(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 101 208**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **83304210.4**

(51) Int. Cl.³: **B 41 J 5/08**

(22) Date of filing: **20.07.83**

(30) Priority: **22.07.82 GB 8221206**

(43) Date of publication of application: **22.02.84 Bulletin 84/8**

(84) Designated Contracting States: **BE CH DE FR GB IT LI LU**

(71) Applicant: **Spiralux Limited**
The Old Vicarage 128 High Street
GB-Edenbridge, Kent TN8 5AY(GB)

(72) Inventor: **Wright, Raymond Grenville Whitehead**
14 Willow Way
Hauxton Cambridge(GB)

(74) Representative: **Pratt, David Martin et al,**
Brookes & Martin High Holborn House 52/54 High Holborn
London. WC1V 6SE(GB)

(54) Keyboards.

(57) A keyboard sub-assembly for a typewriter has a baseboard (1) formed with a plurality of upstanding projections (3) which receive keys (4) with a snap action. Each key (4) is a push-fit onto the corresponding projection (3), and each key (4) is retained on the baseboard (1) by means of a lug (15) having a lip (17) which snap-engages within a recess (12) on the underside of the baseboard (1). A coil compression spring (18) is interposed between each key (4) and the corresponding projection (3). The sub-assembly of the baseboard (1) and the keys (4) can be assembled into a deck (29) with a push-fit, as a result of the baseboard having projecting lugs (27) which snap-engage within slots (32) formed in the deck (29). The keys (4) shroud the projections (3) so as to prevent foreign matter reaching the underside of the baseboard (1).

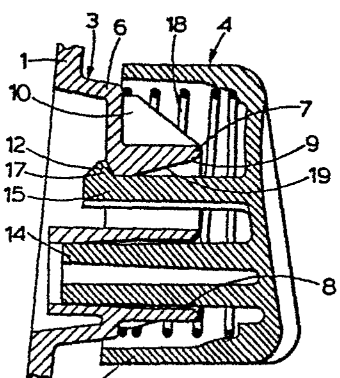

Fig.6

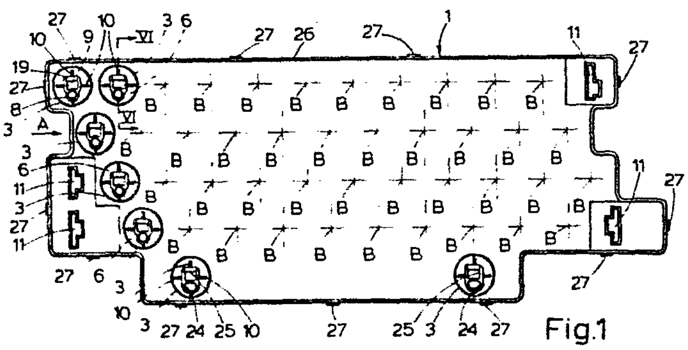

Fig.1

EP 0 101 208 A2

KEYBOARDS

This invention relates to keyboards for typewriters, word processors, computers or similar pieces of apparatus.

Conventional keyboards have keys mounted on the ends of individual levers. The movement of each of the levers is sensed or detected in order to move a respective type bar, a typing head or a typing wheel. Such keyboards are, therefore, essentially mechanical in operation, and so are expensive by virtue of the mechanical linkages used in transmitting motion from each key to the location where lever movement is sensed. Moreover, the keys are normally positioned in a large aperture in a deck, so that there is nothing to prevent foreign matter falling down between the keys and between the keys and the deck aperture. In consequence, foreign matter can easily enter the inside of the keyboard with virtually no facility for cleaning. Such considerations are by imporant if the keyboard is to be used by children.

The aim of the invention is to provide a keyboard which is simple and cheap to assemble, and which is particularly suitable for home or leisure use, where it is desirable to protect the underside of the keyboard from contamination as a result, for example, of liquid being spilt on the keyboard.

The present invention provides a keyboard sub-assembly comprising a base member and a plurality of keys, the base member being constituted by a panel whose upper surface is provided with a plurality of spaced upstanding projections, each of the keys being associated with a respective upstanding projection, wherein the keys and the panel have cooperating retaining means which retain the keys on the projections, but which allow the keys to be moved between raised and depressed positions with respect to the base member, and wherein each of the keys shrouds the associated projection.

Because the projections are shrouded by the keys, and because the base member blanks off the spaces between the projections, it is hardly possible for foreign matter spilt on or around the keys to reach the underside of the base member. This is particularly important where electrical circuitry for detecting movement of the keys is located beneath the base member.

Preferably, the panel is provided with a peripheral upstanding lip. Thus, if liquid is spilt on or around the keys, it will be prevented from reaching the underside of the base member, and will collect within the tray-like base member. The spaces between the projections define a labyrinth-like collecting area for spilt liquid.

In a preferred embodiment, each of the keys is provided with a downwardly-projecting lug which passes through an aperture formed in the associated projection, and the underneath surface of the panel is formed with a respective recess adjacent to each of the apertures, each of the lugs being provided with a retaining lip which snaps into the associated recess on assembly of the respective key onto the base member, the lugs and recesses constituting the retaining means. The keys can, therefore, be located on the base member simply by pushing the keys until they snap into position and are retained by the retaining means.

Advantageously, each key has a downwardly-projecting spigot adjacent to its lug, each of the spigots passing through a hole formed in the associated projection. Preferably, the lugs, spigots, apertures and holes are such that the keys are prevented from rotating with respect to the projections. Each of the spigots may be longer than the lug of the associated key, whereby the free end of each spigot constitutes an actuator for engagement with a respective sensor for sensing movement of that key. Conveniently, each of the spigots is generally cylindrical, and is an easy sliding fit within the associated hole, and each of the lugs is generally rectangular in cross-section.

Each of the projections may be constituted by a boss-like base and a central formation extending upwardly from the base, the central formation having a smaller cross-section than the base. Advantageously, the apertures and holes are formed in the central formations of the projections. Preferably, each of the keys is provided with a downwardly-depending skirt which shrouds the associated projection, the skirt of each key being of such a length that it extends down to the base of the associated projection when the key is in its raised and depressed positions.

Preferably, resilient means are incorporated between each key and the base member to urge each key towards its raised position, and to provide a spring return after each key has been depressed and then released. Advantageously, each of the resilient means is constituted by a coil compression spring which rests on the upper surface of the base of the associated projection and surrounds the central formation of that projection. Conveniently, the base member is a moulded member made of ABS plastics material.

The invention also provides a keyboard comprising a keyboard sub-assembly as defined above, and a deck for supporting and surrounding the keyboard sub-assembly. Advantageously, the keyboard sub-assembly is push-fitted in position on the deck. This means that the base member, keys and springs may be assembled together to form the keyboard sub-assembly, which can then readily be incorporated in any sort of apparatus or appliance. In a preferred embodiment the base member is provided with retaining lugs, each of which is a snap-fit within a respective aperture formed in the deck. Alternatively, the base member can be detachably fixed to the deck in any other suitable way.

The keys and the deck are preferably made from a synthetic plastics material such as high-impact polystyrene.

As mentioned above, the lower ends of the key spigots are preferably used to detect key movement. A preferred arrangement is for depression of a key to be detected electrically immediately underneath that key, thereby avoiding the mechanical linkages of the prior art. A preferred way of doing this is for key depression to cause the key spigot to press together two plastics sheets carrying printed circuits. Thus, the keyboard may further comprise plastics sheet means carrying two printed electrical circuits, each of the circuits having a respective node in alignment with each of the keys, and wherein the arrangement is such that the two nodes aligned with each of the keys are normally spaced apart, and such that said two nodes can be brought into electrical contact by the downward movement of the spigot of the associated key as that key moves from its raised position to its depressed position. Preferably, the two electrical circuits are printed on a pair of overlapping synthetic plastics sheets, and a perforated insulating spacer sheet is positioned between the pair of synthetic plastics sheets, the perforations in the spacer sheet being located at the overlapping nodes and underneath the spigots of the keys. The plastics sheets may be mylar sheets.

Assembly of the keyboard is then extremely straightforward. The plastics sheets and insulating spacer are laid in position in a shaped recess in the deck, after which the keyboard sub-assembly is simply snapped into position in the deck, each spigot being automatically positioned over a corresponding pair of aligned nodes, so that depression of a selected key causes the printed circuit on the two overlapping mylar sheets to make contact at the appropriate nodes. This signal is then fed to drive means, such as a solenoid, which is used to move a printing head, preferably a daisy wheel printing head.

A typewriter keyboard constructed in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a plan view of the base member of the keyboard;

Fig. 2 is an end view of the base member, looking in the direction of the arrow A shown in Fig. 1;

Figs. 3, 4 and 5 are respectively side, plan and end views of one of the keys of the keyboard;

Fig. 6 is an enlarged cross-section taken on the line VI-VI of Fig. 1, but shows a key in position on the base member;

Figs. 7 and 8 are side and underneath views of a bar space key;

Fig. 9 is a cross-section taken on the line IX-IX of Fig. 8;

Fig. 10 is a plan view of a deck into which the base member fits;

Fig. 11 is a cross-section taken on the line XI-XI of Fig. 10;

Fig. 12 is a plan view of a plastics sheet (shown unfolded) which bears a printed circuit; and

Fig. 13 is a plan view of a perforated plastics sheet which forms an insulating spacer between the two halves of the plastics sheet shown in Fig. 12 when these are folded together.

Referring to the drawings, Figs. 1 and 2 show a keyboard base member in the form of a baseboard 1 made from ABS plastics material. At each of a plurality of locations, the baseboard 1 has a corresponding upstanding projection 3 (seven of which are indicated in Fig. 1). Further similar projections 3 are centred at the points B in Fig. 1, there being five rows of projections. There are eleven projections 3 in each of the three uppermost rows, ten projections 3 in the fourth row and two widely-spaced projections 3 in the fifth row, which is positioned along the lowermost edge of the baseboard 1.

The forty-three projections 3 in the four uppermost rows define the positions for keys 4 (one of which is shown in Figs. 3 to 6). The two widely-spaced projections 3 adjacent to the lowermost edge of the baseborad 1 are provided to receive a space bar key 5 (see Figs. 7 to 9).

Referring to Figs. 1 to 6, it can be seen that each projection 3 has a boss-like base 6, from which projects a central formation 7. The central formation 7 of each projection 3 is provided with a cylindrical hole 8, and a substantially rectangular-section hole 9 adjacent to the cylindrical hole. The rectangular hole 9 tapers downwardly along one edge 19, from its mouth towards the base 6. The central formation 7 of each projection 3 is strengthened by three ribs 10. The base of the hole 9 of each projection 3 has an angled recess 12.

As shown in Figures 3 to 6, each key 4 has a slightly recessed top surface 13, from the underside of which projects a cylindrical spigot 14 and a lug 15 of generally rectangular cross-section. The spigot 14 and the lug 15 of each key 4 are surrounded by a peripheral wall 16 of that key. The extremity of each lug 15 is formed with a lip 17 (see Fig. 6).

Each key 4 is pushed into position on its corresponding projection 3, with the interposition of a coil compression spring 18 (see Fig. 6) which acts to urge that key towards its raised position, and to provide a spring return action for that key. To assemble a given key 4 on the baseboard 1, its spring 18 is placed in position so that it rests on the base 6 of the respective projection 3, and surrounds the central projection 7 of that projection. The key 4 is then simply pushed into position so that its spigot 14 passes down the hole 8, and its lug 15 passes down the hole 9. As the lug moves into the hole 9, its lip 17 rides down the tapered edge 19 of that hole until its lip 17 springs with a snap action within the recess 12. The key 4 is then located in position on its corresponding projection 3 in the manner illustrated in Fig. 6. All forty-three keys 4 are pushed into position on the forty-three projections 3 in a similar manner.

The space bar key 5 (see Figs 7 to 9) is symmetrical about the centre line C-C. Towards each end, the bar 5 has a respective spigot 22 and a respective lug 23, the pair of spigots 22 and lugs 23 locating in two pairs of holes 24 and 25 in the two projections 3 adjacent to the lower edge of the baseboard 1. A coil compression spring (not shown, but similar to the springs 18) is positioned between each of these two projections 3 and the space bar key 5, in a similar manner to that described and illustrated with respect to Fig. 6 for the keys 4.

The keys 4 and 5, which are made of high-impact polystyrene, can simply be pushed into position at their desired locations on the baseboard 1. This results in a compact, easily-handled sub-assembly in which the keys 4 and 5 are firmly held with respect to the baseboard 1, but which may be detached therefrom by springing back the lugs 15 and 23, if required.

The baseboard 1 also has slots 11 for the passage of other keys such as tabulation keys and shift keys.

The two projections 3 which locate the space bar key 5 are similar to the projections 3 which locate the keys 4, but have holes 24 and 25 which are a little larger than the holes 8 and 9.

The baseboard 1 has a peripheral, upstanding lip 26 which gives the baseboard a tray-like appearance. Around its periphery, the baseboard 1 has eleven, integrally-moulded, downwardly-projecting lugs 27. Each lug 27 has an end ledge or lip 28 (see Fig. 2). The lugs 27 are provided to enable the sub-assembly of the baseboard 1, the keys 4 and 5 and the springs 18 to be snapped into position in a typewriter deck 29 (see Figs. 10 and 11). The deck 29, which is moulded from high-impact polystyrene, has a shallow recess 30 (see Fig. 10) shaped to receive the baseboard 1. The deck 29 also has eleven rectangular notches 32, which receive the respective lugs 27.

The deck 29 also has a channel 33 for a typewriter ribbon cassette (not shown), and a portion (cut-away from Figs. 10 and 11) for covering a solenoid which drives a daisy wheel print head (not shown). The underside of the deck 29 has slotted projections 34 for the passage of keys such as tabulation keys and shift keys (or their operating levers).

Fig. 12 shows a plastics sheet 35 carrying two printed circuits having nodes (such as 31 and 31<u>a</u>) at the locations of the short transverse lines printed on the circuitry. In use, the sheet 35 is folded about the line D-D, so that the two printed circuits overlap, and a perforated insulating sheet 36 (see Fig. 13) is interposed between the two printed circuits. With the sheet 35 folded around the sheet 36 in this manner, the folded sheet locates accurately in the recess 30 in the deck 29, the portions 37 of the sheet 35 being passed through a slot 38 (see Fig. 11) in the deck 29 to enable the printed circuits to be electrically connected to circuitry for detecting which keys of the keyboard are depressed.

Hence, the keyboard is assembled by folding the sheet 35 around the perforated sheet 36, and by laying the sheets in the recess 30. This automatically positions each of the perforations in the insulating sheet 36 between a respective pair of overlapping nodes such as 31 and 31a. The sub-assembly of the baseboard 1, the keys 4 and 5 and the springs 18 are then snapped into position, the lips 28 engaging with a snap action behind the notches 32. This automatically aligns the lower end of each key spigot 14 with a corresponding pair of nodes such as 31 and 31a, with the result that depression of the corresponding key 4 causes the nodes 31 and 31a to make contact through the corresponding perforation in the insulating sheet 36. The electrical connection of the nodes 31 and 31a is sensed, and the solenoid moves the daisy wheel print head to the appropriate location. It will be appreciated that the insulating sheet 36 holds apart all pairs of overlapping nodes other than the pair of nodes pressed together by the depression of a given key 4.

It will be apparent that the keyboard sub-assembly described above has a number of important advantages, particularly when used as part of a toy typewriter. Thus, the baseboard and the keys are easy and cheap to make, as they can be moulded from cheap plastics materials. Moreover, the keyboard sub-assembly can be assembled easily and quickly by snapping the keys into position on the baseboard, and the sub-assembly can easily be snapped into position on the deck of a toy typewriter. Once assembled, the keys shround the projections provided on the baseboard, and thus prevent foreign matter reaching the underside of the baseboard, where the electrical circuitry is positioned. The keyboard sub-assembly is particularly efficient at preventing liquids spilled on or around the keys from reaching the underside of the baseboard. This is because of the labyrinth-like interconnected spaces between the projections, and the tray-like formation of the baseboard. Thus, any spilled liquid is directed by the skirts of the keys onto the upper surface of the baseboard, the entire area of which is available for collecting the liquid.

Another advantage of the arrangement described above, is the particular formation of lugs and spigots beneath the keys. The cylindrical formation of the spigots permit the keys to be freely mounted for movement between their raised and depressed positions within the corresponding holes in the upstanding projections. This permits the keys to be raised and depressed without substantial risk of jamming. Moreover, the generally rectangular formation of the lugs (and the associated lips) constitutes a very simple arrangement for snapping the keys into position on the baseboard. Furthermore, the particular formation of the lugs and spigot enables the keys to be formed in a single, simple moulding operation. This is to be contrasted with the keys of known assemblies, which require complicated and multiple moulding operations.

Claim(s) Nr 12, 13, 14, 15, 17, 18 + 19 deemed to be abandoned

0101208

CLAIMS

1. A keyboard sub-assembly comprising a base member (1) and a plurality of keys (4), the base member (1) being constituted by a panel whose upper surface is provided with a plurality of spaced upstanding projections (3), each of the keys (4) being associated with a respective upstanding projection (3), wherein the keys (4) and the panel have cooperating retaining means (15,12) which retain the keys (4) on the projections (3), but which allow the keys (4) to be moved between raised and depressed positions with respect to the base member (1), and wherein each of the keys (4) shrouds the associated projection (3).

2. A keyboard sub-assembly as claimed in claim 1, wherein the panel is provided with a peripheral upstanding lip (26).

3. A keyboard sub-assembly as claimed in claim 1 or claim 2, wherein each of the keys (4) is provided with a downwardly-projecting lug (15) which passes through an aperture (9) formed in the associated projection (3), and wherein the underneath surface of the panel is formed with a respective recess (12) adjacent to each of the apertures (9), each of the lugs (15) being provided with a retaining lip (17) which snaps into the associated recess (12) on assembly of the respective key onto the base member, the lugs and recesses constituting the retaining means.

4. A keyboard sub-assembly as claimed in claim 3,

wherein each key (4) has a downwardly-projecting spigot (14) adjacent to its lug (15), each of the spigots (14) passing through a hole (8) formed in the associated projection.

5. A keyboard sub-assembly as claimed in claim 4, wherein the lugs (15), spigots (14), apertures (9) and holes (8) are such that the keys (4) are prevented from rotating with respect to the projections (3).

6. A keyboard sub-assembly as claimed in claim 4 or claim 5, wherein each of the spigots (14) is longer than the lug (15) of the associated key (4), whereby the free end of each spigot (14) constitutes an actuator for engagement with a respective sensor for sensing movement of that key (4).

7. A keyboard sub-assembly as claimed in any one of claims 4 to 6, wherein each of the spigots (14) is generally cylindrical, and is an easy sliding fit within the associated hole (8).

8. A keyboard sub-assembly as claimed in any one of claims 3 to 7, wherein each of the lugs (15) is generally rectangular in cross-section.

9. A keyboard sub-assembly as claimed in any one of claims 1 to 8, wherein each of the projections (3) is constituted by a boss-like base (6) and a central formation (7) extending upwardly from the base (6), the central formation (7) having a smaller cross-section than the base (6).

10. A keyboard sub-assembly as claimed in claim 9 when

to be abandoned

appendant to claim 4, wherein the apertures (9) and holes (8) are formed in the central formations (7) of the projections (3).

11. A keyboard sub-assembly as claimed in claim 9 or claim 10, wherein each of the keys (4) is provided with a downwardly-depending skirt (16) which shrouds the associated projection (3), the skirt (16) of each key (4) being of such a length that it extends down to the base (6) of the associated projection (3) when the key (4) is in its raised and depressed positions.

12. A keyboard sub-assembly as claimed in claim 3, or in any one of claims 4 to 11 when appendant to claim 3, wherein resilient means (18) are incorporated between each key (4) and the base member (1) to urge the key (4) towards its raised position.

13. A keyboard sub-assembly as claimed in claim 12 when appendant to claim 9, wherein each of the resilient means is constituted by a coil compression spring (18) which rests on the upper surface of the base (6) of the associated projection (3) and surrounds the central formation (7) of that projection (3).

14. A keyboard sub-assembly as claimed in any one of claims 1 to 13, wherein the base member (1) is a moulded member made of ABS plastics material.

15. A keyboard comprising a keyboard sub-assembly as claimed in any one of claims 1 to 14, and a deck (29) for supporting and surrounding the keyboard sub-assembly.

Claim(s) Nr 17,18+19 deemed to be abandoned

16. A keyboard as claimed in claim 15, wherein the keyboard sub-assembly is push fitted in position on the deck (29).

17. A keyboard as claimed in claim 16, wherein the base member (1) is provided with retaining lugs (27), each of which is a snap fit within a respective aperture (32) formed in the deck (29).

18. A keyboard as claimed in any one of claims 15 to 17, wherein the keys (4) and the deck (29) are made of high-impact polystyrene.

19. A keyboard as claimed in any one of claims 15 to 18, further comprising plastics sheet means (35) carrying two printed electrical circuits, each of the circuits having a respective node (31,31a) in alignment with each of the keys (4), and wherein the arrangement is such that the two nodes (31,31a) aligned with each of the keys (4) are normally spaced apart, and such that said two nodes (31,31a) can be brought into electrical contact by the downward movement of the spigot (14) of the associated key (4) as that key (4) moves from its raised position to its depressed position.

20. A keyboard as claimed in claim 19, wherein the two electrical circuits are printed on a pair of overlapping synthetic plastics sheets (35), and wherein a perforated insulating spacer sheet (36) is positioned between the pair of synthetic plastics sheets (35), the perforations in the spacer sheet (36) being located at the overlapping nodes (31,31a) and underneath the spigots (14) of the keys

(4).

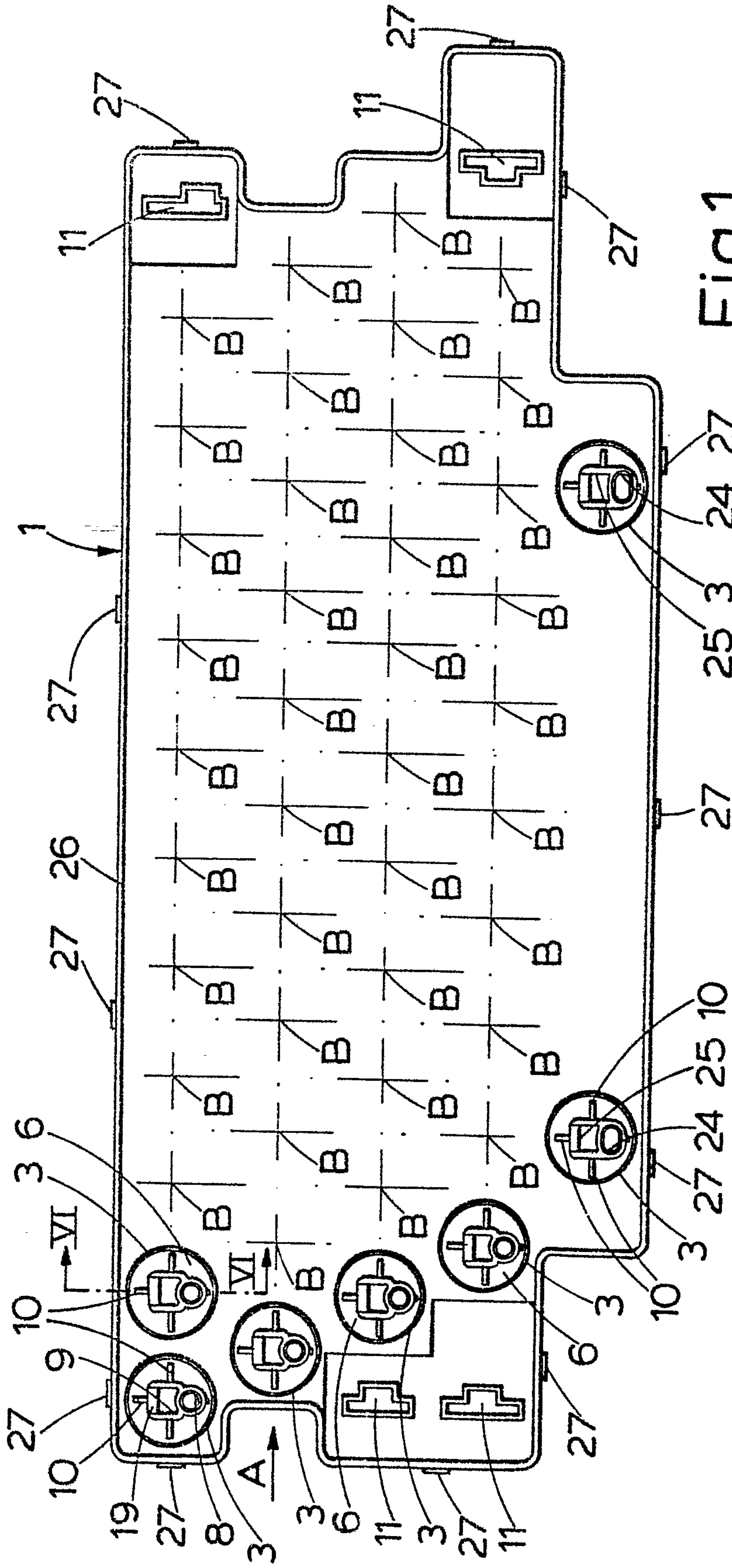

Fig.1

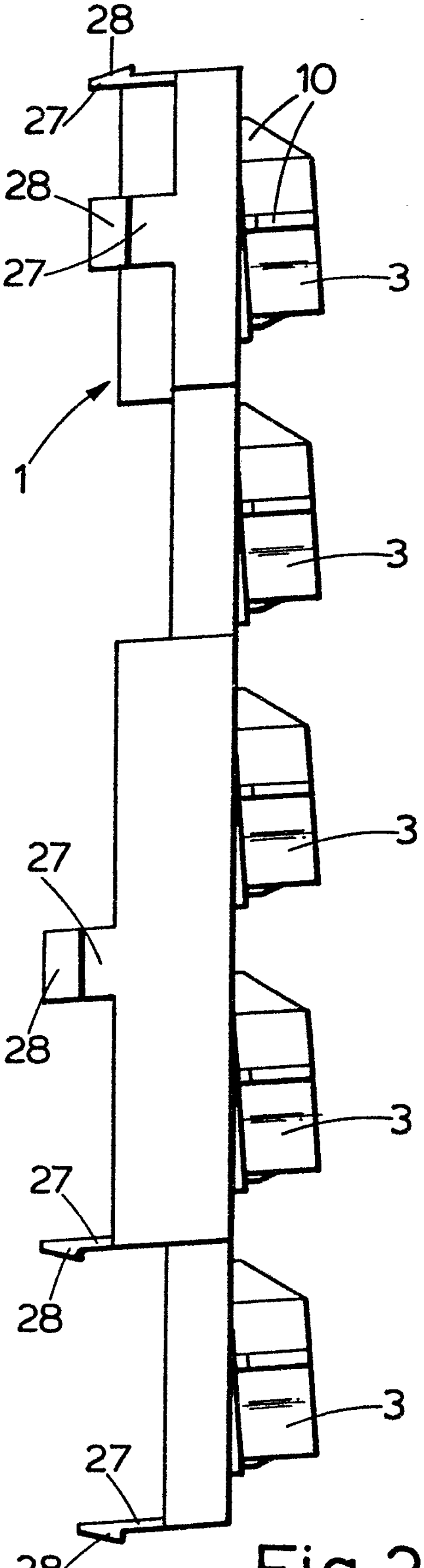

Fig. 2

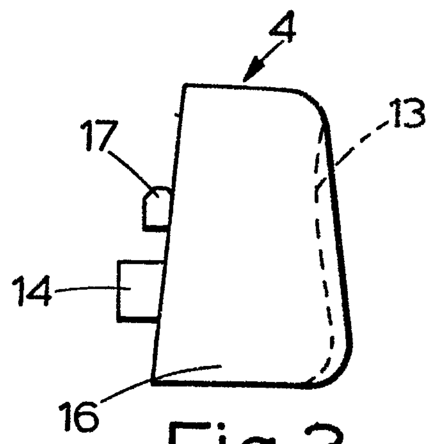

Fig. 3

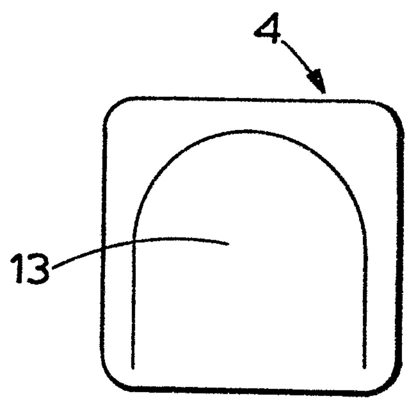

Fig. 4

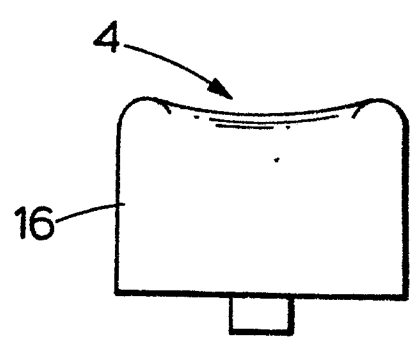

Fig. 5

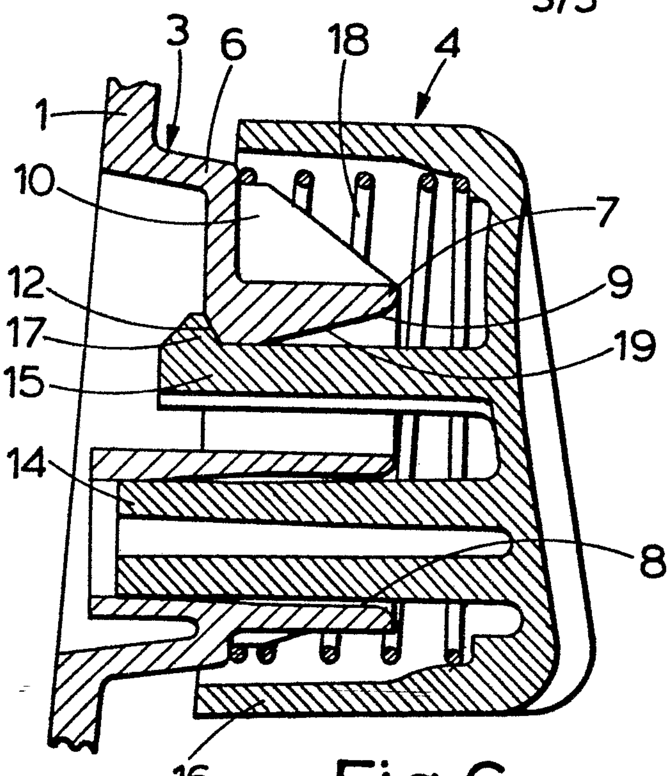

Fig.6

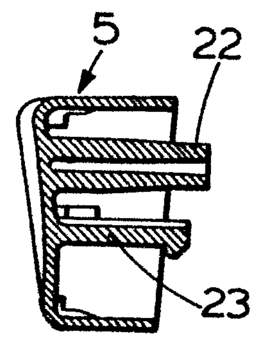

Fig.9

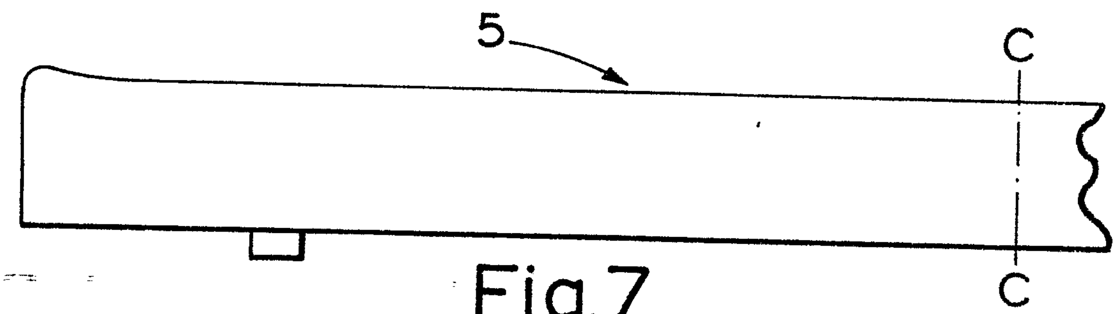

Fig.7

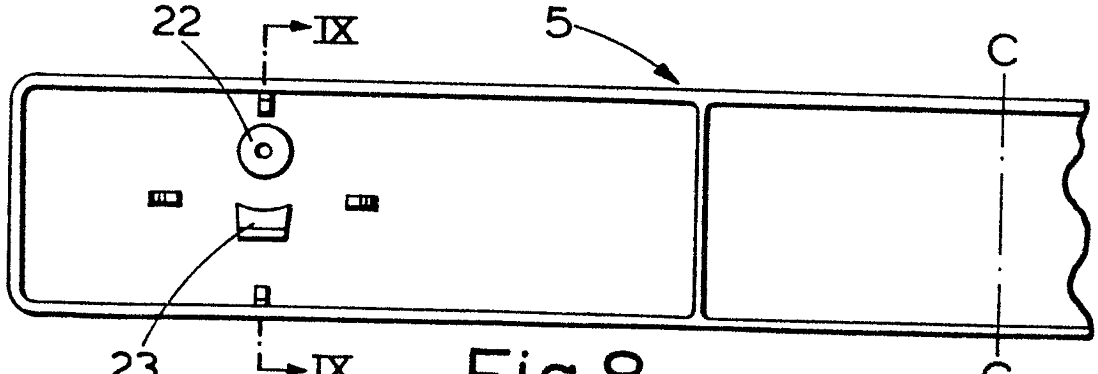

Fig.8

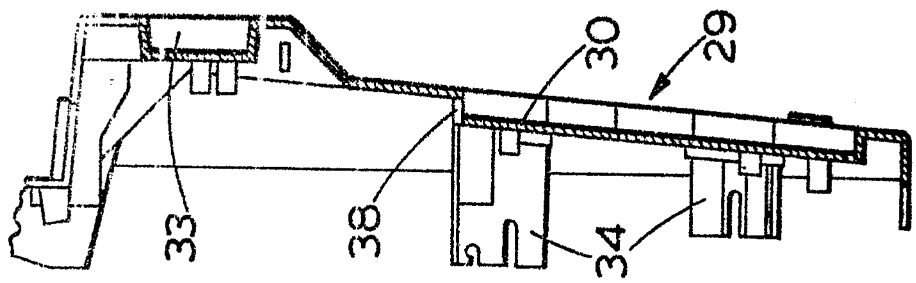

Fig.11

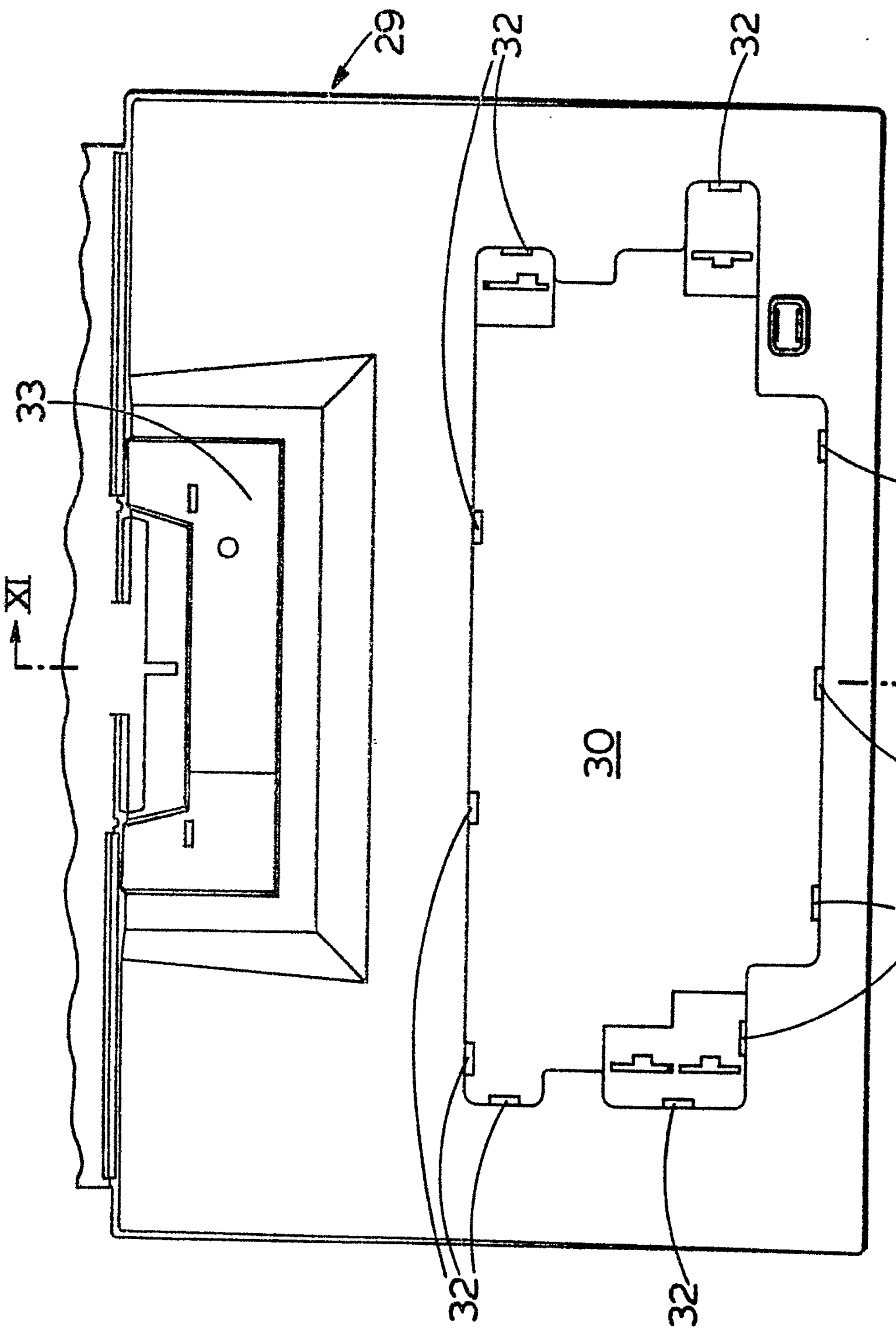

Fig.10

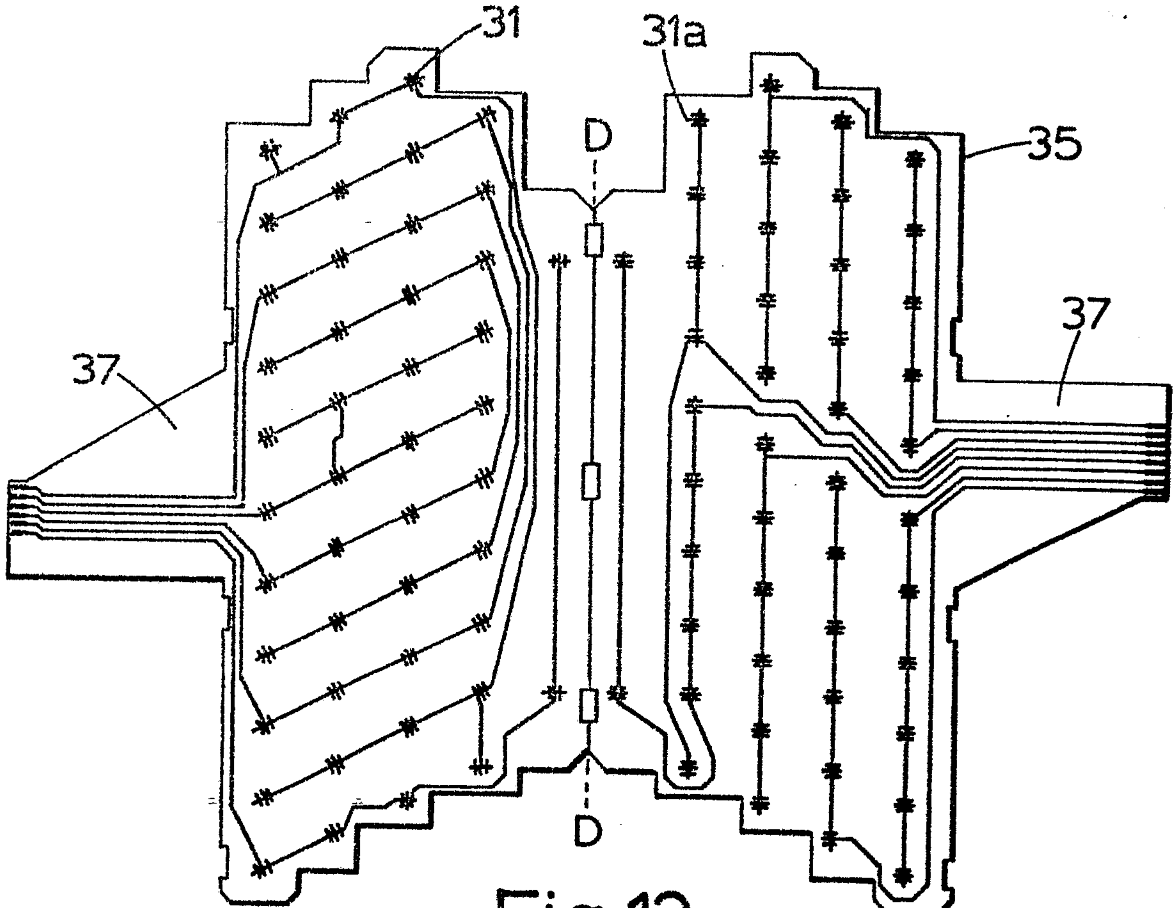

Fig.12

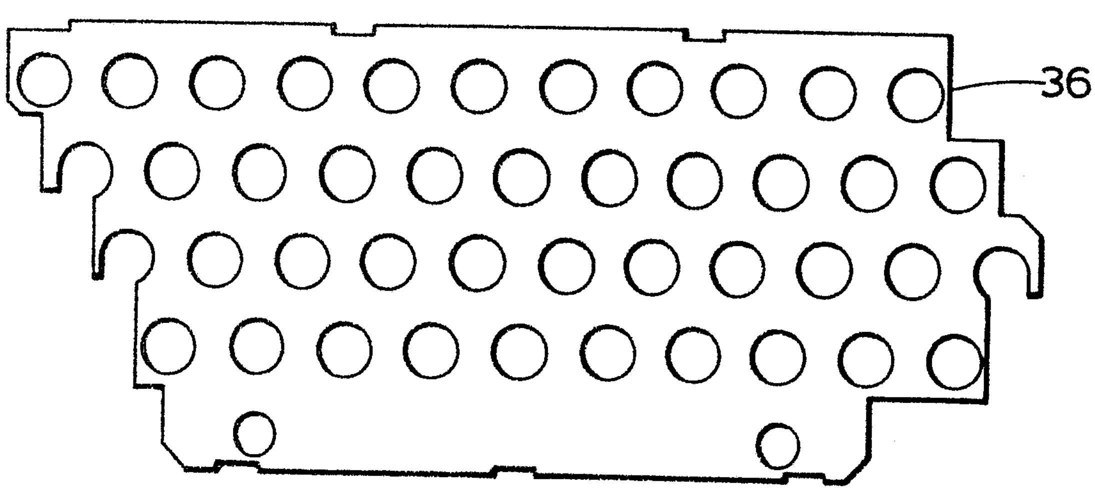

Fig.13