

- 1 -

Description:

Pushbutton switch

The invention concerns a pushbutton switch which displays a multipart housing, in which a pushbutton is guided to be displaceable and an illuminating equipment, an actuating member and switching members in the form of microswitches are arranged, wherein the actuating member is displaced against spring force and acts on the switching member on actuation of the pushbutton.

A pushbutton switch built up in modular mode of construction with an optical display signalling the switching state has become known by US-PS 4 504 713. The pushbutton switch consists of a housing module, a housing cover module, a contact carrier module and a lamp module. The lamp module consisting of a lamp holder and a lamp is arranged at the housing module. The contact carrier module is guided to be displaceable in the housing module, wherein fixed contacts are provided at the housing module and resilient contacts at the contact carrier module. A pushbutton, which is guided to be displaceable in the housing cover module, on actuation displaces the contact carrier module against spring force to an abutment, whilst the contact is produced between the fixed and the resilient contacts. The pushbutton consists of a translucent material so that the lighting-up of the lamp, which projects through a hole of the contact carrier module, can be observed during the contact-making. Mutually overlapping dogs with holes for the reception of the threaded bolts, which are welded on at a panel, for example for lifts, and serve for the fastening of the pushbutton switch, are provided at the housing module and at the housing cover module.

A disadvantage of this pushbutton switch lies in the relatively large overall depth, caused in particular by the lamp module, so that it cannot be used in installations, which have only a small spacing between the panel and the wall or another limitation. The great overall depth results on the one hand from the elongate shape of the incandescent lamps used, which moreover have only a short service life and are sensitive to shocks so that they have to be exchanged

more frequently, which is time-consuming and expensive. On the other hand, the overall depth is caused by the relatively complicated and expensively constructed lamp holder which, for the exchanging of the lamps, displays handles projecting out of the switch housing.

In a command and reporting device published by EP-A-0 548 556, an illuminating equipment is provided in a multipart pushbutton and displaceable with this. The illuminating equipment consists of light-emitting semiconductors which are arranged on a first conductor plate and the light of which is conducted by way of an annular optical conductor to the underside of a glass forming the front side of the pushbutton. The optical conductor extends at the rim of the glass, wherein that surface of the glass, which is not covered by the optical conductor, is covered by an opaque layer so that a light ring is made visible as acknowledgement report on actuation of the pushbutton. The pushbutton is guided to be displaceable in a skirt which is connected with a switch carrier by means of a snap connection. A second conductor plate, on which a microswitch is arranged, is fastened at the lower end of the switch carrier. A pot-like plunger of the pushbutton acts, when actuated, on the switch key of the microswitch. The microswitch is arranged in such a manner that the switch key is displaced in the direction of movement of the pushbutton. Since the illuminating equipment, the plunger and the microswitch beyond that lie one behind the other in the direction of movement of the pushbutton, a relatively great overall depth results. Further disadvantages are to be seen in that two conductor plates are necessary, which must be connected together by way of a flexible multicore conductor and plug contacts, whereby the build-up becomes more complicated and expensive. Beyond that, no uniform illumination of a pushbutton can be achieved by the aforescribed illuminating equipment as well as by a variant thereof displaying a punctiform light source.

The invention is based on the object of proposing a pushbutton switch according to the classifying clause, which switch does not display the aforementioned disadvantages and in particular is constructed more flatly and makes a uniform illumination of the pushbutton possible.

This problem is solved by the invention characterised in the patent claim 1. In this case, the illuminating equipment provided in the housing of the pushbutton switch displays four luminescent diodes which are arranged in about a square on a printed circuit. The switching members in the form of microswitches and the illuminating equipment are arranged to lie one beside the other transversely to the direction of displacement of a pushbutton borne to be displaceable in the housing. The microswitches in this case assume a position, for which the direction of movement of an actuating member and the direction of movement of switch keys of the microswitches extend one at right angles to the other. The printed circuit and the microswitches are clamped in the manner of a sandwich between flanges of a lower housing part and an upper housing part, wherein the lower housing part and the upper housing part are connected together without screws.

The advantages achieved by the invention lie in that a low overall height of the switch is achieved by the particular structuring of the illuminating equipment and its position relative to the microswitches so that it can also be used in installations which display only little space behind the panel. Further advantages result from the insensitivity to vibration and the long service life of the luminescent diodes which therefore practically do not need to be exchanged so that the maintenance costs are reduced. A further reduction in the overall height is achieved by the microswitches being arranged with their smallest dimension extending in the direction of displacement of the pushbutton. Beyond that, due to the deflection of the switching movement, damages of the microswitches are avoided, which could be caused by strong blows on the pushbutton. Due to the square arrangement of the luminescent diodes, a good illumination is achieved for round as well as also for cornered pushbuttons. The snap connection between the lower housing part and the upper housing part enables the microswitches, the printed circuit and the actuating member to be assembled preliminarily into a subassembly without screws and to be stored until the final assembly. Due to the insertion of the feet of the pushbutton into the slots of the actuating member, its strength is improved and its

unobjectionable displacement is assured.

The invention is explained more closely in the following by an example of embodiment illustrated on the drawing. There show:

- Fig. 1 to enlarged scale, a plan view of the pushbutton switch according to the invention with the housing cover taken off,
- Fig. 2 a cross-section along the line II-II of the Fig. 1,
- Fig. 3 a partial cross-section along the line III-III of the Fig. 1,
- Fig. 4 in perspective illustration, a plan view of the pushbutton switch according to Fig. 1,
- Fig. 5 a side elevation of the pushbutton switch to a scale of 1:1,
- Fig. 6 a plan view of the pushbutton switch according to Fig. 5 with round pushbutton,
- Fig. 7 a plan view of the pushbutton switch according to Fig. 5 with square pushbutton,
- Fig. 8 a side elevation of the pushbutton switch with designation plate to a scale of 1:1,
- Fig. 9 plan view of a housing cover of the pushbutton switch according to Fig. 8 for a round pushbutton and designation plate and
- Fig. 10 a plan view of a housing cover of the pushbutton switch according to Fig. 8 for square pushbutton and designation plate.

A lower housing part is denoted by 1 and an upper housing part is denoted by 2 in Figs. 1 to 4, both housing parts displaying a square shape of like size. The lower housing part 1 is provided with a base 3, whilst the upper housing part 2 is formed merely of side walls 4. The lower housing part 1 and the upper housing part 2 each display two dogs 5 and 6, which are provided with holes 7 and 8, are arranged at diagonally opposite corners and mutually overlap. Tubular projections 9 are provided at the dogs 5 of the lower housing part 1 and at their ends remote from the dogs 5 display a bevelled shoulder 10 and slots 11. The holes 8 of the dogs 6 of the upper housing part 2 are intended for the reception of the tubular projection 9. The dogs 6 display eyes 12 at the upper end

and the holes 8 display a countersinking 13, into which the bevelled shoulder 10 can snap during the assembly of the lower housing part 1 and the upper housing part 2. At two parallelly extending side walls 14 and 4, respectively, of the lower housing part 1 and the upper housing part 2, two mutually overlapping flanges 15 and 16 are provided, which are displaced one relative to the other in the direction of the side walls. The flanges 15 of the lower housing part 1 lie in the same plane as the base 3 thereof. The side walls 14 of the lower housing part 1 are interrupted in the region of the flanges 15. The flanges 16 of the upper housing part 2 are arranged at the lower edges of the side walls 4, which rest on the upper edges of the side walls 14 of the lower housing part 1. Beyond that, inwardly directed projections 17 are provided at the lower edges of the side walls 4 of the upper housing part 2.

A housing cover 20 lies on the side walls 4 of the upper housing part 2 by a rim 21 of the thickness of the eyes 12. The housing cover 20 at the one side displays a square projection 22, which is guided in the upper housing part 2. At the other side of the housing cover 20, an annular projection 23 is provided, which for example projects into a circularly round cut-out of a panel 24 at which the switch is to be fastened. The lens cap, which is pushed over a pushbutton 26, is denoted by 25. The lens cap 25 and thereby also the pushbutton 26 are guided to be displaceable in the housing cover 20. The lens cap 25 and the pushbutton 26 display overlapping rims 27 and 28, respectively, wherein the rim 27 of the lens cap 25 in one end setting of the pushbutton 26 lies against the projection 22 of the housing cover 20. Four feet 29 are arranged at the rim 28 of the pushbutton 26.

An illuminating equipment 30 displays a printed circuit 31, which rests on the base 3 and the flanges 15 of the lower housing part 1. A depression 32 and not illustrated holes for the ventilation and the reception of the soldered places of the printed circuit are provided in the base 3, so that their unobjectionable bearing is assured. The printed circuit 31 displays four luminescent diodes 33, which are arranged in a square. The preferably used luminescent diodes 33 have a light cone of approximately 90° so that they can be placed more closely against the inward side of the

pushbutton 26 and conventional luminscent diodes which display a light cone of 60° . Thereby, the overall depth of the switch is reduced without the pushbutton 26 heating up additionally. Moreover, in conjunction with the square arrangement of the four luminscent diodes 33, a uniform illumination of round as well as also of rectangular pushbuttons is achieved. In order in this case to obtain light as white as possible, luminescent diodes with yellow light and pushbuttons 26 of white translucent synthetic material are used, wherein the lens cap 25 pushed over the pushbutton 26 is produced of transparent synthetic material. In place of a single resistor of greater power, which is to be mounted externally, two resistors 34 of smaller diameter and smaller power are provided on the printed circuit 31 for the current supply of the luminscent diodes 33. Thereby, the dissipation heat arising during operation is distributed better and the overall depth is reduced further. Diodes of a bridge rectifier, which are likewise arranged on the printed circuit 31, are denoted by 35. An alternating voltage is fed to the bridge rectifier by way of conductors 36, which are led through slots 37 of the lower housing part 1, for the purpose of the current supply of the luminscent diodes 33.

Two microswitches 40 are arranged laterally of the illumination equipment 30 on the printed circuit 31 in such a manner that the direction of displacement of the pushbutton 26 and the direction of movement of switch keys 41 of the microswitches 40 extend one at right angles to the other. The microswitches 40 and the printed circuit 31 are in this case clamped in the manner of a sandwich between the flanges 15 and 16 of the lower housing part 1 and the upper housing part 2, wherein the microswitches 40 assume a position in which their smallest dimension extends in the direction of displacement of the pushbutton 26. In order to prevent a displacement of the microswitches 40, these are fixed by means of pins 42, which are mounted at them, in holes 43 of the flanges 15 and 16 and of the printed circuit 31. The switch keys 41 of the microswitches 40 are actuated by switching dogs 45 of an actuating member 44 in the form of a substantially square plate. The actuating member 44 bears on the base 3 of the lower housing part 1 by way of

four compression springs 46, which are arranged in the corners of the lower housing part 1 and the upper housing part 2, wherein the compression springs 46 are guided in not illustrated projections of the lower housing part 1 and of the actuating member 44. The actuating member 44 in the middle displays an opening 47, through which the luminescent diodes 33 project. Slots 48, which are open at one longitudinal side and serve for the reception of the feet 29 of the pushbutton 26, are provided at the side rims of the actuating member 44. Hooks 49, which under the influence of the compression springs 46 lie against the projections 17 of the upper housing part 2, are arranged beside the slots 48, whereby a limiting position of the actuating member 44 is determined. The connection terminals of the microswitches 40 are connected with three conductors 50, 51 and 52.

Pushbutton switches of the aforescribed kind are used for example in lifts, where they are used in the cage as cage call transmitter or on the storeys as storey call transmitter. In this case, the switches are fixed at a panel (24, Fig. 2), to which threaded bolts are welded, which project through the holes 7 of the dogs 5.

As shown in the Figs. 5, 6 and 7, a square pushbutton 60 and a housing cover 61 fitting therewith can be used in place of the round pushbutton 26 and the housing cover 20 belonging thereto.

According to the Figs. 8, 9 and 10, a laterally prolonged housing cover 62 is provided, which is suitable for a round pushbutton and displays a substantially semicircular designation plate 63 (Fig. 9). The designation plate 63 lies in a depression of the housing cover 62 and is screwed to the housing cover 62 by means of a threaded bolt 64 welded to the plate 63, an underlay washer 65 and a nut 66. Dogs for the additional fastening of the housing cover 62, for example at a lift panel, are denoted by 67, wherein the number of a storey can be indicated on the designation plate 63 in normal numbers and in numbers of the Braille script. In place of the housing cover 62 according to Fig. 9, a similarly constructed housing cover 68 for a square pushbutton and a square designation plate 69 can also be used (Fig. 10).



Patent Claims:

1. Pushbutton switch which displays a multipart housing, in which a pushbutton (26) is guided to be displaceable and an illuminating equipment (30), an actuating member (44) and switching members in the form of microswitches (40) are arranged, wherein the actuating member (44) is displaced against spring force and acts on the switching members (40) on actuation of the pushbutton (26), characterised thereby that the illuminating equipment (30) preferably displays four luminescent diodes (33), which are arranged in about a square on a printed circuit (31), that the microswitches (40) and the illuminating equipment (30) are arranged to lie one beside the other transversely to the direction of displacement of the pushbutton (26), that the microswitches (40) assume a position, for which the direction of movement of the actuating member (44) and the direction of movement of switch keys (41) of the microswitches (40) extend one at right angles to the other, that the printed circuit (31) and the microswitches (40) are laid in the manner of a sandwich between flanges (15, 16) of a lower housing part (1) and an upper housing part (2), wherein the lower housing part (1) and the upper housing part (2) are connected together without screws.

2. Pushbutton switch according to claim 1, wherein the lower housing part (1) and the upper housing part (2) display a square shape of like size and each display two dogs (5, 6), which are provided with holes (7, 8), are arranged at diagonally opposite corners and mutually overlap, characterised thereby that a tubular projection (9) is provided at the dog (5) of the lower housing part (1) and at its end remote from the dog (5) displays a bevelled shoulder (10) and slots (11) and that the holes (8) of the dogs (6) of the upper housing part (2) are intended for the reception of the tubular projection (9) and at the upper end display a countersinking (13), into which the bevelled shoulder (10) snaps on the assembly of the lower housing part (1) and the upper housing part (2).



3. Pushbutton switch according to claim 1, characterised thereby that the actuating member (44) is a substantially square plate which bears on the base (3) of the lower housing part (1) by way of four compression springs (46), which are arranged in the corners of the lower housing part (1) and the upper housing part (2).
4. Pushbutton switch according to claim 3, characterised thereby that the actuating member (44) displays switching dogs (45), by means of which the switch keys (41) of the microswitches (40) are actuated.
5. Pushbutton switch according to claim 3, characterised thereby that hooks (49), which under the influence of the compression springs (46) lie against projections (17) of the upper housing part (2), are provided at the actuating member (44), whereby a limit position of the actuating member (44) is determined.
6. Pushbutton switch according to claim 3, characterised thereby that the actuating member (44) displays slots (48), which are open at one side and serve for the reception of feet (29) of the pushbutton (26).
7. Pushbutton switch according to claim 1, characterised thereby that the luminescent diodes (33) display a light cone of approximately 90°.
8. Pushbutton switch according to claim 1, characterised thereby that a bridge rectifier for the current supply of the luminescent diodes (33) is provided on the printed circuit (31).