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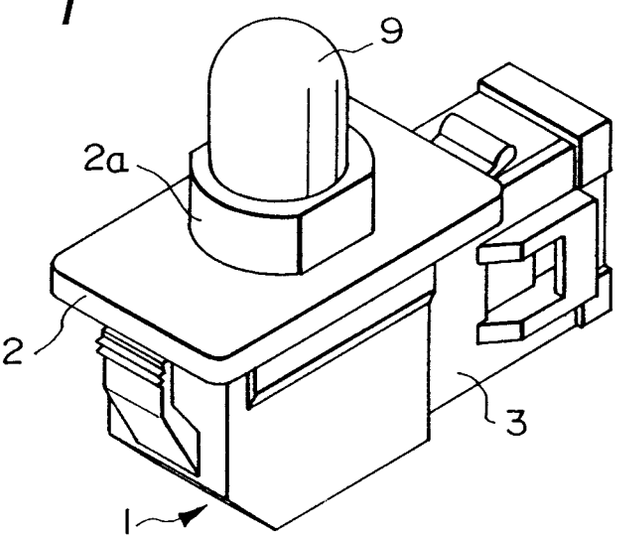
(54) Switch

(57) A switch comprises a case, a protrusion arranged at the case, a fixed contact point fixed to the case, a movable contact point rotatably pivoted by a supporting column, and a push button for rotating the movable contact point around the supporting column. The movable contact point is abutted against the protrusion when the movable contact point is rotated through motion of the push button, the contact point section of the movable contact point is moved up and down in an axial direction of the supporting column and slidably contacted with the fixed contact point.

FIG. 1



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Description

[0001] This invention relates to a switch which is preferably used in a refrigerator or the like.

[0002] A related art switch, which is for example a switch operated when a door of a refrigerator is opened or closed to turn ON or turn OFF an electric lamp for use in lighting up an inner area of a refrigerator or to turn ON or turn OFF a cooling motor is provided with a case 21 composed of a molded product of synthetic resin. Two fixed contact points 22, 23 composed of resilient metallic plates and a common movable contact point 24 composed of resilient metallic plate are fixed to this case 21. A contact point section 24a of the common movable contact point 24 is kept at a state opposite to the contact point sections 22a, 23a of the fixed contact points 22, 23 and then the contact point section 24a can be moved to or away from each of the contact point sections 22a, 23a, respectively.

[0003] In addition, a doglegged driving member 25 fitted to the supporting column 21a arranged at the case 21 is installed within the case 21, and the driving member 25 is rotatably arranged around the supporting column 21a to drive the movable contact point 24 at one end of the driving member 25.

[0004] In addition, a push button 26 which can be turned around a fulcrum point of the shaft 26a is fixed to the case 21 and at the same time a coil spring 27 is arranged between the case 21 and the push button 26 so as to always resiliently push against the push button 26 with this coil spring 27.

[0005] Then, the push button 26 is operated such that the push button 26 is resiliently pressed in a counterclockwise direction around a fulcrum point of the shaft 26a by the coil spring 27, a part of the push button 26 is projected out of the hole 21b of the case 21 and the protrusion 26b of the push button 26 is engaged with the inner side of the case 21 to prevent the push button 26 from being further turned.

[0006] Then, such a switch as above is fixed to a refrigerator and the push button 26 is operated through an opening or closing operation of a door of the refrigerator.

[0007] Fig. 10 shows a state in which a part of the push button 26 is projected out of the hole 21b of the case 21 as the door of the refrigerator is opened and under this state, the contact point section 24a of the movable contact point 24 comes into contact with the contact point section 22a of the fixed contact point 22, the movable contact point 24 and the fixed contact point 22 are made conductive to cause a lamp in the refrigerator to be lit or the cooling motor to be turned off.

[0008] Then, when the push button 26 is pushed by the door in a direction of arrow P while the door of the refrigerator is closed under this state, the push button 26 is rotated in a clockwise direction against the coil spring 27 around a fulcrum point of the shaft 26a and the push button 26 is pushed into the case 21.

[0009] Then, the driving member 25 is turned around the supporting column 21a by this push button 26, the movable contact point 24 can be moved through rotation of the driving member 25, the contact point section 24a is moved away from the contact point section 22a and comes into contact with the contact point section 23a of the fixed contact point 23.

[0010] At this time, the contacted state of the contact point section 24a with the contact point section 23a becomes an abutted state, i.e. a butting type contacted state and at the same time, the lamp in the refrigerator is turned off or the cooling fan motor becomes its connected state.

[0011] In addition, when the door is opened under this state, the push button 26 is partially projected out of the hole 21b by the coil spring 27 as shown in Fig. 10 and at the same time the movable contact point 24 is returned to its original state due to its spring characteristic, thereby the driving member 25 is pushed back to cause the contact point section 24a to be moved away from the contact point section 23a and contacted against the contact point section 22a of the fixed contact point 22 in a butting state, the lamp is lit or the cooling fan motor is turned off.

[0012] The prior art switch has some problems that the driving member 25 is required for driving the movable contact point 24, the number of component parts is increased to cause its cost to be increased, it requires a certain storing space to cause its size to be large in scale.

[0013] In addition, since the movable contact point 24 is made of resilient metallic plate, not only its material cost is high and its price is costly expensive, but also a state of the contact point section 24a with the contact point sections 22a, 23a is of a butting type and a sliding operation scarcely occurs between the contact point section 24a and the contact point 22a, 23a, resulting in that there occurs a problem that an oxidation film of the contact point caused by arc generated between the contact point section 24a and the contact point sections 22a, 23a is left and a poor contact state is generated.

[0014] According to the present invention ther is provided a switch, including a case; a protrusion arranged at the case; a fixed contact point fixed to the case; a movable contact point rotatably pivoted by a supporting column; and a push button for rotating the movable contact point around the supporting column, wherein the movable contact point is abutted against the protrusion when the movable contact point is rotated through motion of the push button, the contact point section of the movable contact point is moved up and down in an axial direction of the supporting column and slidably contacted with the fixed contact point.

[0015] Preferably, a coil spring is fixed to the supporting column, the movable contact point is pushed against the fixed contact point and at the same time the movable contact point can be moved up and down along the protrusion by a resilient pressure of the coil spring.

[0016] Preferably, one end of the coil spring is en-

gaged with the movable contact point, the other end of it is engaged with the case, the movable contact point is resiliently pressed in a rotating direction around the supporting column and the movable contact point is turned in compliance with a motion of the push button.

[0017] Preferably, the upper part of the coil spring is resiliently pressed by a lid section constituting a part of the case and the movable contact point is resiliently pressed by the lower part of the coil spring.

[0018] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

[0019] Fig. 1 is a perspective view for showing a switch of the present invention.

[0020] Fig. 2 is a top plan view in section for showing a substantial part of the switch of the present invention.

[0021] Fig. 3 is a sectional view taken along a line 3-3 of Fig. 2.

[0022] Fig. 4 is a sectional view taken along a line 4-4 of Fig. 2.

[0023] Fig. 5 is a sectional view of substantial part for showing a fixed state of the push button of the switch of the present invention.

[0024] Fig. 6 is a top plan view in section of a substantial part for illustrating an operation of the switch of the present invention.

[0025] Figs. 7A to 7E are illustrative views for showing a changing-over operation of the contact point of the switch of the present invention.

[0026] Fig. 8 is a perspective view for showing another preferred embodiment of the switch of the present invention.

[0027] Fig. 9 is a top plan view in section of a substantial part for showing another preferred embodiment of the switch of the present invention.

[0028] Fig. 10 is a top plan view in section for showing a substantial part of the prior art switch.

[0029] Referring to Figs. 1 to 9, the switch of the present invention will be described, wherein Fig. 1 is a perspective view for showing a switch of the present invention, Fig. 2 is a top plan view in section for showing a substantial part of the switch of the present invention, Fig. 3 is a sectional view taken along a line 3-3 of Fig. 2, Fig. 4 is a sectional taken along a line 4-4 of Fig. 2, Fig. 5 is a sectional view of substantial part for showing a fixed state of the push button of the switch of the present invention, Fig. 6 is a top plan view in section of a substantial part for illustrating an operation of the switch of the present invention, Figs. 7A to 7E are illustrative views for showing a changing-over operation of the contact point of the switch of the present invention, Fig. 8 is a perspective view for showing another preferred embodiment of the switch of the present invention and Fig. 9 is a top plan view in section of a substantial part for showing another preferred embodiment of the switch of the present invention.

[0030] Then, referring to Figs. 1 to 7, one preferred embodiment of the switch of the present invention will be described, wherein the switch is operated when a door of a refrigerator is opened or closed to illuminate a lamp for use in lighting up an inner area of the refrigerator or to turn ON or OFF the cooling fan motor. The case 1 composed of molded product of synthetic resin is constituted by a box member 2 having a vacant cavity therein and a lid 3 for closing the vacant cavity of the box member 2, wherein the lid 3 is assembled with the box member 2 by snap fitting an arm arranged at the lid 3 to the box member 2 at its protrusion.

[0031] In addition, the box member 2 is provided with a cylinder part 2a, a supporting column 2b integrally arranged with the box member 2 within the vacant cavity and a protrusion 2c arranged at the bottom part in the vacant cavity.

[0032] Additionally, the fixed contact points 4, 5 composed of a metallic plate have contact point sections 4a, 5a and terminal sections 4b, 5b and each of them is fixed to the box member 2.

[0033] In addition, the common fixed contact point 6 composed of a metallic plate and having the terminal section 6a is fixed to the box 2 with its part being inserted into the supporting column 2b (see Fig. 3).

[0034] Further, the movable contact point 7 composed of a metallic plate is provided with a contact point section 7a arranged at one end, a hole 6b arranged at the other end, a protrusion 6c arranged between the contact point section 6a and the hole 6b, and an arm 6d formed at a side part by bending.

[0035] Then, such a movable contact point 7 as above is constructed such that the supporting column 2b is inserted into the hole 7b and rotatably pivoted by the supporting column 2b and during rotation of the movable contact point 7, the protrusion 7c is abutted against the protrusion 2c of the box 2, it rides over the protrusion 2c to cause the contact point section 7a to move up and down in an axial direction of the supporting column 2b and further, the movable contact point 7 can be moved to or away from the contact point sections 4a, 5a of the fixed contact points 4, 5 while it is always in contact with the common fixed contact point 6.

[0036] Additionally, the coil-like coil spring 8 is set such that the supporting column 2b is -inserted into and passed through the central part of the coil section 8a and fixed to the box 2, its one end 8b is engaged with the arm 7d of the movable contact point 7 and the other end 8c is engaged with a part of the box 2.

[0037] Then, the movable contact point 7 is always resiliently pressed by the coil spring 8 around the supporting column 2b and at the same time the movable contact point 7 is always resiliently pressed against the common fixed contact point 6 by the coil section 8a, resulting in that the movable contact point 7 and the fixed contact point 6 are always contacted from each other.

[0038] In addition, the coil spring 8 fixed to the box 2 resiliently presses against the upper part of the coil section 8a with the lid 3 so as to increase a pressing pressure of the movable contact point 7 against the fixed

contact point 6 and then the contacted state between both contact points 6, 7 is positively attained.

[0039] Additionally, the push button 9 composed of molded product of synthetic resin includes an engaging section 9a formed at one end having a slit groove and a concave section 9b arranged inside it, wherein the push button 9 is inserted into the cylinder part 2a of the box 2 and snap engaged there, movable in a vertical direction with the cylinder 2a being applied as a guide, the engaging section 9a is engaged with the box 2 so as to prevent the push button 9 from being disengaged from the case 1.

[0040] In addition, the coil-like spring 10 is inserted into the concave part 9b of the push button 9, the other end is engaged with a part of the box 2 and the push button 9 is always resiliently pressed by a spring 10 in an upward direction.

[0041] Further, the push button 9 is operated such that an arm section 7d of the movable contact point 7 is always abutted against a part of the push button 9 to prevent the movable contact point 7 from being further rotated and additionally the movable contact point 7 is rotated through motion of the push button 9 to perform a changing-over operation of the contact point.

[0042] Then, such a switch as above is fixed to a refrigerator and the push button 9 is operated through opening or closing of the door of the refrigerator.

[0043] Next, the operation of the switch of the present invention will be described. Fig. 2 shows a state in which the door of the refrigerator is opened and a part of the push button 9 is projected out of the cylinder part 2b of the case 1 in an outward direction. Under this state, the contact point section 7a of the movable contact point 7 comes into contact with the contact point section 4a of the fixed contact point 4, the common fixed contact point 6 and the fixed contact point 4 are made to be electrically conductive and the lamp in the refrigerator is lit or the cooling fan motor is turned off.

[0044] Then, under the state shown in Fig. 2, when the door of the refrigerator is closed and the push button 9 is pushed by the door in a direction P of an arrow, the push button 9 is moved linearly against the spring 10 and the push button 9 is pushed into the case 1 as shown in Fig. 6.

[0045] Then, the movable contact point 7 is rotated by this push button 9 around the supporting column 2b against a spring characteristic of the coil spring 8.

[0046] Thus, the protrusion 7c of the movable contact point 7 is abutted against the protrusion 2c of the case 1, it rides over the protrusion 2c along the protrusion 2c, the contact point section 7a moves up and down, the contact point section 7a is moved away from the contact point section 4a of the fixed contact point 4, contacted with the contact point section 5a of the fixed contact point 5, resulting in that the fixed contact point 6 and the fixed contact point 5 are connected to each other.

[0047] At this time, the lamp in the refrigerator is turned off or the cooling fan motor is connected.

[0048] Further, the changing-over of the contact point between the state shown in Fig. 2 and the state shown in Fig. 6 is at first performed such that as shown in Fig. 7A, the movable contact point 7 and the fixed contact point 4 are made electrically conductive and the protrusion 7c of the movable contact point 7 and the protrusion 2c of the case 1 are spaced apart from each other.

[0049] Then, as the movable contact point 7 is rotated around the supporting column 2b, the contact point section 7a is rotated while being slidably contacted with the contact point section 4a until the protrusion 7c strikes against the protrusion 2c as shown in Fig. 7B.

[0050] In addition, as a rotation of the movable contact point 7 is constituted, the protrusion 7c rides on the protrusion 2c as shown in Fig. 7C and at the same time the contact point section 7a is moved away from the contact point section 4a and then the protrusion 7c rides over the protrusion 2c as shown in Fig. 7D and concurrently the contact point section 7a becomes a contacted state with the contact point section 5a.

[0051] Further, as the rotation of the movable contact point 7 is continued, the contact point section 7a is moved while it is being slid at the contact point section 5a as shown in Fig. 7E and at the same time the protrusion 7c is moved away from the protrusion 2c to perform the changing-over of the contact points.

[0052] Further, as the door is opened under the state shown in Fig. 6, the push button 9 is partially projected by a spring 10 in an outward direction from the case 1 and at the same time, the movable contact point 7 returns back to its original state by the coil spring 8, thereby the contact point section 7a is moved away from the contact point section 5a and contacted with the contact point section 4a of the fixed contact point 4, the fixed contact point 6 and the fixed contact point 4 are connected from each other, the lamp is lit or the cooling fan motor is turned off.

[0053] Then, a changing-over of the contact point during that period is carried out by performing the operation in an opposite manner to the aforesaid operation, i. e. from the operation shown in Fig. 7E to the operation shown in Fig. 7A.

[0054] In addition, Figs. 8 and 9 show another preferred embodiment of the switch of the present invention, wherein this preferred embodiment is constituted such that a shaft 11a of a push button 11 is fixed to the case 1, the push button 11 is rotatably attached around the shaft 11a, the movable contact point 7 is abutted against the push button 11, the spring 12 is fixed to the case 1 and one end of the spring 12 always resiliently pushes the push button 11 in an upward direction.

[0055] Since other constitutions are similar to those of the aforesaid preferred embodiment, same reference numerals are affixed to the same component elements and their description will be eliminated.

[0056] In this preferred embodiment, as the push button 11 is pushed in a direction of arrow P, the push button 11 is rotated around the shaft 11a against the spring 12

and pushed into the case 1 as shown in Fig. 9.

[0057] Then, since the changing-over of the contact point is carried out in the same operation as that of the aforesaid preferred embodiment, its description will be eliminated.

[0058] The switch of the present invention can provide a switch showing a positive contact in which oxidization films of the contact point sections 4a, 5a and 7a under an application of are generated during changing-over of the contact points can be removed by a sliding operation of the contact point due to the fact that the movable contact point 7 is moved up and down in an axial direction of the supporting column 2b along the protrusion 2c of the case 1 under motion of the push button 9 and slid along the fixed contact points 4, 5.

[0059] In addition, the push button 9 is abutted directly against the movable contact point 7 to eliminate the prior art driving member 25, resulting in that a less-expensive and small-sized switch can be provided.

[0060] Further, since it is not necessary that the movable contact point 7 is made of a metallic plate having a spring characteristic, the less-expensive switch can be provided

[0061] In addition, since the movable contact point 7 is resiliently pushed against the fixed contact point 6 by the coil spring 8 fixed to the supporting column 2c, the movable contact point 7 and the fixed contact point 6 can be positively contacted, resulting in that a stable connected switch can be provided.

[0062] Additionally, since the movable contact point 7 is resiliently pushed in a rotating direction by the coil spring 8, the coil spring 8 can operate to push the movable contact point 7 against the fixed contact point 6 and perform a resilient pushing of the movable contact point 7 in its rotating direction, resulting in that it is possible to provide a less-expensive and superior productive switch in which the number of component parts can be reduced.

[0063] Further, since the coil spring 8 is resiliently pushed by the lid 3, the movable contact point 7 can be forcedly pushed by the fixed contact point 6, resulting in that it is possible to provide a switch in which a more positive contact of the contact point is attained.

Claims

1. A switch comprising: a case; a protrusion arranged at said case; a fixed contact point fixed to said case; a movable contact point rotatably pivoted by a supporting column; and a push button for rotating said movable contact point around said supporting column, wherein said movable contact point is abutted against said protrusion when said movable contact point is rotated through motion of said push button, the contact point section of said movable contact point is moved up and down in an axial direction of said supporting column and slidably contacted with said fixed contact point.

2. A switch according to Claim 1, wherein a coil spring is fixed to said supporting column, said movable contact point is pushed against said fixed contact point and said movable contact point can be moved up and down along said protrusion by a resilient pressure of said coil spring.

3. A switch according to Claim 2, wherein one end of said coil spring is engaged with said movable contact point, the other end of it is engaged with said case, said movable contact point is resiliently pressed in a rotating direction around said supporting column and said movable contact point is turned in compliance with a motion of said push button.

4. A switch according to Claim 3, wherein the upper part of said coil spring is resiliently pressed by a lid section constituting a part of said case and said movable contact point is resiliently pressed by the lower part of said coil spring.

FIG. 1

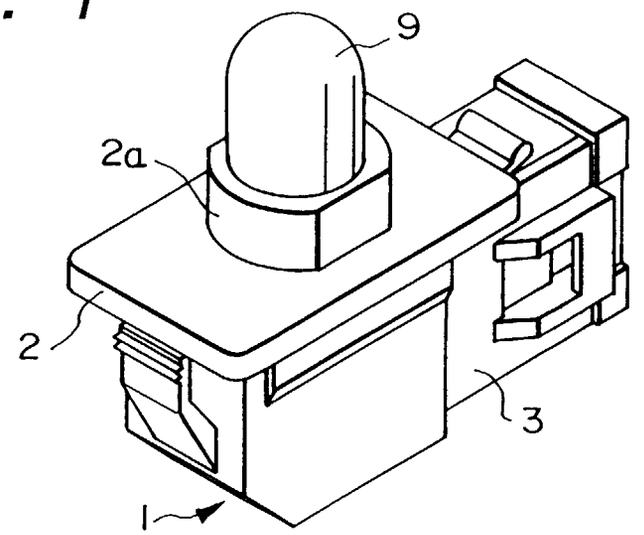


FIG. 2

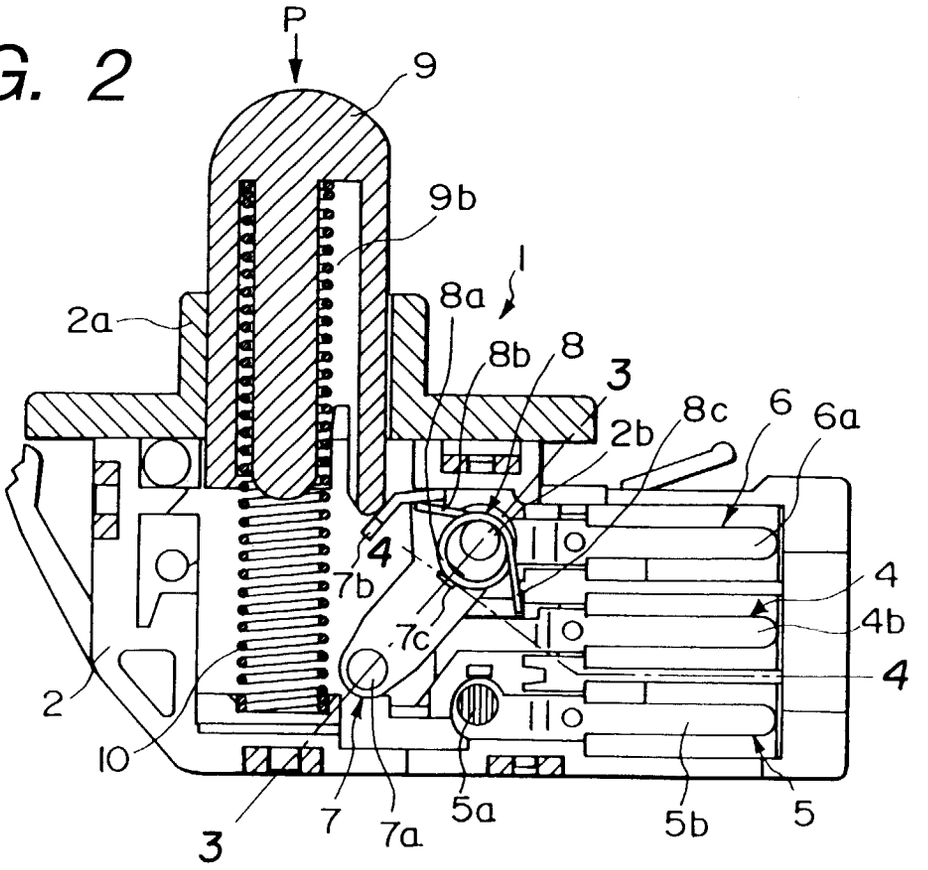


FIG. 3

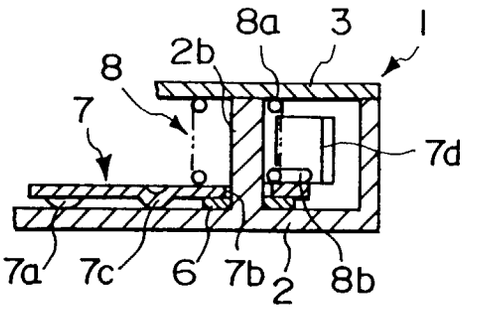


FIG. 4

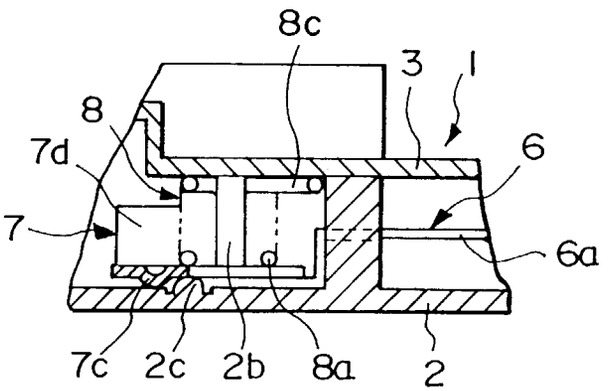


FIG. 5

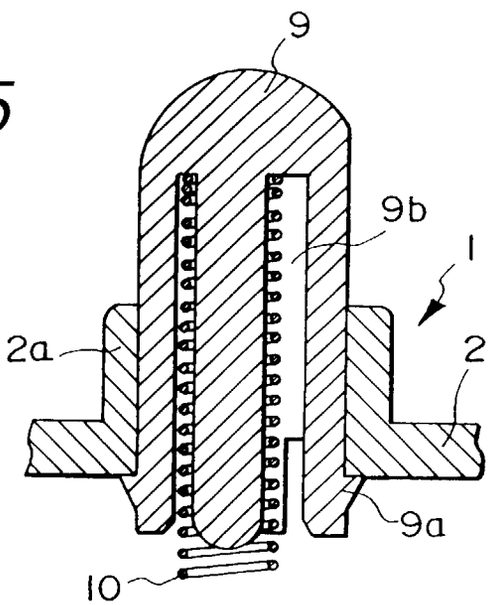


FIG. 6

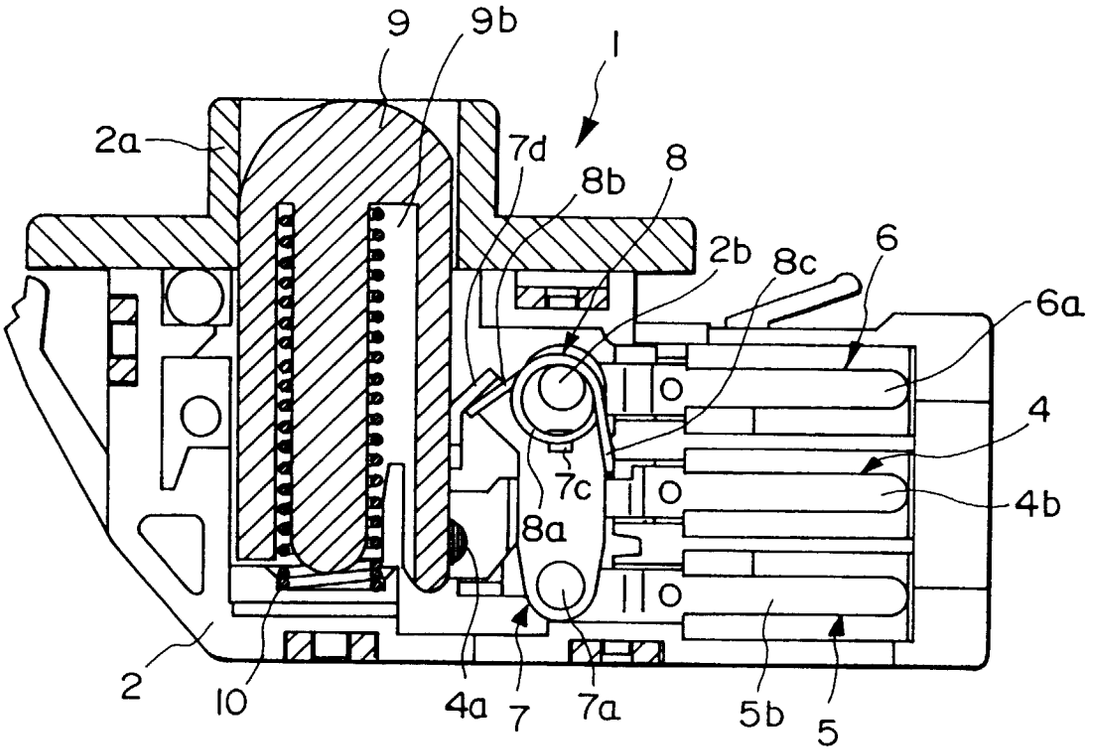


FIG. 8

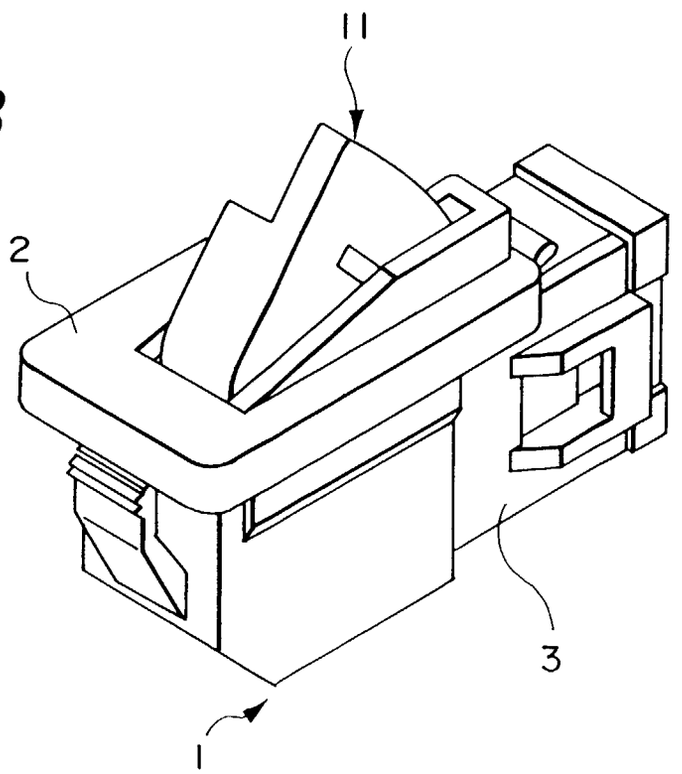


FIG. 7A

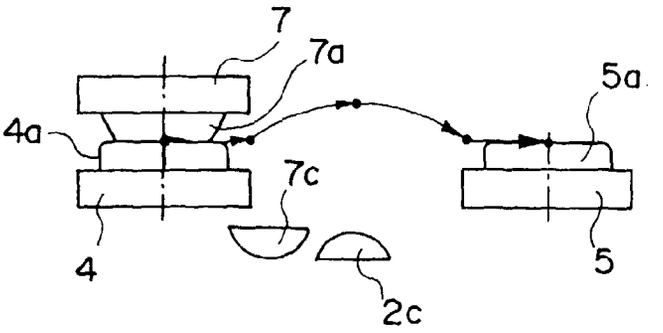


FIG. 7B

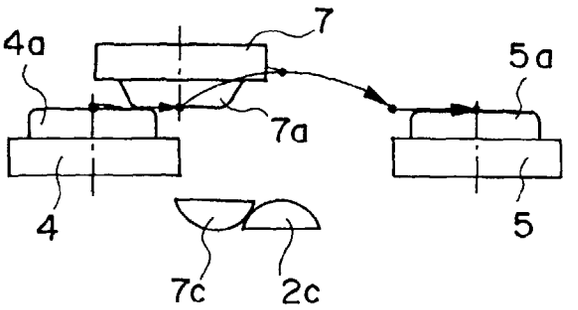


FIG. 7C

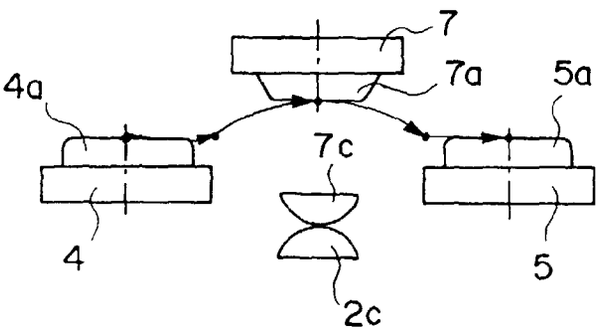


FIG. 7D

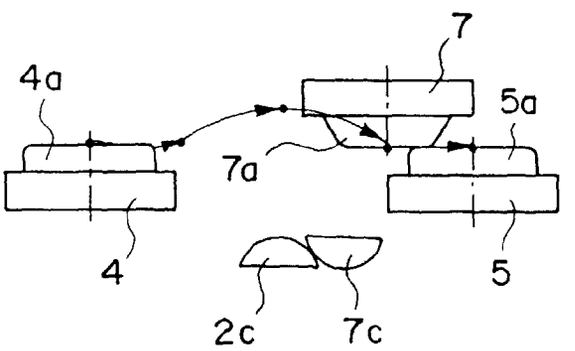


FIG. 7E

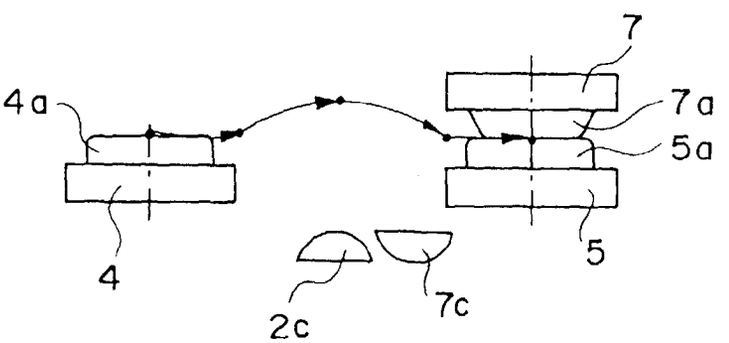


FIG. 9

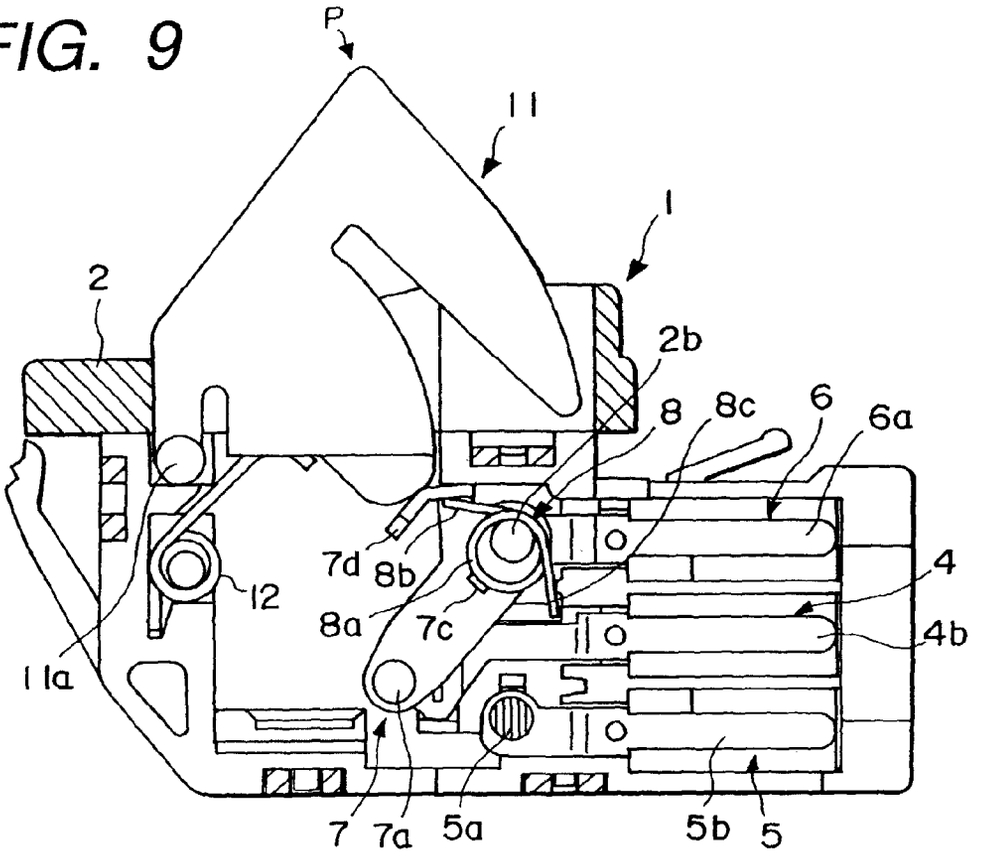
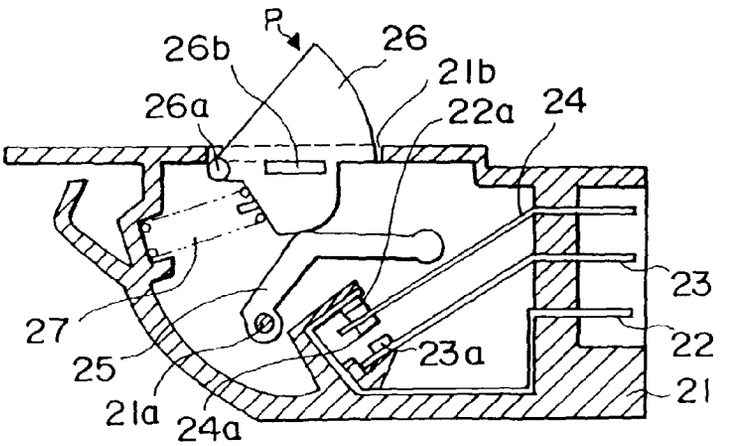


FIG. 10
PRIOR ART



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 7894

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.6)
A	US 3 819 894 A (FLUMIGNAN D ET AL) 25 June 1974 * claim 1; figures 1,4,5,13 *	1-4	H01H3/16 H01H19/56
A	US 3 881 077 A (PIBER EARL T) 29 April 1975 * claim 1; figures 1-5 *	1-4	
A	US 1 626 463 A (HARRINGTON) 26 April 1927 * claim 1; figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	27 January 1999	Mausser, T

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 30 7894

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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27-01-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3819894 A	25-06-1974	NONE	
US 3881077 A	29-04-1975	NONE	
US 1626463 A	26-04-1927	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82