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(71) Applicant: **Domustech S.P.A.**
10015 Ivrea (TO) (IT)

(72) Inventors:
• **Colombo, Pierangelo**
20033 Desio (MI) (IT)
• **Lavazza, Alberto**
21010 Vizzola Ticino (VA) (IT)

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(54) **Slim pushbutton unit**

(57) Slim pushbutton unit (21), comprising a support base (23) and a button (24), mounted on the support base (23), provided for moving between an actuating position and a rest position. The button (24) has a body (28) hinge-mounted on the support base (23) through a linkage comprising a bridge section (29) of the aforementioned body (28). The crosspiece of the bridge (29)

constitutes the pin (31) of the hinge-mounting and has an appendage (32). The support base (23) comprises a protruding slug (34) that defines cylindrical surfaces (36, 37) and a channel (38), respectively coupled with the pin (31) and with the appendage (32) for rotational guidance and axial contrast of the button (24), substantially without any play.

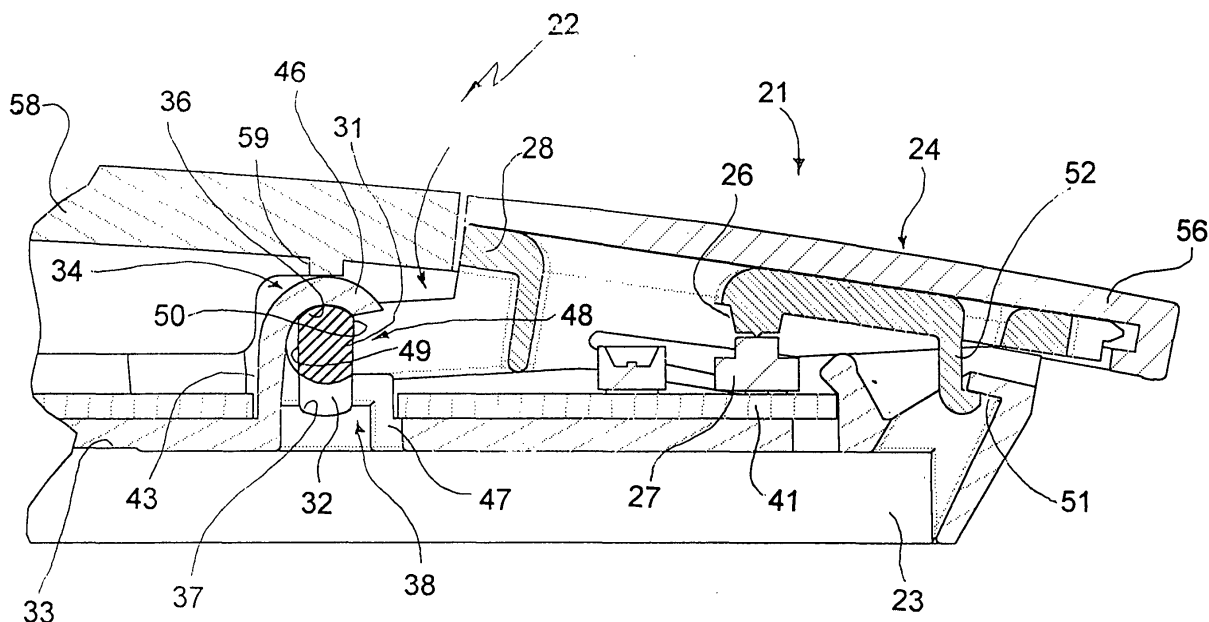


FIG. 4

Description

FIELD OF THE INVENTION

[0001] This invention relates to a slim-size pushbutton unit for domestic electrical systems.

[0002] In particular, the invention relates to a slim-size pushbutton unit comprising a support base and a pushbutton mounted on said base having the possibility of moving between an actuation position and a rest position.

BACKGROUND OF THE INVENTION

[0003] Pushbutton units are widely used on button panels of systems for residential environments, where aesthetics is a factor of considerable importance.

[0004] One problem linked with this form of use is due to the fact that the buttons, on account of their working tolerances or wear, are liable to dissymmetrical sticking and misalignments that are immediately obvious on the button panels.

SUMMARY OF THE INVENTION

[0005] One object of this invention is to produce a slim pushbutton unit, the button of which is easy to actuate, and which has a stable and perfectly defined position assuring optimal alignment and where the distances between buttons and between one button and the rest of the device the assembly is fitted in are absolutely identical.

[0006] Another object of the invention is to produce a slim pushbutton unit the button of which moves smoothly and precisely and without any risk of tilting when actuated.

[0007] These objects are achieved by the pushbutton unit of the invention in which the button has a body hinge-mounted on its support via a linkage according to the characteristic part of claims 1 or 24 or 25 or 27.

[0008] The device of the invention is particularly suited to making button panels usable comfortably in systems in residential environments having very high level aesthetics and functionality. The device is also suitable for use in button panels of various types and with a limited number of different components.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The characteristics of the invention will become clear from the description that follows, provided solely by way of non-restrictive example, with the aid of the accompanying drawings, in which:

Fig. 1 represents an expanded schematic view of a pushbutton unit according to invention together with other identical pushbutton units on a button panel; Fig. 2 is a schematic view of the pushbutton units

of figure 1, partly assembled;

Fig. 3 represents an axial section of the pushbutton unit of the invention;

Fig. 4 represents another section of the pushbutton unit of the invention;

Fig. 5 represents a schematic view of a button panel that uses the pushbutton unit of the invention; and Fig. 6 represents a schematic view of an electric module for domestic electrical systems with the button panel of Fig. 5.

DESCRIPTION OF A PREFERRED MODE FOR CARRYING OUT THE INVENTION

[0010] With reference to figures 1 and 4, the numeral 21 is used to designate a slim pushbutton unit used in a button panel 22 intended, for example but not exclusively, for domestic systems.

[0011] The pushbutton unit 21 comprises a support base 23 and a button 24 of plastic material, wherein the button 24 is mounted on the base 23 and is provided for moving between a rest position and an activation position. In the rest position, an operating part 26 of the button 24 is remote from the base 23 and from an actuating component 27 whereas, in the activation position, said part 26 actuates the component 27.

[0012] According to the invention, the button 24 has a body 28 that is suitable for assembling with the support base 23 by hinge-mounting with a linkage comprising a bridge section 29 of the body 28, wherein the crosspiece of this bridge section forms the pin 31 of the hinge-mounting and a contrast appendage 32 which protrudes from the pin 31.

[0013] The support base 23 has a flat part 33 which, associated with the button 24, offers a protruding structure consisting of a profiled slug 34. Said slug has opposing hinging surfaces 36 and 37, cylindrical in shape for example, and a channel 38, for cooperating respectively with the pin 31 and the appendage 32.

[0014] The cylindrical surfaces 36 and 37 are tightly coupled as bearings with the pin 31 and the channel 38 is coupled as a guide with the appendage 32. In this way, the button 24 is guided by the surfaces 36 and 37 and by the channel 38 without any play in its rotational actuating motion and remains strictly confined, again in this case without any play, in its axial reference position.

[0015] In detail, the pushbutton unit 21 comprises a support plate 41, which is mounted on the flat part 33 of the base 23 by means of teeth 42 (Fig. 3). The support plate 41 supports the associated activating component 27 and presents an aperture 43 (Fig. 4) through which the profiled slug passes 34. The component 27, made typically of a micro-switch, is in a line with the pin 31 and in correspondence with the operating part 26 of the button 24.

[0016] The profiled slug 34 is hook shaped and has, in the most protruding and embossed part, a central section 46 and, adjacent to the base, two lateral sections

47-1 and 47-2. The section 46 and the sections 47-1 and 47-2 together bound off a passage area 48 for the pin 31, in the button assembling stage, as will be described below.

[0017] The central section 46 defines the coupling surface 36 as the upper cylindrical sector in figure 3, and the sections 47-1 and 47-2 define the coupling surface 37 as the lower cylindrical sectors in figure 3 for coupling, from diametrically opposed ends, with a central section and, respectively, with the lateral sections of the pin 31.

[0018] The support base 23 comprises a shoulder 51 and the body 28 of the button 24 comprises a tooth 52 that may be stopped by the shoulder for defining the rest position of the button.

[0019] To advantage, the body 28 of the button 24 (Fig. 3) comprises two elastically resilient tongues 53, produced towards the bottom in the arms defined by the bridge section 29. The tongues collaborate with the support plate 41 to recall the button 24 to its rest position.

[0020] The body 28 of the button 24 has a flattened structure (Figs. 1 and 2) and may accommodate a snap-fit identifying button cover, also called button cover plate and designated with the numeral 56. For this purpose, the button body comprises a pair of elastically resilient ribs 57-1 and 57-2, made at its sides and having a blocking action on the cover plate 56.

[0021] The pushbutton unit 21 comprises also a stable cover plate 58 (Fig. 4) which is suitable for stable assembly with the support base 23, above the bridge section 29. The stable cover plate 58, on the face towards the base 23, has a protrusion 59 which, during use, collaborates with the central section 46 of the slug 34, thereby helping to make the coupling between the pin 31 and the surfaces 36 and 37 tighter and more secure.

[0022] The bridge section 29 protrudes and is inclined towards the bottom with respect to the body 28 of the button 24, and the stable cover plate 58 extends above this section and is co-planar, during use, with the button cover plate 56.

[0023] As depicted in the figures 1, 5 and 6, the pushbutton unit 21 may be assembled in one of various locations of the button panel 22: the support base 23 is common to all the locations and has a substantially rectangular section.

[0024] The bodies of the buttons 24 protrude from the two sides of the support base 23 and are arranged in a line on the two sides of the base 23. According to the invention, it is possible for the button cover plates 56 to engage the bodies of various buttons. This produces an increase in the surface area actuated by the buttons, in association with a number of independent actuators that is less than the number of locations.

[0025] In detail, the button panel 22 comprises four locations for each side, with the possibility of incorporating from one to four buttons per side via plates. The contrast action of the teeth 52 on the shoulders 51 pro-

vides an effective anti-tear function for the buttons 28 in their rest positions, exceeding the limits associated with the embossed structures of the buttons and the ample activating surface.

[0026] The button panel 22 (Fig. 6) may be snap-fitted with built-in modules 61, which may in turn be inserted in standard rectangular boxes, or with wall-mount modules not shown in the drawings. Coupling takes place via contrast surfaces 62-1, 62-2 of the module 61 and contrast surfaces 63-1, 63-2 of the support base 23, complementary to the surfaces 62-1, 62-2 of the module 61.

[0027] In particular these modules are described in the Italian patent applications No. TO2001A000477 and TO2001A000481 entitled respectively: "Modular plate for electrical systems" and "System for control and actuations for domestic electrical systems", and filed by the Applicant on May 23, 2001.

[0028] The pin 31 of the button 24 has a cylindrical surface 45 and is profiled longitudinally in such a way as to present two substantially flat faces 49 and 50 with a thickness associated with the area of passage 48 between the surfaces 36 and 37 and, for example, only slightly greater than the clearance of this area.

[0029] The contrast appendage 32 has the same thickness determined by the faces 49 and 50 and, together with these faces, lies substantially perpendicular to the bridge section 29. The guide channel 38 for the appendage 32 is in turn formed by the lateral sections 47-1 and 47-2 of the relative protruding structure 34.

[0030] The coupling of the pin 31 with the central section 46 and with the lateral sections 47-1 and 47-2 is assured by two cylindrical sectors of the surface 45, respectively for the surface 36 and for the surface 37.

[0031] In assembly of the pushbutton units 21 (Fig. 1) on the button panel 22, the support plate 41 is mounted on the support base 23, with the slugs 34 passing through the apertures 43, and it is blocked by the action of the teeth 42.

[0032] Each of the buttons 24 is first placed vertically with respect to the support plate 41 (Fig. 2), with the pins 31 presented ready for insertion in front of the area of passage 48 of the relative slug 34 and, later, having this area 48 traversed by the faces 49 and 50 with limited deformation of the section 46.

[0033] The buttons are now rotated to their natural position, until the tabs 53 are meshed with the support plate 41. The teeth 52 bend to overcome the shoulder 51 and spring into their working position. In this condition, the pins 31 can rotate but not move with respect to the coupling surfaces 36 and 37.

[0034] After the buttons 24 are positioned, the stable cover plate 58 is blocked on the base 23, making the hinging of the buttons more robust through the protrusion 59. The button cover plates 56 can now be inserted on the bodies of each of the buttons 24 either individually or via the incorporation of various buttons, depending on the configuration selected for the button panel.

[0035] The button panel 22 may then be snap-fitted with module 61, or another wall-mount module.

[0036] With this structure, the individual buttons 24 remain in positions that are perfectly defined by the base 23 and by the tight, play-free coupling granted by the protruding structures 34 and by the stable cover plate 58.

[0037] The button panel has mounting possibilities on components that can be built into standard format boxes, with the buttons 24 protruding for comfortable actuation. The coupling between the tooth 52 of the buttons and the shoulder 51 prevents the button from becoming unhinged from its support base 23, following an impact or abnormal lifting action on the button itself.

[0038] Naturally, while the principle of the invention remains constant, the embodiments and construction details may vary significantly with respect to what has been described and illustrated up to now by way of non-restricting example, without exiting from the scope of this invention.

Claims

1. Slim pushbutton unit (21) comprising a support base (23) and a button (24) mounted on said base (23), said button (24) being provided for moving between an activating position and a rest position, **characterized in that** said button (24) has a body (28) which is hinge-mounted on said support base (23) by means of a linkage comprising:

a bridge section (29) of said body (28), said bridge section having a crosspiece which forms a hinge pin (31) for said button and a contrast appendage (32); and
a protruding structure (34) of said support base (23), said protruding structure (34) having coupling surfaces (36, 37, 38) respectively coupled with said pin (31) and with said contrast appendage (32) for guiding the button (24) in its rotation, and contrasting it axially, substantially without play.

2. Pushbutton unit (21) according to claim 1, **characterized in that** it comprises a support plate (41) for an actuating component (27), said protruding structure (34) is extending through an aperture (43) of said support plate (41), and said component (27) is provided for being contrasted by an operating part (26) of said button (24).

3. Pushbutton unit according to claim 1 or 2, **characterized in that** said contrast appendage (32) protrudes from the pin (31) and wherein the relative coupling surface comprises a guide channel (38) for said appendage (32).

4. Pushbutton unit according to claim 1 or 2 or 3, **characterized in that** the pin (31) is delimited by a cylindrical surface (45) and the protruding structure (34) is hook-shaped having, in an embossed part, a central section (46) and, adjacent to the base, two lateral sections (47-1 and 47-2), and wherein said central section (46) and said lateral sections (47-1 e 47-2) define the coupling surfaces (36, 37), at diametrically opposing ends, for said cylindrical surface (45).

5. Pushbutton unit according to claim 4, **characterized in that** the coupling surfaces (36, 37) are made of cylindrical sectors.

6. Pushbutton unit (21) according to claim 4 or 5, **characterized in that** the hinge pin (31) is profiled longitudinally in such a way as to offer two substantially flat faces (49, 50) and the protruding structure (34) defines an area of passage (48) between the coupling surfaces (36, 37), and wherein said pin (31) is coupled with the central section (46) and with the lateral sections (47-1 and 47-2) of the protruding structure (34) through two sectors of the cylindrical surface (45), the button (24) being suitable for assembly with said support base (23) via the two faces (49, 50) passing through the above-mentioned area of passage (48).

7. Pushbutton unit according to claim 6, **characterized in that** said appendage and said faces (49, 50) limit thickness of the pin (31) to a value associated with the clearance of the above-mentioned area of passage (48),

8. Pushbutton unit according to claim 6 or 7, **characterized in that** said faces (49, 50) are substantially perpendicular to said bridge section (29),

9. Pushbutton unit according to claims 3 and 6, **characterized in that** said appendage is delimited by the above-mentioned faces (49, 50) and wherein the guide channel (38) is formed by the lateral sections (47-1 e 47-2) of the protruding structure (34).

10. Pushbutton unit (21) according to one of the previous claims, **characterized in that** the support base (23) comprises a shoulder (51) and wherein the body (28) of the button comprises a tooth (52) suitable for being stopped by the above-mentioned shoulder (51) for defining said rest position.

11. Pushbutton unit according to one of the previous claims, **characterized in that** said support base (23) has a rectangular section and wherein the body of the button protrudes from one end of the above-mentioned support base (23).

12. Pushbutton unit according to claims 10 and 11, **characterized in that** said tooth (52) and said shoulder provide an anti-tear function for the button (28) in the rest position.

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13. Pushbutton unit according to one of the previous claims, **characterized in that** the body (28) of the button comprises elastically resilient tabs (53), and wherein said tabs (53) may be contrasted by the support base (23) and provide a recall function of the button (24) to said rest position.

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15. Pushbutton unit according to one of the previous claims, **characterized in that** the body (28) of the button has a flattened structure and is suitable for accommodating a snap-fit button cover plate (56) with the function of covering the buttons.

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16. Pushbutton unit according to claim 15, **characterized in that** said button (24) comprises a pair of resilient ribs, produced laterally on said body (28) and with a blocking action on the button cover plate (56).

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17. Pushbutton unit according to one of the previous claims, **characterized in that** it comprises a stable cover plate (58) which is suitable for stable assembly with the support base (23) above the bridge section (29).

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18. Pushbutton unit according to one of the claims from 4 to 9 and claim 17, **characterized in that** said stable cover plate (58) comprises a protrusion (59) suitable for contrasting said embossed part, with the function of rendering more robust the coupling between central section (46) and pin (31).

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19. Pushbutton unit (21) according to one of the previous claims, **characterized in that** said bridge section (29) protrudes from the body (24) of the button (28) and **in that** said stable cover plate (58) extends above the above-mentioned bridge section (29) co-planar, during use, with said button cover plate (56).

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20. Pushbutton unit (21) according to one of the previous claims, **characterized in that** it is suitable for assembly in one of various button panel locations and **in that** said support base (23) is common to all the locations.

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21. Button panel employing various pushbutton units according to claim 20, **characterized in that** said support base (23) has a substantially rectangular shape and wherein the bodies of the above-mentioned buttons are arranged in a line on the two sides of the above-mentioned support base (23).

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22. Button panel for pushbutton units according to claims 20 and 21, **characterized in that** it comprises button-cover plates (56) having the possibility of engaging the bodies (28) of various buttons (24) for an increase in the actuating surface in association with a number of independent actuators lower than the number of locations for the buttons (24).

23. Button panel according to claim 22, **characterized in that** it comprises four locations for each side, with the possibility of incorporating via plates from one to four buttons per side.

24. Button panel (22) for pushbutton units comprising a support base (23) and a set of buttons, **characterized in that** the above-mentioned buttons comprise respective bodies (24) hinge-mounted on said support base (23) and arranged in a line and protruding on the two sides of the above-mentioned base (23), wherein said support base (23) comprises a shoulder (51) and wherein the body (28) of the button comprises a tooth (52) suitable for being stopped by the above-mentioned shoulder (51) for defining the rest position of the button and with a substantial anti-tear function for said button (28).

25. Button panel (22) for pushbutton units comprising a support base (23) and a set of buttons, **characterized in that** the above-mentioned buttons are hinge-mounted on said base (23) and are arranged in a line on the two sides of the above-mentioned support base (23), said button panel comprising button-cover plates having the possibility of engaging the bodies of various buttons for an increase in the actuating surface in association with a number of independent actuators lower than the number of locations for the buttons.

26. Button panel according to claim 25, **characterized in that** it comprises four locations per each side, with possibility of incorporating via plates from one to four buttons per side.

27. Button panel (22) for slim pushbutton units comprising a support base (23) and a set of buttons (24) which are mounted on said base (23) and are each provided for moving between an activation position and a rest position, **characterized in that** the above-mentioned buttons are hinge-mounted on said base (23) by way of protruding structures (34) in the support base (23), said button panel comprising a support plate (41) for actuating components (27) and wherein said protruding structures (34) pass through respective apertures (43) of the above-mentioned support plate (41) with the actuating components (27) contrastable by working parts (26) of the buttons (24), said buttons being arranged in a line on the two sides of the above-men-

tioned support base (23) and having parts protruding from the above-mentioned support base.

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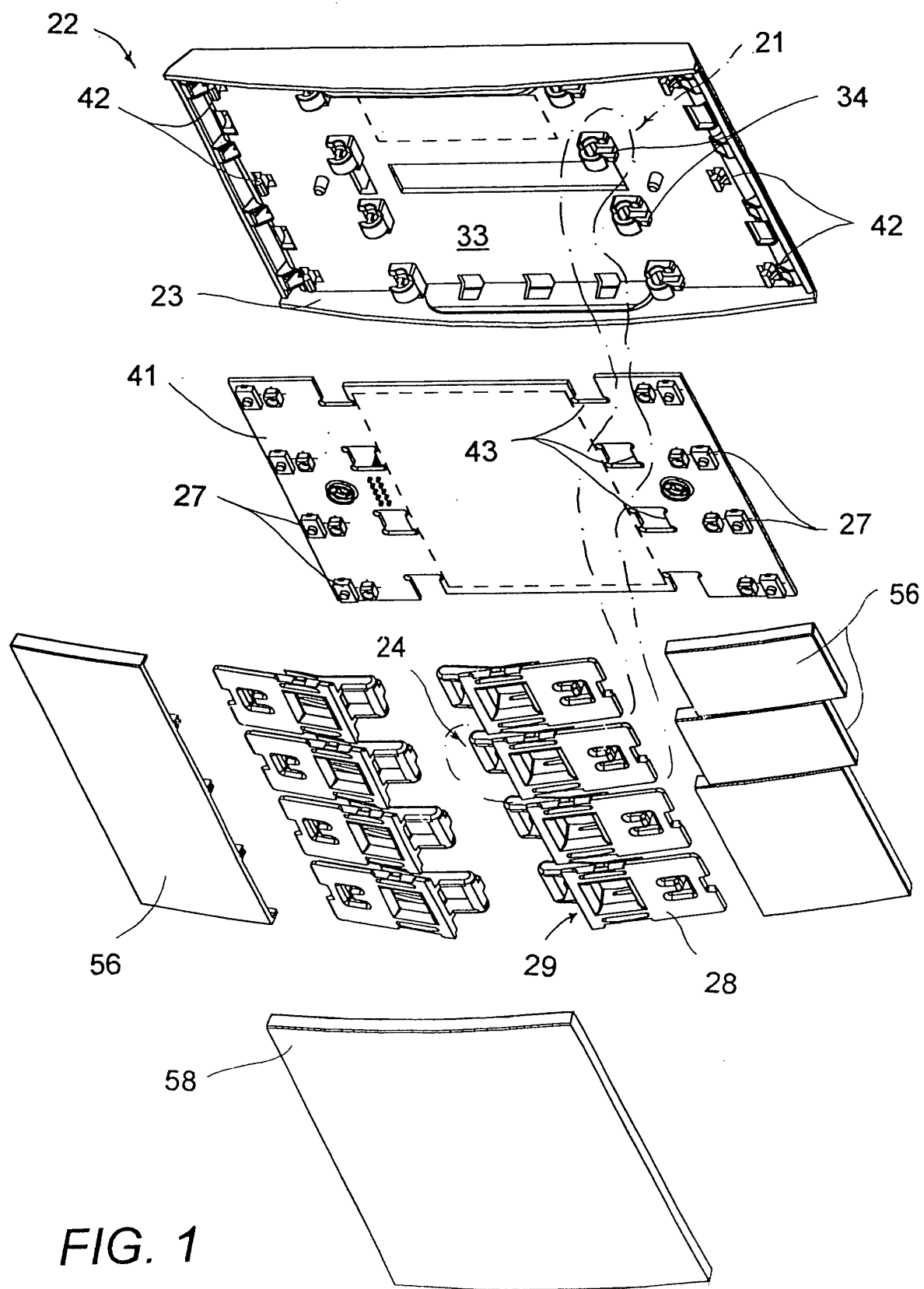
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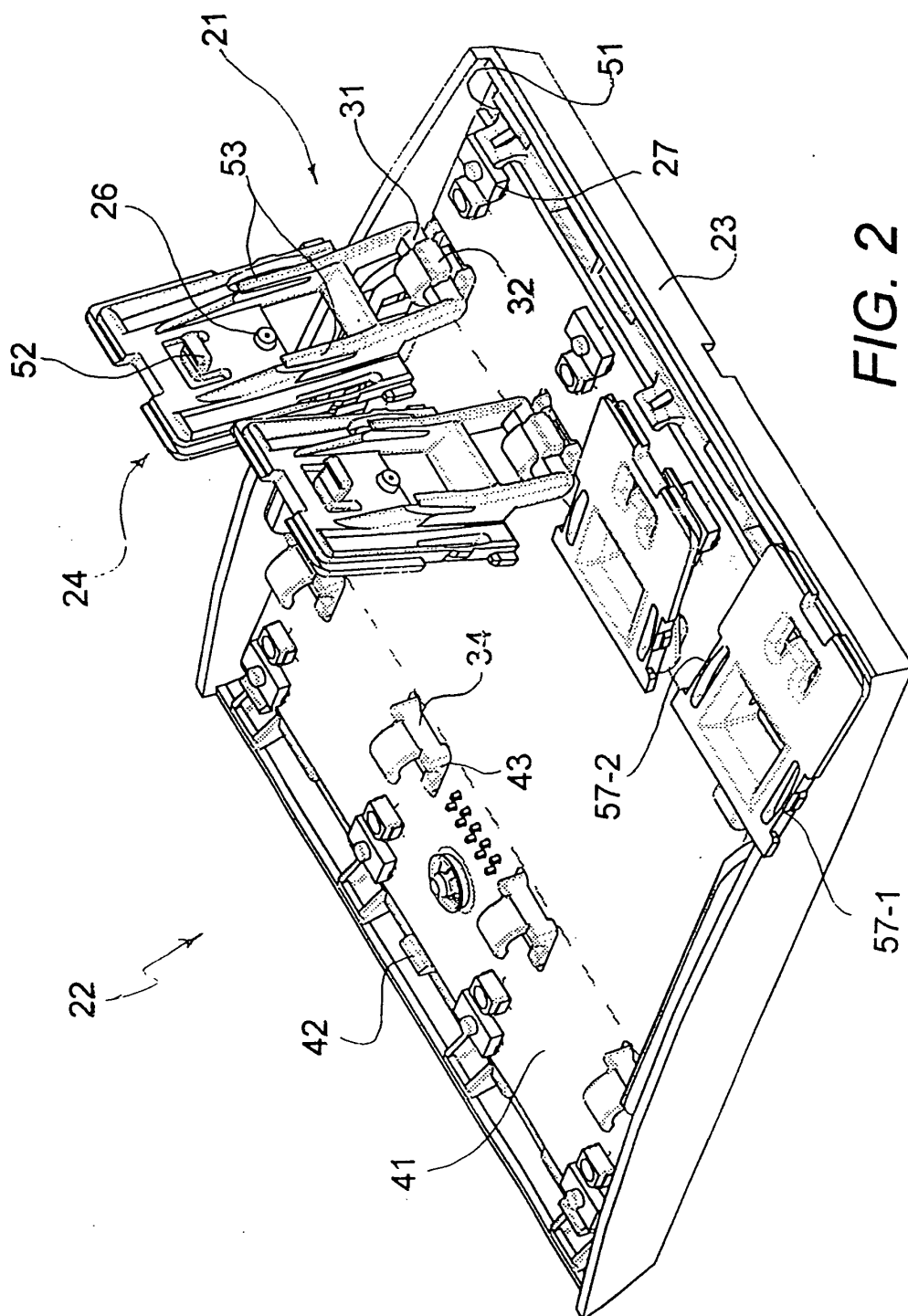
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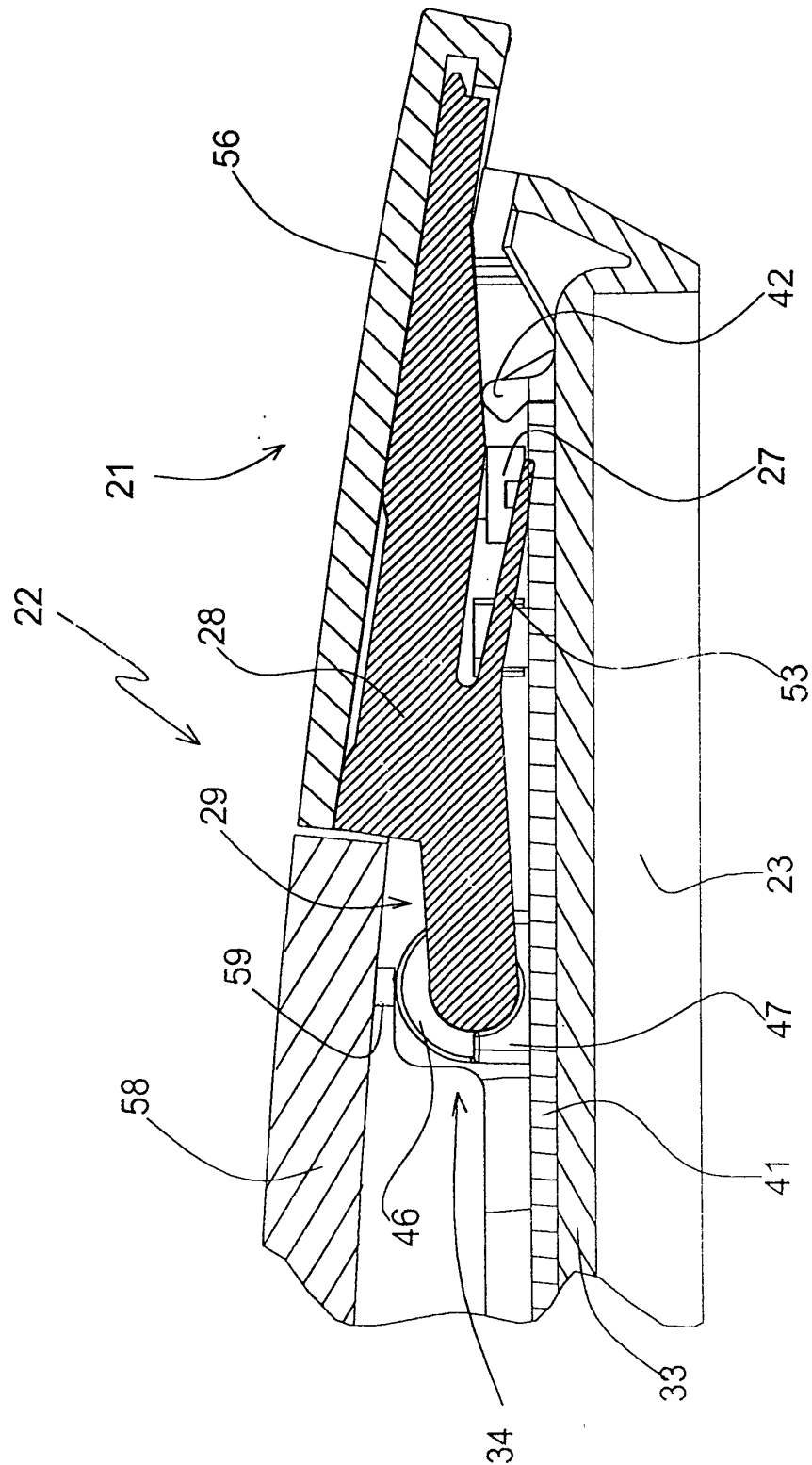


FIG. 3

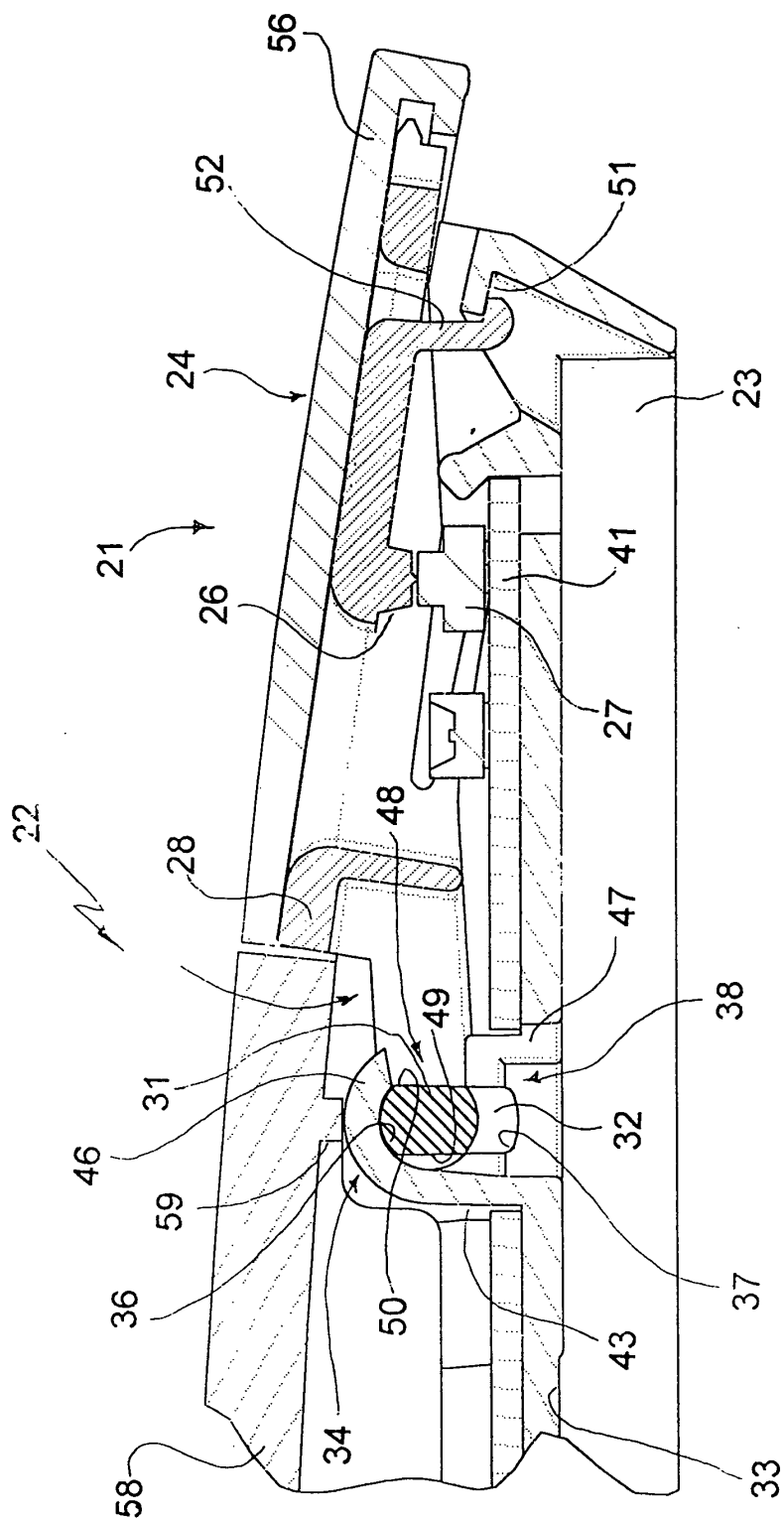


FIG. 4

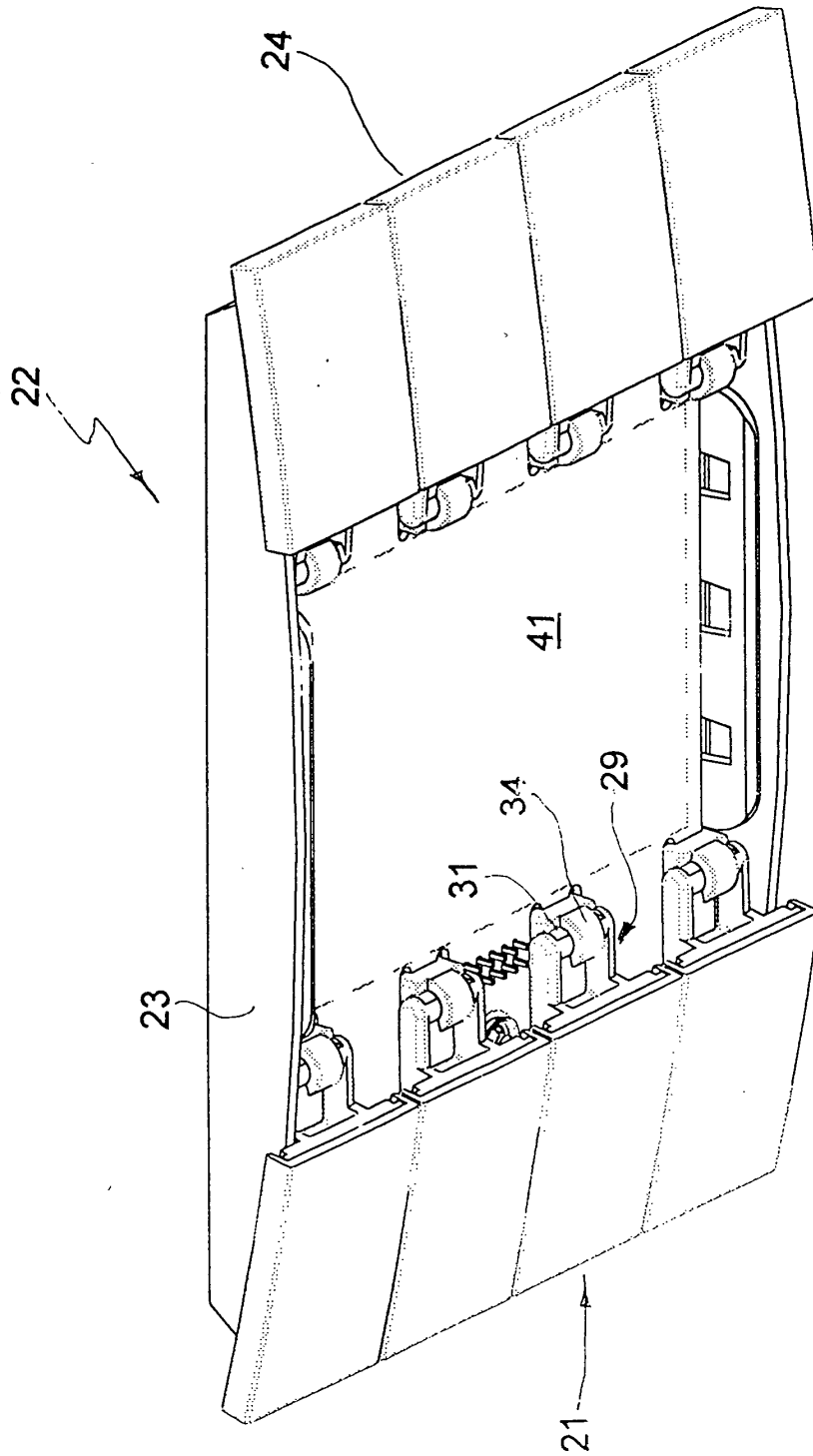


FIG. 5

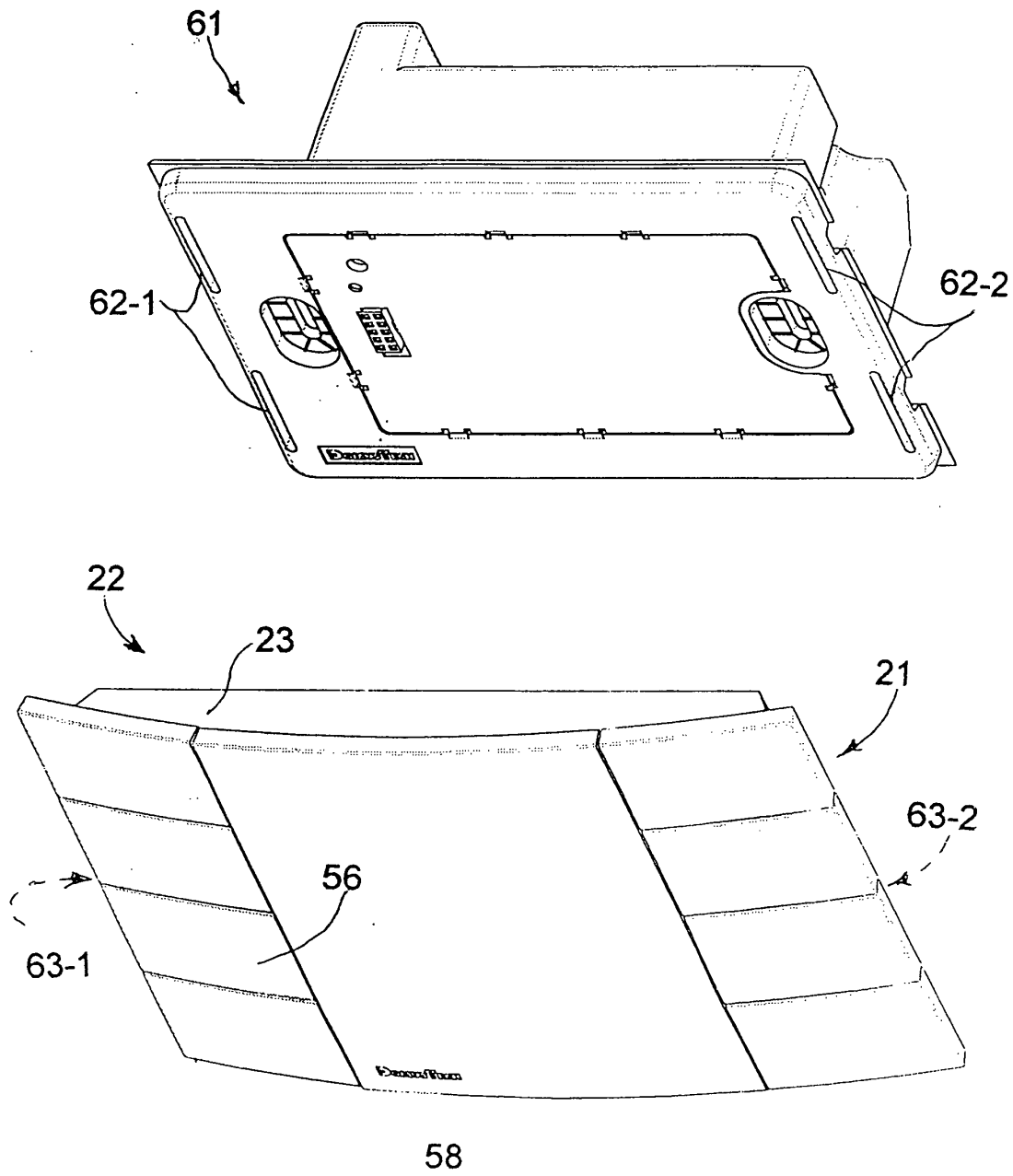


FIG. 6