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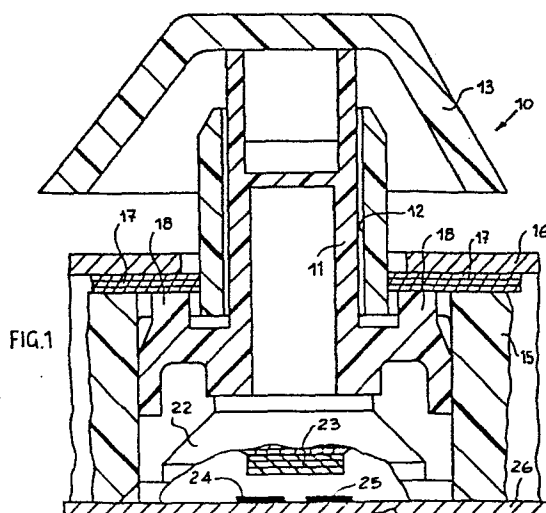
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54 Contact keyboard and method of its manufacture.

57 A contact keyboard comprising a plurality of keys (10) each having an actuator (11) movable axially in opposition to the action of an elastic element (22) to effect the connection of parts (23-25) of an electric circuit. The actuators (11) are slidable in guide recesses (12) formed by moulding in a single block (15) of plastics material. Assembly of the actuators, the guide block, the elastic elements and the electric circuit on a supporting plate (16) can be effected automatically. Assembly takes place with the block (15) upside down, on the plate (16). The actuators (12) are moulded in one piece with connecting sprues and are inserted in one operation. The sprues are then removed, the elastic elements (22) are put in place and then a printed circuit board (26) is fitted.



CONTACT KEYBOARD AND METHOD OF ITS MANUFACTURE

The present invention relates to a contact keyboard for a typewriter or other office machine and to a method of manufacturing the keyboard. The keyboard according to the invention is of the type comprising a plurality of keys each having an actuator movable axially in opposition to the action of an elastic element to effect the completion of an electric circuit, and in which each actuator is slidable in a corresponding guide recess.

A keyboard is known wherein each actuator is slidable in a small block of plastics material suitably shaped to form a modular element insertable in a corresponding seat in a base structure in accordance with a predetermined arrangement. This keyboard, although having some advantages associated with the modularity of the keys, does, however, present the drawback of being rather costly, precisely because prior to the fitting of each modular element in the base structure each module must be pre-assembled separately.

The object of the present invention is to provide a contact keyboard which has a limited number of parts to be assembled and which is reliable and inexpensive.

In accordance with this object, the keyboard according to the invention is characterised in that a plurality of guide recesses for the actuators is formed in a single support block.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a sectional side view of a key of the keyboard according to the invention;

Fig. 2 is a perspective view of some details of the keyboard according to the invention;

Fig. 3 is a median section of another detail of the keyboard according to the invention in a first embodiment;

Fig. 4 is a median section of the detail of Fig. 3 in a second embodiment;

Fig. 5 is a plan view of a further detail of the keyboard according to the invention;

Fig. 6 is a side view of the detail of Fig. 5;

Fig. 7 is a perspective view of some parts of the keyboard according to the invention and of some apparatus necessary for the manufacture thereof;

5 Fig. 8 is a perspective view of the parts of the keyboard of Fig. 7 after their assembly;

Fig. 9 is a perspective view of other parts of the keyboard according to the invention and of other apparatus necessary for the manufacture thereof;

10 Fig. 10 is a perspective view of the parts of the keyboard of Figs. 7 and 9 after their assembly; and

Fig. 11 is a perspective view of further parts of the keyboard according to the invention and of a further apparatus necessary for the manufacture thereof.

15 Referring to Fig. 1, the keyboard according to the invention comprises a plurality of keys 10 each of which has a cap 13 mounted on an actuator 11 which is slidable axially within a cylindrical recess 12 formed in a block 15 of thermoplastic material.

20 According to a characteristic of the invention, all the recesses 12 of the keyboard are formed in the block 15 (Fig. 2) by moulding.

The block 15 is mounted on a support plate 16 (Fig. 1) with the interposition of a mat 17 of sound-absorbing material, for example rubber. To facilitate the mounting of the block 15 on the plate 16, the block itself may be constituted by several elements 20 (Fig. 2), in each of which there is formed a plurality of recesses 12 and interconnected by flexible tongues 21 produced in one piece with the elements 20.

30 The actuators 11 are also of thermoplastic material, are formed in a cluster during a single moulding stage and are interconnected by sprues 30. The arrangement of the actuators 11 in the cluster corresponds to that of the recesses 12 in the block 15. The sprues 30 are suitable for being removed after  
35 the cluster of actuators 11 has been inserted in the corresponding recesses 12 in the block 15, as will be described later on.

An elastic element 22 (Fig. 1) constituted by a dome

of silicone rubber in the form of an inverted cup is adapted to cooperate with the bottom part of each actuator 11. According to a first embodiment, the median section of each elastic element 22 is that illustrated in Fig 3, while in a second embodiment each elastic element 22 may have the median section of the type illustrated in Fig. 4. Each actuator 11 (Fig. 1) is urged by the corresponding elastic element 22 towards the sound-absorbing mat 17, against which it is arrested by two stop elements 18 of the actuator.

10           A cylindrical pad 23 (Figs. 1,3,4) of conductive silicone rubber is fixed to the inside of each dome 22 and is adapted to short-circuit two elements 24 and 25 of a printed circuit 26 when the key 10 is depressed, to generate in this way in known manner a corresponding electric signal. The  
15           shape of the elastic elements 22 ensures snap contact of the pad 23 on the elements 24 and 25.

          The elastic elements 22 of the keyboard may be produced individually or formed in one or more rubber mats 28 (Figs. 5 and 6), in an arrangement corresponding to that of the  
20           recesses 12, by technologies known per se.

          The method of manufacture of the keyboard hereinbefore described, which is one of the characteristics of the invention, is as follows.

          The plate 16 is arranged on a work bench 40 (Fig. 7) and the mat 17 of sound-absorbing material is fixed to this plate.  
25           The block 15 with the recesses 12 is formed by moulding in a press 41 of known type and is thereafter mounted on the mat 17. In this way, the group A illustrated in Figure 8 is produced.

          The group A so formed is placed in an apparatus 42 (Fig. 9) on which is also arranged the cluster of sliders 11  
30           which has been formed by moulding in a press 43 of known type. The apparatus 42 inserts the sliders 11 automatically into the corresponding seats 12 in the block 15 and removes the sprues 30 therefrom. In this way, the group B illustrated in Fig. 10  
35           is produced.

          The group B so formed is placed in a machine 44 also prearranged for testing the keyboard itself. The elastic elements 22 are then arranged to correspond with the actuators 11.

This is done with the aid of a tray 45 when each elastic element 22 is independent of the others, or by directly arranging the rubber mats 28 on the block 15.

Finally, the printed circuit 26 is mounted. Before  
5 fixing the printed circuit 26 to the block 15 and the plate 16 with screws, each single key 10 is tested by the machine 44 in any known manner.

After this last stage, the keyboard according to the invention is finished and ready to be packed.

CLAIMS

1. A contact keyboard for a typewriter or other office machine, comprising a plurality of keys (10) each having an actuator (11) movable axially in opposition to the action of an elastic element (22) to effect the completion of an electric circuit, and in which each actuator is slidable in a corresponding guide recess (12), characterised in that a plurality of the guide recesses (12) is formed in a single support block (15).
2. A contact keyboard according to claim 1, characterised in that the said block (15) is of plastics material moulded to produce the guide recesses (12).
3. A contact keyboard according to claim 1 or 2, characterised in that the actuators (11) are of plastics material, produced as a single moulding with the actuators interconnected by removable sprues (30), and disposed so as to be positionable opposite the guide recesses (12).
4. A contact keyboard according to any of the preceding claims, characterised in that each of the elastic elements (22) is of an elastomer and is shaped in the form of a dome inside which is fixed a conductive pad (23) for short-circuiting electric circuit parts (24,25).
5. A method of manufacturing a contact keyboard according to any of the preceding claims, characterised by the steps of:
  - a) moulding a support block with guide recesses for the actuators;
  - b) producing the actuators by moulding in such manner that they are positionable opposite the guide recesses and are joined by removable sprues;
  - c) inserting the actuators in the corresponding guide recesses and removing the sprues;
  - d) inserting the elastic elements to correspond with the actuators; and
  - e) mounting the electric circuit.

6. A method according to claim 5, characterised in that, before fixing the circuit to the block, a test apparatus is arranged to test each key of the keyboard.

7. A method according to claim 5, characterised in that  
5 the block is mounted on a base plate with the interposition of a layer of sound-absorbing material.

8. A method of manufacturing a contact keyboard of the type comprising an electric circuit provided with a set of fixed contacts, a corresponding set of contacts movable axially in  
10 opposition to the action of elastic elements, a set of actuating sliders for actuating the movable contacts and a corresponding set of guide and stop elements for the sliders, characterised by the following steps:

a) positioning the set of guide elements according  
15 to the desired distribution of the keyboard;

b) disposing the set of guide elements on a base, these being inverted with respect to the normal working arrangement;

c) producing the movable sliders and arranging the  
20 set on a support, the sliders being inverted with respect to the normal arrangement in the same arrangement as the guide elements;

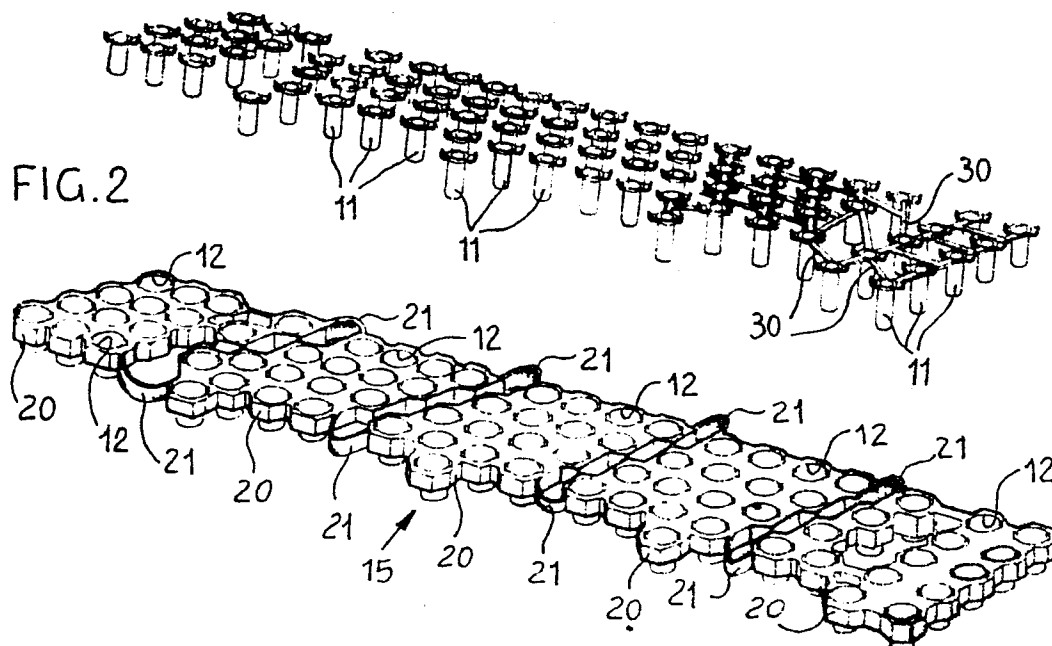
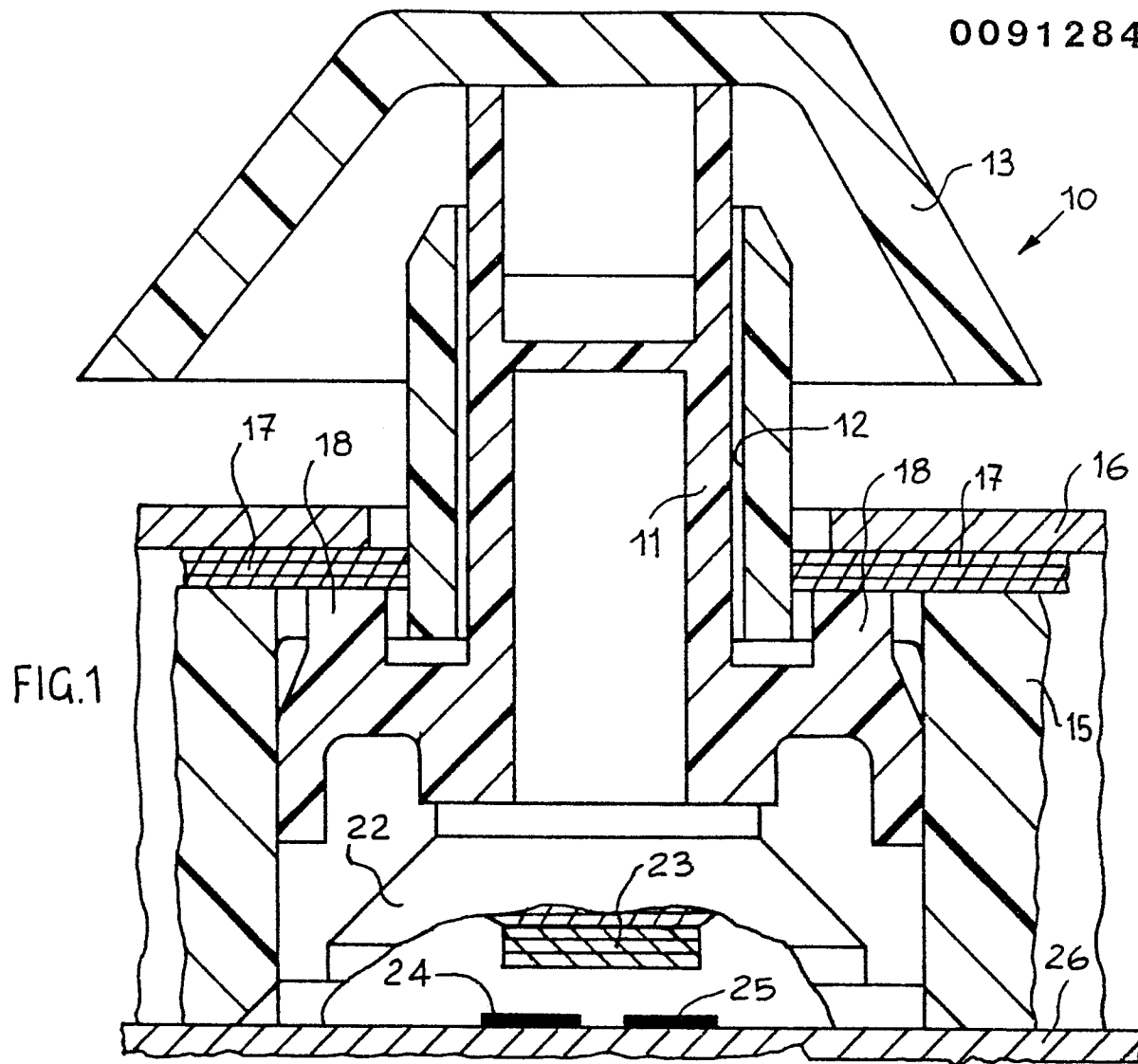
d) producing the set of movable contacts and arranging them on a support, these being inverted and in the same  
25 arrangement as the guide elements;

e) inserting the sliders in the corresponding guide elements;

f) superposing the movable contacts on the sliders;

g) superposing the electric circuit with the fixed  
30 contacts on the movable contacts; and

h) fixing the guide elements together with the electric circuit.





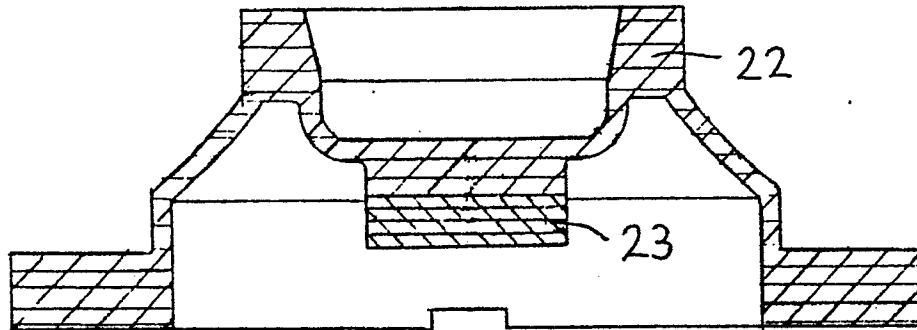


FIG. 3

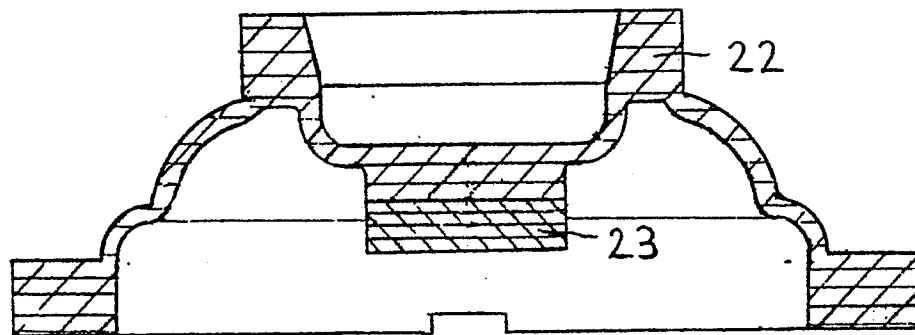


FIG. 4

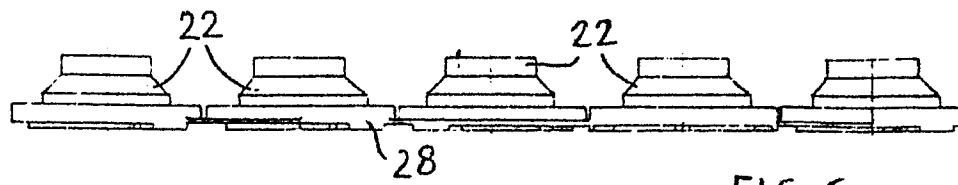


FIG. 6

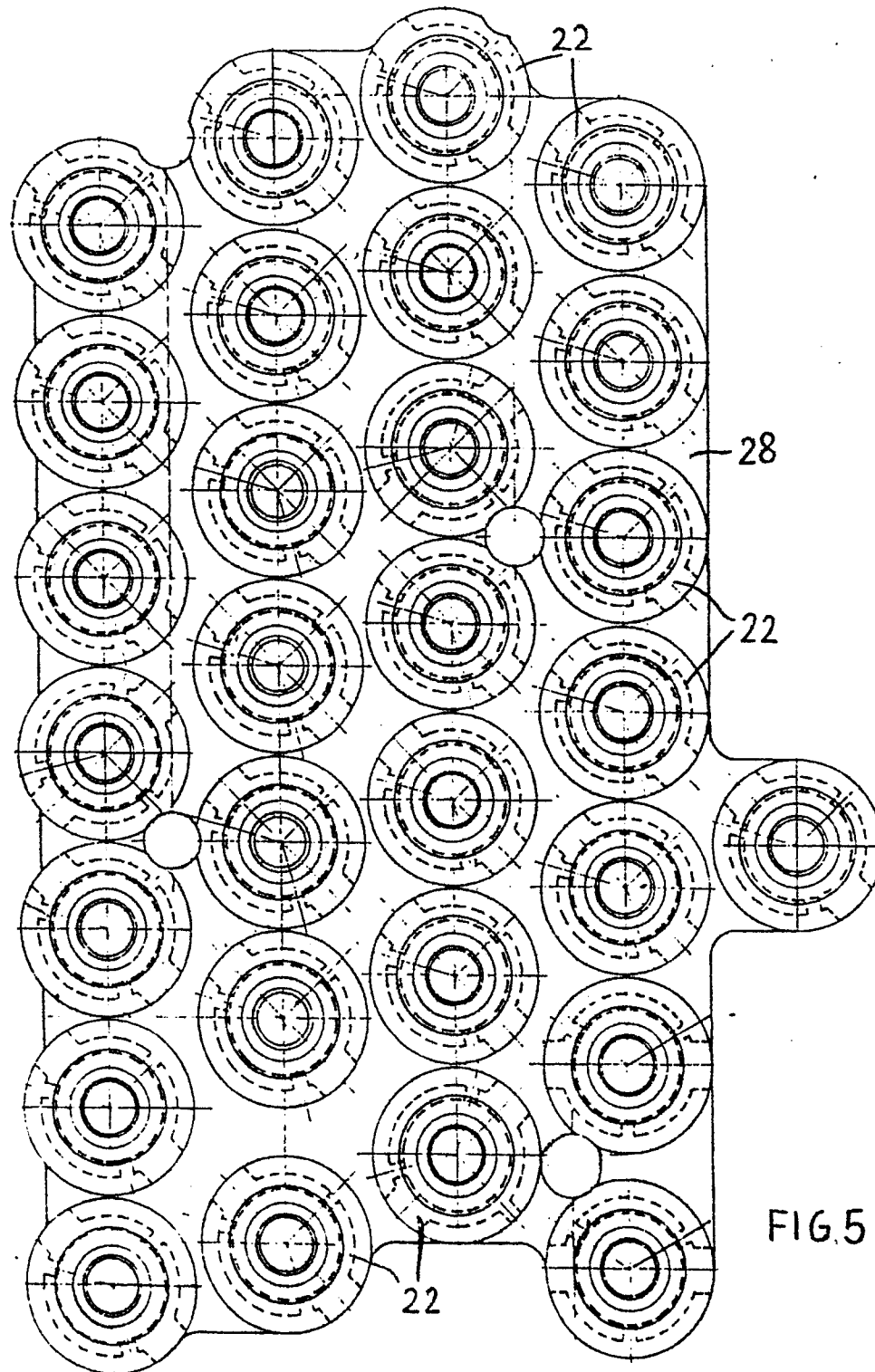


FIG. 5

