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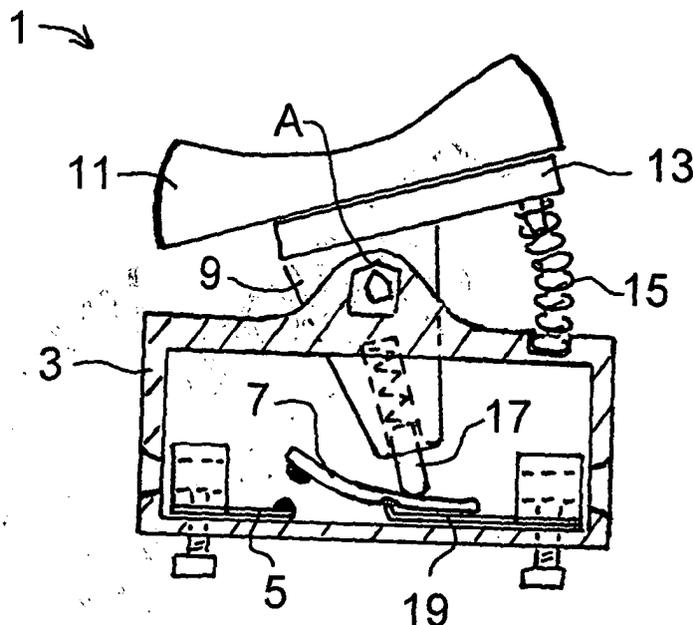
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(54) **Improvements in and relating to electrical switches**

(57) An electrical switching device (1) comprises a body (3) mounted to which is at least one fixed contact (5) and at least one moving contact (7), and a part (9) to cause the moving contact to contact the fixed contact, a digital operating member (11) and an intermediate

member (13) between the said part and the operating member; a biasing spring (15) is selectably arranged to act or not to act on said intermediate member. The switching device may act as either as a bi-stable ON / OFF switch or as a momentary contact switch, such as a bell push.



**Figure 1**

## Description

**[0001]** The present invention relates to electrical switches for use in buildings.

**[0002]** Electrical switches are used in buildings for controlling lighting and other similar electrical loads. For simple room lighting applications switches are frequently required to have two stable operative states, a first state, an OFF state where the switch does not conduct electricity, and a second state, an ON state, where the switch conducts electricity, and hence a load wired to the switch is powered. Such switches may be operated to one or other stable state by digital manipulation of an operating member, such as a rocker. For other applications, such as bell pushes, switches are required where the switch is arranged to be normally in one state, such as normally OFF, and to only operate in the other state, such as the ON state momentarily, only while a force is applied digitally to an operating member. For a complex installation, an installer will require both types of switches, with matching styles, hence cost and inconvenience is incurred by having to provide a range of switches including both types.

**[0003]** According to the present invention, there is provided an electrical switching device comprising a body, mounted to which is at least one fixed contact and at least one moving contact, means to cause the moving contact to contact the fixed contact, a digital operating member to move the moving contact characterised in that an intermediate member is arranged between the said means and said operating member and in that a biasing means is arranged to act or not to act on said intermediate member by selection.

**[0004]** A benefit of the switching means having a biasing means that is selectably arranged to act or not to act on the intermediate member, is that such a switching means may be arranged to act either as a bi-stable ON/OFF switch or as a momentary contact switch.

**[0005]** Preferably the digital operating member is removable from the switching device. More preferably a tool is required for the removal of the digital operating member. A benefit of the removable digital operating member is that an installer may obtain access to internal parts of the switching device. A benefit of requiring a tool to remove the digital operating member is that dangerous access to live parts may be prevented.

**[0006]** Preferably the digital operating member is arranged to move pivotably about a first axis. A benefit of the digital operating member being arranged to move pivotably about a first axis is that the switching device may be a rocker switch.

**[0007]** Preferably the intermediate member is arranged to move pivotably about a second axis. More preferably the intermediate member is arranged to move about the same axis as the digital operating member. A benefit of the intermediate member being arranged for pivotal movement about the second axis is that the construction of the switching device may be sim-

plified. A benefit of the intermediate member being arranged for pivotal movement about the same axis as the digital operating member is that the construction of a rocker switch may be simplified.

5 **[0008]** Preferably the digital operating member is arranged to be retained to the body by clip fit features about the axis. More preferably the clip fit features provide a fulcrum for pivoting about the axis.

A benefit of the digital operating member having clip fit features providing a fulcrum is that a large rocker may be easily and robustly supported.

10 **[0009]** Preferably the digital operating member is arranged to be retained to the intermediate member by clip fit features.

15 **[0010]** A benefit of the digital operating member being retained to the intermediate member by clip fit features is that a small rocker may be easily supported. A further benefit is that positive engagement between the digital operating member and the intermediate member is ensured.

20 **[0011]** Preferably the intermediate member is arranged to be retained to the body by clip fit features about the axis. More preferably the clip fit features provide a fulcrum for pivoting about the axis. A benefit of the intermediate member having clip fit features providing a fulcrum is that the intermediate member may be easily assembled to and retained to the body.

25 **[0012]** Preferably the intermediate member is selectably re-locatable between two positions with respect to the pivot axis, a first position where the biasing means acts on the intermediate member and a second position where the biasing means can not act on the intermediate member. More preferably the digital operating member is arranged to cover the intermediate member when the digital operating member is mounted to the body. A benefit of the re-locatable intermediate member is that the operation of the biasing means may be selected by an installer while the digital operating member is removed from the body.

30 **[0013]** In an embodiment the intermediate member is preferably separable from the said means. More preferably the intermediate member is arranged to snap fit to the said means. A benefit of the intermediate member being separable is that it may easily be relocated. Preferably a direction of movement of the intermediate member when being relocated is perpendicular to the pivot axis to disengage it from the said means.

35 **[0014]** In an alternative embodiment the intermediate member is preferably retained to the said means. A benefit of the intermediate member being retained is that accidental loss of the intermediate member by an installer may be prevented.

40 **[0015]** Preferably the movement of the intermediate member when being relocated is linear. More preferably the intermediate member is located and retained slidably to the said means.

45 **[0016]** In a further embodiment where the intermediate member is retained, preferably the movement of the

intermediate member when being relocated is rotational. More preferably the intermediate member is retained to the said means by a snap fit arrangement permitting the rotational relocation.

**[0017]** Preferably terminals are provided within the body for making electrical connections and are arranged to be accessible on removal of the digital operating member.

**[0018]** Preferably the biasing means is retained to the body. A benefit of the biasing means being retained to the body is that accidental loss of the biasing means by an installer may be prevented.

**[0019]** In an embodiment the biasing means is resiliently compressible. Preferably the biasing means comprises a coil compression spring. In a further embodiment the compressible biasing means is comprised of a rubber or a resilient plastics material.

**[0020]** In an alternative embodiment the biasing means is resiliently extendable. More preferably the resiliently extendable biasing means comprises a coil spring.

**[0021]** Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a partly sectioned side view of an electrical switching device according to the invention, shown in an OFF state;

Figure 2 is a partly sectioned side view of the electrical switching device shown in Figure 1, but in an ON state

Figure 3 is a partly sectioned side view of the electrical switching device shown in Figure 1, shown in an OFF state and with an intermediate member in an alternative position to that shown in Figure 1.

Figure 4 is a partly sectioned side view of the electrical switching device shown in Figure 1, shown in an ON state and with an intermediate member in an alternative position to that shown in Figure 1.

Figure 5 is a side view of a removable intermediate member suitable for use with the electrical switching device shown in Figure 1;

Figure 5A is a plan view of the removable intermediate member shown in Figure 5;

Figure 5B is a side view of a said means for use with the intermediate member shown in Figure 5;

Figure 5C is an end view along a pivotal axis of the said means shown in Figure 5B.

Figure 6 is a perspective view of a pivotable intermediate member suitable for use with the electrical

switching device shown in Figure 1;

Figure 7 is a perspective view of a slidable intermediate member suitable for use with the electrical switching device shown in Figure 1; and

Figure 8 is a partly sectioned side view of a second embodiment of an electrical switching device according to the invention, shown in an OFF state.

**[0022]** From Figure 1, an electrical switching device 1 may be seen to comprise a body 3 mounted to which is at least one fixed contact 5 and at least one moving contact 7. A sub rocker 9 is provided as a means to cause the moving contact to contact the fixed contact. A rocker 11 is provided as a digital operating member to enable a person to digitally operate the switching device and an intermediate member 13 is provided between the sub-rocker and the rocker so that a compression coil spring 15 being a biasing means may be selectively arranged to act or not to act on the intermediate member 13. The body 3 is shown in partial section so that moving contact 7 and fixed contact 5 are visible. The moving contact 7 pivots about a fulcrum contact 19 and is held against the fulcrum contact by the plunger 17 which is biased towards the moving contact by a spring. As shown in Figure 1, the switching device 1 is in an OFF state, and the moving contact 7 is positioned away from fixed contact 5. In use, a person operating the switch will digitally apply a force 2F as shown in Figure 2 to the rocker 11. The force 2F causes the rocker to move about an axis A, so as to cause the plunger 17 to move along a top surface of the moving contact 7, causing it to pivot about the fulcrum contact 19, and make electrical contact with the fixed contact 5. The switching device is now in an ON state, and will remain so while a force 2F is applied. When force 2F is removed, biasing spring 15 applies a force in a direction substantially opposite to arrow 2F, so as to return the rocker to the position shown in Figure 1, and hence the switch reverts to an OFF state. Such a mode of operation is useful for operation of a signal bell or a relay that requires a single pulse to operate.

**[0023]** Figures 3 and 4 show the same switching device 1 shown in Figure 1, but with the intermediate member 13 in an alternative position to that shown in Figure 1. The biasing spring 15 is retained to the base in its location hole 21, and a free end 16 of the spring 15 does not contact the intermediate member 13. From these Figures, spring location 14 on the intermediate member 13 may be clearly seen. Although in this embodiment, spring location 14 is a protrusion, it could equally well be a recess or a hole. The protrusion is used to locate the free end 16 of the spring when the intermediate member is in the position shown in Figures 1 and 2.

**[0024]** Preferably the spring 15 is arranged so that the free end 16 does not contact the rocker 11 so as to impart a force sufficient to overcome any frictional forces

resisting the pivoting movement of the rocker.

**[0025]** More preferably the spring is arranged so that the free end 16 does not contact the rocker 11.

**[0026]** Hence, the spring 15 has no effect on the operation of the switching device by digital manipulation of the rocker 11. Hence when a force 4F is applied to the rocker, the switch will operate to an ON state, and when the force 4F is removed, the switching device will remain in the ON state, until such time as a force 3F is applied to the rocker to cause the switch to move to an OFF state. Once in an OFF state, the switch will remain OFF until a force 4F is applied again.

**[0027]** From Figures 5 and 5A a removable intermediate member 51 is shown and comprises an arm 53 having a recess 54 to locate a free end of a biasing means, and two identical retaining pegs 55 and 55'. Each retaining peg comprises a bevelled nose portion 57, a slot 56 and an enlarged retaining portion 58. The slot 56 permits the enlarged retaining portion to deflect such that the pegs may be inserted into holes 44 and 44' of the sub-rocker 41 described below. From Figures 5B and 5C a said means or sub-rocker 41 is shown, and comprises a pair of protrusions 42 and 42' on a pivotal axis of the sub rocker arranged so that when the sub-rocker is mounted to the body of a switching device the sub-rocker may be pivotally moved about the axis. The rocker shown is arranged for use in a switching device having two moving contacts, and hence is provided with two resilient protrusions 43 and 43' to resile against the moving contacts. The sub-rocker 41 has two holes 44 and 44' to receive and removably retain the retaining pegs 55 and 55' of the intermediate member 51. The intermediate member may be retained to the sub-rocker such that the end of the intermediate member having the recess 54 protrudes the sub rocker at either end 4A or end 4B. A screwdriver slot 59 is provided to facilitate the removal of the intermediate member from the sub-rocker 41 when it is required to re-position the intermediate member.

**[0028]** Figure 6 shows a further intermediate member 61 similar to intermediate member 51 comprising an arm 63 having a recess 64 to locate a free end of a biasing means, and two identical retaining pegs 65 and 65'. Each retaining peg comprises a bevelled nose portion 67, a slot 66, an enlarged retaining portion 68 and a screwdriver slot 69. Intermediate member 61 has a third peg 46 centrally positioned between pegs 65 and 65'. The third peg 46 has a tapered retaining portion 48 and a slot 47, and is arranged so that the retaining portion 48 may deflect to permit insertion of the peg into central positioned hole 45 of sub-rocker 41 and once inserted the retaining portion 48 is arranged to be non-removable. In operation, the intermediate member 61 may be raised away from the sub-rocker 41 sufficiently to disengage the retaining pegs 65 and 65' to enable the re-positioning of the intermediate member. However, since the retaining member is retained to the sub-rocker a risk of accidental loss arising from separation from the sub-

rocker is avoided.

**[0029]** From Figure 8 a partly sectioned side view of a second embodiment 81 of an electrical switching device according to the invention, and is shown in an OFF state. Switching device 81 comprises a body 803 mounted to which is at least one fixed contact 805 and at least one moving contact 807. A sub rocker 809 is provided as a means to cause the moving contact to contact the fixed contact. A rocker 811 is provided as a digital operating member to enable a person to digitally operate the switching device and an intermediate member 813 is provided between the sub-rocker 809 and the rocker 811 so that a compression coil spring 815 being a biasing means may be selectably arranged to act or not to act on the intermediate member 813. The body 803 is shown in partial section so that moving contact 807 and fixed contact 805 are visible. The moving contact 807 pivots about a fulcrum contact 819 and is held against the fulcrum contact by the plunger 817 which is biased towards the moving contact by a spring.

**[0030]** The sub-rocker is arranged to pivot about an axis 8A, and rocker 811 is provided with a snap fit arrangement comprising protrusions 831 and 832 which locate about a protrusion 833 on the body concentric with axis 8A. A further set of identical protrusions are provided on the rocker and body on the other side of the body not visible in this view.

**[0031]** Body 803 is provided with mounting flanges 823 and 823' for mounting the switching device. Body 803 is also provided with holes 825 and 827 which provide access to terminals 806 and 829 for the connection of electrical wires to the switching device. The holes 825 and 827 are arranged to be accessible on removal of the digital operating member or rocker 811 to permit an installer to make electrical connections to the terminals within the body from a front of the switch.

**[0032]** As shown in Figure 8, the switching device 81 is in an OFF state, and the moving contact 807 is positioned away from fixed contact 805. In use, a person operating the switch will digitally apply a force 8F to the rocker 811. The force 8F causes the rocker to move about an axis 8A, so as to cause the plunger 817 to move along a top surface of the moving contact 807, causing it to pivot about the fulcrum contact 819, and make electrical contact with the fixed contact 805. The switching device is now in an ON state, and will remain so while a force 8F is applied. When force 8F is removed, biasing spring 815 applies a force in a direction substantially opposite to arrow 8F, so as to return the rocker to the position shown in Figure 801, and hence the switch reverts to an OFF state.

**[0033]** Figure 7 shows a perspective view of a slidable intermediate member 71, which comprises a body 76 of substantially uniform cross-section, having at one end a recess 73 for receiving a free end of a biasing means, and along each longitudinal side a tapered face 72 and 72'. Tapered face 72 is provided with detents 74 and 75. In use the intermediate member 71 is mounted to a sub-

rocker similar to those described herein, adapted to receive intermediate member 71 by having a matching tapered groove perpendicular to the pivotal axis of the sub-rocker. The slidable intermediate member 71 may be moved with respect to the sub-rocker to which it is mounted, in the direction of arrow 7M to move the recess 73 out of engagement with the biasing means, and hence providing an ordinary ON/OFF switching action, or moved in the opposite direction to engage the biasing means and provide a momentary action switch.

### Claims

1. An electrical switching device (1, 81) comprising a body (3, 803) mounted to which is at least one fixed contact (5, 805) and at least one moving contact (7, 807), means (9, 809) to cause the moving contact to contact the fixed contact, a digital operating member (11, 811) to move the moving contact, **characterised in that** an intermediate member (13, 813) is arranged between the said means (9, 809) and said operating member (11, 811) and **in that** a biasing means (15, 815) is selectably arranged to act or not to act on said intermediate member (13, 813).
2. A switching device as claimed in claim 1, wherein the digital operating member (811) is removable from the switching device (81).
3. A switching device as claimed in any of the preceding claims, wherein the digital operating member (11, 811) is arranged to move pivotably about a first axis (A, 8A).
4. A switching device as claimed in any of the preceding claims, wherein the intermediate member (13, 813) is arranged to move pivotably about a second axis.
5. A switching device as claimed in claim 4, wherein the intermediate member (13, 813) is arranged to move about the same axis (A, 8A) as the digital operating member (11, 811).
6. A switching device as claimed in any of the preceding claims when dependant on claim 3, wherein the digital operating member (811) is arranged to be retained to the body (833) by clip fit features (831, 832) about the axis (8A).
7. A switching device as claimed in any of the preceding claims, wherein the digital operating member is arranged to be retained to the intermediate member by clip fit features.
8. A switching device as claimed in any of the preceding claims, wherein the intermediate member (13, 813) is arranged to be retained to the body (3, 803) by clip fit features that comprise a fulcrum for pivotal movement.
9. A switching device as claimed in any of the preceding claims, wherein the intermediate member (13, 813) is selectably re-locatable between two positions with respect to the pivot axis (A, 8A), a first position (Fig. 1, Fig. 2, Fig. 8) where the biasing means (15, 815) acts on the intermediate member (13, 813) and a second position (Fig. 3, Fig. 4) where the biasing means (15, 815) can not act on the intermediate member (13, 813).
10. A switching device as claimed in claim 9, wherein the digital operating member (11, 811) is arranged to cover the intermediate member (13, 813) when the digital operating member (11, 811) is mounted to the body (3, 803).
11. A switching device as claimed in either of claims 9 or 10, wherein the intermediate member is separable (13, 813) from the said means (9, 809).
12. A switching device as claimed in claim 11, wherein the intermediate member (13, 813) is arranged to snap fit to the said means (9, 809).
13. A switching device as claimed in either of claims 9 or 10, wherein the intermediate member (13, 813) is preferably retained to the said means (9, 809).
14. A switching device as claimed in claim 13, wherein the intermediate member (71) is retained slidably to the said means (9, 809).
15. A switching device as claimed in claim 13, wherein the intermediate member (61) is retained to the said means (41) by a snap fit arrangement (45, 47, 48) permitting a rotational relocation (45, 46).
16. A switching device as claimed in any of the preceding claims, wherein the biasing means (15, 815) is retained to the body (3, 803).
17. A switching device as claimed in claim 16, wherein the biasing means (15, 815) comprises a coil compression spring.
18. A switching device as claimed in claim 16, wherein the biasing means (15, 815) is comprised of a rubber or a resilient plastics material.
19. A switching device as claimed in any of claims 1 to 15, wherein the biasing means (15, 815) is resiliently extendable.

20. A switching device as claimed in any of the preceding claims, wherein terminals (806, 829) are provided within the body (803) for making electrical connections and are arranged to be accessible (825, 827) on removal of the digital operating member (811). 5

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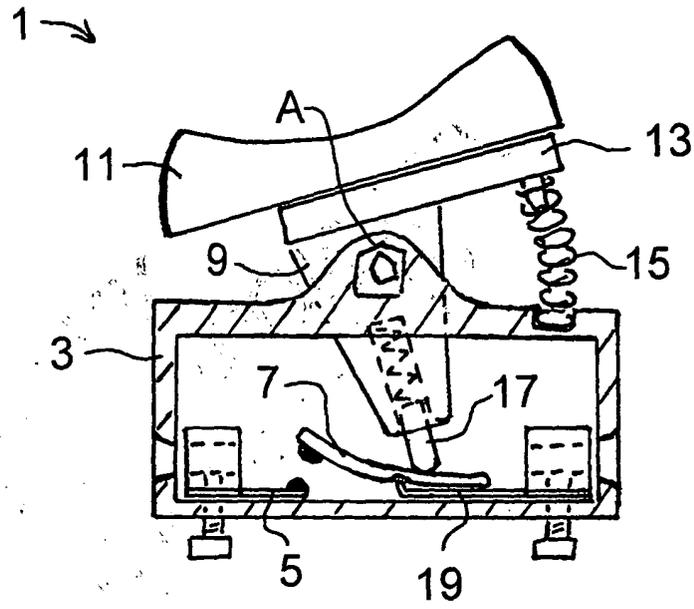


Figure 1

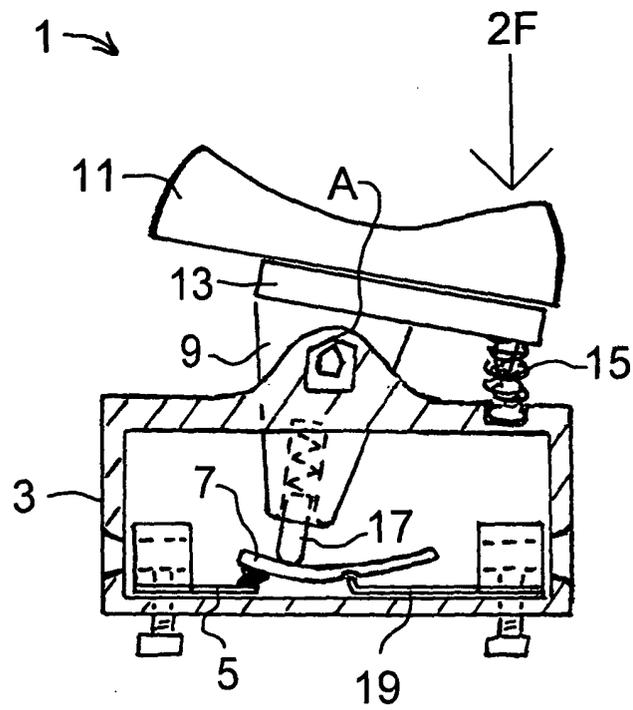


Figure 2

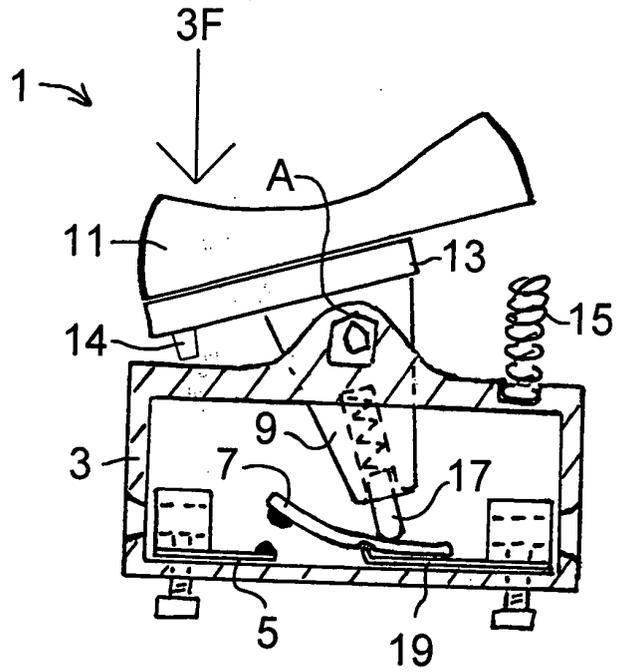


Figure 3

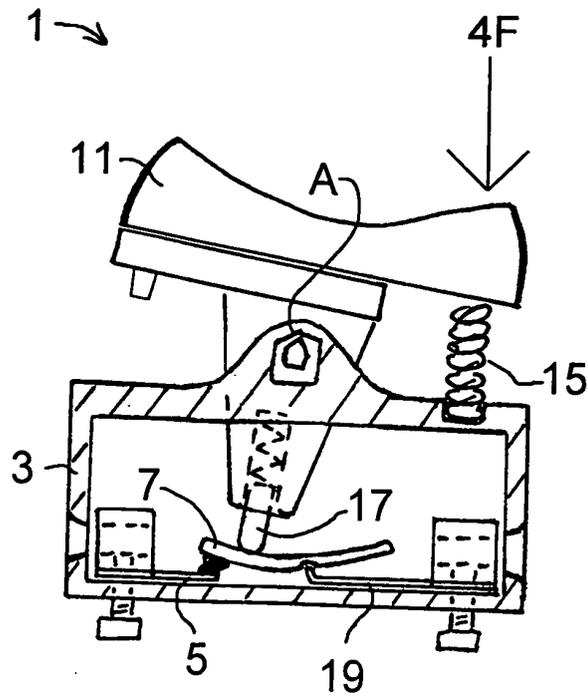


Figure 4

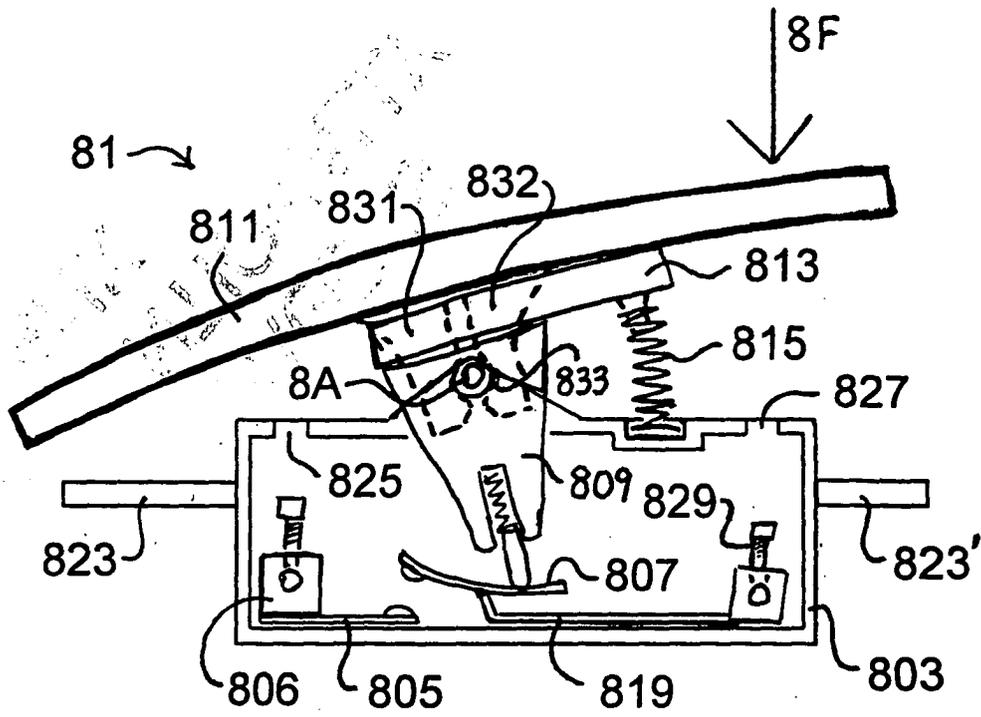


Figure 8

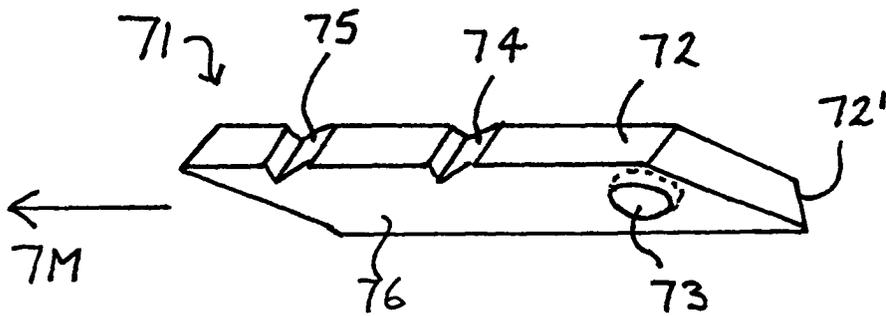


Figure 7

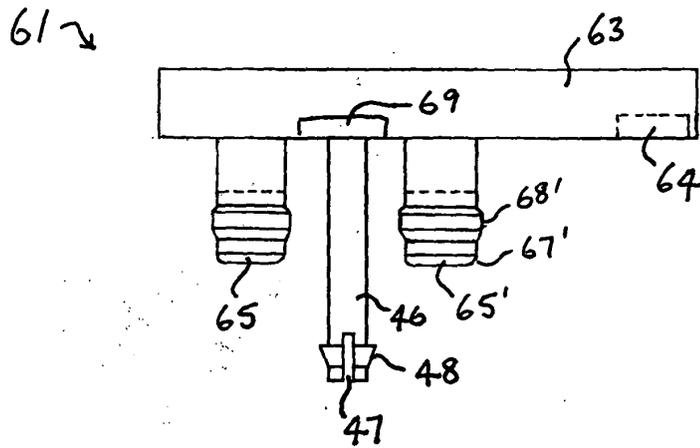


Figure 6

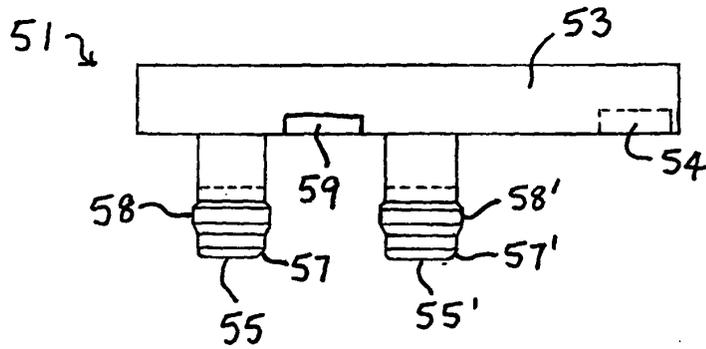


Figure 5

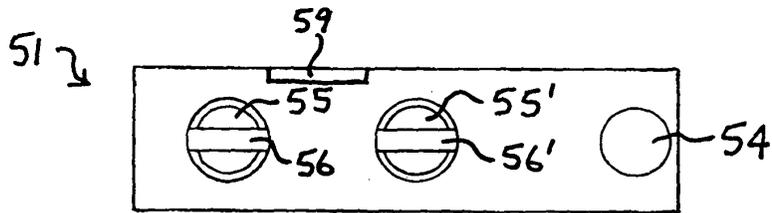


Figure 5A

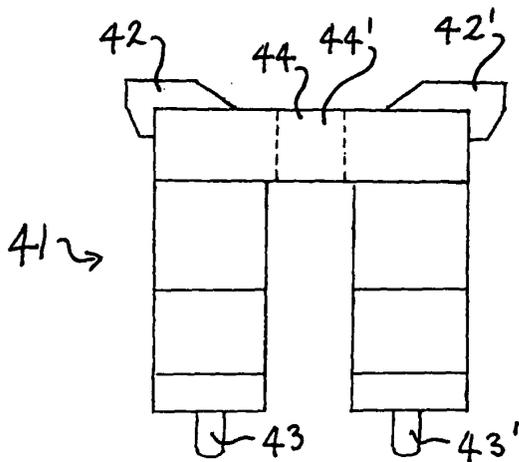


Figure 5B

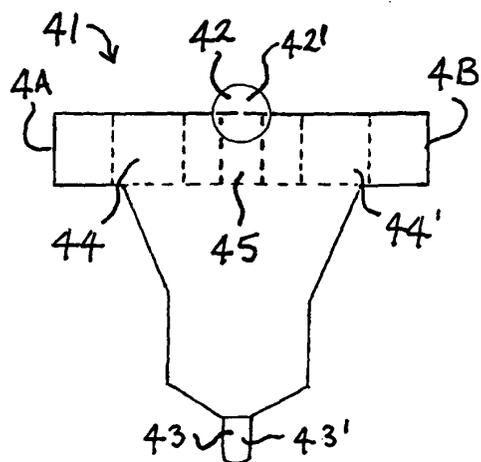


Figure 5C



European Patent  
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EUROPEAN SEARCH REPORT

Application Number  
EP 04 25 2827

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)
X	DE 197 45 017 A (MERTEN GMBH & CO KG GEB) 15 April 1999 (1999-04-15) * abstract; figures 1-3 *	1-8, 16-20	H01H23/24
A	DE 195 37 253 A (ABB PATENT GMBH) 10 April 1997 (1997-04-10) * the whole document *	1-20	
			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		4 August 2004	Simonini, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 25 2827

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04-08-2004

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