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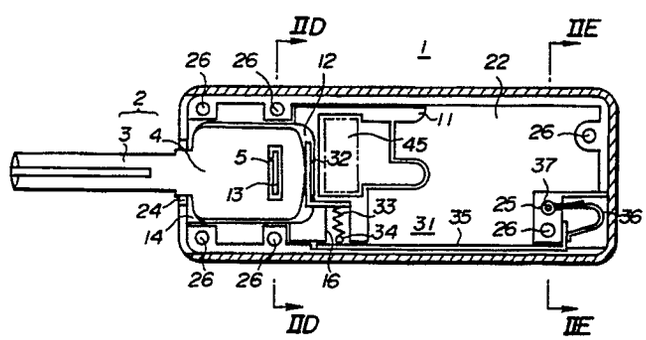
(54) An electrostatic shock-preventing key device.

(57) The present invention relates to word an electrostatic shock-preventing key device which is constructed in such a way that a key's body is made of a conductive material and is accommodated in a case made of an insulating material and can be pushed out of the case only by its inserted portion at the time of locking and unlocking and the case which is provided with a resistor for preventing static shock due to the discharge of static electricity accumulated on the user's body. An electrostatic shock-preventing key device comprises a key's body made of a conductive material and composed of an inserted portion and a grip portion; a sliding plate provided with a protrusion for mounting thereon the key grip portion and for externally moving the key's body; a case made of an insulating material and composed of a compartment for slidably accommodating the sliding plate and a cover for covering said compartment; and a conductive portion including a contact piece being in contact with the key's grip portion mounted onto the sliding plate, a compression-spring abutting onto contact piece, a ball constantly being urged downward by compression-spring, a slender conductive piece whereon ball travels being urged downward by the compression spring, a resistor connected at one end to conductive piece, and a conductive plate connected to the other end of resistor and mounted onto the outer surface of the case.

FIG.2B



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FIELD OF THE INVENTION

The present invention relates to an electrostatic shock preventing key device whereof a key's body made of a conductive material is accommodated in a case made of an insulating material and can be pushed out of the case only its by inserted portion at the time of locking and unlocking and the case which is provided with a resistor for preventing a static shock due to the discharge of static electricity accumulated on the user's body.

BACKGROUND OF THE INVENTION

If any person stays in a hotel or building where floors are covered with carpets, he will receive a charge of static electricity. Consequently, when the person insert a key into a door's key hole, he may get an electrostatic shock as a result of the discharge of the static electricity from his body. A motorcar is also charged with static electricity since its body is insulated from the earth by rubber tires. Therefore, when a driver inserts a key into the car door's lock, he may receive a shock from static electricity flowing from the motorcar's body.

The present applicant has previously proposed an electrostatic shock-preventing key device. This prior art is described in the Japanese laid open patent publication No.JPU 63-136172. The key previously proposed by the present applicant is such that:the key's body is made of a conductive material and consists of an inserted portion and a grip portion; a sliding plate has a protrusion for engaging thereon the key's grip and a protrusion for sliding the key's body; a case made of an insulating material has a compartment for slidably putting therein a sliding plate and a cover; the case is provided with an electricity conductor placed on at least one surface, a resistor is connected to said conductor and also to the slide, a contact piece is in contact with the grip of the key's body when the inserting portion of the key's body is projected from the case by means of the sliding plate, and a leaf spring is provided for keeping the inserted portion of the key's body in its projected position.

TECHNICAL PROBLEMS AND MEANS TO SOLVE THE PROBLEMS

The above-mentioned an electrostatic shock preventing key previously proposed by the present applicant has such a drawback that the set positions of the contact piece and the leaf spring must be changed if the size and form of the key grip portion are changed. Furthermore, if the key grip is made with sharp corners, the contact piece and the leaf spring are subjected to the damaging of their surfaces by the sharp corners of the key's grip each time the key is slid out of the key's body, causing the contact piece and the spring to lose their resiliency thereby unable to keep the key's body in the necessary position and the key's grip cannot enter into contact with the contact piece, i.e. the key becomes unable to discharge the static electricity.

The present invention has been made in view of the above-described drawbacks of the prior art and has as its purpose to provide an electrostatic shock-preventing key wherein only an inserted portion of the key's body can be slid in and out of a case without lessening the ability of the key's body to be in the necessary position and also thereby not losing its ability to discharge static electricity.

The electrostatic shock preventing key, according to the present invention, includes a key made of a conductive material and composed of an inserted portion and a grip portion; a sliding plate provided with a protrusion for mounting thereon the key's grip portion and for externally sliding in the key's body; a case made of insulating material and having a compartment for slidably accommodating the sliding plate and a cover for covering said compartment; and a conductive portion including a contact piece being in contact with the key's grip portion which is bonded to the sliding plate, a compression-spring abutting onto said contact piece, a ball constantly being urged downward by said compression-spring, a slender conductive piece whereon said ball travels and being urged downward by the compression-spring, a resistor connected at one end to said conductive piece, and a conductive plate connected to the other end of said resistor and mounted onto the outer surface of the case.

The device according to the present invention is constructed so as to project only the inserted portion of the key from the receiving compartment of the case by externally sliding the sliding plate when the key has to be used. When the key is being used to lock or unlock, static electricity on the person's body flows naturally through the resistor of the key's device and therefore is slowly discharged without giving the person a shock.

Since an electrostatic shock preventing key device according to the present invention comprises a key body made of a conductive material and composed of an inserted portion and a grip portion; a sliding plate provided with a protrusion for mounting thereon the key's grip portion and for externally sliding the key's body; a case made of an insulating material and composed of a compart-

ment for slidably accommodating the sliding plate and a cover for covering said compartment; and a conductive portion including a contact piece that is in contact with the key grip portion which is bonded to the sliding plate, a compression-spring abutting onto said contact piece, a ball constantly being urged downward by said compression-spring, a slender conductive piece whereon said ball travels and being urged downward by the compression-spring, a resistor connected at one end to said conductive piece, and a conductive plate connected to the other end of said resistor and mounted onto the outer surface of the case, the inserted portion of the key's body being able to be completely retracted into the case while the key is not being used. This means that the whole device can be made smaller and easier to carry. In contrast to the prior device which had to change the set positions of the contact piece while being in contact with the key's grip depending on the key's grip shape, the device according to the present invention requires no readjustment of the key's grip position. Furthermore, since the present device has no portion being subjected to wear during the movement of the key inside the case, the device may be improved remarkably in its practical use and quality.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1A is a front view showing a conventional electrostatic shock-preventing key device;

Fig.1B is a sectional view along line IB-IB of Fig. 1A;

Fig.2A is a front view showing an embodiment of the present invention;

Fig.2B is a sectional view along line IIB-IIB of Fig. 2A;

Fig.2C is a rear view of the device shown in Fig.2B;

Fig.2D is a sectional view along line IID-IID of Fig.

Fig.2E is a sectional view along line IIE-IIE of Fig. 2B;

Fig.3A is a plan view showing the shape of a sliding plate of the device shown in Fig. 2B;

Fig.3B is a side view of the device shown in Fig.3A;

Fig.4 is a construction view showing the conductive portion of the electrostatic shock-preventing key device;

Fig.5 is a plan view showing the shape of the cover of the device shown in Fig.2B.

Fig.6 is a plan view showing the key's body accommodated inside the case of the electrostatic shock-preventing key device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig.1A and 1B show a conventional electrostatic shock-preventing key device. Fig.1A is a front view and Fig.1B is a sectional view along line IB-IB of Fig.1A. In these drawings, numeral 51 designates a complete set of the conventional electrostatic shock-preventing key device. A key body 2 made of a conductive material is composed of an inserted portion 3 and a grip portion 4. A sliding plate 52 has an engaged protrusion 53 for mounting thereon the grip portion 4 of the key's body 2 and a protrusion 54 for sliding the key's body 2. A case 55 made of an insulating material is composed of a compartment 56, in which a sliding plate 52 is slidably accommodated, and a cover 57 for covering the compartment 56. The case 55 is provided with a conductor 58 mounted on at least one surface of the case, a resistor 59 connected with the conductor 58, a contact piece 60 which comes into contact with the grip portion 4 of the key's body 2 when the inserted portion 3 of the key's body 2 is projected from the case 55 by sliding the sliding plate 52 connected with the resistor 59, and a leaf spring 61 for retaining the inserted portion 3 of the key's body 2 in the projected position.

In the above-mentioned conventional electrostatic shock-preventing key 51, the inconvenience was that any change in the size and/or shape of the grip portion 4 of the key's body 2 was accompanied by the need for re-setting the positions of the contact piece 60 and the leaf spring 61.

Furthermore, if the key grip portion 4 of the key's body 2 is made with sharp corners, the contact piece 60 and the leaf spring 61 are subjected to the damaging of their surfaces by the sharp corners of the key's grip portion 4 each time the key is slid out of the key's body 2, causing the contact piece 60 and the spring to lose their resiliency and thereby unable to keep the key's body 2 in the necessary position and the key's grip portion 4 cannot enter into contact with the contact piece 60, i.e. the key becomes unable to discharge the static electricity.

Fig.2A - 2E show an embodiment of the present invention. Numeral 1 designates a complete an electrostatic shock-preventing key device. A key's body 2 is made of a conductive material and is composed of an inserted portion 3, a grip portion 4 and a through-hole 5. A slide plate 11 for mounting the key's body 2 thereon is made of an insulating material such as a synthetic resin etc. Figs.3A and 3B are respectively plan and side views showing the sliding plate 2 which has a recessed portion 12 for mounting thereon the grip

portion 4 of the key's body 2, a protrusion 13 for engaging the through-hole 5 of the key's body 2, a protrusion 14 for engaging thereon the grip portion 4 of the key's body 2, a protrusion 15 for sliding the sliding plate 11 and a slot 16. In Figs.2A - 2E, a case 21, in which the slide 11 is slidably accommodated, is made of an insulating material such as a synthetic resin or the like and and has a compartment 22 for accommodating the sliding plate 11, a slotted hole 23 made on the rear surface of the case 21, an opening 24 through which the inserted portion 3 of the key's body 2 moves in and out of the case, a through-hole 25 and tapped-holes 26.

Fig.4 is a construction view showing the conducting portion of electrostatic shock-preventing key 1. In Fig.4, numeral 31 is the whole conducting portion, 32 is a contact piece being in contact with the grip portion 4 of the key's body 2, 33 is a compression spring abutting on said contact piece 32, 34 is a ball constantly being urged downward by said compression spring 33, 35 is a slender conductive piece whereon said ball 34 travels being urged downward by the compression-spring 33, 35a and 35b are recessed portion's for engaging the ball 34 therein, 36 is a resistor which is connected at its one end to the conducting piece 35 so as to slowly discharge the static electricity and has a high resistance of, for example, several megaohms selected so as not to give a shock to the human body. 37 is a coil spring connected to the other end of the resistor 36, and 38 is a conductive plate being in contact with the coil's spring 37 and being secured to the outer surface of the case 21 as shown in Fig.2C. It is also possible to directly connect the other end of the resistor 36 to the conductive plate 38. The conductive plate 38 has a slotted hole 39 which in its shape corresponds to the slotted hole 23 made in case 21. In Fig.2A, a cover 41 for covering the receiving compartment 22 is made of a metal sheet so as to increase the strength of the key device 1 and has the configuration shown in Fig. 5, The cover 41 has through-holes 42 made in the respective positions corresponding to the positions of the tapped-holes 26 on the case 21 for threadably securing the cover 41 to the case 21, and it also has a notch made therein so as not to interfere with the resistor 36 and the coil spring 37 shown in Fig.2B. In Fig.2A, a name plate 44 made of synthetic resin covers the whole top surface of the cover 41. When the electrostatic shock-preventing key is put into a housing (not shown), a permanent magnet 45, mounted on the sliding plate 11, drives the reed-switch provided in the housing to indicate that the key has been accommodated in the housing. Accordingly, the conductive plate 38 and the cover 41 are made of a non-magnetic material.

Fig.6 is a plan view showing an electrostatic shock-preventing key device 1 being accommodated in the case 21.

Operation of the above-mentioned an electrostatic shock-preventing key device 1:

When the case 21 of the electrostatic shock-preventing key 1, in the initial position shown in Fig.6, is held in the hand the protrusion 15 of the sliding plate 11 is manually moved forward, the inserted portion 3 of the key's body 2 is projected from the case 21 through the opening 24 as shown in Figs.2A - 2C.

In this case the ball 34 initially engaged in the recess 35b of the conductive piece 35 as illustrated by the two-dotted chain-line in Fig.4, leaves from the recess 35b, moves forward in the direction indicated by A (allow), being pushed downward by the compression-spring 33, and falls into a recess 35a of the conductive piece 35. Accordingly, it is possible to perceive with the fingertips that the inserted portion 3 of the key's body 2 is placed in the projected position by engaging the ball 34 in the recess 35a and also.in the retracted position by engaging the ball 34 in the recess 35b. The inserted potion 3 of the key's body 2 can be retracted into the case 21 by sliding the protrusion 15 in a direction opposite to the direction shown by an arrow A.

When a person carrying a charge of static electricity on his body, holds the static shock-preventing key 1 in his hand, the static electricity accumulated on the person's body flows through the conductive plate 38, the ball 34, the compression spring 37, the contact piece 32 and enters into the key's body 2. Next, when the inserted portion 3 of the key's body 2, projected from the case 21, is inserted into the key hole of a lock (not shown), the static electricity is discharged into the earth through the key hole and metal structure. Accordingly, static shock can be prevented, if the resistor 36 is selected to be of a suitable resistance value at which it may produce a current not giving static shock to the human body.

As described above, since the electrostatic shock-preventing key device according to the present invention, comprises: a key's body made of a conductive material and composed of an inserted portion and a grip portion; a sliding plate provided with a protrusion for mounting thereon the key's grip portion and for externally sliding the key's body; a case made of an insulating material and composed of a compartment for slidably accommodating the sliding plate and a cover for covering said compartment; and a conductive portion including a contact piece that is in contact with the key's grip portion which is bonded to the sliding plate, a compression-spring abutting onto said contact piece, a ball constantly being urged downward by said compression-spring, a slender con-

ductive piece whereon said ball travels and being urged downward by the compression-spring, a resistor connected at one end to said conductive piece, and a conductive plate connected to the other end of said resistor and mounted onto the outer surface of the case, it is possible to completely retract the inserted portion of the key's body into case while the key is not being used, i.e. the whole key device can be made smaller and easier to carry.

In contrast to the prior art where the positions of the contact piece had to be changed, being in contact with the key grip depending on the key grip's shape, the device according to the present invention requires no readjustment of the key grip's position. Furthermore, the device has no portion wearing due to friction at the time of sliding the key grip in and out of the case and therefore may be remarkably improved in its quality.

Claims

(1) An electrostatic shock-preventing key device comprising: a key body made of a conductive material and composed of an inserted portion and a grip portion; a sliding plate provided with a protrusion for mounting thereon the key's grip portion and for externally moving the key's body; a case made of an insulating material and composed of a compartment for slidably accommodating the sliding plate and a cover for covering said compartment; and a conductive portion including a contact being in contact with the key's grip portion mounted on the sliding plate, a compression-spring abutting onto said contact piece, a ball constantly being urged downward by said compression-spring, a slender conductive piece whereon said ball travels and being urged downward by the compression-spring, a resistor connected at one end to said conductive piece, and a conductive plate connected to the other end of said resistor and mounted onto the outer surface of the case.

(2) The electrostatic shock-preventing key device according to claim 1, characterized in that the key's grip portion has a through-hole made therein so as to mount the grip portion of the key onto the sliding plate.

(3) The electrostatic shock-preventing key device according to claim 1, characterized in that the sliding plate has a recessed portion for mounting thereon the key grip portion, a protrusion made in said recessed portion so as to engage the through-hole of the key's grip portion and a protrusion for engaging the other end of the grip's portion of the key's body.

(4) The electrostatic shock-preventing key device according to claim 1, characterized in that the conductive piece provided at the conductive portion has plural recesses for engaging the ball when said ball is traveling along said conductive piece.

FIG.1A

(Prior Art)

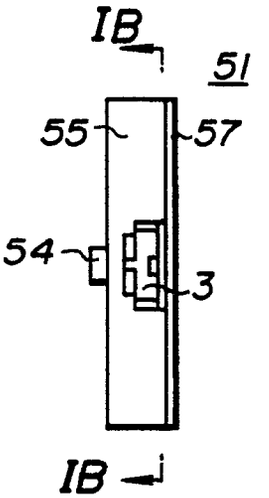

FIG.1B

(Prior Art)

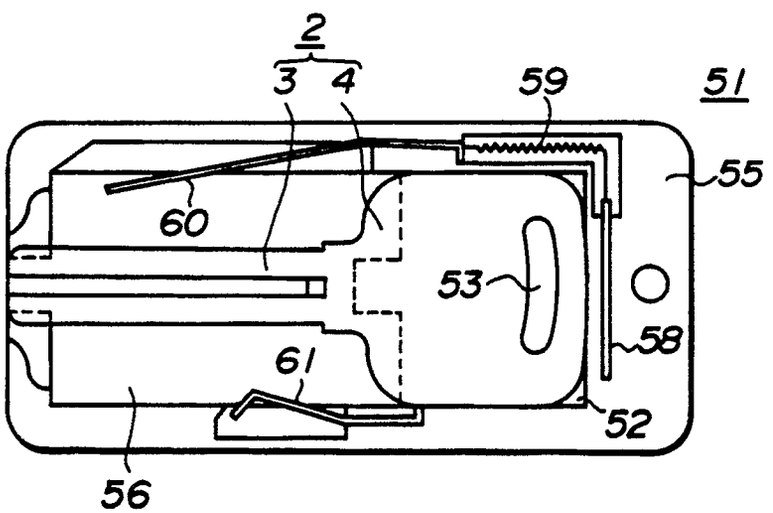

FIG.2A

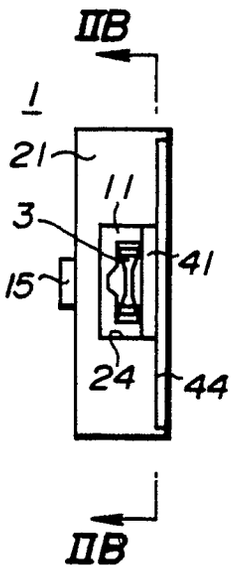
IIB
1
21
11
3
41
15
24
44
IIB

FIG.2B

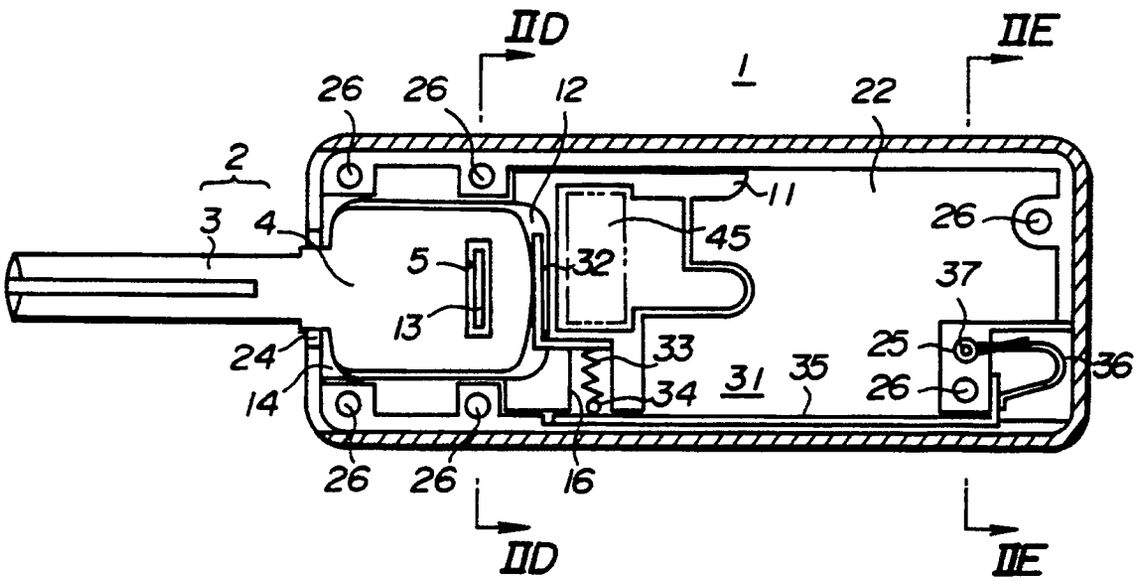
IID
IIE
1
26
26
12
22
2
3
4
11
45
26
5
32
37
13
24
33
25
36
14
34
31
35
26
26
26
16
IID
IIE

FIG.2C

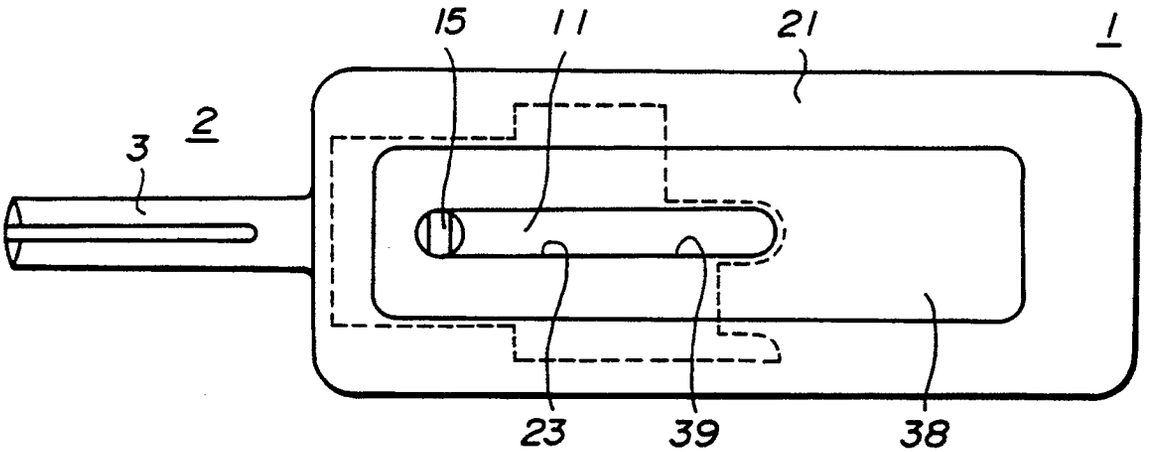

FIG.2D

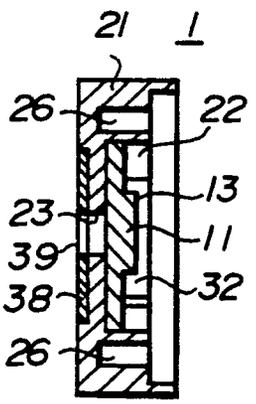

FIG.2E

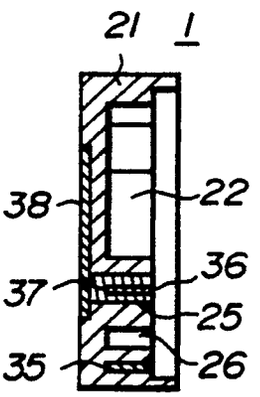

FIG. 3A

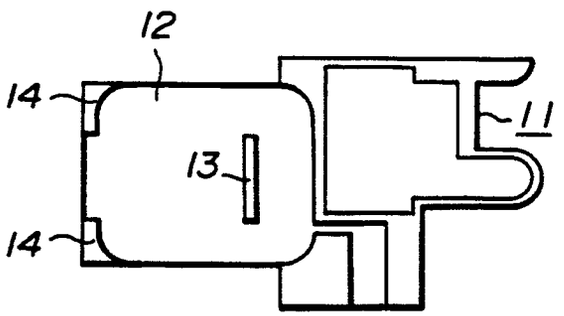

FIG. 3B

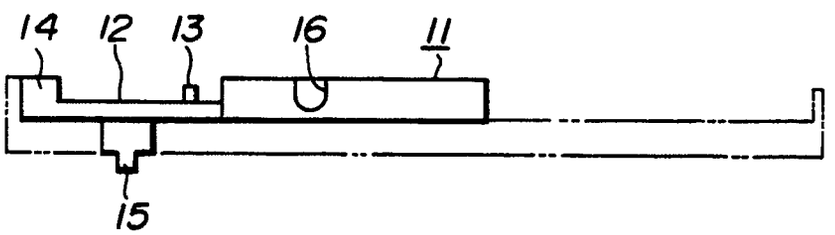

FIG. 4

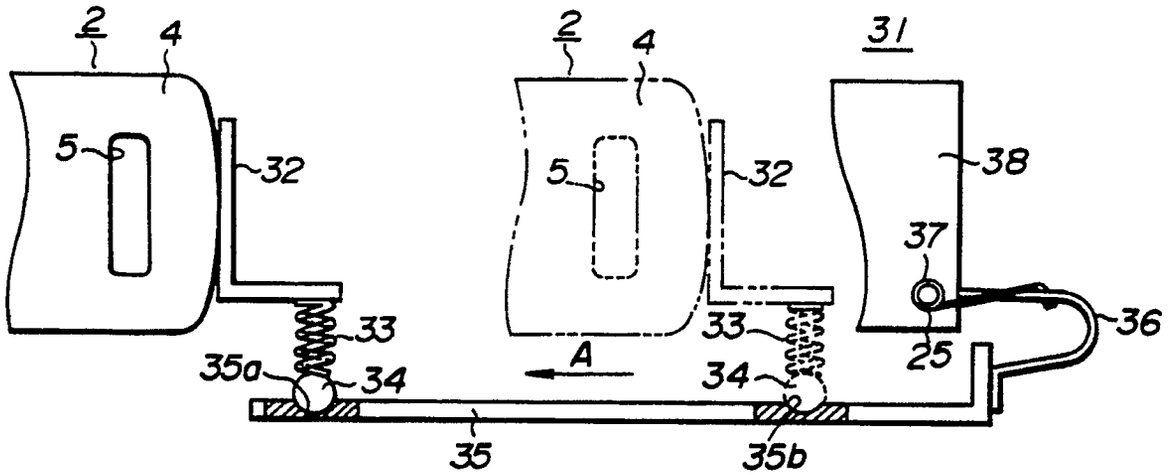
2
4
5
32
33
35a
34
35
2
4
5
32
33
34
35b
A
31
38
37
25
36

FIG. 5

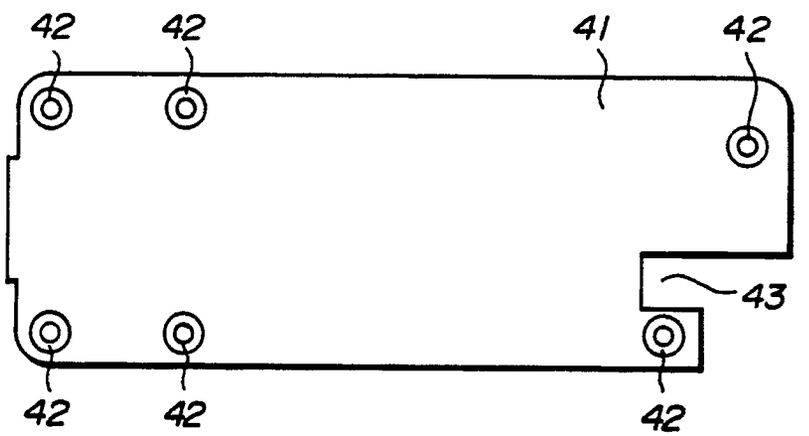
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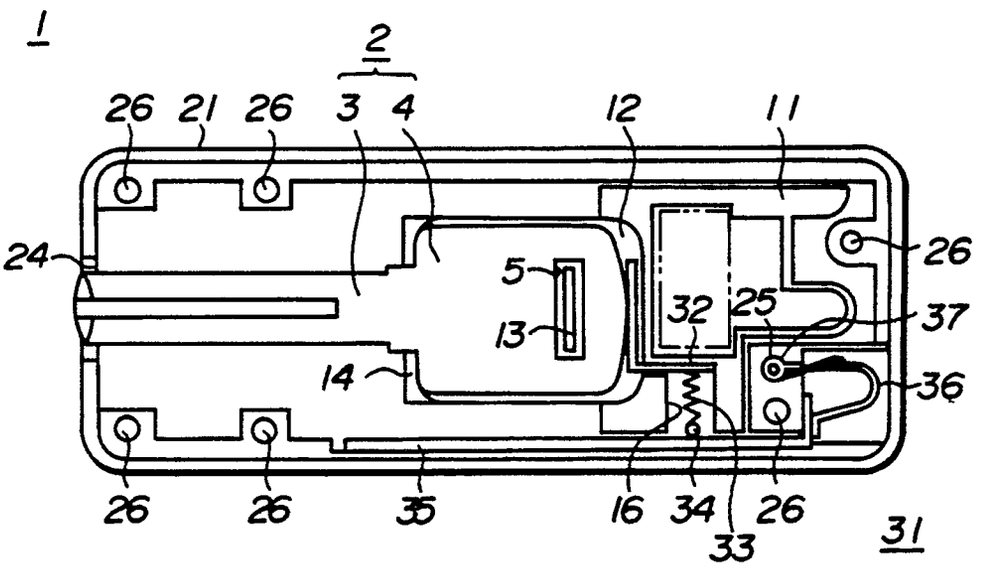
FIG.6



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 6073

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2611372 (MOTOHIRO GOTANDA) * claims 1, 6 * -----	1, 2	H05F3/02

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H05F
A61N
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 JUNE 1990	DAILLOUX C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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