them, as clearly shown in the figures.

[0014] Basically, and with special ref. to figures 2, 3 and 7, said buttons are realized by defining some delimited portions of said rigid support, and contained inside respective said through-aperture; moreover the elastic operation is assured by the fact that the connection between said buttons and said rigid support is carried out by respective thin and prolonged connections 7A, 7B, 7C to the edges of said through apertures, which are comprised into said rigid support 4.

[0015] Obviously the rigid support 4 is supposed to be rigid when referred to its full size, as said thin and prolonged connections 7A, 7B, 7C, particularly when made of plastic, do offer a suitable elasticity which is intrinsic with the plastic material itself.

[0016] The advantage then is obtained that:

- with the same material of the rigid support 4, properly worked and preferably mould injected,
- and with a sole and simple working operation,

the following three components are obtained, each of which being provided with a distinct and autonomous functionality:

- rigid support 4;
- single buttons 3A, 3B, 3C...;
- elastic connection means 7A, 7B, 7C....

[0017] Once the lower portion of the control panel which is formed by said rigid support 4, by said buttons, by said PCB etc., has been assembled, the control panel itself is being completed by laying on the outer surface of the rigid support 4, with known means, a continuous and partially flexible membrane (see fig. 1, 2 and 4); said membrane shows not only the requested aesthetic and design features, but its flexibility allows that, in correspondence of said through apertures 6A, 6B, 6C, the

small areas of said membrane so delimited, and whose rear side are into contact with said buttons, properly shaped to protrude as necessary, become actually the control and command areas to be pushed by the user's fingers.

[0018] Moreover the same elastic membrane may easily be identified and/or mapped in properly selected zones 15 by colours, operating indications/symbols etc., so that each of said zones of said membrane itself may provide suitable information exactly corresponding to the function activated by pushing said corresponding zones.

[0019] The just illustrated solution offers some advantageous improvements: the first one consists in that in said PCB may be mounted some light signalling, and obviously oriented outwards, light sources 8A, 8B.

[0020] In order to allow that the emitted light by said sources may be observed by the user in front of said control panel, said rigid support 4 is being made and shaped so as to show a second group of apertures 9A, 9B, exactly arranged in correspondence of said light sources 8A, 8B.

[0021] Preferably, said flexible membrane too must be produced to be at least partially transparent in correspondence of said second apertures 9A, 9B, so that the light emitted in the inside may be transmitted outwards in said zones 15, and there easily observed by the user (fig. 1).

[0022] Moreover profitably, inside said second apertures 9A, 9B is carried out, preferably still enbloc, a respective plurality of internally through-conduits 10A, 10B, which works as light-guides and which are connected to the inner edges of said second apertures 9A, 9B, and stretch towards said respective light sources 8A, 8B (see fig. 4, 5 and 8).

[0023] Therefore a further useful improvement is achieved, consisting in the fact that the light conveying means, from the light sources on the PCB, can be made with simplified working operations and without really producing or mounting new components.

[0024] Finally, with ref. to the same figures, it must be observed that said buttons 3A, 3B, etc. are provided with suitable respective extensions 13A, 13B oriented inwards, i. e. towards the respective switches 2A, 2B, 2C...; it allows of using a rigid support 4 which is really very thin, as a function of the existing further constraints, and of making said buttons as respective portions of said rigid support 4, and co-planar with it.-

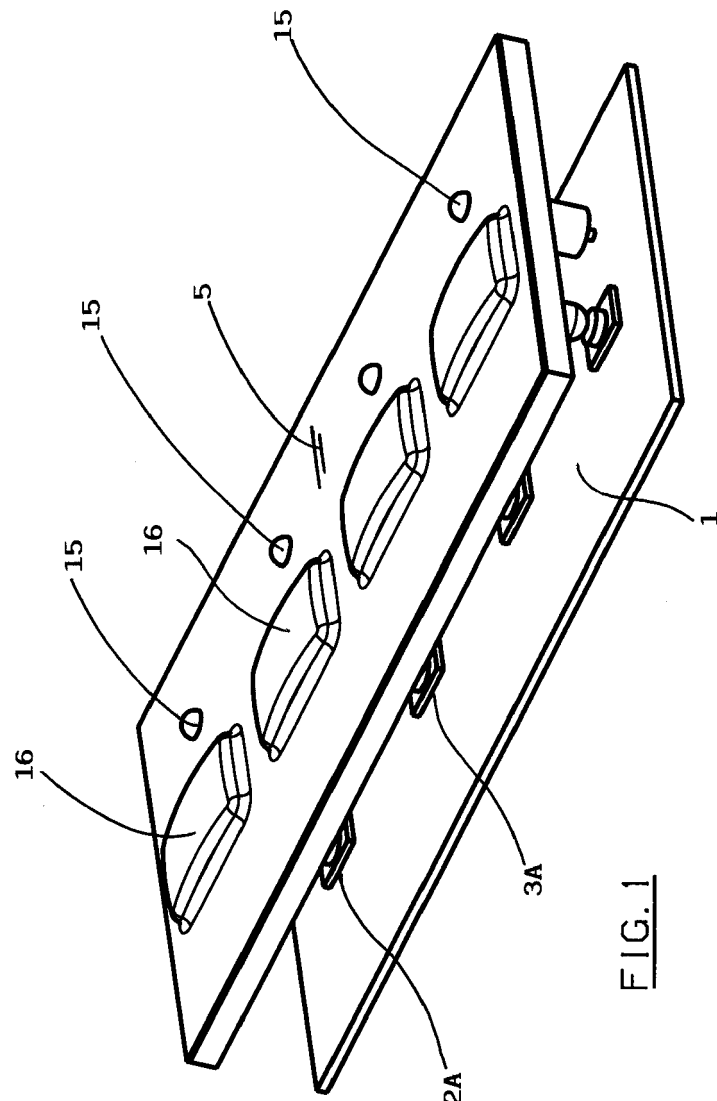
In the same time it will be possible to assure a preferred distance "d" between said support 4 and said PCB 1, without compromising the functionality of the control means of the control board.

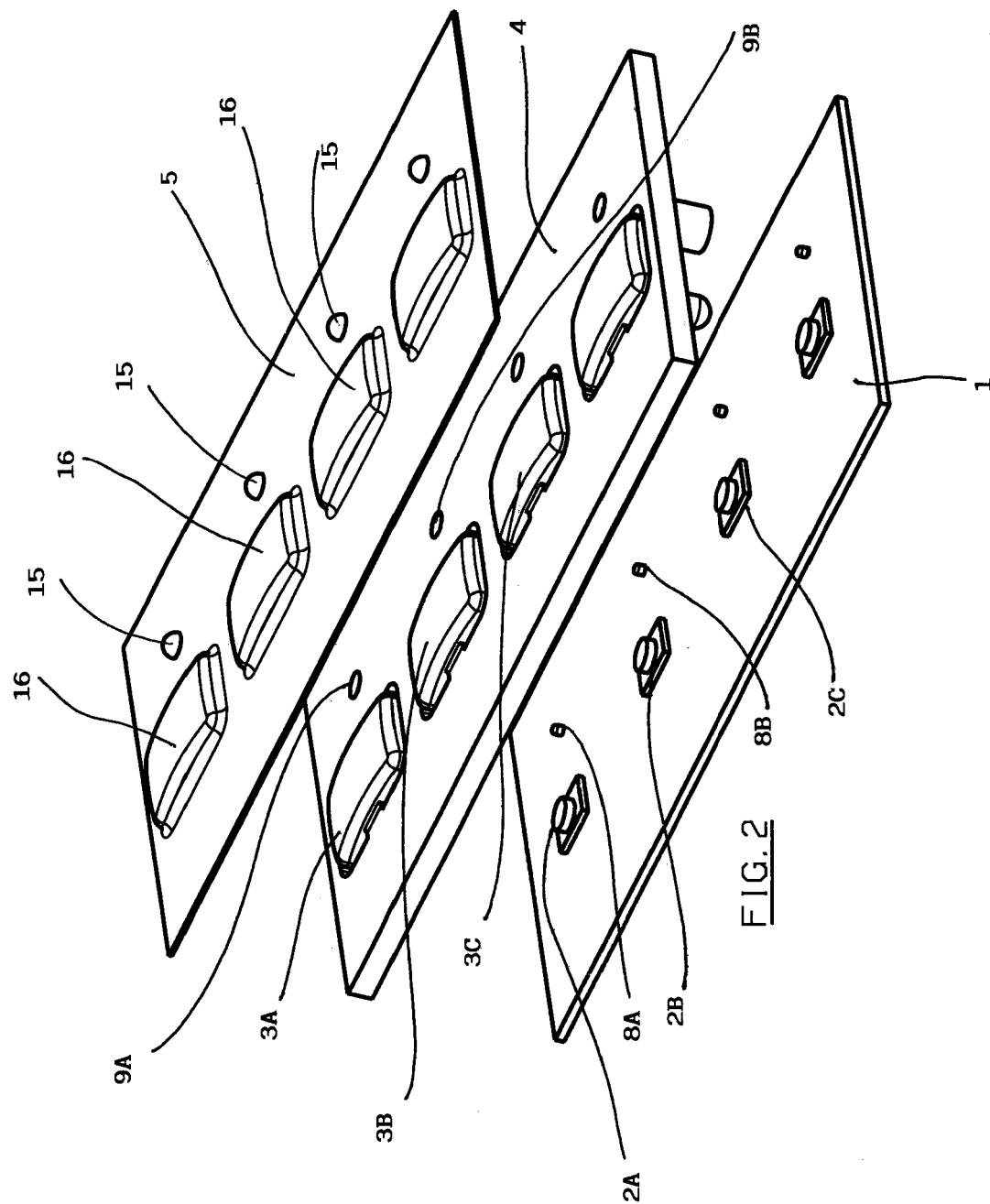
Claims

1. Control panel, especially for household appliances, comprising:

- a printed circuit board (PCB) (1),
 - a plurality of switches (2A, 2B, 2C) arranged on said PCB, and whose activation devices involve respective buttons (3A, 3B, 3C) oriented outwards and accessible even through elastic means, **characterized in that** it also comprises:
 - an essentially but not totally rigid support (4), placed above said PCB on the outer side of said control panel, said support (4) being provided with a plurality of through apertures (6A, 6B, 6C) arranged in correspondence to respective said buttons (3A, 3B, 3C),
 - a flexible membrane (5) laid on the outer face of said essentially rigid support (4).
- 5
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2. Control panel according to claim 2, **characterized in that** said buttons (3A, 3B 3C) are made enbloc with said essentially rigid support (4), and are shaped as thin appendixes protruding out from the inner edges of said through apertures towards the respective inner central zone.
- 20
3. Control panel according to claim 2, **characterized in that** said protruding appendixes are connected to the edges of said through-apertures by respective and essentially elastic connections (7A, 7B, 7C).
- 25
4. Control panel according to claim 1 or 2, **characterized in that** said membrane is placed in a continuous way on said through apertures (6A, 6B, 6C) as well.
- 30
5. Control panel according to any one of previous claims, **characterized in that:**
- said PCB shows one or more light sources (8A, 8B), preferably LED's, on the same side of said buttons (3A, 3B, 3C),
 - a plurality of second through-apertures (9A, 9B, 9C) provided of said essentially rigid support (4), and arranged in correspondence to respective said light sources (8A, 8B).
- 35
40
6. Control panel according to claim 5, **characterized in that** said flexible membrane shows at least partial transparency features at least on the face portions corresponding to said second through apertures (9A, 9B).
- 45
7. Control panel according to claim 5 or 6, **characterized in that** a plurality of hollow conduits (10A, 10B, 10C) is arranged among the inner edges of said second through apertures (9A, 9B) and corresponding respective light sources, said conduits being able of working as light conveying means from said light sources (8A, 8B) to respective said second through-apertures (9A, 9B).
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8. Control panel according to one of claims from 3 on,

characterized in that said buttons are provided with respective extensions (13A, 13B, 13C) oriented inwards and protruding towards respective said switches (2A, 2B, 2C), said extensions being able to go into contact with said switches only when said buttons are properly pushed.





SEC B-B
FIG. 5

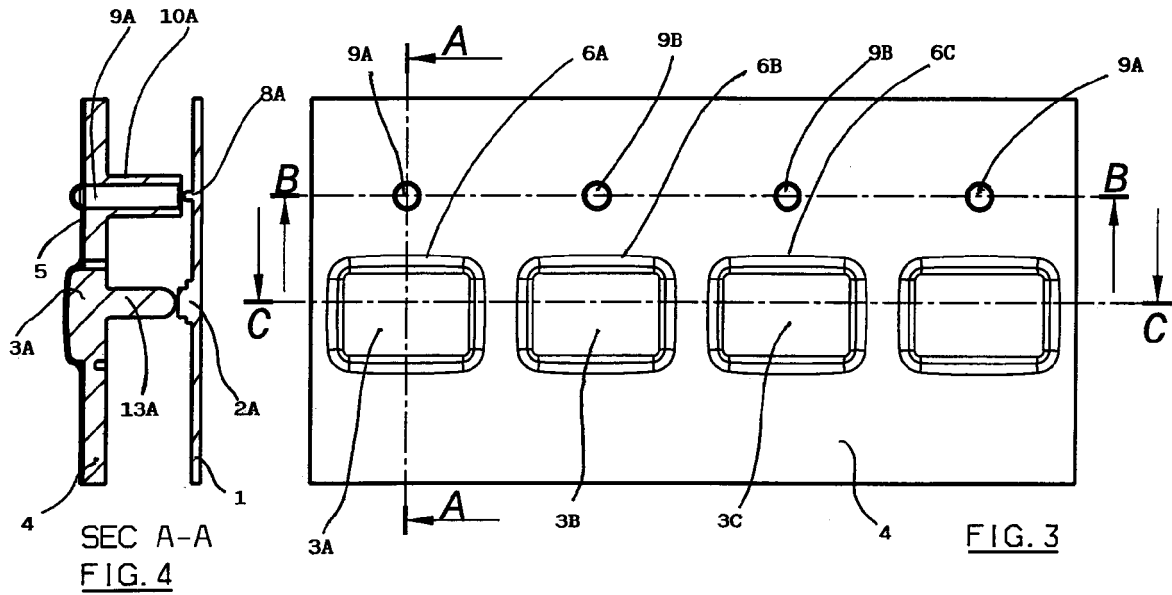
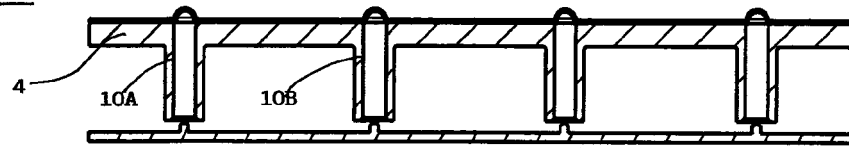
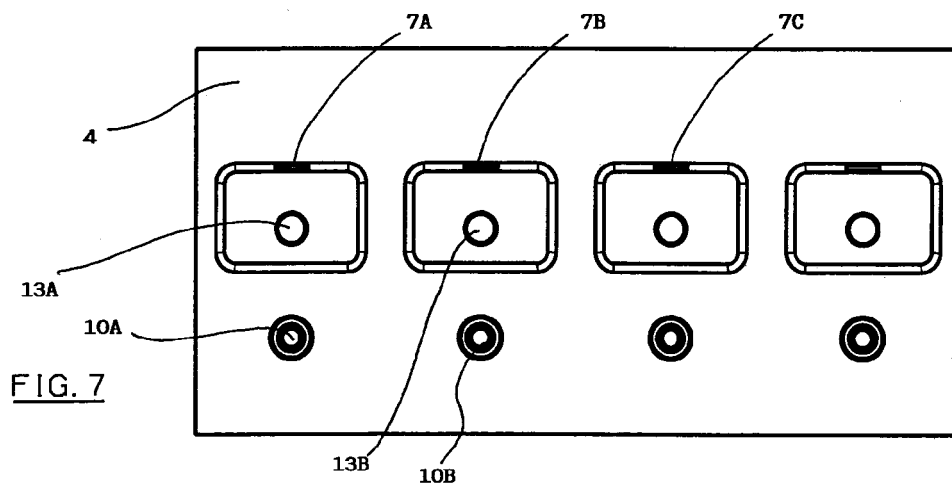
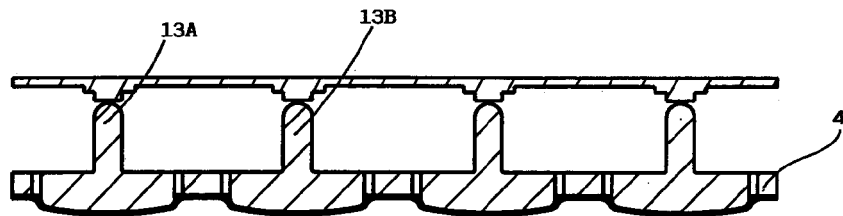
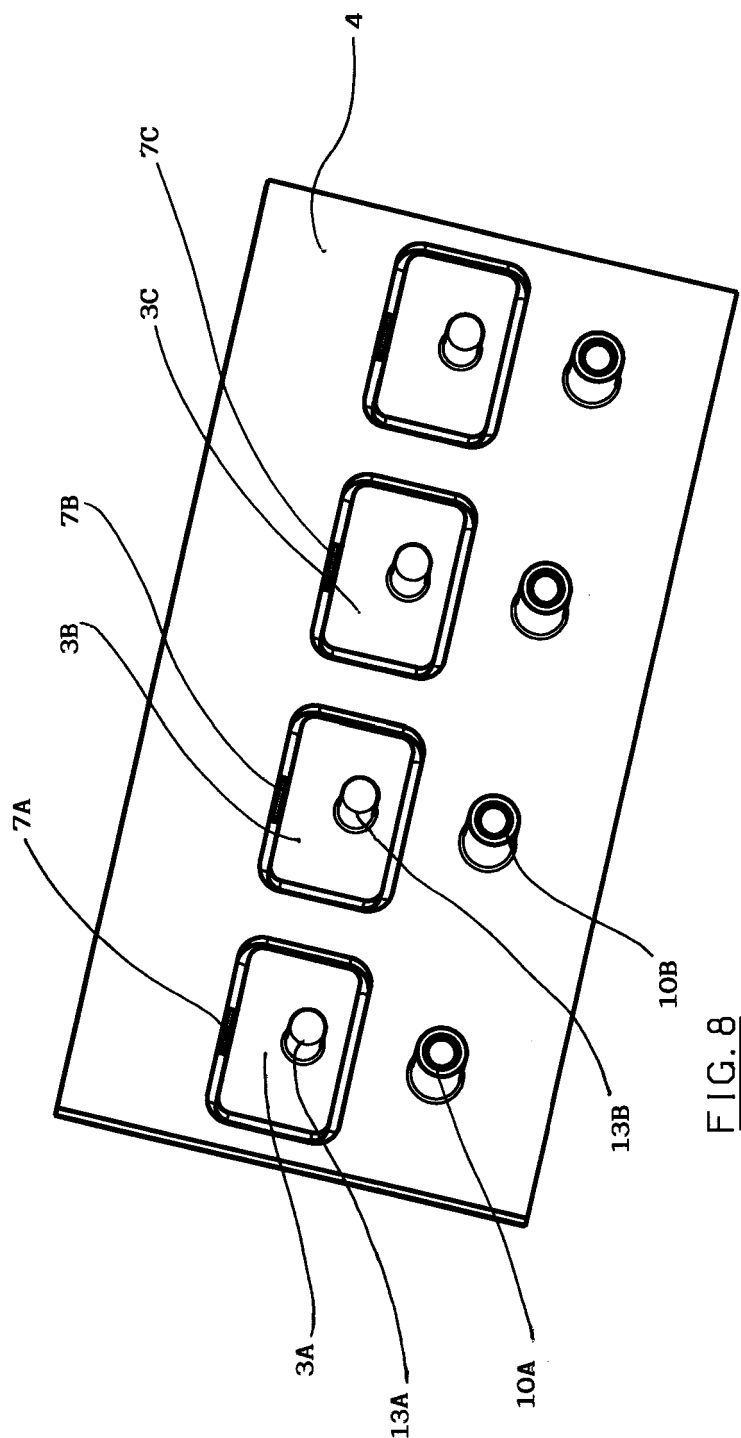


FIG. 3

SEC C-C
FIG. 6







European Patent
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EUROPEAN SEARCH REPORT

Application Number
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Place of search The Hague		Date of completion of the search 23 November 2007	Examiner Overdijk, Jaco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document 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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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