

The invention relates to a push-button device for operating a switching contact of a switching device having a key head which can be pressed down from a quiescent position into a switching position and can be
5 connected to the switching device via guide brackets, the guide brackets, which have legs crossing mutually in the manner of scissors, being mounted on the key head and on the switching device so as to be pivotable about axes perpendicular to the operating direction and being
10 mounted on the switching device so as to be displaceable perpendicular to the operating direction and with respect to the direction of the axes.

A push-button device of the type mentioned above is, for example, disclosed in German Patent 37 19 839. In
15 the solution which is described there the mutually crossing legs of the guide brackets are connected to one another by a firm hinge so that the guide brackets jointly form a pair of scissors. To permit up and down movement of the key head, the ends of the legs of the
20 guide brackets are mounted so as to be pivotable and horizontally displaceable in slots, both in the key head as well as in the switching device. This device is to ensure that the key head always moves parallel with respect to itself and thus cannot jam even when it is not
25 pressed down in the centre. This is especially requisite in the case of larger keys on a keyboard.

In the known solution, the guide brackets are assembled in such a manner that in each case one of the legs of a bracket has a joint pin and the other leg a
30 hole for accommodating such a joint pin. When the two guide brackets which form a pair of scissors are fitted together, the respective pin of the one bracket engages into the joint hole of the other bracket. The pins are secured in this position by securing elements such as,
35 for example, snap rings or the like. This operation makes assembly of the guide brackets more complicated, more time consuming and more expensive since a further part is required for each joint in addition to the guide brackets.

The invention is based on the object of specifying a push-button device of the type mentioned initially, which is cheaper to produce and saves time during assembly.

5 According to the invention, this object is achieved in that the guide brackets are linked to the key head so as to be pivotable about axes fixed to the head, and in that on one of the mutually crossing legs respectively a driver is provided and on the respectively other
10 leg a control cam, interacting with said leg, is provided, in such a manner that the guide brackets always move by equal angular magnitudes relative to the key head.

 In the solution according to the invention the
15 joint between the mutually crossing legs of the guide brackets is dispensed with. Likewise, assembly of a joint is no longer necessary. The securing elements and their assembly can be dispensed with. The interaction of the driver and the control cams ensures that, despite the
20 missing common joint, the guide arrangement consisting of the two guide brackets has precisely the same behaviour, when the key head is pressed down, as the pair of scissors described in the known patent. The key head moves parallel to itself even when it is actuated at an
25 edge or a corner. The key head is prevented from jamming.

 Stops for limiting the pivoting movement of the guide brackets are preferably constructed on at least one of the mutually crossing legs of a guide bracket.

 The guide bracket can be assembled on the key
30 head in a simple manner by constructing bearing yokes on the key head, into which bearing yokes in each case one axis section of the guide brackets can be clipped. Even during extrusion of the key heads from plastic such a bearing can be produced in a very simple manner.

35 To facilitate the assembly of the key heads, which have already been provided with the guide brackets, on the switching device, for example a keyboard, it is expedient, should the possibility exist, to lock or fix the guide brackets in that assembly position in which the

free ends of the mutually crossing legs of the brackets can be precisely inserted into the guides on the switching device. For this purpose, the known arrangement has latching elements which initially hold the guide brackets in the assembly position, it being possible to release or overcome the latches by pressing down the key head after the insertion of the guide brackets into the guides of the switching device.

The invention is intended to specify a simpler solution even in this respect. According to the invention, it is in this case proposed that the push-button device has clamping means for fixing the guide brackets in an assembly position of the key head, the assembly position of the key head being located outside its actuating travel from the quiescent position to the switching position and it being possible to neutralize the clamping action by pressing down the key head. In the case of the solution according to the invention, frictional locking between two clamping surfaces is thus sufficient for keeping the guide brackets in a position in which their corresponding ends can be inserted into the guide slots of the switching device. Pressure on the key head, which overcomes the clamping force, is sufficient to neutralize the clamping action. If the key head is to be disassembled again, it needs lifting only to the extent that the clamping action is in force again. The key button [sic] with the corresponding brackets can then be removed easily.

The clamping action described above can be achieved without any additional means by shaping the control cam in such a manner that, when the guide brackets are pivoted into the assembly position, the driver on one leg of the one guide bracket is stressed against the control cam on the crossing leg of the respectively other guide bracket.

Another possibility consists in arranging and constructing in each case at least one clamping element on the mutually crossing legs of the guide brackets in such a manner that the clamping elements on the mutually

crossing legs in the assembly position of the key head become frictionally locked with one another. Here too, however, one of the clamping elements can be formed by the driver which engages into a corresponding clamping cutout on the other leg. According to another embodiment which is robust and very simple to produce, the one clamping element has a groove which tapers off towards its bottom, while the other clamping element is a spring which engages in the groove and is shaped so as to complement said groove.

According to a further embodiment, a first clamping surface is arranged on the key head in such a manner that in the assembly position of the key head it becomes frictionally locked with a second clamping surface on at least one of the guide brackets. In this embodiment therefore the clamping means do not act between the two guide brackets but between at least one guide bracket and the key head.

Fixing the guide brackets in an assembly position can be dispensed with when, according to a modified embodiment of the invention, bearing pins are arranged on the free ends, remote from the key button [sic], of the bracket legs, which bearing pins are intended to engage in undercut guide slots, provided on the switching device, and which are bevelled off at their respective free end at an angle to the pin axis in such a manner that they can be clipped during displacement of the free leg ends in the direction of the respective pin axis into the guide slots [sic]. The preassembled key button [sic] is placed on the switching device and connected thereto by clipping in the bearing pins.

In the case of the solution according to the invention the guide brackets can be constructed to be identical for the purpose of lowering the manufacturing costs for the entire guide arrangement.

Further features and advantages of the invention result from the following description which, in conjunction with the appended drawings, explains the invention with reference to exemplary embodiments. In the drawings

Figure 1 shows a perspective schematic and partially cut away view of a key head with guide brackets,

Figure 2 shows a section along the line I-I in Figure 1, the key head with the guide brackets being assembled on a switching device,

Figure 3 shows a perspective view from below into a key head according to a second embodiment of the invention,

Figure 4 shows a partial view of the embodiment shown in Figure 3, in the direction of the arrow A in Figure 3,

Figure 5 shows a perspective view of the guide brackets of a third embodiment,

Figure 6 shows a schematic side view of the guide brackets, shown in Figure 5, in the assembly position,

Figure 7 shows a position, corresponding to Figure 2, of a key head with guide brackets according to a fourth embodiment of the invention,

Figure 8 shows a view, corresponding to Figure 7, of the arrangement shown there, in the assembly position,

Figure 9 shows on an enlarged scale a schematic partial sections [sic] along the line IX-IX in Figure 5 and

Figure 10 shows a view, corresponding to Figure 4, of a modified embodiment of the invention.

The push-button device shown in Figure 1 comprises a key head, designated generally by 10, and two identically constructed U-shaped guide brackets 12 having in each case a first leg 14 and a second leg 16 which are connected at their one end by a continuous axis which forms the U-crossweb. As can be seen in particular in Figure 3 the axes 18 of the two guide brackets 12 are clipped into bearing yokes 20 which are arranged on the inside of the top surface 22 of the box-shaped key head 10. The guide brackets 12 are thus mounted on the key head 10 so as to be pivotable about fixed axes.

The legs 14 and 16 carry in each case at their free ends a bearing pin 24 which is aligned outwardly and

is intended to engage in each case in an open guide slot 26 which is constructed by means of bracket-shaped extensions 30 on a switching device 28 which, by the way, is not shown in more detail.

5 As can be seen in Figure 1, the two guide brackets 12 with their mutually crossing legs 14 and 16 form a type of scissors, the mutually crossing legs 14 and 16, however, not being connected to one another by a fixed joint. Instead, the two legs 14 and 16 carry out a
10 rotating and translational movement relative to one another. So that coupling is nevertheless achieved between the movement of the one guide bracket with [sic] the movement of the other guide bracket in such a manner that the key head 10 is always displaced parallel to
15 itself during its up and down movement between a quiescent position and a switching position, a pin-shaped driver 32 is arranged in each case on the inside of the leg 16 of the one guide bracket 12, which driver is intended to bear on a control cam 34 which is constructed
20 in the central part of the other leg 14. A lobe 36 which is constructed on the respective leg 14 slides at the same time on a control cam 38 which is constructed on the central section of the respective leg 16. When one of the guide brackets 12 is pivoted during lifting or pressing
25 down of the key head 10 it automatically entrains the legs 14 and 16 on the other guide brackets 12 by means of the driver pin 32 on its leg 16 and the lobe 36 on its leg 14 in such a manner that the key head 10 maintains its alignment and cannot jam during its up and down
30 movement, irrespective of the place where it is actuated. It can be seen on the other side that during assembly the two guide brackets 12 only have to be inserted into one another in the manner shown in Figure 1. Further assembly with the help of additional elements is not required.

35 For assembling the arrangement shown in Figure 1 and consisting of the key head 10 and the guide brackets 12 on the switching device 28, the guide brackets 12 have to be set up at a distance [lacuna] that the distance a between the outer tangents of the bearing

pins 24 (Figure 1) is smaller than the distance b between the free ends of the extensions 30, intended to accommodate the bearing pins 24, on the switching device 28. To facilitate the assembly it is expedient when the guide brackets 12 can be locked in this assembly position. In the solution according to the invention this is achieved by clamping means on the guide brackets 12 or, on the one hand, on the guide brackets 12 and [lacuna] the key head 10.

In the embodiment shown in Figures 1 and 2 the control cams 34 on the legs 14 are shaped in such a manner that, when the key head 10 is pulled upwards beyond its quiescent position, the driver pins 32 become frictionally locked with the respective control cam 34. In the representation in Figure 2, this means that the driver pin 32 travels towards the left-hand side in the direction of the arrow B until it clamps on the control cam 34. In a corresponding design of the control cam 34 this is the case precisely at that moment when the bearing pins 24 have emerged from the guide slots 26 and the key arrangement can thus be easily taken out and reinserted in an inverted manner. In this solution, only the control cam 34 has to be designed correspondingly. Separate clamping elements are not required.

In the embodiment shown in Figures 3 and 4 there is arranged on the inside of the top surface 22 of the key head 10 close to the intersection point of two legs 14 and 16 a stationary post 40 which has an inclined surface 42 on its side facing the legs 14 and 16. The respective leg 14 has on the side facing the post 40 a nose 44 (Figure 4) which slides upwardly on the inclined surface 42, when the guide brackets 12 are set up, and comes to rest on the vertical surface 46 of the post 40 on reaching the assembly position, the post 40 being bent outwards slightly (in Figure 4 towards the left-hand side) so that a clamping action is produced which secures the guide brackets 12 in the assembly position.

In the embodiment according to Figures 5 and 6 a spring 52 or a clamping element 56 having a groove 54 are

in each case arranged on the legs 14 or 16 on mutually facing surfaces 48 and 50. When the guide brackets 12 are set up, as can be recognized schematically in Figure 6, the spring 52 engages in the groove 54 of the clamping element 56 in a clamping manner for holding the guide brackets 12 in the assembly position shown.

For the sake of simplicity, a further embodiment of the clamping means is indicated in Figure 5. For this purpose, a nose 58 is arranged on one of the axes or shafts 18, which nose, according to Figure 9, during pivoting of the guide brackets 12 interacts with a side wall 60 of the key head 10 in such a manner that the respective guide bracket clamps in the relevant position (Figure 9).

Figures 7 and 8 finally reproduce a last embodiment in which a spring-like extension 62 is constructed parallel to the control cam 34 and at a distance therefrom on the respective leg 14 of the guide brackets 12 so that a clamping slot 64 is formed which is open with respect to the driver pin 32 on the crossing leg 16. When the guide brackets 12 are pivoted into the assembly position the driver pin 32 enters the clamping slot 64 so that the guide brackets 12 are again secured in their assembly position.

All embodiments have in common the fact that the clamping action is carried out by lifting up the key head 10 away from the switching position and beyond the quiescent position and can be released without any problems by pressing down the key. At the same time this operation can be repeated as often as desired.

Figure 10 shows a modified embodiment of the push-button device described, the same parts being designated by the same reference symbols.

In this embodiment the bearing pins 24 are bevelled at their free ends while forming an approach surface 25. In like manner the bracket-shaped extensions 30 which form the undercut guide slots 26 have on their outside a complementary bevelled approach surface 31.

The key head 10 which is connected to the guide brackets 12 is then assembled on the switching device 28 by placing the key-head arrangement with the bearing pins 24 on the brackets 30 and pressing it in the direction of the arrow B, the free ends of the bracket legs 14, 16 being deflected by the approach surfaces 25, 31 in the direction of the pin axes and the bearing pins 24 subsequently snapping into the guide slots 26. In this embodiment fixing the guide brackets 12 in an assembly position is not required. The assembly can be carried out in any position of the guide brackets 12.



Patent Claims

1. Push-button device for operating a switching contact of a switching device (28) having a key head (10) which can be pressed down from a quiescent position into a switching position and can be connected to the switching device (28) via guide brackets (12), the guide brackets (12), which have legs (14, 16) crossing mutually in the manner of scissors, being mounted on the key head (10) and on the switching device (28) so as to be pivotable about axes (18, 24) perpendicular to the operating direction and being mounted on the switching device (28) so as to be displaceable perpendicular to the operating direction and with respect to the direction of the axes, characterized in that the guide brackets (12) are linked to the key head (10) so as to be pivotable about axes (18) fixed to the head, and in that on one of the mutually crossing legs (14, 16) respectively a driver (32) is provided and on the respectively other leg (14) a control cam (34), interacting with said leg, is provided, in such a manner that the guide brackets (12) always move by equal angular magnitudes relative to the key head (109) [sic].

2. Push-button device according to Claim 1, characterized in that stops for limiting the pivoting movement of the guide brackets (12) are constructed on at least one of the mutually crossing legs (14, 16) of a guide bracket (12).

3. Push-button device according to Claim 1 or 2, characterized in that bearing yokes are constructed on the key head (10), into which bearing yokes in each case one axis section (18) of the guide brackets (12) can be clipped.

4. Push-button device according to one of Claims 1 to 3, characterized in that it has clamping means for fixing the guide brackets (12) in an assembly position of the key head (10), the Monday [sic] position of the key head (10) being located outside its actuating travel from the quiescent position to the switching position and it being possible to neutralize the clamping action by



pressing down the key head (10).

5. Push-button device according to Claim 4, characterized in that the control cam (34) is shaped in such a manner that, when the guide brackets are pivoted into the assembly position, the driver (32) on one leg (16) of the one guide bracket (12) is stressed against the control cam (34) on the crossing leg (14) of the respectively other guide bracket (12).

6. Push-button device according to Claim 4, characterized in that in each case at least one clamping element (62, 32; 52, 56) is arranged and constructed on the mutually crossing legs (14, 16) of the guide brackets (12) in such a manner that the clamping elements on the mutually crossing legs (14, 16) in the assembly position of the key head (10) become frictionally locked with one another.

7. Push-button device according to Claim 6, characterized in that one of the clamping elements is formed by the driver (32).

8. Push-button device according to Claim 6, characterized in that the one clamping element (56) is [lacuna] a groove (54) which tapers off towards its bottom and in that the other clamping element (52) is a spring which engages in the groove and is constructed so as to complement said groove.

9. Push-button device according to Claim 4, characterized in that a first clamping surface (40, 46; 60) is arranged on the key head (10) in such a manner that in the Monday [sic] position of the key head (10) it becomes frictionally locked with a second clamping surface (44; 58) on at least one of the guide brackets (12).

10. Push-button device according to one of Claims 1 to 3, characterized in that on the free ends, remote from the key head, of the bracket legs (14, 16) bearing pins (24) are arranged which are intended to engage in undercut guide slots (26), provided on the switching device (28), and which are bevelled off at their respective free end at an angle to the pin axis in such a manner that they can be clipped during displacement of the free leg



ends in the direction of the respective pin axis into the guide slots (26) [sic].

11. Push-button device according to one of Claims 1 to 10, characterized in that the guide brackets (12) are
5 constructed to be identical.