

Description

[0001] The present invention relates to a refrigerator having a door switch for switching an internal light on and off in response to opening and closing of a door.

[0002] The use of refrigerators to preserve food is well known. A known refrigerator uses cool air currents supplied from an evaporator to both a freezing compartment and a chilling compartment. In such a refrigerator, the freezing compartment is used to store food, such as meat and fish, required to be stored at a temperature below freezing whereas the chilling compartment is used to store food, such as vegetables, fruits, and drinking water, required to be stored at a temperature above freezing.

[0003] In the known refrigerator, a lamp is provided in each of the freezing and chilling compartments, with a door switch installed at the door of each compartment and used for turning on or off an associated lamp in response to an opening action of the respective door. That is, when the door of a compartment is opened, the door switch automatically turns on the lamp provided in the compartment, thus allowing the lamp to illuminate the compartment. The door switch automatically turns off the lamp when the door is closed.

[0004] As shown in Figure 1, a conventional door switch includes a push button, which is installed by a door of the refrigerator and closes the door switch when the door is opened.

[0005] Figure 2 shows the conventional door switch when it is turned off, while Figure 3 shows the door switch when it is turned on. The construction of the conventional door switch will now be described with reference to Figures 2 and 3.

[0006] As shown in the drawings, the conventional door switch 10 has a casing 11, which is set in the refrigerator cabinet 1, with a push button 12 movably set in the casing 11. The door switch 10 also has a fixed switching blade 16 and a movable switching blade 17, which are installed in the casing 11. A guide wall 18 is transversely set in the casing 11 to divide the interior of the casing 11 into first and second chambers, with the push button 12 movably arranged in the first chamber, and the two blades 16, 17 arranged in the second chamber. The guide wall 18 has an opening 19.

[0007] In the first chamber of the casing 11, the push button 12 is normally biased outward by a spring 13 set at the inner end of the push button 12, and so the button 12 projects slightly from the casing 11 at its outer end due to the force exerted on it by the spring 13 when a door 2 is open. However, when the door 2 is closed, the door 2 presses the outer end of the push button 12, thus depressing the button 12 into the casing 11.

[0008] The push button 12 is installed in the casing 11 such that it is elastically movable between a projected position and a retracted position by the spring 13 and the door 2.

[0009] An actuation member 14 is attached to the side

of the push button 12 within the casing 11, and so the actuation member 14 moves along with the push button 12 in the same direction. This actuation member 14 is also arranged to always be in movable contact with the guide wall 18 and is inserted into the opening 19 of the guide wall 18 at its outer end. The guide wall 18 thus guides linear reciprocation of the actuation member 14 during an operation of the door switch 10.

[0010] The fixed blade 16 and the movable blade 17 are arranged within the second chamber of the casing 11 such that the two blades 16, 17 are parallel to each other and spaced apart from each other when in their normal positions. The fixed blade 16 has a fixed contact 16a at its outer end, while the movable blade 17 has a movable contact 17a at a position corresponding to the fixed contact 16a. The movable contact 17a is thus selectively brought into contact with the fixed contact 16a in response to movement of the actuation member 14. The movable blade 17 is normally spaced apart from the fixed blade 16 due to its elasticity, and so the contacts 16a, 17a of the two blades 16, 17 are normally spaced apart from each other when the door 2 is closed.

[0011] In order to move the movable blade 17 relative to the fixed blade 16, the actuation member 14 has an actuating projection 15 at its outer end. This projection 15 passes through the opening 19 of the guide wall 18 and catches the outer end of the movable blade 17.

[0012] The operation of the above-mentioned conventional door switch 10 is shown in Figures 2, 3 and 4.

[0013] Figure 2 is a sectional view of the door switch 10 when it is open. Figure 4 is a block diagram, showing an operation of the switch 10 for turning on or off a lamp 3.

[0014] As shown in Figure 2, when the door switch 10 is opened by the closing door 2, the door 2 presses the push button 12, thus depressing the push button 12 into the casing 11 and compressing the spring 13. In this case, the actuation member 14 is fully retracted along with the push button 12, so that the movable blade 17, which is placed on the projection 15 of the actuation member 14, is spaced apart from the fixed blade 16 due to its elasticity. Therefore, the movable contact 17a is spaced apart from the fixed contact 16a, thus opening the door switch 10 and turning off the lamp 3 as shown in Figures 2 and 4.

[0015] When a user opens the door 2, the compressing force of the door 2 is removed from the push button 12, thus allowing the push button 12 to be project from the casing 11 by the restoring force of the spring 13 as shown in Figure 3. Therefore, the actuation member 14 is moved outward along with the push button 12, and so the projection 15 of the actuation member 14 pushes the movable blade 17 toward the fixed blade 16, thus bringing the contacts 16a, 17a of the two blades 16, 17 into contact with each other. The door switch 10 is thus electrically activated to turn on the lamp 3.

[0016] However, the conventional door switch 10 for refrigerators is mechanically actuated as described

above, and fails to tightly seal the casing 11, and so water or wet air may be undesirably introduced into the casing 11. That is, since the door switch 10 is designed such that the push button 12 is movable between a projected position and a retracted position relative to the casing 11, a gap is inevitably formed between the push button 12 and the casing 11 and this undesirably allows the introduction of water or wet air into the casing 11, thereby causing the door switch 10 to fail to operate normally.

[0017] In addition, because the contacts 16a, 17a of the two blades 16, 17 set within the casing 11 selectively and repeatedly come into contact with each other in a mechanical manner with the actuation member 14, the conventional door switch 10 does not protect the two contacts 16a, 17a from wet air. Therefore, the two contacts 16a, 17a are undesirably exposed to wet air in the compartment of the refrigerator, and so sparks may be generated at the gap between two contacts 16a, 17a. In addition, water may be undesirably introduced into the casing 11 of the door switch 10 when a user washes the cabinet 1 using water. The door switch 10 thus may have a short circuit.

[0018] On the other hand, refrigerant gas may be undesirably introduced into the casing 11 of the door switch 10 through the gap between the push button 12 and the casing 11. Particularly when the refrigerator uses an explosive R600a refrigerant gas, the explosive refrigerant gas may cause an unexpected explosion within the casing 11, in addition to forming sparks at the gap between the contacts 16a, 17b. The conventional door switch 10 is thus reduced in its operational safety.

[0019] A refrigerator according to the present invention is characterised in that the door switch comprises a sealed reed switch.

[0020] Preferably, the switch includes a resiliently mounted push button located so as to be depressed by the door when the door is closed and a magnet moved by the push button for opening and closing the reed switch. More preferably, the magnet is mounted to the push button. Still more preferably, the magnet is arranged such that the reed switch is closed when the door is open.

[0021] An embodiment of the present invention will now be described, by way of example, with reference to Figures 5 to 7 of the accompanying drawings, in which:

Figure 1 is a front perspective view of a conventional refrigerator, with the door of a chilling compartment being opened;

Figure 2 is a sectional view of a conventional door switch of the refrigerator when the door is closed and turns off the door switch;

Figure 3 is a sectional view of the conventional door switch when the door is opened and turns on the door switch;

Figure 4 is a block diagram, showing an operation of the conventional door switch for turning on or off a lamp;

Figure 5 is a sectional view of a door switch included in a refrigerator in accordance with the present invention when a door is closed and opens the door switch;

Figure 5a is an enlarged view of the reed switch which is marked as "A" in Figure 5;

Figure 6 is a sectional view of the door switch included in the refrigerator of this invention when the door is opened and closes the door switch;

Figure 6a is an enlarged view of the reed switch which is marked as "B" in Figure 6; and

Figure 7 is a block diagram, showing an operation of the door switch of this invention for turning on or off a lamp.

[0022] Reference now should be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same components.

[0023] Figure 5 is a sectional view of a door switch 30 of the refrigerator in accordance with the preferred embodiment of the present invention when a door 2 is closed and turns off the door switch 30.

[0024] Referring to Figure 5, the door switch 30 has a casing 31, which is set in the refrigerator cabinet 1, with a push button 32 and a reed switch 40 set within the casing 31. A partition wall 38 is arranged within the casing 31 at a position between the push button 32 and the reed switch 40. In the present invention, an opening 39 may be formed on the partition wall 38 at a central portion corresponding to the reed switch 40.

[0025] In the casing 31, the push button 32 is normally biased outward by a spring 33 set at the inner end of the push button 32, and so the button 32 is slightly projected from the casing 31 at its outer end through a hole 30a of the casing 31 by the restoring force of the spring 33 when the door 2 is opened. However, when the door 2 is closed, the door 2 presses the outer end of the push button 32, thus depressing the button 32 into the casing 31. A magnet 50 is mounted on the side of the push button 32 such that the magnet 50 is movable along with the push button 32 in the same direction, and closes the reed switch 40 when the movable magnet 50 is aligned with the reed switch 40.

[0026] In the present invention, the reed switch is a magnetically operable switch, which comprises a hermetically sealed glass tube, with two reed blades (referred to as "fixed switching blades" in the description of this invention) made of a magnetic material through a pressing process and set in the glass tube such that the blades are appropriately overlapped with each other, in addition to having a gap between them. In the casing 31, the reed switch 40 is installed within a chamber 70, formed by a support wall 51 at a position around the partition wall 38. As best seen in Figure 5a, the reed switch 40 of the present invention comprises two fixed switching blades 42, 43, which extend from the outside of the sealed glass tube 41 into the interior of the tube 41

through the opposite ends of the tube 41. A movable switching blade 44, made of an elastic material, extends from the first fixed blade 42 toward the second fixed blade 43 within the glass tube 41 such that the movable switching blade 44 normally overlaps the second fixed blade 43 at its free end while being spaced apart from said blade 43 by a predetermined gap when the reed switch 40 is open.

[0027] As described above, the second fixed blades 43 and the movable switching blade 44 of the reed switch 40, which form the contacts of the door switch 30 of the present invention, are held by the sealed glass tube 41, and so the reed switch 40 is free from any misalignment of the blades 43, 44 during operation. The reed switch 40 also has a high response speed during an operation, and is protected from the undesired introduction of moisture or gas into its contacts.

[0028] The glass tube 41 of the reed switch 40 is arranged in a hole 52 formed at the support wall 51. After the glass tube 41 is arranged in the hole 52 of the support wall 51 as described above, the chamber 70 formed by the support wall 51 is sealed by an epoxy resin, thus forming an epoxy-molded layer 60 on the support wall 51 including the hole 52.

[0029] In the casing 31 of the door switch 30, the reed switch 40 is spaced apart from the magnet 50 attached to the movable push button 32 by a predetermined gap, with the partition wall 38 being arranged between the switch 40 and the magnet 50.

[0030] The operational effect of the door switch 30 of the present invention will now be described.

[0031] When the door 2 is closed, the door 2 presses the push button 32, thus depressing the button 32 into the casing 31 and thereby compressing the spring 33 as shown in Figure 5. In such a case, the magnet 50 moves along with the push button 32, thus being moved away from the reed switch 40. As shown in Figure 5a, the reed switch 40 is therefore released from the magnetic field of the magnet 50, and the movable switching blade 44 integrated with the first fixed blade 42 is elastically returned to its original position, at which the movable blade 44 is spaced apart from the second fixed blade 43 due to its elasticity. Therefore, the two fixed blades 42, 43 are separated from each other, and so the circuit of the door switch 30 is broken to turn off the lamp 3 in the refrigerator cabinet 1 as shown in Figure 7.

[0032] When a user opens the door 2, the compressing force of the door 2 is removed from the push button 32, thus allowing the push button 32 to be elastically projected from the casing 31 by the restoring force of the spring 33 as shown in Figure 6. In this case, the magnet 50 is moved along with the push button 32 in the same direction, thus being positioned close to and aligned with the reed switch 40, with the partition wall 38 having the opening 39 and being positioned between the reed switch 40 and the magnet 50. As shown in Figure 6a, the reed switch 40 is therefore positioned within the area of influence of the magnetic field of the magnet

50, and so the movable switching blade 44 is magnetically attracted toward the second fixed blade 43, thus being brought into contact with the fixed blade 43. The two fixed blades 42, 43 are thus electrically connected to activate the door switch 30, and turn on the lamp 3.

[0033] As described above, the door switch according to this invention is operated by both a sealed reed switch and a movable magnet. That is, the sealed reed switch is set within the switch casing, while the magnet is arranged to be movable along with the push button, and selectively, magnetically operates the reed switch when the door of the refrigerator is opened to allow the magnet to be positioned close to the reed switch. Since the contacts of the reed switch are completely sealed by a glass tube, the contacts are completely protected from moisture even when water or wet air is introduced into the casing of the door switch. In addition, the casing of the door switch is partially molded with epoxy resin at a position around the reed switch, and so the reed switch is completely protected from water or gas, thus being free from sparks at the gap between the contacts.

[0034] The door switch of this invention is installed at the same position in the refrigerator cabinet as that of a conventional door switch, and is produced using the same casing and push button as those of the conventional door switch. Therefore, the door switch of this invention is easily and simply installed in the refrigerator, and is produced at a low production cost through a simple production process.

Claims

1. A refrigerator having a door switch (30) for switching an internal light on and off in response to opening and closing of a door (2), **characterised in that** the door switch (30) comprises a sealed reed switch (40).
2. A refrigerator according to claim 1, wherein the door switch (30) includes a resiliently mounted push button (32) located so as to be depressed by the door (2) when the door (2) is closed and a magnet (50) moved by the push button (32) for opening and closing the reed switch (40).
3. A refrigerator according to claim 2, wherein the magnet (50) is mounted to the push button (32).
4. A refrigerator according to claim 2 or 3, wherein the magnet (50) is arranged such that the reed switch (40) is closed when the door (2) is open.
5. A refrigerator having a door switch comprising:
 - a casing set in a refrigerator cabinet;
 - a push button set within said casing so as to be normally projected from said casing at its outer

end and be movable in opposite directions;
elastic means for normally biasing said push
button to project the outer end of said push but-
ton from said casing;
a magnet mounted to said push button so as 5
be movable along with said push button in the
same direction; and
a reed switch set within said casing while being
spaced apart from said push button by a pre-
determined gap, and selectively turned on or 10
off by said magnet.

6. A refrigerator having the door switch according to
claim 5, wherein said reed switch is installed within
a chamber formed by a support wall provided within 15
said casing, said support wall being sealed by an
epoxy resin to seal said chamber including said
reed switch.
7. A refrigerator having the door switch according to 20
claim 5, wherein said elastic means is a spring pro-
vided at an inner end of said push button.
8. A refrigerator having the door switch according to
claim 6, wherein said magnet is mounted on a side- 25
wall of said push button so as to be selectively
aligned with said reed switch such that when the
refrigerator door is open, said magnet is moved out-
ward along with said push button by a restoring
force of said elastic means, thereby magnetically 30
turning on said reed switch using its magnetic field,
while when the refrigerator door is closed, said
magnet is moved inward along with said push but-
ton while compressing said elastic means, thereby
releasing said reed switch from the magnetic field 35
and turning off said reed switch.
9. A refrigerator having the door switch according to
claim 5, wherein a partition wall is provided within
said casing at a position between said push button 40
and said reed switch, and so an magnetic field of
said magnet is applied to said reed switch through
said partition wall.
10. A refrigerator having the door switch according to 45
claim 9, wherein an opening is formed on said par-
tition wall at a central portion corresponding to said
reed switch.

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FIG. 1
(PRIOR ART)

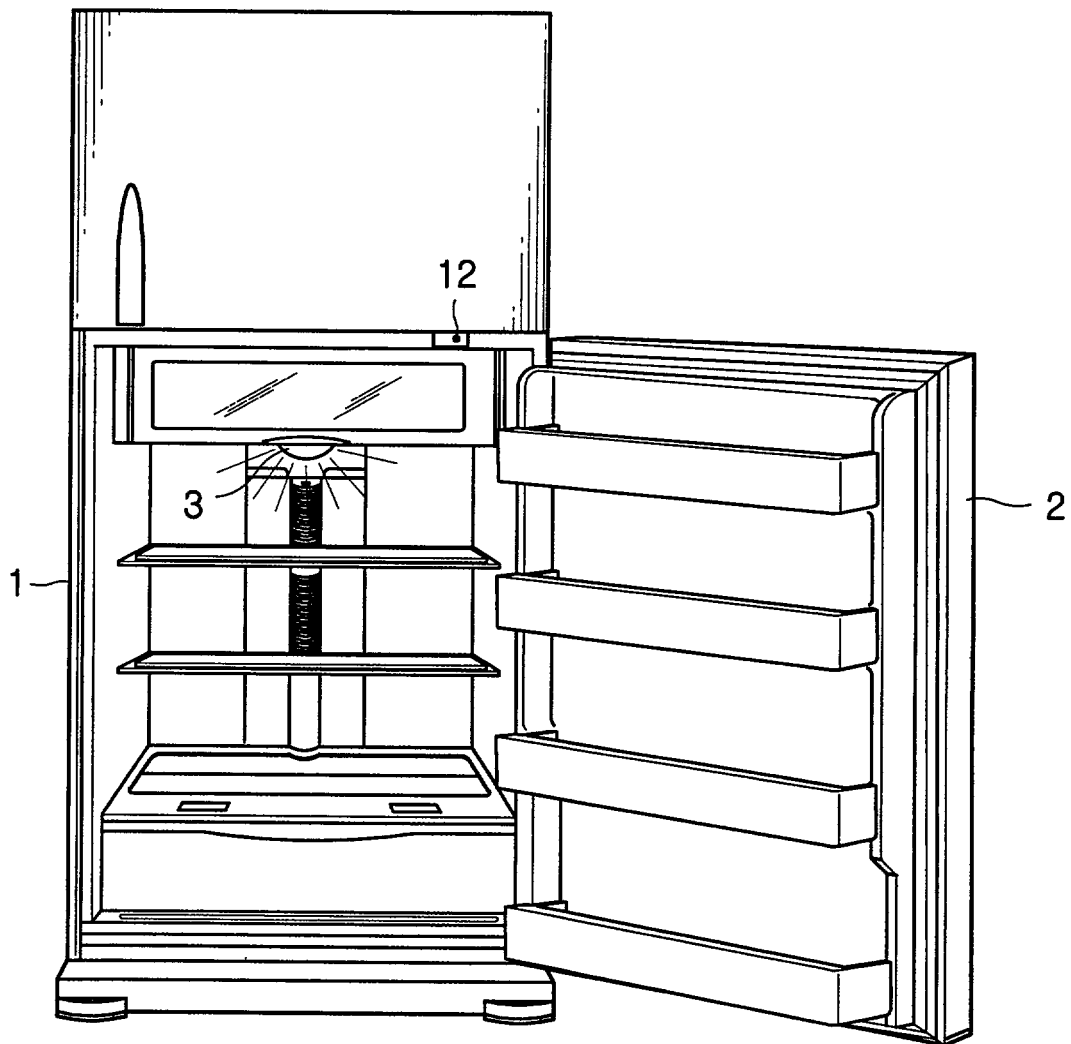


FIG. 2
(PRIOR ART)

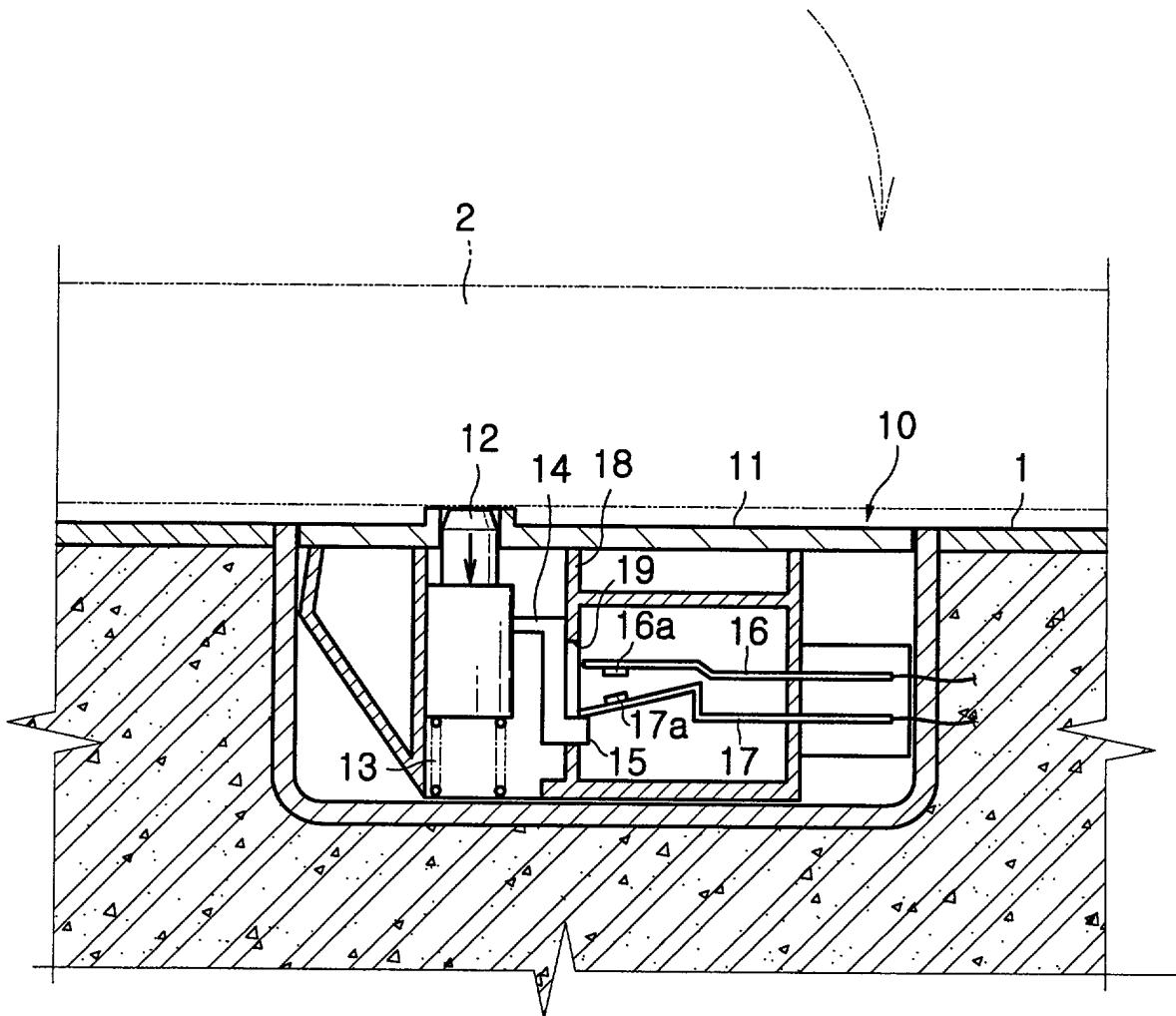


FIG. 3
(PRIOR ART)

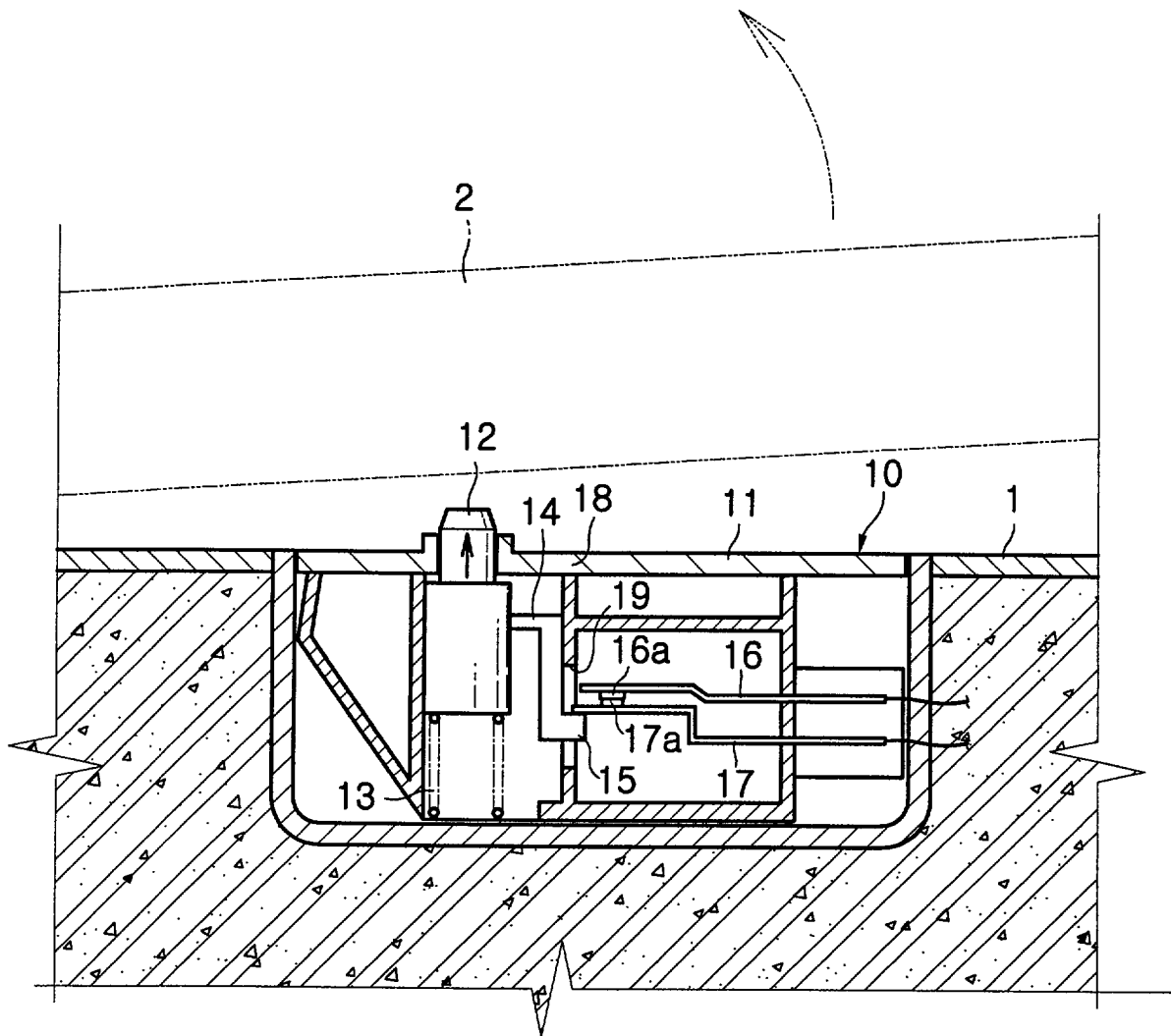


FIG. 4

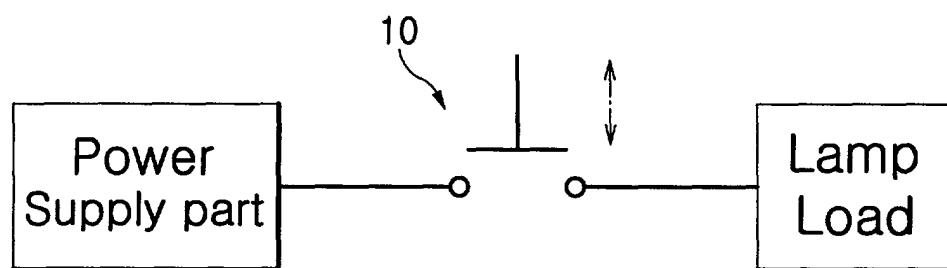


FIG. 5

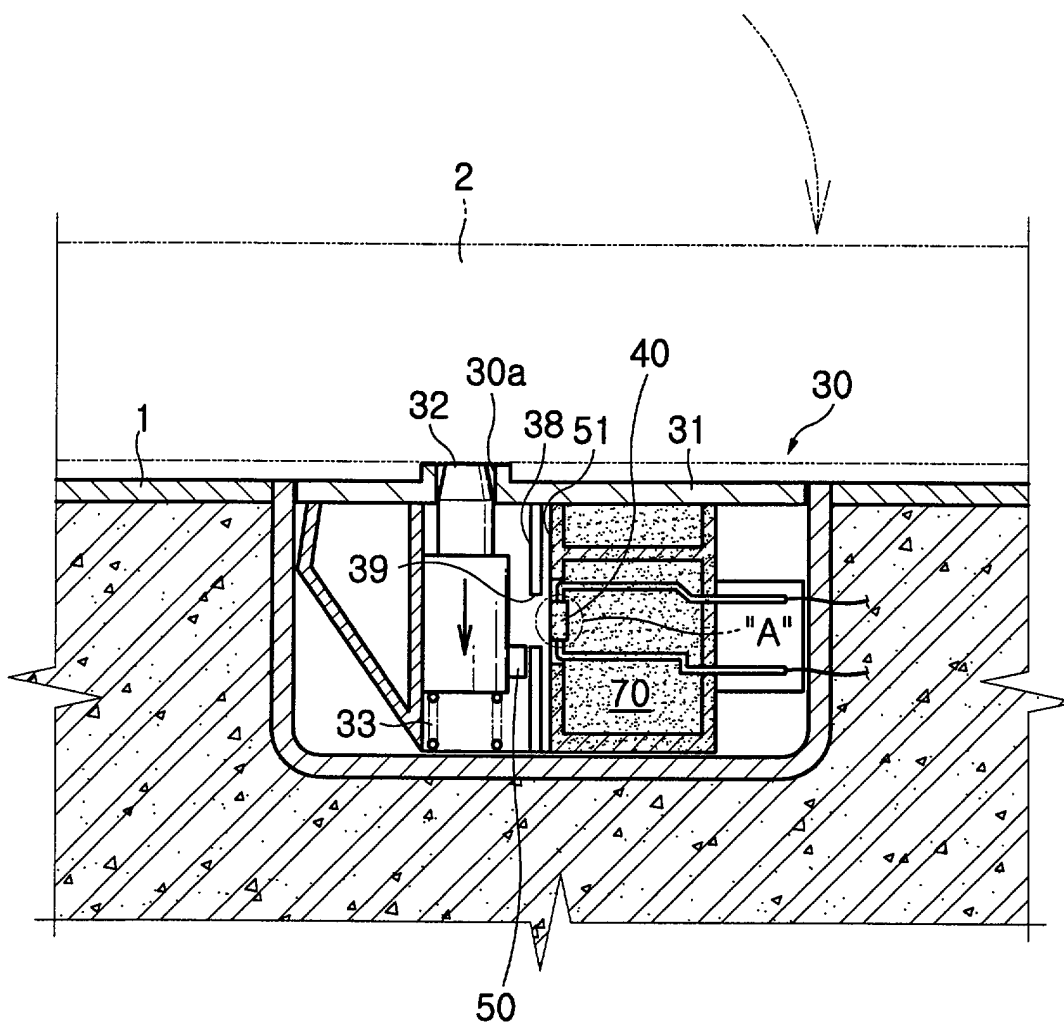


FIG. 5a

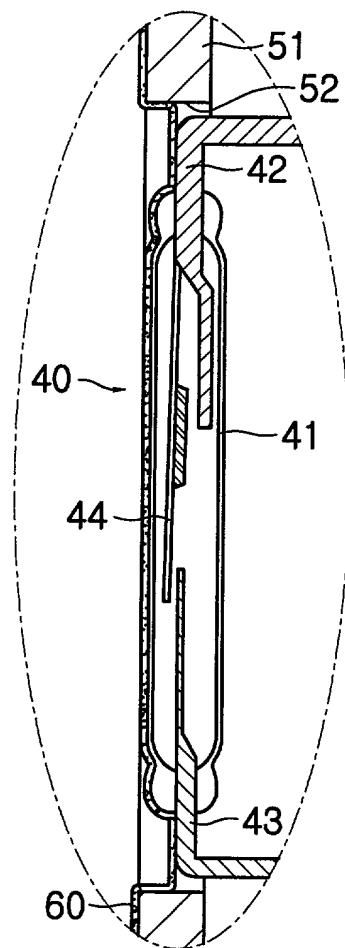


FIG. 6

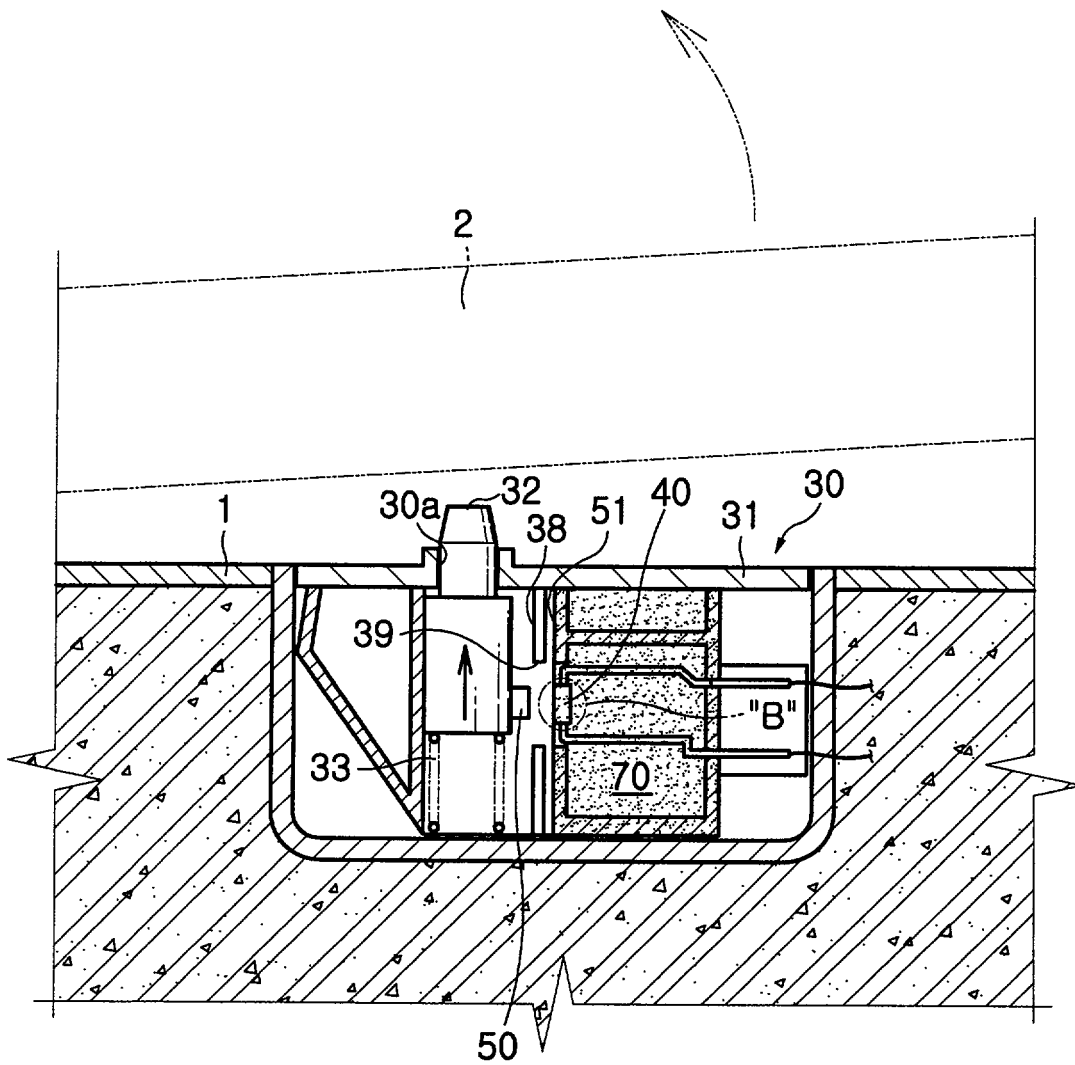


FIG. 6a

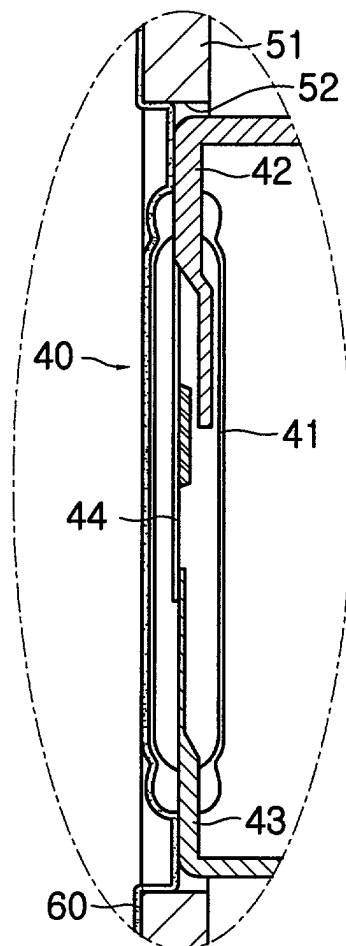


FIG. 7

