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A PUSH-BUTTON ARRANGEMENT FOR AN ELECTRICAL SWITCH

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This invention relates to the construction of electrical push-button operated switches, especially but not exclusively for use in telephone instruments.

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A recent development in the field of such manually operable switching is the use of a rubber (or rubber-like material) dimple pad, which is a sheet of the rubber (or rubber-like material) with a dimple per push-button position. Each such dimple is a dome on the sheet surface which has on its concave (inner) surface a region of conductive material e.g. metal or conductive plastics. The dimple pad is located over a sheet of an electrically insulating material having electrically conductive regions on it. When a push-button is depressed, its dimple's dome is collapsed so that its conductive region contacts the conductive regions on the lower sheet to complete one or more connections. On release of the push-button it restores to rest, assisted by the resilience of the dimple. In the case of a telephone-keypad we use a 4 x 3 dimple pad, with a corresponding matrix of conductive tracks on the lower sheet.

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An object of the matrices is to produce a simple and inexpensive push-button switch using such dimple switches, and to produce a keypad using such push-buttons.

According to the invention there is provided a push-button arrangement, which includes a substantially

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rectangular portion of an electrically insulating material formed integral with a supporting structure of the same material, the rectangular portion being coupled to the supporting structure by a region of reduced thickness extending along one edge of the rectangular portion, which region of reduced thickness forms an integral hinge for the rectangular portion, a portion along the edge parallel to the first-mentioned edge which is depressed to operate the arrangement, and a pair of arms each extending along a respective one of the other edges of the rectangular portion from adjacent the depressible portion to a region on the supporting structure spaced from the depressible portion of the rectangular portion, wherein the resilience of the hinge and the arms together assist in the restoration of the depressed button when it is released, and wherein when in use in an electrical device switch means is so located as to be operated by the depression of the depressible portion.

According to the invention there is also provided a push-button switch arrangement, which includes a substantially rectangular portion of an electrically insulating material formed integral with a supporting structure of the same material, the rectangular portion being coupled to the supporting structure by a region of reduced thickness extending along one edge of the rectangular portion, which region of reduced thickness forms an integral hinge for the rectangular portion, a bent-up part of the rectangular portion along the edge parallel to the first-mentioned edge, which bent-up part is depressed to operate the switch, a pair of arms each extending along a respective one of the other pair of edges of the rectangular portion from adjacent the bent-up part to a region on the supporting structure spaced from the depressible portion of the rectangular portion, and electrical contact means under the bent-up portion of the

51 rectangular portion and adapted to be operated when the push-button is depressed, the resilience of the hinge and the arms assisting in the restoration of the depressed button when it is released.

5 Embodiments of the invention will now be described with reference to the accompanying drawings, in which :

10 Fig. 1 is a view from above of a push-button embodying the invention, which is the end-most push-button of a unitary structure of three such push-buttons.

 Fig. 2 is a part-sectional view along the line II-II of Fig. 1.

15 Fig. 3 is a side view, looking along the arrows III-III of Fig. 1.

 Fig. 4 is a perspective view of a telephone keypad using twelve push-buttons each of which embodies the invention. In this case all twelve push-buttons are made as a unitary structure.

20 In Figs. 1 to 3, we show one end of a unitary structure which is a frame having sides 1 and 2 and two ends, one of which is shown at 3. As can be seen this end portion has two holes 4 and 5 for mounting bolts. The push-button shown is in a cut-out 6 in the frame 1-2-3, and has a rectangular portion 7 secured to and integral with the frame side 1. The region interconnecting the side 1 and the rectangular portion 7 is, as shown at 8, Fig. 2, of reduced thickness, so that it acts as a hinge.

30 At the side of the portion 7 remote from its hinge 8 there is a raised portion 9 which forms the push-button as "seen" by the user. Extending from the "push-button" edge of the portion 9 there are two arms 10, 11 each of which connects with and is integral with the frame near to the side 1, as can be seen from Fig. 2.

35 In use for a telephone keypad, four such units are assembled together to give a 4 x 3 matrix

with each push-button head 9 projecting through a cover plate. Below these we have a 4 x 3 dimple pad of the type described above, with the conductive tracks on an insulating surface below the pad. Then
5 when a push button is depressed it pivots about its hinge 8 and its arms 11 so as to compress the dimple underneath it. This urges the conductive material disc inside the dimple on to the conductive tracks to complete the appropriate connections.

10 When the push-button is released it is reset to its original condition by the resilience of the depressed dimple, plus that of the material of the push-button's hinge and arms.

In one example the push-button head has
15 a width of 12 mm with the overall width of each button assembly of 17.5 mm. The width from the top of side 1 to the bottom of side 2, Fig 1 is 20 mm. The length of the slanting portion of the arm 11 is 10 mm, while for the central push-button of the three this length is 12 mm, and for the other
20 end push-button this length is 8 mm.

We now refer to Fig 4, in which the twelve push-buttons of the keypad are moulded in a single structure. Thus we have a one-piece keypad
25 20. In this case it will be noted that the sidearms of the individual push-buttons are slightly bent in plan. However, this does not affect the principle on which the arrangement operates.

The button's heads, such as 21 each project
30 through a rectangular hole in a cover plate 22: in practice this hole is just wide enough for the push-button head. The dimple pad is shown at 23. If desired, in the interests of adequate sealing of the "electronics" a thin rubber or rubber-like sheet
35 can be interposed between the frame 20 and the pad 23.



CLAIMS :

1. A push-button arrangement, which includes a substantially rectangular portion of an electrically insulating material formed integral with a supporting structure of the same material, the rectangular portion being coupled to the supporting structure by a region of reduced thickness extending along one edge of the rectangular portion, which region of reduced thickness forms an integral hinge for the rectangular portion, a portion along the edge parallel to the first-mentioned edge which is depressed to operate the arrangement, and a pair of arms each extending along a respective one of the other edges of the rectangular portion from adjacent the depressible portion to a region on the supporting structure spaced from the depressible portion of the rectangular portion, wherein the resilience of the hinge and the arms together assist in the restoration of the depressed button when it is released, and wherein when in use in an electrical device switch means is so located as to be operated by the depression of the depressible portion.
2. An arrangement as claimed in claim 1, wherein each said arm extends along substantially the whole of the length of the rectangular portion.
3. An arrangement as claimed in claim 1, wherein each said arm extends along part of the length of the rectangular portion.
4. A multi-push-button arrangement which includes a frame forming a supporting structure for a plurality of arrangements each as claimed in claim 1, 2 or 3.
5. A push-button switch arrangement, which includes a substantially rectangular portion of an electrically insulating material formed integral with a supporting structure of the same material, the rectangular portion being coupled to the supporting structure by a region of reduced thickness extending along one edge of the rectangular portion, which region of reduced thickness



forms an integral hinge for the rectangular portion, a bent-up part of the rectangular portion along the edge parallel to the first-mentioned edge, which bent-up part is depressed to operate the switch, a pair of arms each
5 extending along a respective one of the other pair of edges of the rectangular portion from adjacent the bent-up part to a region on the supporting structure spaced from the depressible portion of the rectangular portion, and electrical contact means under the bent-up portion of the
10 rectangular portion and adapted to be operated when the push-button is depressed, the resilience of the hinge and the arms assisting in the restoration of the depressed button when it is released.

6. An arrangement as claimed in claim 5, wherein each
15 said arm extends along substantially the whole of the length of the rectangular portion.

7. An arrangement as claimed in claim 5, wherein each said arm extends along part of the length of the rectangular portion.

8. A push-button switch as claimed in claim 5, 6 or
20 7, and wherein the contact means consists of a dome-like part of a rubber or rubber-like material raised towards the rectangular portion, and a member of an electrically conductive material in said dome, which member is pushed
25 onto stationary electrical contacts to complete a connection when the button is depressed, the resilience of the dome facilitating reset on release of the button.

9. An electrical keypad having a number of switches each as claimed in claim 8, wherein the push-buttons and
30 their supporting structure are an integral frame-like member and wherein the domes for all push-buttons are formed on a single sheet-like member.

10. An electrical keypad as claimed in claim 9, and which has a thin rubber-like sheet between the said
35 supporting structure and the sheet carrying the domes.

11. An electrical push-button switch substantially as described with reference to Fig. 4 of the accompanying drawings.