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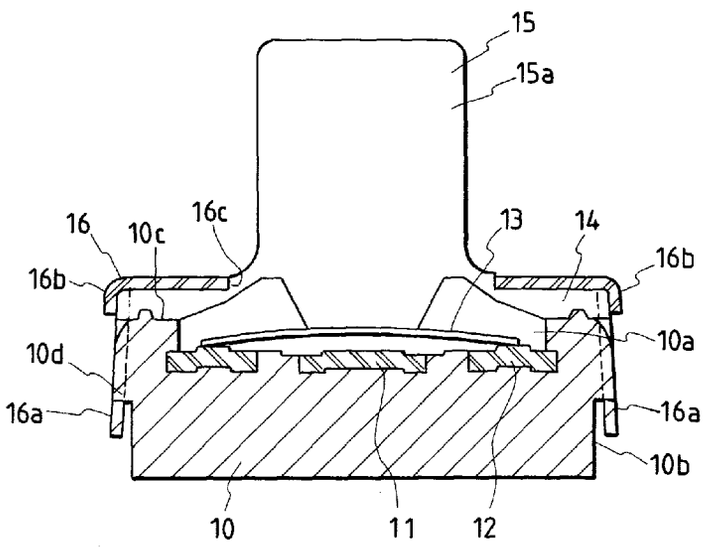
(54) Push-button switch

(57) A push-button switch comprises a housing (10) having a pair of fixed contacts (11,12) disposed on an inner bottom portion of a recess (10a); a metal contact (13) disposed within said recess of the housing, said metal contact being in contact with one of said fixed contacts at all times and capable of coming into contact with and away from the other fixed contact; a spacer member (14) formed as an elastic member, an outer peripheral portion of said spacer member being placed around said recess of the housing to prevent the entry of dust into the recess; a frame (16) formed by a metallic plate, said frame being fixed to the housing while pressing down the outer peripheral portion of said spacer member toward the surface of the housing on which said outer peripheral portion is place; and a stem (15) which can cause said metal contact to be deformed downward when depressed, said stem having an operating part (15a) which projects from a central hole of said frame to the side opposite to the recess side, wherein said frame is provided with opposed bent pieces (16b) which are bent along side walls of said housing and which are opposed to a side end face of the outer peripheral portion of said spacer member.

FIG. 1



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Description

[0001] The present invention relates to a small-sized push-button switch in which a spacer member formed of a rubbery material or the like is disposed between a housing and a frame to improve dustproofness and operating touch.

Description of the Related Art

[0002] Fig. 4 is a sectional view showing this type of a conventional push-button switch. This conventional push-button switch comprises a housing 1 in which a central fixed contact 2 and a peripheral fixed contact 3 are disposed so as to be spaced on an inner bottom portion of a recess 1a and with terminals 4 and 5 being projected outward from side walls 1b, the terminals 4 and 5 being rendered conductive with the fixed contacts 2 and 3, a circular plate-like metal contact 6 which is in contact with the peripheral fixed contact 3 at all times and which can come into contact with and away from the central fixed contact 2; a spacer rubber 7 whose outer peripheral portion is put on a rib-formed surface 1c present around the recess 1a of the housing 1 and which closes the recess 1a; a frame 8 which is constituted by a metallic plate and which is fixed to the housing 1 while holding down the outer peripheral portion of the spacer rubber 7 toward the rib-formed surface 1c; and a stem 9 mounted on the metal contact 6 through the spacer rubber 7, the stem 9 having an operating part 9a projecting upward from a central hole 8a formed in the frame 8. The frame 8 is fixed by caulking bosses ld formed on an upper end face of the housing 1. Further, the outer peripheral portion of the spacer rubber 7, which is pressed down from above against the frame 8, is in pressure contact with the rib-formed surface 1c of the housing 1 throughout the whole circumference while the rib-formed surface 1c is allowed to bite into the outer peripheral portion of the spacer rubber. Thus, there is provided a dustproof structure in which the recess 1a is hermetically sealed with the spacer rubber 7.

[0003] In the push-button switch of such a construction, when the operating part 9a of the stem 9 is depressed a predetermined stroke in the figure, the central portion of the metal contact 6 is inverted while creating a click touch and comes into contact with the central fixed contact 2, so that the central fixed contact 2 is conducted to the peripheral fixed contact 3 through the metal contact 6 to turn ON the switch. With the switch ON, if the depressing force against the operating part 9a of the stem 9 is released, the inverted metal contact 6 leaves the central fixed contact 2 and reverts to its original shape by virtue of its own elasticity, so that the switch turns OFF. At the same time, the stem 9 is pushed up to its initial position by the metal contact 6. The initial position of the stem 9 is determined by abutment of its flange portion with the inner peripheral portion (the circumference of the central hole 8a) of the frame 8. With the frame 8, the stem 9 is prevented from coming off the housing 1.

[0004] In the conventional push-button switch described above, since the outer peripheral portion of the spacer rubber 7, which is pressed down from above by the frame 8, is held and fixed in a compressed state, the peripheral edge portion of the spacer rubber 7 is apt to protrude slightly outward from side walls 1b of the housing 1 and form an expanded portion 7a (see Fig. 4). In mounting this type of a push-button switch onto a circuit board or the like, the push-button switch as a finished product, which is packaged with stick or embossed tape, is taken out and set to a predetermined position by means of a mounting machine. Such an automatic mounting is generally adopted. Therefore, if the expanded portion 7a of a rubbery material is protruded around the housing 1, the push-button switch is apt to be caught in the stick or embossed tape due to a frictional resistance of the expanded portion 7a when the push-button switch is taken out from the mounting machine, which has been an obstacle to smooth execution of the automatic mounting.

[0005] In the present invention, a metallic plate frame which holds down the outer peripheral portion of a spacer member formed of a rubbery material or the like is provided with opposed bent pieces at positions opposed to portions, among the spacer member, which may protrude to the exterior of the housing, to prevent the spacer member from being caught in a packaging stick or embossed tape and thereby permit automatic mounting of the push-button switch to be done always smoothly.

[0006] According to the present invention there is provided a push-button switch comprising a housing having a pair of fixed contacts disposed on an inner bottom portion of a recess; a metal contact disposed within the recess of the housing, the metal contact being in contact with one of the fixed contacts at all times and capable of coming into contact with and away from the other fixed contact; a spacer member formed as an elastic member, an outer peripheral portion of the spacer member being placed around the recess of the housing to prevent the entry of dust into the recess; a metallic frame fixed to the housing while pressing down the outer peripheral portion of the spacer member toward the surface of the housing on which the spacer member is placed; and a stem which can cause the metal contact to be deformed downward when depressed, the stem having an operating part which projects from a central hole of the frame to the side opposite to the recess side, characterized in that the frame is provided with opposed bent pieces which are bent along side walls of the housing and which are opposed to a side end face of the outer peripheral portion of the spacer member.

[0007] For example, if the external shape of the housing is generally square and that of the spacer member is generally circular, the opposed bent pieces may be formed in an opposed relation to the side end face of the outer peripheral portion of the spacer member at four

positions of approximately equal intervals and adjacent to the side walls of the housing. If the external shape of the housing and that of the spacer member are substantially the same, the opposed bent pieces may be formed in an opposed relation to substantially the whole circumference of the side end face of the outer peripheral portion of the spacer member.

[0008] The push-button switch of this construction is assembled while the portions of the spacer member which is formed of a rubbery material or the like and may protrude to the exterior of the housing are covered with the opposed bent pieces of the frame. In automatic mounting of the push-button switch, therefore, the inconvenience in taking out the push-button switch from its package such that the switch is caught in the stick or embossed tape due to a frictional resistance of the spacer member, is difficult to occur.

[0009] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view of a push-button switch according to an embodiment of the present invention;

Fig. 2 is a perspective view of a frame shown in Fig. 1;

Fig. 3 is a perspective view of a frame used in another embodiment of the present invention; and

Fig. 4 is a sectional view of a conventional push-button switch.

[0010] The present invention will be described hereinunder by way of embodiments thereof illustrated in the accompanying drawings, in which Fig. 1 is a sectional view of a push-button switch embodying the present invention and Fig. 2 is a perspective view of a frame shown in Fig. 1.

[0011] The push-button switch shown in Fig. 1 comprises a housing 10 having a central fixed contact 11 and a peripheral fixed contact 12 spaced from each other on an inner bottom portion of a recess 10a, with terminals (not shown) being exposed to the exterior of the housing from side walls 10b, the terminals being conducted to the fixed contacts 11 and 12; a circular plate-like metal contact 13 disposed in the recess 10a of the housing 10, the metal contact 13 being in contact with the peripheral fixed contact 12 at all times and capable of coming into contact with and away from the central fixed contact 11; a flange-like spacer rubber 14 whose outer peripheral portion is placed on a rib-formed surface 10c present around the recess 10a of the housing 10; a stem 15 integral with the spacer rubber 14 and mounted on the metal contact 13; and a frame 16 formed by a metallic plate having bent retaining pieces 16a and opposed bent pieces 16b, the bent pieces 16a and 16b being bent downward along the side walls 10b of the housing 10, the frame 16 being fixed to the housing 10 while pressing down the outer peripheral portion of the spacer rubber 14 toward the rib-formed surface 10c. An operating part 15a of the stem 15 projects upward from the central hole 16c of the frame 16. The frame 16 has an external shape which is generally square like the external shape of the housing 10 and, as shown in Fig. 2, the bent retaining pieces 16a are formed at two parallel sides of the frame 16 and the opposed bent pieces 16b are formed four in all at the central portions of the four sides. The paired bent retaining pieces 16a are engaged with stepped engaging portions 10d (see Fig. 1) formed in the side walls 10b of the housing 10, and the opposed bent pieces 16b are opposed to the side end face (outer peripheral surface) of the outer peripheral portion of the spacer rubber 14.

[0012] In this embodiment, the external shape of the spacer rubber 14 is generally circular and therefore the side end face of the outer peripheral portion of the spacer rubber 14 approaches the side walls 10b of the housing 10 at four positions of equal intervals. At these four positions the opposed bent pieces 16b are disposed respectively in an opposed relation thereto. The flange-like spacer rubber 14, which is pressed down from above by the outer peripheral portion of the frame 16, is in pressure contact with the rib-formed surface 10c of the housing 10 while the rib on the rib-formed surface 10c is allowed to bite into the spacer rubber throughout the whole circumference, so that the recess la, which is sealed with both the spacer rubber 14 and the underside of the stem 15, has a dustproof structure of a high hermetic sealability.

[0013] The push-button switch described above is packaged as stick package or embossed tape package after completion of its assembly, then in mounting the switch onto a circuit board or the like, the switch is automatically taken out from the stick or embossed tape and set to a predetermined position by means of a mounting machine. In this automatic mounting operation, if the peripheral edge portion of the spacer rubber 14, which is compressed from above by the frame 16, is protruded and exposed from the side walls 10b of the housing 10, its frictional resistance may obstruct the switch taking-out operation by the mounting machine. In this embodiment, however, the opposed bent pieces 16b of the frame 16 are formed at four positions of equal intervals at which the spacer rubber 14 may protrude to the exterior of the housing 10; thus, an improvement is made so as to prevent protrusion and exposure of the spacer rubber 14 to the exterior of the housing 10. Therefore, such an inconvenience as the push-button switch being caught in the stick or embossed tape due to a frictional resistance of the spacer rubber 14 in the automatic switch mounting operation is difficult to occur, and thus a smooth execution of the automatic mounting operation can be ensured.

[0014] In the push-button switch described above, the stem 15 and the spacer rubber 14, which are integral with each other, are combined with the frame 16 and thereafter this combined body is chucked and mounted

to the housing 10. The assembling work is performed in this procedure. At this time, a proper relative positional relation between the stem 15 and the frame 16 can be established by the opposed bent pieces 16b which come into abutment with the side end face (outer peripheral surface) of the outer peripheral portion of the spacer rubber 14. Therefore, a positional deviation in the assembling stage can be avoided and it is possible to effect an automatic assembling work in high yield. In this push-button switch, moreover, the spacer rubber 14 and the stem 15 are formed integrally in one piece with each other to reduce the number of components used, whereby a great reduction of the product cost can be expected.

[0015] The operation of this push-button switch is the same as in the foregoing conventional product. That is, when the operating part 15a of the stem 15 is pushed a predetermined stroke downward in Fig. 1, the central portion of the metal contact 13 is inverted while creating a click touch and comes into contact with the central fixed contact 11, so that the central fixed contact 11 is rendered conductive with the peripheral fixed contact 12 through the metal contact 13 to turn ON the switch. With the switch ON, if the depressing force for the operating part 15a of the stem 15 is released, the metal contact 13, which was inverted, leaves the central fixed contact 11 and reverts to its original shape by virtue of its own elasticity, so that the switch turns OFF and at the same time the stem 15 is pushed upward to its initial position by the metal contact 13. The initial position of the stem 15 is determined by abutment of the inner peripheral portion of the spacer rubber 14 with the inner peripheral portion (the circumference of the central hole 16c) of the frame 16. With the frame 16, the stem 15 is also prevented from coming off the housing 10.

[0016] Although in the push-button switch of the above embodiment, the external shape of the housing is generally square and that of the spacer rubber is generally circular, it goes without saying that the present invention is also applicable to the case where the external shape of the housing and that of the spacer rubber are almost equal to each other. To be more specific, when the housing and the spacer rubber are almost equal in external shape, there is a fear that the side end face (outer peripheral surface) of the outer peripheral portion of the spacer rubber may protrude to the exterior of the housing substantially throughout the whole circumference thereof. In this case, with such a shape of frame as shown in Fig. 2, it is impossible to surely avoid the foregoing inconvenience involved in taking out the push-button switch in the automatic mounting operation. For example, however, if the external shape of the housing and that of the spacer rubber are generally squares of the same size, the shape of the metallic plate frame 16 may be made into such a box shape as shown in Fig. 3 in which opposed bent pieces 16b of a large width having the respective one sides as base ends (bent lines) are projected downward from four sides of a top plate portion which is generally square in external shape so as to enclose the outer peripheral surface of the spacer rubber substantially throughout the whole circumference. The frame 16 shown in Fig. 3 is applied to a push-button switch of the type in which bosses formed on the upper end face of the housing are inserted through caulking holes 16d and then caulked to fix the frame to the housing.

[0017] The present invention, which is practiced in such a mode as described above, brings about the following effects.

[0018] Of the spacer member formed of a rubbery material or the like, there are portions which may protrude to the exterior of the housing. Since the push-button switch is assembled while the portions are covered with the opposed bent pieces of the frame, such inconvenience as the push-button switch being caught in the package stick or embossed tape due to a frictional resistance of the spacer member is difficult to occur.

[0019] Further, if the spacer member and the stem are formed integrally as one piece, not only the number of components used can be reduced but also a proper relative positional relation between the stem and the frame can be established by the opposed bent pieces which come into abutment with the outer peripheral surface of the spacer rubber. Consequently, a positional deviation in the assembling stage can be avoided, the automatic assembling work can be done in high yield, and it is possible to attain a great reduction of the product cost.

Claims

1. A push-button switch comprising:

a housing having a pair of fixed contacts disposed on an inner bottom portion of a recess;

a metal contact disposed within said recess of the housing, said metal contact being in contact with one of said fixed contacts at all times and capable of coming into contact with and away from the other fixed contact;

a spacer member formed as an elastic member, an outer peripheral portion of said spacer member being placed around said recess of the housing to prevent the entry of dust into the recess;

a frame formed by a metallic plate, said frame being fixed to the housing while pressing down the outer peripheral portion of said spacer member toward the surface of the housing on which said outer peripheral portion is placed; and

a stem which can cause said metal contact to be deformed downward when depressed, said stem having an operating part which projects from a central hole of said frame to the side opposite to the recess side,

wherein said frame is provided with opposed bent pieces which are bent along side walls of said housing and which are opposed to a side end face of the outer peripheral portion of said spacer member.

2. A push-button switch according to claim 1, wherein when the external shape of said housing is generally square and that of said spacer member is generally circular, said opposed bent pieces are formed in an opposed relation to the side end face of the outer peripheral portion of said spacer member at four positions of approximately equal intervals and adjacent to the side walls of the housing.

3. A push-button switch according to claim 1, wherein when the external shape of said housing and that of said spacer member are substantially the same, said opposed bent pieces are formed in an opposed relation to substantially the whole circumference of the side end face of the outer peripheral portion of said spacer member.

4. A push-button switch according to any of claims 1 to 3, wherein said spacer member and said stem are formed integrally in one piece with each other.

FIG. 1

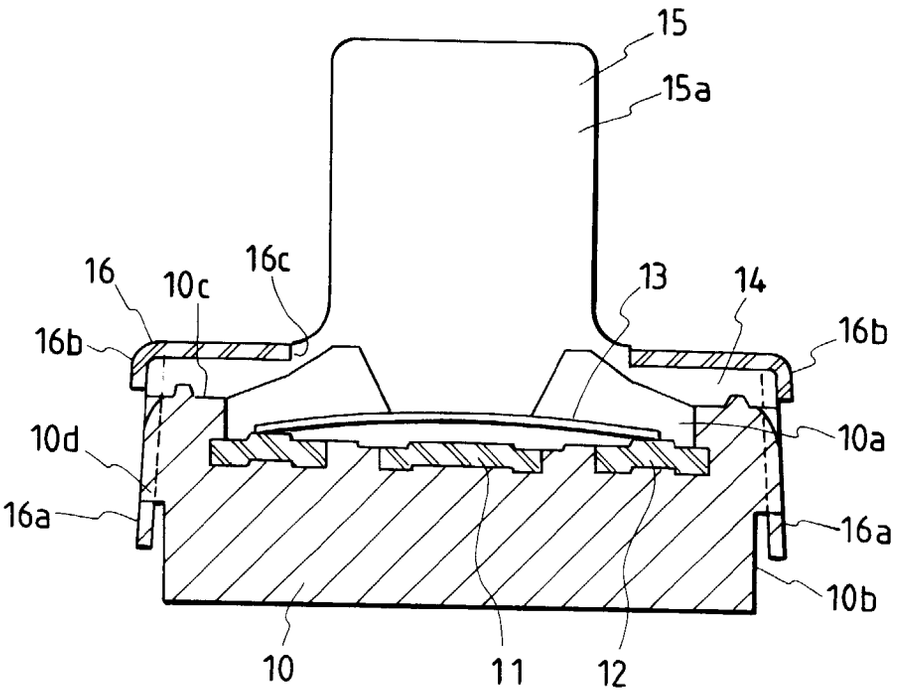

15
15a
16
10c
16c
13
14
16b
16b
10d
10a
16a
16a
10b
10
11
12

FIG. 2

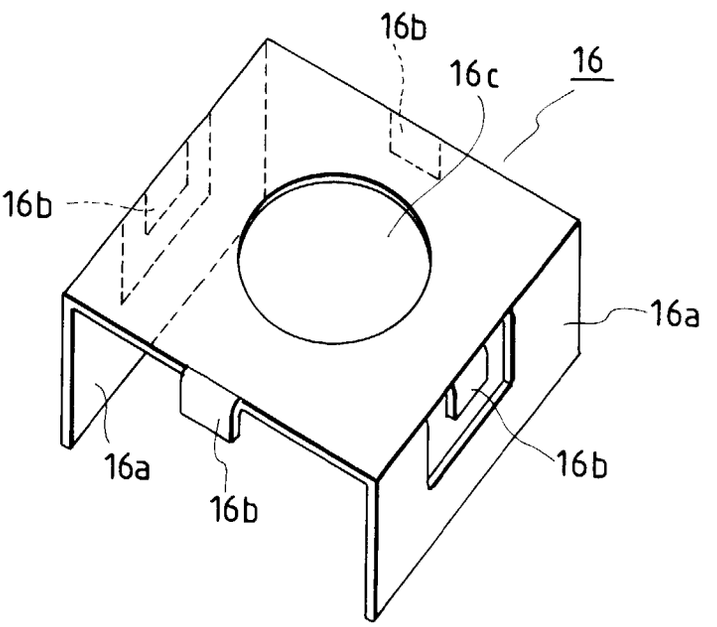

16b
16c
16
16b
16a
16a
16b
16b

FIG. 3

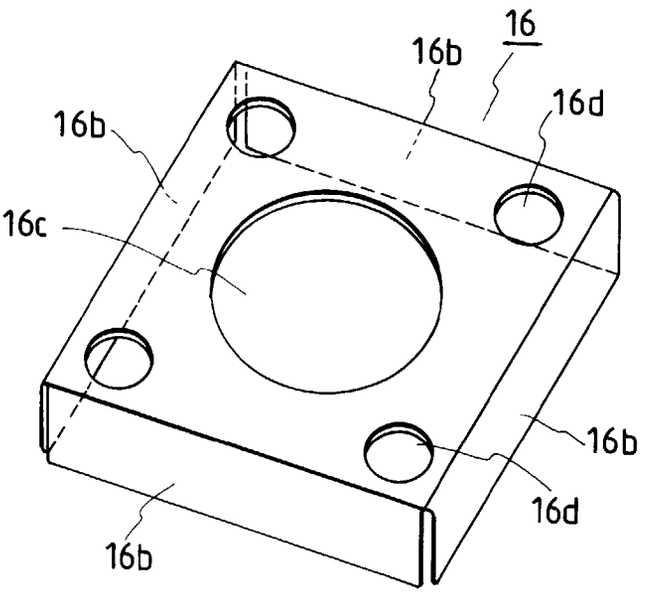
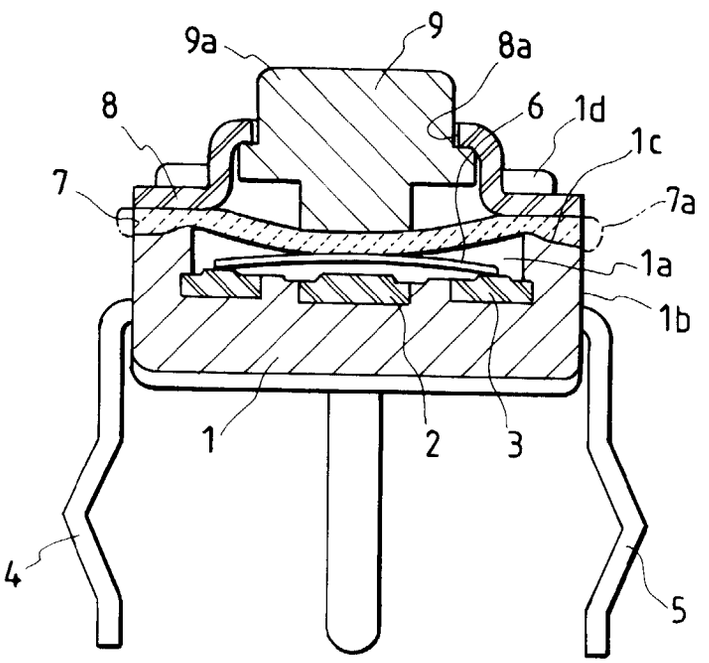


FIG. 4
PRIOR ART



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EUROPEAN SEARCH REPORT

Application Number EP 98306425.4

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 5345051 A (MIIKE, T.) 06 September 1994 (06.09.94), the whole doucment. --	1,2	H 01 H 13/70
A	US 4468542 A (POUNDS, W.R.) 28 August 1984 (28.08.84), description, fig. 1. --	1	
A	US 5268542 A (VOLL, W.) 07 December 1993 (07.12.93), fig. 1. --	1	
A	EP 0446088 A1 (SEXTANT AVIONIQUE) 11 September 1991 (11.09.91), fig. 1. ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. 6)

H 01 H 13/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	30-11-1998	ZUGAREK

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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