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Push switch

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U1S S1820 S1855

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JP006382327 A

(58) Field of search

As for published application
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NUJX NWA
INT CL[5] **H01H**
updated as appropriate

FIG. 1A

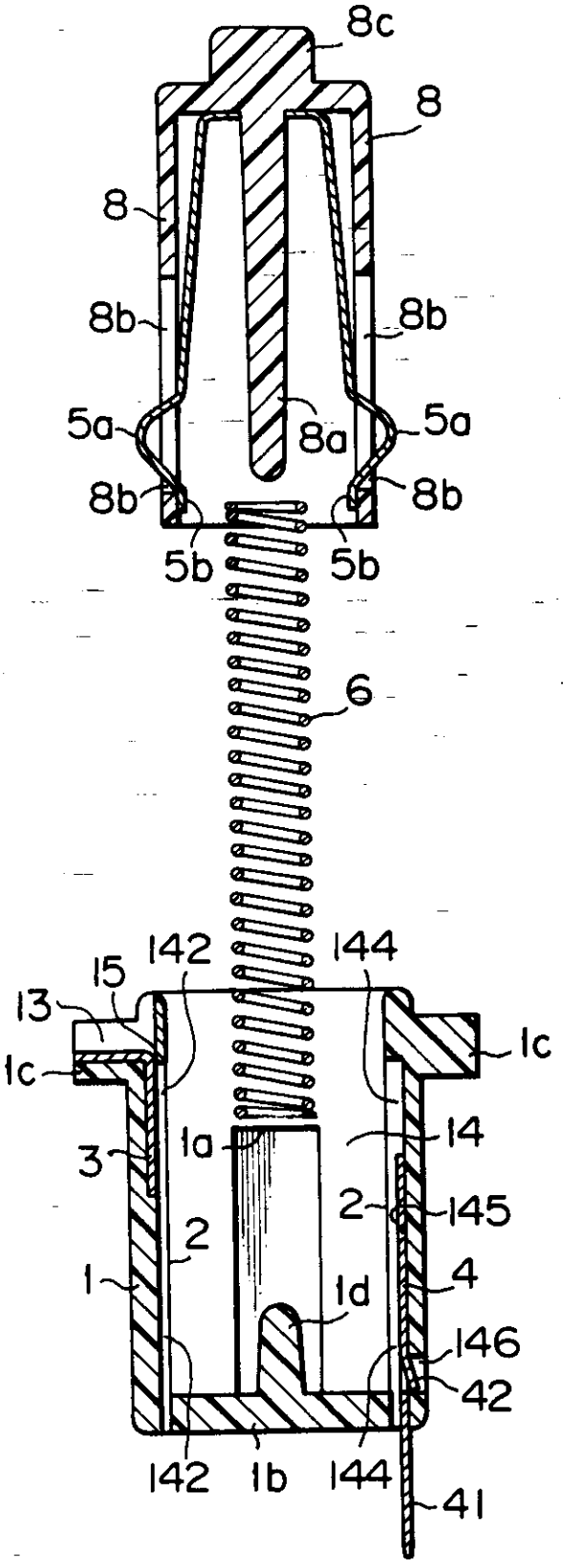

8c
8
8
8b
8b
5a
8a
5a
8b
8b
5b
5b
6
142
144
15
13
1c
1c
3
1a
14
2
145
2
1
1d
4
146
42
142
1b
144
41

FIG. 1B

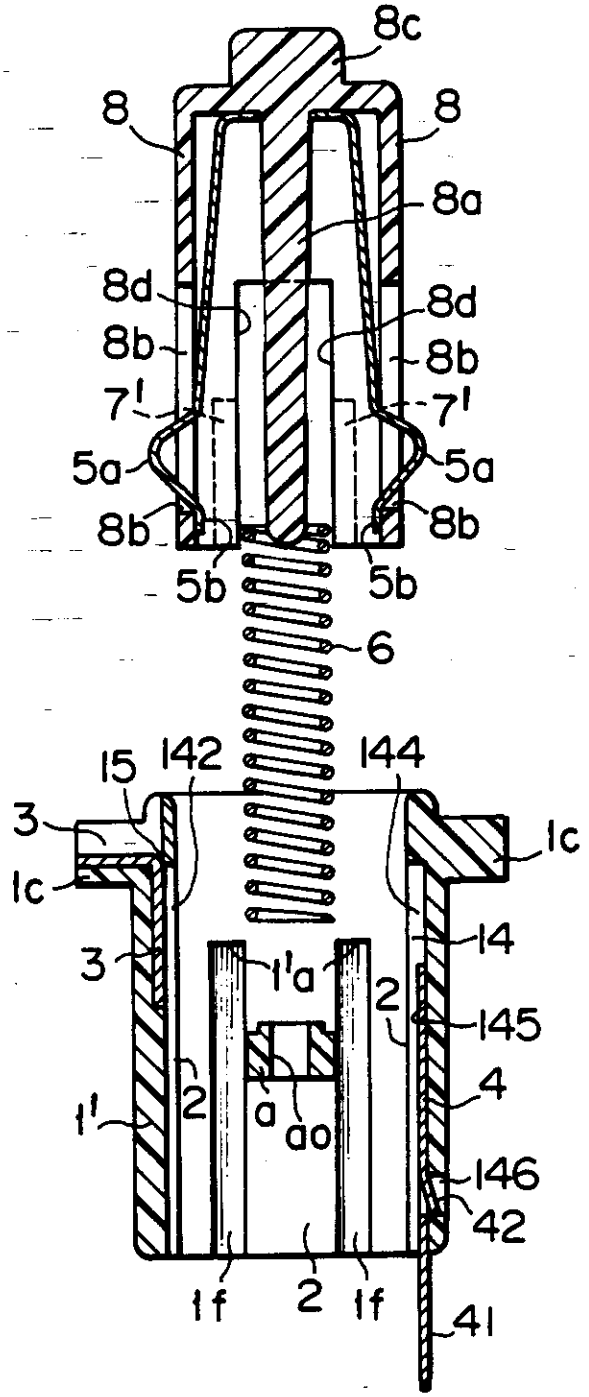

8c
8
8
8a
8d
8d
8b
8b
7'
7'
5a
5a
8b
8b
5b
5b
6
15
142
144
3
1c
1c
14
3
1'a
2
145
4
2
a
ao
1'
146
42
1f
2
1f
41

FIG. 2A

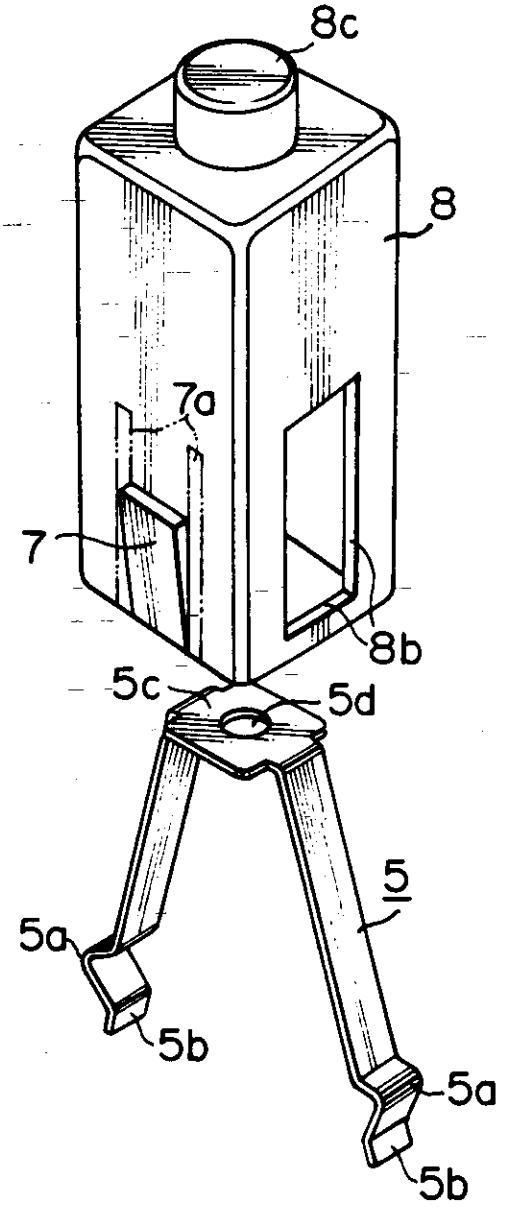


FIG. 2B

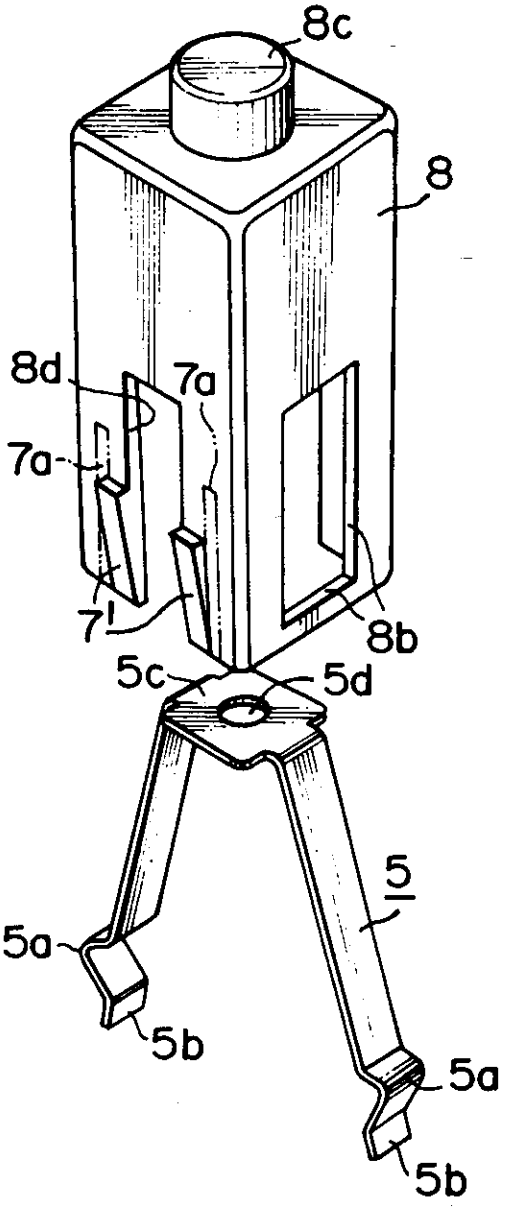


FIG. 3A

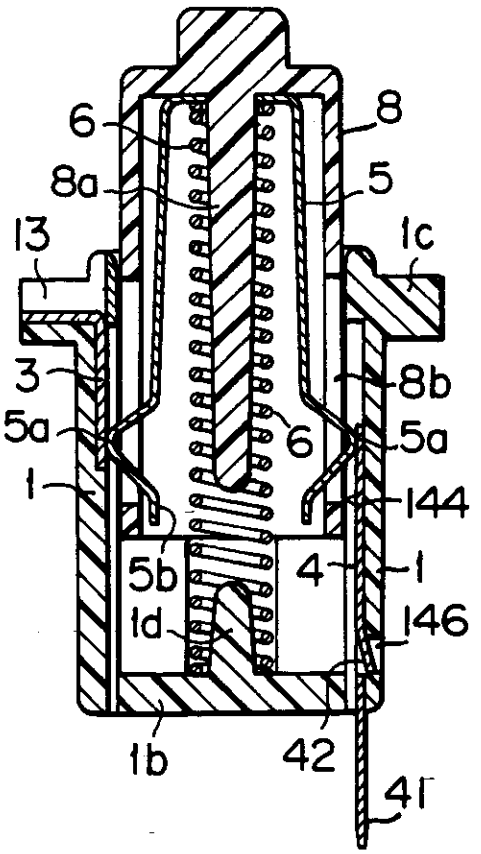

6
8
8a
5
13
1c
3
8b
5a
6
5a
1
144
5b
4
1
1d
146
1b
42
41

FIG. 3B

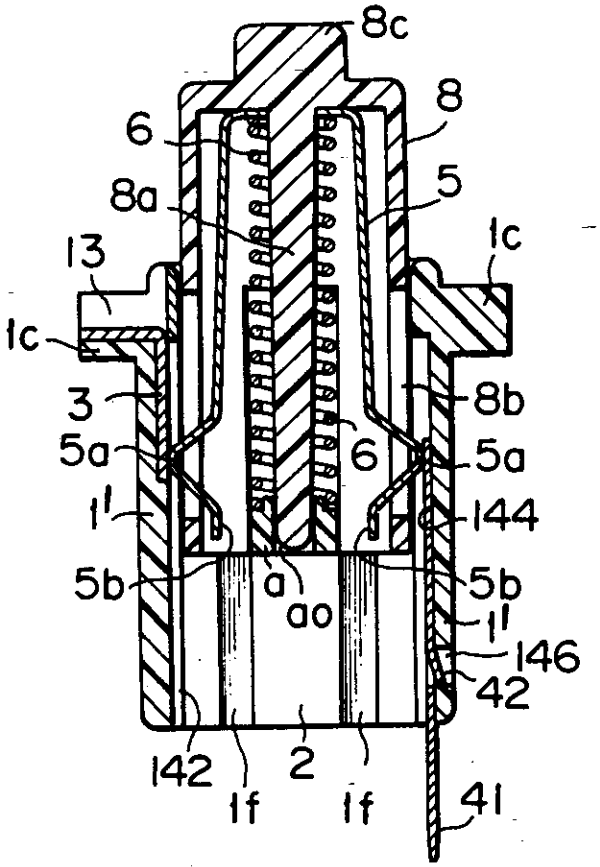

8c
6
8
8a
5
13
1c
1c
3
8b
5a
6
5a
1'
144
5b
a
ao
5b
1'
146
42
142
2
1f
1f
41

FIG. 4A 5/9

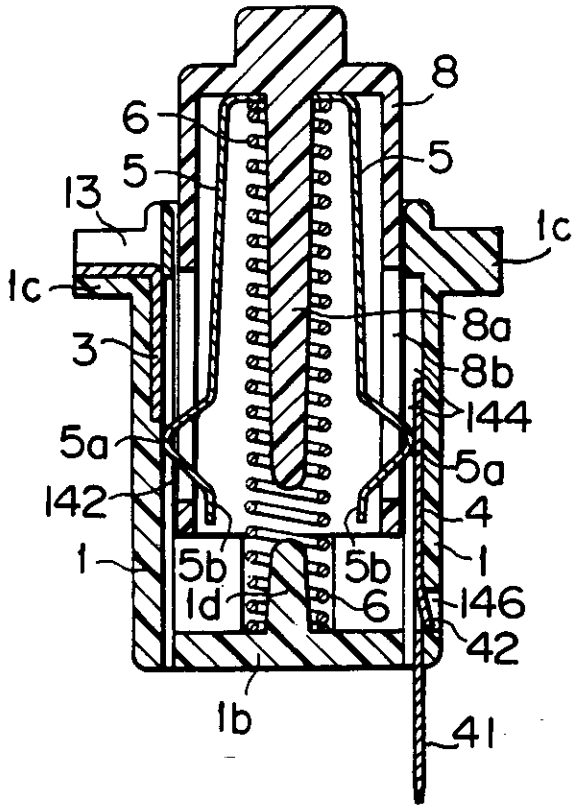


FIG. 4B

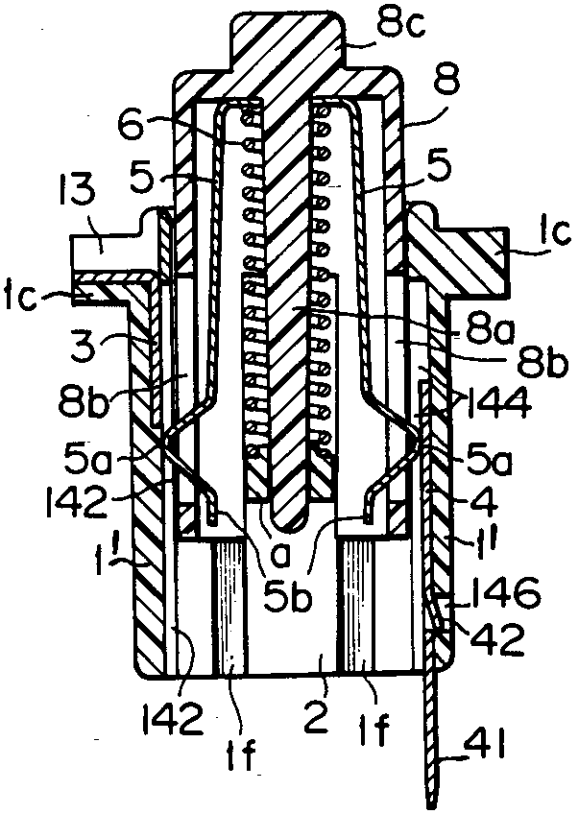


FIG. 5A

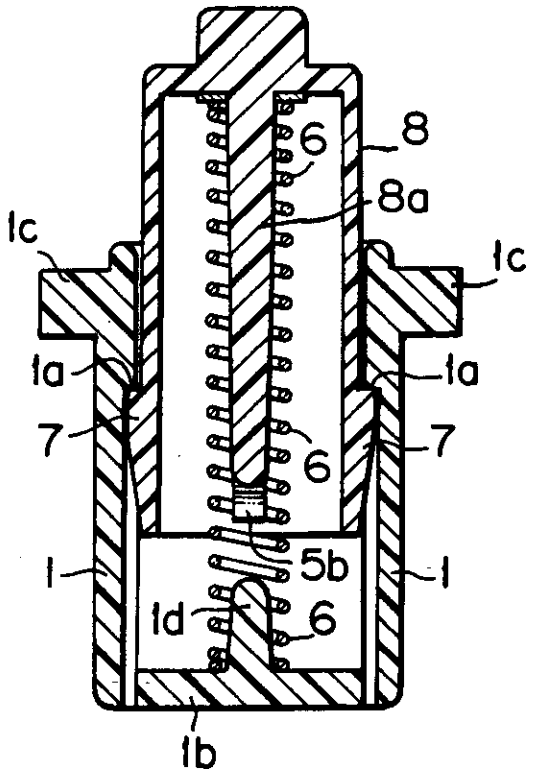

8
6
8a
1c
1c
1a
1a
7
7
6
1
5b
1
1d
6
1b

FIG. 5B

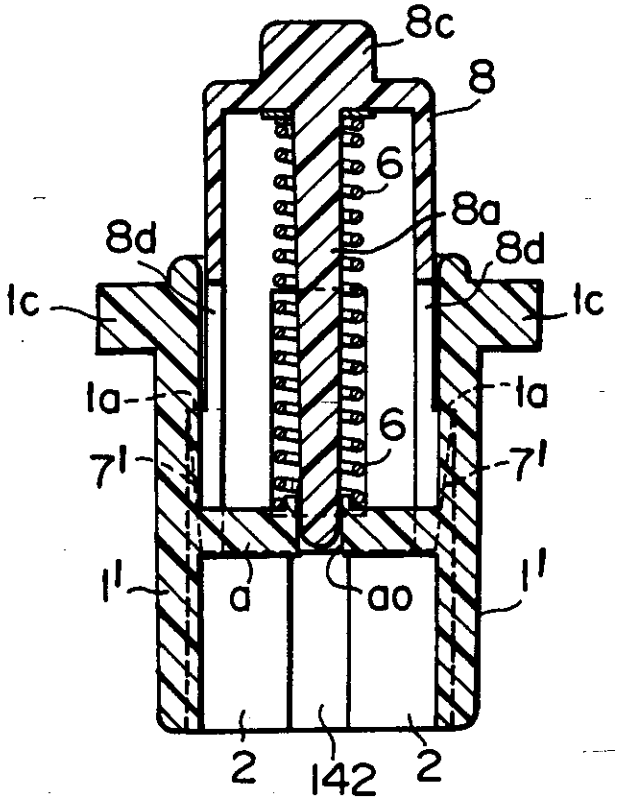

8c
8
6
8a
8d
8d
1c
1c
1a
1a
6
7'
7'
1'
1'
a
ao
2
142
2

FIG. 6A

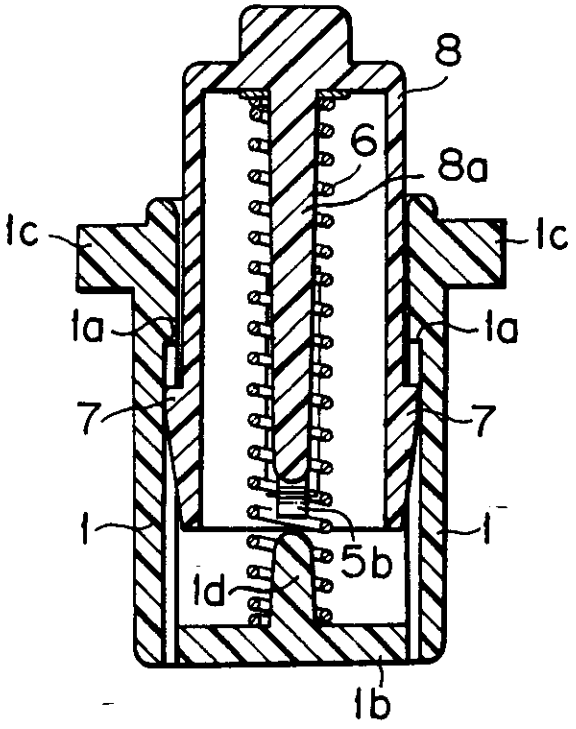


FIG. 6B

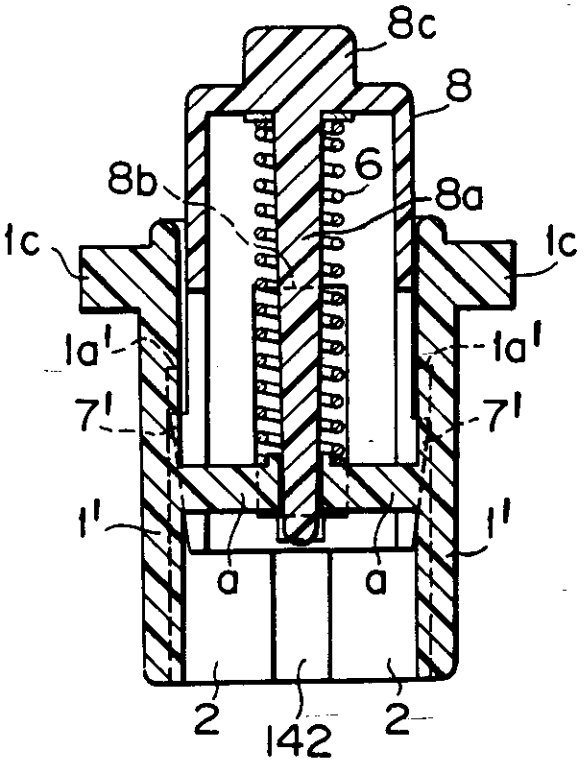


FIG. 7

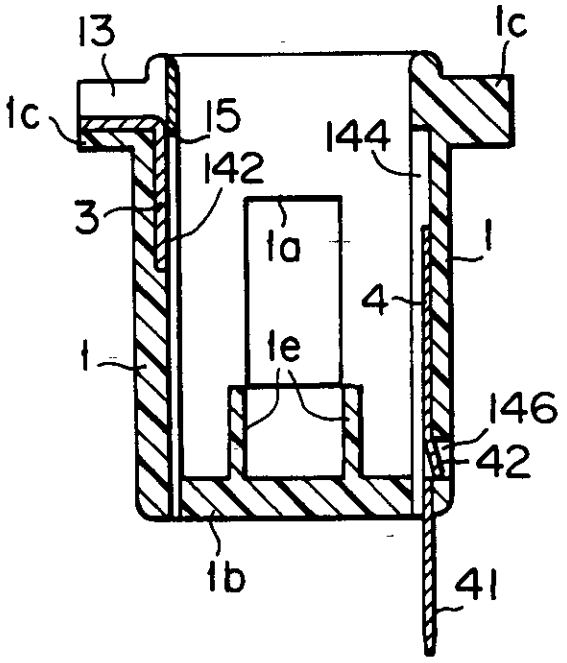


FIG. 8

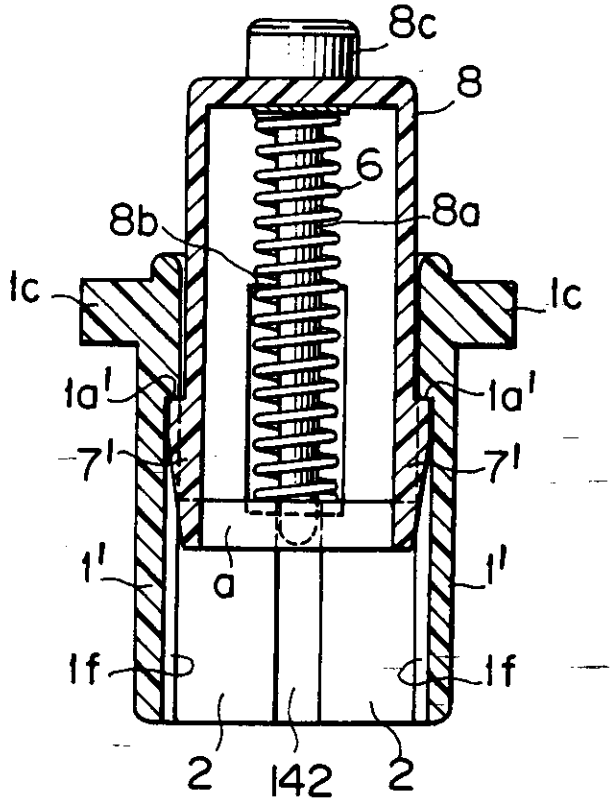
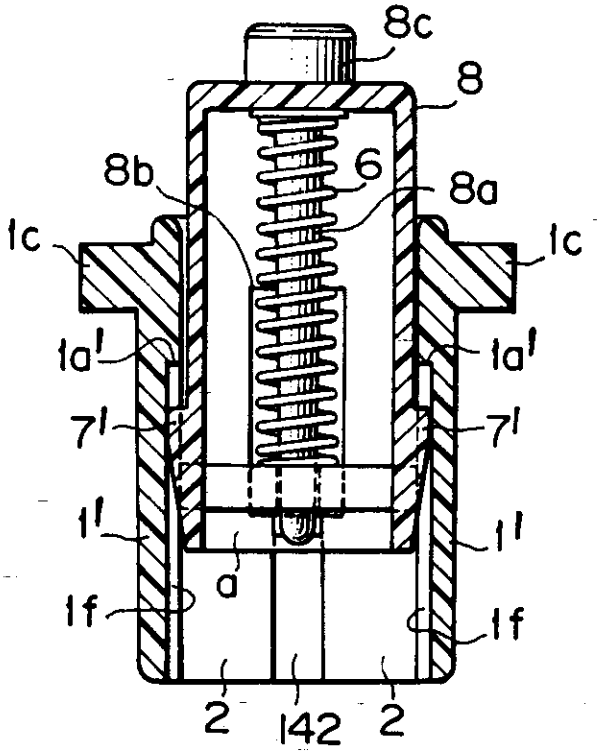

8c
8
6
8a
8b
1c
1c
1a'
1a'
7'
7'
1'
1'
a
1f
1f
2
142
2

FIG. 9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8
8b
6
8a
1c
1c
1a'
1a'
7'
7'
1'
1'
a
1f
1f
2
142
2

PUSH SWITCH

The present invention relates to push switches.

Japanese Utility Model Examined Publication No. 63-82327 discloses a push switch comprising a body having a front plate for attachment and formed with an insulated member and a hollow portion for shaft insertion in the center; a primary fixed contact member, which is inserted and locked from one end of said body into one of a pair of contact member insertion holes formed on the outside of said hollow portion of said body; a secondary fixed contact member, which is inserted and locked from the other end of said body into the other contact member insertion hole; a stepped push shaft, which is inserted so that resiliency resulting in protrusion is constantly applied to the body by a resilient member within said hollow portion; and a movable contact member, which is fixed on the end of said push shaft and is inserted from one side of the body in said pair of contact member insertion holes, and has a pair or resilient conducting pieces so that contact is made with respect to said primary fixed contact member and said secondary fixed contact member.

According to the present invention, there is provided a

push switch comprising an insulating cylinder having a spring support and locking tabs formed therein, and, disposed within said insulating cylinder on opposite inner walls thereof, a pair of partially opposed fixed contacts, a push member including a movable contact of generally U-shape, each arm of said movable contact having a contact portion and, beyond the contact portion, an end portion, the push member having windows therein, one for each contact portion, the end portions of the arms of the movable contact having rest positions resiliently engaging inner edges of said windows, the push member further including resilient locking parts thereon, and a spring for reacting between the insulating cylinder and the push member, the arrangement being such that, on assembly of the push member into the insulating cylinder, the resilient locking parts of the push member engage with the locking tabs in the insulating cylinder to prevent removal of the push member from the insulating cylinder with the spring urging the push member to a normal position partially projecting from the insulating cylinder, the contact portions of the movable contact slidably engaging the associated fixed contacts with the end portions of the movable contact displaced from engagement with said inner edges of the windows.

With the contact portions of the movable contact each engaging a respective one of the fixed contacts, the switch is in its 'on' condition.

When the push member is pushed fully into the cylinder against the resilience of the spring, the contact portion of

one of the arms of the movable contact will lose contact with the associated fixed contact and run on the inner wall of the cylinder, and the fixed contacts will no longer be shorted so that the switch is in its 'off' condition.

The movable contact is at least temporarily locked in subassembly with the push member by the end portions of the arms of the movable contact beyond the contact portions, preferably by inserting the movable contact onto a center boss of the push member so that said end portions snap onto edges of the window holes in the push member. The push member fitted with the movable contact can then be easily mounted inside the cylinder by being simply pushed in and clicked into position in the manner of a snap-fit.

By way of example only, embodiments of the invention will now be described in greater detail with reference to the accompanying drawings of which:

Figs 1A and 1B are exploded cross-sectional views of different push switches;

Figs 2A and 2B are corresponding perspective views in which the pushing parts and movable contacts are separated;

Figs 3A and 3B are respective central vertical sectional views;

Figs 4A and 4B are vertical sectional views for states different from Figs 3A and 3B;

Figs 5A and 5B are further vertical sectional views;

Figs 6A and 6B are vertical sectional views for a state different from that of Figs 5A and 5B;

Fig 7 is a vertical sectional view of a variant bottomed cylinder;

Fig 8 is a side vertically section through a resilient locking piece portion of a pushing part; and

Fig 9 is similarly view for a state different from that of Fig 8.

A first embodiment is described with reference to Figs 1A to 6A.

An insulating cylinder 1 has a bottom 1b and is preferably of plastics material. It has locking tabs 1a on its inside surface as indicated in Fig. 1A ~~and Fig. 2A~~, and a pair of fixed contacts 3,4 (preferably metal strips) are arranged as indicated in Fig. 3A and Fig. 5A partially opposing each other on a pair of inner walls 2 of the cylinder 1. A partly protruding push member 8 is provided as indicated in Fig. 3A with a substantially U-shaped movable contact 5 (preferably of phosphor bronze) to make sliding contact with the fixed contacts 3,4 as

indicated in Fig. 3A. The push member 8 is inserted into the cylinder 1 onto spring 6 as indicated in Fig. 3A, which is positioned in between the push member 8 and the bottom 1b of said cylinder 1, and has resilient locking pieces 7 for engaging with the locking tabs 1a.

Assembly of the movable contact piece 5 onto a center boss 8a of the push member is with both ends 5b beyond contact portions 5a snapped onto inside edges of window holes 8b of the push member 8 as indicated in Fig. 1, the push member 8 being shown as a covered square cylinder.

The cylinder 1 further has an outer lip 1c on the upper edge of its square cylindrical body. The outer lip 1c has an insertion hole 15 including an indentation 13 for attachment of one fixed contact 3, and hollow portion 14 of the cylinder 1 forms a square away from the indentation 13.

Groove 142, in which one of the contact portions 5a of movable contact 5 can slide, is in the same inner wall 2 as the fixed contact insertion hole 15 as indicated in Fig. 1A and Fig. 3A. Groove 144, in which the other moving contact portion 5a slides, is in the opposing inner wall 2, and fixed contact insertion groove 145 and locking hole 146 are provided beyond and as extensions of the groove 144.

Push member 8 in the shape of a covered square cylinder can be made from plastics material, together with long thin center boss 8a, and holding formations for a spring 6 and movable contact 5 housed in the push

member 8. The free end 8c is larger in diameter and shorter than the boss 8a, and window holes 8b for contact positions 5a help assembly locate and prevent rotation of pushing part 8.

Two resilient locking parts 7, for example formed integrally with push member 8, are of a size that allows them to engage with locking tabs 1a on the upper portion of the inner walls of the hollow portion of the cylinder 1. The movable contact 5 is formed as a resilient, conducting metal strip or band of phosphor bronze, etc. Control hole 5d, in base portion 5c fits about the center boss 8a, and both sides are bent away from base portion 5c. Moreover, both sides are bent outwardly then back inwardly to "V" shapes for the contact portions 5a, and end portions are bent out again, with the overall result of the movable contact 5 being having a generally "U" shape. Assembly is complete when both ends 5b beyond contact portions 5a snap fit at edges of window holes 8b of said push member 8.

Fixed contacts 4 affords a plug portion 41 at one end as a conducting metal strip of a width slightly more than for insertion into the groove 145. Locking projection 42 can be made by bending the extra width portion.

Furthermore, a fixed contact having a lead wire connected by means of a press-fit connection, etc. can be used in place of plug portion 41 for fixed contact 4.

The other fixed contact 3 is formed so one end engages the indentation 13, and a right angle bend to

the other end ensures the latter is a tight press fit into the insertion hole 15.

The push switch being described has its components in a state where some are temporarily locked in position by center boss 8a of push member 8 being first inserted into hole 5d of movable contact 5, as indicated in Fig. 1A, then both ends 5b beyond contact portions 5a snapping onto inside edges of window holes 8b of push member 8. The spring 6 fits onto center boss 1d provided on bottom 1b of the cylinder 1 and fixed contacts 3,4 are locked in position at locking projections 32,42, locking hole 146, and the hole edge of the enlarged opening and the opening edge, respectively; further in fixed contact piece insertion groove 145 and fixed contact piece insertion hole 15, respectively; and also by the lower end of push member 8 being inserted into the cylinder 1 so that contact portions 5a of movable contact piece 5 are pushed together while center boss 8a goes into the spring 6 from its top. As resilient locking parts 7 then continue being inserted into the cylinder 1 against resilience of spring 6, and being bent slightly inwardly against their own resiliency, they engage with locking tabs 1a with a click-action which prevents push member 8 from coming out, as indicated in Fig. 3A and Fig. 5A.

Furthermore, the number 7a in Fig. 2 indicates notches for facilitating deflection of resilient locking parts 7. Cylindrical portion 1e having an inner diameter slightly greater than the outer diameter of spring 6 (as indicated in Fig. 7) can be provided in place of center boss 1d in order to prevent positional displacement of

the spring 6.

A push switch as described has applications including as automobile door switches. Then, Fig. 3A and Fig. 5A indicate a state corresponding to the door being open. Push member 8 moves up inside bottomed cylinder 1 until resilient locking parts 7 make contact with locking tabs 1a due to the resiliency of spring 6. One of the contact portions 5a of movable contact 5 makes contact with fixed contact 3, and since the other contact portion 5a is constantly in contact with fixed contact 4, the interior dome light will light by opening the door. The attaching member can be connected to the negative (or earth) electrode of the battery by metal of the car body, and plug 41 of fixed contact piece 4 can be connected to the earth (or positive) electrode of the battery via the interior light.

If the door is closed, actuator 8c of push member 8 is pushed by the door into the cylinder 1 against resilience of the spring 6 as indicated in Fig. 4A and Fig. 6A. Since contact portion 5a moves away from fixed contact 3 and makes contact with opposing inner wall 2 of the cylinder 1, the interior light goes out even if the other contact portion 5a is in contact with the fixed contact 4.

Pushing member 8 thus moves up and down inside the cylinder 1 smoothly without becoming inclined within the cylinder 1. The amount of protrusion of push member 8 is restricted by the resilient locking parts 7 engaging with and locking onto said locking tabs 1a inside the cylinder 1.

Summarising resulting advantages, they include resilient locking parts of a spring load protruding push member engaging and locking onto locking tabs formed inside surface a cylinder, the amount of protrusion being restricted and preventing the push member from coming out. In addition, push member mounting is extremely easy (inside said cylinder) by a single click action after the manner of a so-called "cassette locking mechanism". Accordingly, it is easy to automate assembly work.

Moreover, the pushing part 8 being a covered square cylinder, and assembly involving ends 5b beyond contact portions 5a of the movable contact 5 as inserted over the center boss 8a, snap action at edges of window holes 8b of the push member 8, the movable contact 5 will not easily come out of the push member 8, all of which further contributes to easy assembly and automation thereof. In addition, the movable contact can move with the push member within an insulating bottomed cylinder, so no dust cover or insulating cover is required for prevention of accidents caused by electrical shorts, thus leading to advantages both in terms of costs and space.

A second embodiment of the present invention is now described with reference to the drawings.

Cylinder 1' used in this embodiment is a square cylindrical body formed with plastics material as indicated in Fig. 1B, and having outer lip 1c provided at its upper end. Outer lip 1c contains fixed contact insertion hole 15 which passes between indentation 13,

for attachment of fixed contact 3 to outer lip 1c. Hollow portion 14 of cylinder 1' is of square section.

Groove 142, in which one of the contact portions 5a of movable contact 5 is slidable, is formed in an inner wall 2 opposing that opened for the fixed contact insertion hole 15, as indicated in Figs.1B and 3B. Groove 144, in which the other contact portion 5a is slidable, is provided in an inner wall 2 opposite to that for groove 142, and fixed contact insertion groove 145 and locking hole 146 are provided in the bottom of that groove and in the groove side wall, respectively, as indicated in those above drawings.

Four opposing grooves 1f' are shown formed in the inside walls of cylinder 1' in order to form locking tabs 1a'.

Push member 8 is again formed as a covered square cylinder typically from plastics material. As well as long thin center boss 8 and a hold portion for spring 6 and movable contact 5 that is larger in diameter than the boss 8a and much shorter, and center boss 8a, push member 8 has window holes 8b in contact with a pair of side plates to prevent rotation of the push member 8.

Two resilient locking parts 7', for example, are formed on push member 8 and are of a size that allows them to engage with locking tabs 1a' on the upper portion of the inner walls of the cylinder 1'.

The push switch of the second embodiment has components capably of being temporarily locked in

position
~~portion~~ by center boss 8a of push member 8 when first inserted into hole 5d of movable contact 5 as is indicated in Fig. 1B, until both ends 5b beyond contact portions 5a ~~&~~ snap onto the inside edges of window holes 8b of push member 8.

Fixed contacts 3,4 are locked in position at locking projections 32,42, locking hole 146, the hole edge of the enlarged opening and the opening edge, respectively; and further in fixed contact insertion groove 145 and fixed contact insertion hole 15, respectively.

When push member 8 is inserted into the cylinder 1' from its bottom, while the upper portion of spring 6 goes onto center boss 8a of said push member 8, contact portions 5a of movable contact 5 can be inserted and be being pushed together. As resilient locking parts 7' go further into cylinder 1 in opposition to the resilience of spring 6 try bend slightly to the inside against their resiliency, then engage with locking tabs 1a with a click action to prevent push member 8 from coming out as indicated in Fig. 3B, Fig. 5B and Fig. 8.

Furthermore, the number 7a in Fig. 2 indicates notches for facilitating deflection of resilient locking pieces 7'.

Accordingly, in this embodiment too, the push member 8 moves up and down inside cylinder 1' smoothly without becoming inclined, the outer surface of push member 8 making sliding contact with the inner surface of cylinder 1'. The amount of protrusion of pushing part

8 is restricted by resilient locking parts 7' engaging with and locking onto the locking tabs 1a' formed on the inside surface of cylinder 1'. Movement of the push member is thus even smoother to the guiding action provided by the spring holder guide hole of the center boss.

CLAIMS

1. A push switch comprising an insulating cylinder having a spring support and locking tabs formed therein, and, disposed within said insulating cylinder on opposite inner walls thereof, a pair of partially opposed fixed contacts, a push member including a movable contact of generally U-shape, each arm of said movable contact having a contact portion and, beyond the contact portion, an end portion, the push member having windows therein, one for each contact portion, the end portions of the arms of the movable contact having rest positions resiliently engaging inner edges of said windows, the push member further including resilient locking parts thereon, and a spring for reacting between the insulating cylinder and the push member, the arrangement being such that, on assembly of the push member into the insulating cylinder, the resilient locking parts of the push member engage with the locking tabs in the insulating cylinder to prevent removal of the push member from the insulating cylinder with the spring urging the push member to a normal position partially projecting from the insulating cylinder, the contact portions of the movable contact slidably engaging the associated fixed contacts with the end portions of the movable contact displaced from engagement with said inner edges of the windows.

2. A push switch according to claim 1, wherein the cylinder has a closed-off bottom end affording said spring support.

3. A push switch as claimed in claim 1 in which the push member includes a central depending boss about which the spring is mounted, the insulating cylinder including a transverse wall defining said spring support and in which is formed a central guide hole into which the free end of the said boss projects.

4. A push switch substantially as described with reference to and as illustrated by the accompanying drawings.

REGISTER ENTRY FOR GB2247989

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Priority claimed:
12.09.1990 in Japan - doc: 02095889

Title PUSH SWITCH

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H01H

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Publication No GB2247989 dated 18.03.1992

Examination requested 11.09.1991

Patent Granted with effect from 24.08.1994 (Section 25(1)) with title PUSH SWITCH

09.04.1994 Notification of change of Address For Service address of
MEWBURN ELLIS, 2 Cursitor Street, LONDON, EC4A 1BQ, United Kingdom [ADP No. 00000109001]

to
MEWBURN ELLIS, York House, 23 Kingsway, LONDON, WC2B 6HP, United Kingdom [ADP No. 00000109001]
dated 14.03.1994. Written notification filed on GB2270363
Entry Type 7.3 Staff ID. BH Auth ID. HEO

**** END OF REGISTER ENTRY ****

RENEWAL DETAILS

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DATE NOT IN FORCE	
DATE OF LAST RENEWAL	
YEAR OF LAST RENEWAL	00
STATUS	PATENT IN FORCE