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(11) **EP 1 561 886 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
10.08.2005 Bulletin 2005/32

(51) Int Cl.7: **E05B 19/04**

(21) Application number: **05002045.2**

(22) Date of filing: **01.02.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

(71) Applicant: **ALPS ELECTRIC CO., LTD.**
Tokyo 145-8501 (JP)

(72) Inventor: **Baba, Takashi**
Ota-ku Tokyo 145-8501 (JP)

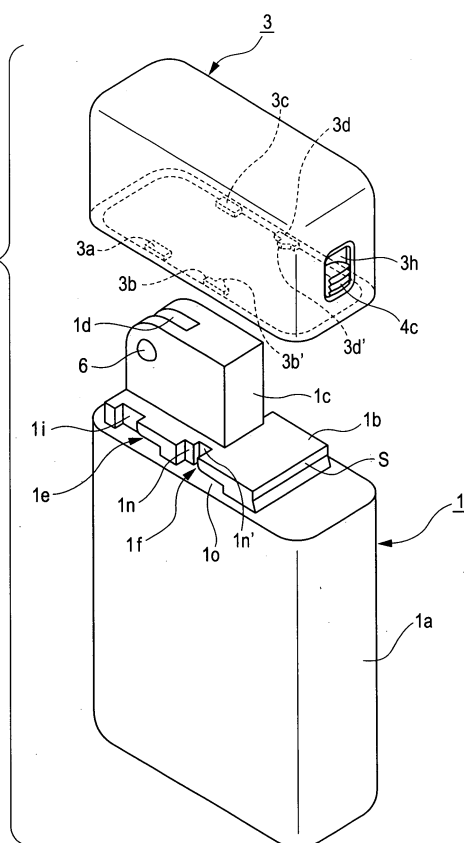
(30) Priority: **09.02.2004 JP 2004032168**

(74) Representative: **Klunker . Schmitt-Nilson . Hirsch**
Winzererstrasse 106
80797 München (DE)

(54) **Remote control device**

(57) A remote control device includes a casing (1) including a remote control circuit, a mechanical key (2) accommodated in an accommodating space (1d) in the casing so as to be capable of pivoting, and a cap (3) for preventing the mechanical key from moving out. The cap is engageable and releasable by sliding along an upper face of a base (1a). In the cap, a stopper (4) capable of reciprocating in the direction orthogonal to the direction that engages and releases the cap and a coil spring (5) for urging the stopper toward the upper face of the base are disposed. The cap is capable of being locked by making the stopper come into contact with a right side (S) of a projection (1b) formed on the upper face of the base so as to block movement of the cap in the direction that releases the cap. The cap is capable of being unlocked by moving the stopper from a contact position where the stopper is in contact with the right side to a position where the stopper is separated from the projection through the operation of a knob (4c) so as to allow the cap to move in the direction that releases the cap.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to remote control devices used in automotive keyless entry systems, and more specifically, it relates to a remote control device including a mechanical key serving as an auxiliary key.

2. Description of the Related Art

[0002] As an example of remote control devices of this type, one is known in which a casing (cabinet) including a remote control circuit and having a space for accommodating a mechanical key, a first end face of the space being open, and an elastic unit arranged inside the casing and holding the mechanical key by elastically pressing sides of the mechanical key, the casing and the mechanical key being connected with a connection unit arranged therebetween, are included (see, for example, Japanese Unexamined Patent Application Publication No. 2003-113683 (in particular, pages 3 to 4, Figure 1)). In this device, the casing includes a mounting unit with a mounting hole, and a grip of the mechanical key includes a mounting hole. The casing and the mechanical key are connected by means of a ring connection unit passing through the mounting holes of the casing and mechanical key or by means of a strip connection unit whose opposite ends are connected to the casing and the mechanical key, respectively.

[0003] In such a remote control device, the mechanical key is held in the casing by receiving a pushing force of the elastic unit. Therefore, in order to use the mechanical key, a user removes the connection unit from the mounting holes of the casing and mechanical key, and then pulls out the mechanical key against the pushing force of the elastic unit. In the case that the connection unit is, for example, a strip having a moderate length, the mechanical key can be pulled out from the casing without removing the connection unit, thus resulting in enhanced user convenience.

[0004] For the known remote control device described above, in order that the mechanical key can be connected to the casing with the connection unit or that the mechanical key can be pulled out when required, partially exposing the mechanical key to the outside of the casing is necessary. This requirement results in significant design limitations. In addition, the mechanical key can be easily detached from the casing, and as a result, the mechanical key may not be available in the event of an emergency that requires the mechanical key because it was detached from the casing. To overcome these problems, there is a way in which the base of the mechanical key is pivotally supported in the casing, and a cap for covering the base of the mechanical key is included so that the cap is capable of being attached to and de-

tached from the casing. In this structure, however, if the cap is merely engaged with and released from the casing, another problem arises that the cap may be easily removed from the casing and become lost when the remote control device undergoes the impact of, for example, a fall.

SUMMARY OF THE INVENTION

[0005] In view of these circumstances, an object of the present invention is to provide a remote control device capable of reliably preventing a mechanical key from moving out even when subjected to an external impact.

[0006] In order to achieve the above object, a remote control device according to the present invention includes a casing including a remote control circuit; a mechanical key accommodated in an accommodating space in the casing so as to be capable of moving in and out; and a cap for preventing the mechanical key from moving out, the cap being engageable and releasable by sliding along a predetermined face of the casing. In this remote control device, a stopper capable of reciprocating in the direction orthogonal to the direction that engages and releases the cap is disposed in the cap, and an elastic unit for urging the stopper toward the predetermined face is disposed in the cap. The cap is capable of being locked by making the stopper come into contact with a projection formed on the predetermined face of the casing so as to block movement of the cap in the direction that releases the cap, the cap is capable of being unlocked by moving the stopper against a pushing force of the elastic unit from a contact position where the stopper is in contact with the projection to a position where the stopper is separated from the projection so as to allow the cap to move in the direction that releases the cap.

[0007] In the remote control device having the above structure, the cap for preventing the mechanical key from moving out is locked at an engagement position where the mechanical key is engaged with the predetermined face of the casing. This locked state of the cap is not released unless the stopper is moved in the direction against a pushing force of the elastic unit. Accordingly, even if the remote control device undergoes the impact of, for example, a fall, the cap is prevented from being detached from the casing, and this reliably prevents the mechanical key from moving out from the casing.

[0008] In the remote control device described above, preferably, the stopper may include a tapered face at a portion facing the projection. According to this structure, for sliding the cap from the release position to the engagement position so that the stopper is moved to a contact position where the stopper is in contact with the projection, the stopper is smoothly moved up to the contact position while the tapered face of the stopper is being in contact with the projection. As a result, the cap is reliably locked at the engagement position, thus realizing

the remote control device with no malfunction.

[0009] In this case, preferably, the cap may include a guiding wall for guiding the stopper so that the stopper reciprocates, the guiding wall being disposed between inner walls thereof and include a window opening formed in a side thereof, the side facing the guiding wall. The stopper may include a convex knob positioned in the window opening. Therefore, the cap is moved from the contact position up to a position where the cap is separated from the projection through the operation of the knob, thus allowing the cap to be unlocked. When the use of the mechanical key is required, the cap can be readily detached from the casing, and therefore, the remote control device with enhanced user convenience is realized.

[0010] In this case, preferably, the stopper may include a hollow extending in the direction in which the stopper reciprocates, and the hollow allows the knob to be elastically deformed in the direction away from the window opening. Therefore, the stopper can be readily incorporated into the cap merely by inserting the stopper into a space between the guiding wall and the sides of the cap facing the guide wall while maintaining the state in which the knob is elastically deformed toward the hollow and then returning the knob in the direction in which the knob is positioned in the window opening of the cap. This realizes the remote control device with increased ease of construction.

[0011] In the remote control device according to the present invention, the cap for preventing the mechanical key from moving out is capable of being locked at the engagement position where the cap is engaged with the predetermined face of the casing. The locked state of the cap is not released unless the stopper is moved in the direction against a pushing force of the elastic unit. Accordingly, even if the remote control device undergoes the impact of, for example, a fall, the cap is prevented from being detached from the casing, and this reliably prevents the mechanical key from moving out of the casing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a perspective view showing an external appearance of a remote control device according to the present invention.

Fig. 2 is a front view of a casing of the remote control device when a mechanical key is accommodated.

Fig. 3 is a plan view of the casing when the mechanical key is accommodated.

Fig. 4 is a left side view of the casing when the mechanical key is accommodated.

Fig. 5 is an illustration showing when the mechanical key is moved out from the casing.

Fig. 6 is an exploded perspective view of a cap, a stopper, and a coil spring of the remote control de-

vice.

Fig. 7 is a front view of the cap when the stopper and the coil spring are in the process of being incorporated.

Fig. 8 is a front view of the cap with the stopper and the coil spring incorporated.

Fig. 9 is a bottom view of the cap with the stopper and the coil spring incorporated.

Fig. 10 is an illustration for explanation of the locking operation of the cap with respect to the casing.

Fig. 11 is an illustration for explanation of the locking operation of the cap with respect to the casing.

Fig. 12 is an illustration for explanation of the locking operation of the cap with respect to the casing.

Fig. 13 is an illustration for explanation of the unlocking operation of the cap with respect to the casing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] The preferred embodiment according to the present invention will be described with reference to the drawings. Fig. 1 is a perspective view of a remote control device according to the present invention. Fig. 2 is a front view of a casing of the remote control device when a mechanical key is accommodated. Fig. 3 is a plan view of the casing when the mechanical key is accommodated. Fig. 4 is a left side view of the casing when the mechanical key is accommodated. Fig. 5 is an illustration showing when the mechanical key is moved out from the casing. Fig. 6 is an exploded perspective view of a cap, a stopper, and a coil spring of the remote control device. Fig. 7 is a front view of the cap when the stopper and the coil spring are in the process of being incorporated. Fig. 8 is a front view of the cap with the stopper and the coil spring incorporated. Fig. 9 is a bottom view of the cap with the stopper and the coil spring incorporated. Figs. 10 to 12 are illustrations for explanation of the locking operation of the cap with respect to the casing. Fig. 13 is an illustration for explanation of unlocking the cap with respect to the casing. In the explanation below, descriptions indicating directions and positions, such as left, right, upper, lower, and the like, are with reference to Figs. 2 and 12 unless specified otherwise.

[0014] The remote control device according to this embodiment is used in an automotive keyless entry system so as to perform wireless communications with a vehicle-mounted apparatus. As shown in Figs. 1 to 9, the remote control device mainly includes a casing 1 including an unshown remote control circuit and driving battery for driving the remote control circuit, a mechanical key 2 accommodated in the casing 1, a cap 3 attachable and detachable with respect to the casing 1, a stopper 4 arranged in the cap 3, and a coil spring 5 arranged in the cap 3.

[0015] The casing 1 is formed from synthetic resin and includes a parallelepiped base 1a. In plan view, an upper

face of the base 1a exhibits a rectangular shape whose longer sides extend laterally. A projection 1b of a rectangular shape in plan view is disposed on the upper face of the base 1a. A protrusion 1c of a rectangular shape in plan view extends in the longitudinal direction from the center of an upper face of the projection 1b to the left. An accommodating space 1d is arranged inside the casing 1 and is open from an upper face of the protrusion 1c along the left sides of the protrusion 1c, the projection 1b, and the base 1a. The mechanical key 2 is accommodated in the accommodating space 1d. A first side along the longitudinal direction of the projection 1b includes engagement portions 1e and 1f arranged separately from one another in the longitudinal direction, and a second side along the longitudinal direction of the projection 1b includes engagement portions 1g and 1h arranged separately from one another in the longitudinal direction. The engagement portions 1e and 1g include notches 1i and 1k, respectively, formed by vertically cutting the first and second sides of the projection 1b, and include slide notches 1j and 1m, respectively, formed in the sides of the projection 1b so as to extend from the bases of the notches 1i and 1k to the right. The engagement portions 1e and 1g are symmetric about a lateral line in plan view (in Fig. 3). The engagement portions 1f and 1h include notches 1n and 1p, respectively, formed by vertically cutting the first and second sides of the projection 1b, and include slide notches 1o and 1q, respectively, formed in the sides of the projection 1b so as to extend from the bases of the notches 1n and 1p to the right. Inside walls of the notches 1n and 1p include stepped notches 1n' and 1p', respectively. Each of the stepped notches 1n' and 1p' are dented in L shape in plan view with respect to the bases of the notches 1n and 1p by one stage in the direction orthogonal to Fig. 2. Inside walls of the slide notches 1o and 1q include recesses 1o' and 1q', respectively. The second engagement portions 1f and 1h are symmetric about a lateral line in plan view (in Fig. 3).

[0016] As shown in Figs. 2 to 4, the mechanical key 2 is accommodated in the accommodating space 1d of the casing 1 so as to be capable of moving in and out. Specifically, a pivotal pin 6 disposed in the protrusion 1c supports the upper end of the mechanical key 2 so that the mechanical key 2 is capable of pivoting with respect to the casing 1. As shown in Fig. 5, the mechanical key 2 is capable of being pulled out of the accommodating space 1d of the casing 1 by the operation of pivoting the mechanical key 2 in the direction indicated by the arrow A. On the other hand, the mechanical key 2 that is moved out is capable of being accommodated into the accommodating space 1d by the operation of pivoting the mechanical key 2 in the direction indicated by the arrow B.

[0017] The cap 3 is formed from synthetic resin. As shown in Figs. 6 to 9, the cap 3 is of a box shape having a base, and, viewed from below, exhibits a rectangular shape whose longer sides extend laterally. An engage-

ment lug 3a and an engagement lug 3b with a nail 3b' protrude from an edge of a first inner wall of the cap 3 in such a way that the engagement lugs 3a and 3b are arranged separately from one another in the longitudinal direction. An engagement lug 3c and an engagement lug 3d with a nail 3d' protrude from an edge of a second inner wall of the cap 3 at positions opposite to the engagement lugs 3a and 3b, respectively. A guiding wall 3g is arranged between the first and second inner walls in the longitudinal direction at a position to the right of the engagement lugs 3b and 3d in the cap 3. A window opening 3h whose vertical sides are longer is disposed in a side wall of the cap 3 to the right of the guiding wall 3g, the side wall facing the guiding wall 3g.

[0018] The stopper 4 is also formed from synthetic resin and includes a rectangular flat portion 4a, a parallelepiped base portion 4b protruding from a right side face (a front face in Fig. 6) of the flat portion 4a, a knob 4c projecting from a front surface of the base 4b, and a protrusion 4d (see Figs. 7 and 8) protruding from an upper (lower in Fig. 6) face of the base portion 4b, the upper face facing the base of the cap 3. A hollow 4e extending vertically and opening at opposite sidewalls of the base portion 4b is formed inside the base portion 4b, and therefore, the knob 4c is capable of being subjected to elastic deformation toward the hollow 4e. A tapered face 4f is formed in a lower (upper in Fig. 6) corner on a left side face (a back face in Fig. 6) of the flat portion 4a.

[0019] The coil spring 5 is of a conical shape and incorporated into the cap 3 together with the stopper 4. The coil spring 5 is inserted into a space 3i, which is defined by a wall face of the guiding wall 3g, a face of the side with the window opening 3h of the cap 3, the opposite inner walls of the cap 3 in the longitudinal direction, and the base of the cap 3, in such a way that a leading end at a larger-diameter end of the coil spring 5 first enters the space 3i. After the insertion of the coil spring 5, the stopper 4 being in a state in which the left side face of the flat portion 4a faces the wall face of the guiding wall 3g is fit into the space 3i. At this time, as shown in Fig. 7, the knob 4c is elastically deformed toward the hollow 4e so that the distance between a tip face (a right face in Fig. 7) of the knob 4c and the left side face of the flat portion 4a is smaller than the longitudinal distance of the space 3i, and the stopper 4 is fit into the space 3i while maintaining this state. After the insertion of the stopper 4, the knob 4c is returned from the elastically deformed state so as to be positioned in the window opening 3h. The incorporation is completed in this way.

[0020] The stopper 4 incorporated in this way is regulated by inside walls, which surround the stopper 4, defining the space 3i so that lateral movements and back-and-forth (the direction orthogonal to Fig. 7) movements are restricted and guided so that only vertical reciprocating movements are allowed, and the movements of the stopper 4 are regulated at a position where the knob

4c is in contact with the bottom of the window opening 3h. As shown in Fig. 8, the larger-diameter end of the coil spring 5 is latched to an inner base face defining the space 3i, and the other end of the coil spring 5 is latched to an upper (lower in Fig. 6) face of the stopper 4 while being fit onto the protrusion 4d, so that the stopper 4 is downwardly urged by the coil spring 5. In this state, the knob 4c is in contact with the bottom of the window opening 3h and the stopper 4 is held at its lowest position.

[0021] Next, the operation of attaching and detaching the cap 3 in which the stopper 4 and the coil spring 5 are incorporated in this way to and from the casing 1 is described.

[0022] For attaching the cap 3 to the casing 1, as shown in Figs. 1 and 10, the engagement lugs 3a and 3c of the cap 3 are inserted into the notches 1i and 1k of the projection 1b, respectively, and at the same time, the engagement lugs 3b and 3d are inserted into the notches 1n and 1p while fitting the nails 3b' and 3d' to the stepped notches 1n' and 1p', respectively. Then, a lower face of the cap 3 comes into contact with the upper face of the casing 1 and is arranged on the base 1a so that the cap 3 covers the projection 1b and the protrusion 1c. In the course of this process, the bottom face of the stopper 4 presses the upper face of the projection 1b, and is then pushed upwardly in the cap 3 by projection 1b against a pushing force of the coil spring 5, so that the stopper 4 is held while pressing the upper face of the projection 1b. The top position of the window opening 3h is set so as not to interfere with the movements of the stopper 4. When the cap 3 is slid from the state shown in Fig. 10 in the direction indicated by the arrow C, the engagement lugs 3a, 3b, 3c, and 3d start engaging into the slide notches 1j, 1o, 1m, and 1q, respectively, and therefore, the upward movement of the cap 3 with respect to the base 1a is restricted.

[0023] As the cap 3 is slid in the direction of the arrow C, the stopper 4 is moved together with the cap 3 while sliding the bottom face of the stopper 4 along the upper face of the projection 1b. When the cap 3 continues being slid further in the direction of the arrow C, the tapered face 4f of the stopper 4 comes into contact with a right corner P of the projection 1b, as shown in Fig. 11, and then, the stopper 4 starts falling while being guided by the tapered face 4f. As shown in Fig. 12, at the point in time when right end faces of the engagement lugs 3b and 3d of the cap 3 come into contact with right end faces of the slide notches 1o and 1q, the movement in which the cap 3 is slid in the direction of the arrow C is blocked, and therefore, the cap 3 is positioned at an engagement position. At this time, the stopper 4 is in its lowest position and held so as to maintain the state in which the left side face of the stopper 4 is in contact with a right side S of the projection 1b. In this state, if the cap 3 aims to be slid in the direction opposite to the direction of the arrow C, since the left side face of the stopper 4 is in contact with the right side S of the projection 1b, the cap 3 is prevented from moving to a release position

(shown in Fig. 10), where the engagement is released, and the cap 3 is in a locked state. At the engagement position of the cap 3, the nails 3b' and 3d' of the engagement lugs 3b and 3d of the cap 3 are snapped into the recesses 1o' and 1q' of the slide notches 1o and 1q, respectively, so that the cap 3 does not rattle with respect to the casing 1 and is reliably prevented from being slid to the release position. In addition, the positions of the cap 3 and the casing 1 in the transverse direction are determined by the contact between a longitudinal side of the protrusion 1c or the projection 1b and a longitudinal inner wall face of the cap 3.

[0024] As described above, in the locked state of the cap 3, as shown in Fig. 12, the cap 3 is attached so as to cover an opening area of the accommodating space 1d in the projection 1b and the protrusion 1c on the base 1a, and therefore, the accommodated mechanical key 2 is regulated by the contact between the mechanical key 2 and the cap 3 so as not to pivot. As a result, the mechanical key 2 is prevented from moving out of the casing 1.

[0025] On the other hand, for releasing the locked state and detaching the cap 3 from the casing 1, from the locked state of the cap 3, as shown in Fig. 12, the knob 4c is slid in the direction indicated by the arrow D and moved up to the position corresponding to the top position of the window opening 3h, as shown in Fig. 13, so that the stopper 4 is moved from the contact position where the stopper 4 is in contact with the right side S of the projection 1b up to a position where the stopper 4 is separated from the right side S, and therefore, the cap 3 can freely move in the direction that releases the cap 3. The cap 3 is pushed in the direction indicated by the arrow E while maintaining the state described above, thus starting the cap 3 sliding in the direction of the arrow E. As the cap 3 slides, the engagement lugs 3a, 3b, 3c, and 3d of the cap 3 start moving in the direction away from the positions where they are engaged with the slide notches 1j, 1n, 1k, and 1p, respectively. As shown in Fig. 10, at the point in time when the engagement lugs 3a, 3b, 3c, and 3d reach individual positions (release positions) entirely separated from the slide notches 1j, 1n, 1k, and 1p, the cap 3 can be detached from the casing 1.

[0026] The remote control device as described above is normally used in the state in which the cap 3 is attached to the casing 1 accommodating the mechanical key 2, as shown in Fig. 12. When the remote control device performs wireless communications with a vehicle-mounted apparatus in a vehicle by means of a remote control circuit included in the casing 1 and identification is verified, the vehicle-mounted apparatus conducts locking/unlocking a door of the vehicle or starting/stopping an engine thereof in response to instructions from the remote control circuit. If the operation of the remote control device over wireless communications should become impossible due to trouble of the remote control circuit or battery exhaustion, the cap 3 is de-

tached from the casing 1, and the mechanical key 2 is then extracted from the accommodating space 1d of the casing 1 in such a way described above, as shown in Fig. 5, thus allowing manual locking/unlocking the door and starting/stopping the engine.

[0027] As explained above, in the remote control device according to the present invention, the cap 3 for preventing the mechanical key 2 from moving out is locked at an engagement position where the cap 3 is engaged with the upper face of the base 1a of the casing 1. This locked state of the cap 3 is not released unless the stopper 4 is moved in the direction against a pushing force of the coil spring 5. Accordingly, even if the remote control device undergoes the impact of, for example, a fall, the cap 3 is prevented from being detached from the casing 1, and this reliably prevents the mechanical key 2 from moving out of the casing 1. In addition, since the stopper 4 includes the tapered face 4f at a portion facing the projection 1b, the stopper 4 can be smoothly moved up to the contact position where the stopper 4 is in contact with the right side S of the projection 1b while the tapered face 4f of the stopper 4 is being in contact with the right corner P of the projection 1b. As a result, the cap 3 is reliably locked at the engagement position, and malfunction almost never occurs.

[0028] The guiding wall 3g for guiding the stopper 4 so that the stopper 4 is capable of reciprocating is arranged between the opposite inner walls of the cap 3. The window opening 3h is disposed in the side of the cap 3, the side facing the guiding wall 3g, and the convex knob 4c of the stopper 4 is positioned in the window opening 3h. Therefore, moving the stopper 4 through externally operating the knob 4 from the contact position where the stopper 4 is in contact with the right side S of the projection 1b up to the position where they are separated from one another allows the cap 3 to move in the direction that releases the cap 3, thus enabling the cap 3 to be unlocked. Accordingly, when the use of the mechanical key 2 is required, the cap 3 can be readily detached from the casing 1, thus achieving the remote control device with enhanced user convenience.

[0029] The stopper 4 includes the hollow 4e extending along the direction of reciprocating movement of the stopper 4, and the hollow 4e allows the knob 4c to be elastically deformed in the direction away from the window opening 3h. Therefore, the stopper 4 can be readily incorporated into the cap 3 merely by fitting the stopper 4 into a space between the guiding wall 3g and the sides of the cap 3 while maintaining the state in which the knob 4c is elastically deformed toward the hollow 4e and then returning the knob 4c in the direction in which the knob 4c is positioned in the window opening 3h of the cap 3. This realizes the remote control device with enhanced ease of construction.

[0030] In the state in which the cap 3 is attached as shown in Fig. 12, the stopper 4 and the protrusion 1c pivotally supporting the mechanical key 2 are arranged in line in the longitudinal direction, thus realizing an ef-

fective use of an inside area of the cap 3. As a result, a reduction in size in the longitudinal direction and the direction orthogonal thereto can be realized. At the same time, since the stopper 4 is arranged in the cap 3 and the protrusion 1c does not interfere with the construction of the stopper 4, the workability of construction is improved.

[0031] The knob 4c of the stopper 4 does not protrude from an external surface of the cap 3, and the locked state of the cap 3 can be released by the operation of sliding the stopper 4. In other words, the lock of the cap 3 is not released unless a user slides the stopper 4 while pressing and holding the knob 4c with his or her finger. Therefore, a misoperation of unintentionally releasing the lock almost never occurs.

Claims

1. A remote control device comprising:

a casing (1) including a remote control circuit; a mechanical key (2) accommodated in an accommodating space (1d) in the casing so as to be capable of moving in and out; and a cap (3) for preventing the mechanical key from moving out, the cap being engageable and releasable by sliding along a predetermined face of the casing,

wherein a stopper (4) capable of reciprocating in the direction orthogonal to the direction that engages and releases the cap is disposed in the cap, and an elastic unit (5) for urging the stopper toward the predetermined face is disposed in the cap;

the cap is capable of being locked by making the stopper come into contact with a projection (1b) formed on the predetermined face of the casing so as to block movement of the cap in the direction that releases the cap; and the cap is capable of being unlocked by moving the stopper against a pushing force of the elastic unit from a contact position where the stopper is in contact with the projection to a position where the stopper is separated from the projection so as to allow the cap to move in the direction that releases the cap.

2. The remote control device according to Claim 1, wherein the stopper includes a tapered face (4f) at a portion facing the projection.

3. The remote control device according to Claim 1 or Claim 2, wherein the cap includes a guiding wall (3g) for guiding the stopper so that the stopper reciprocates, the guiding wall being disposed between inner walls thereof, and includes a window

opening (3h) formed in a side thereof, the side facing the guiding wall, and

the stopper includes a convex knob (4c) positioned in the window opening.

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4. The remote control device according to Claim 3, wherein the stopper includes a hollow (4e) extending in the direction in which the stopper reciprocates, and the hollow allows the knob to be elastically deformed in the direction away from the window opening.

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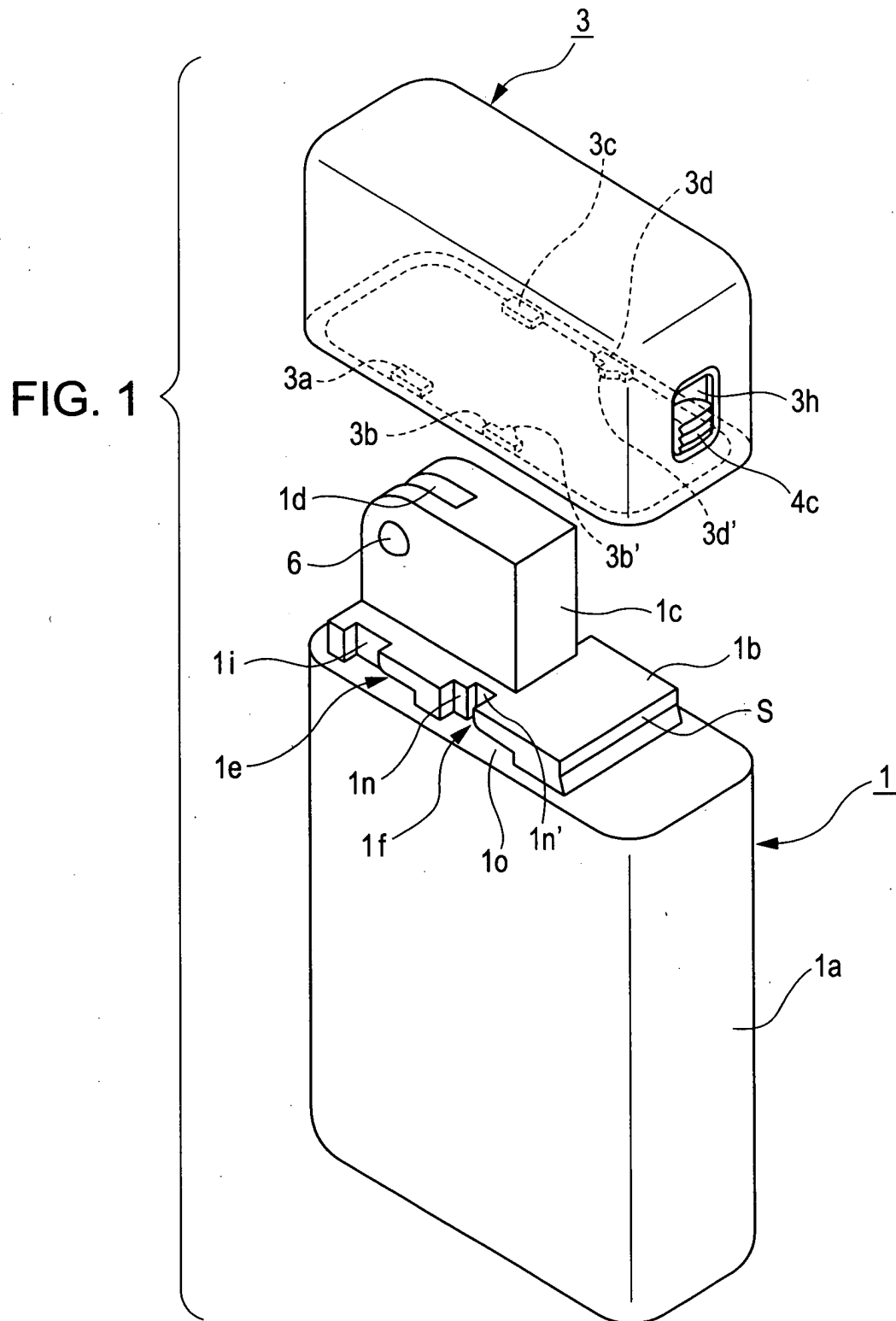


FIG. 2

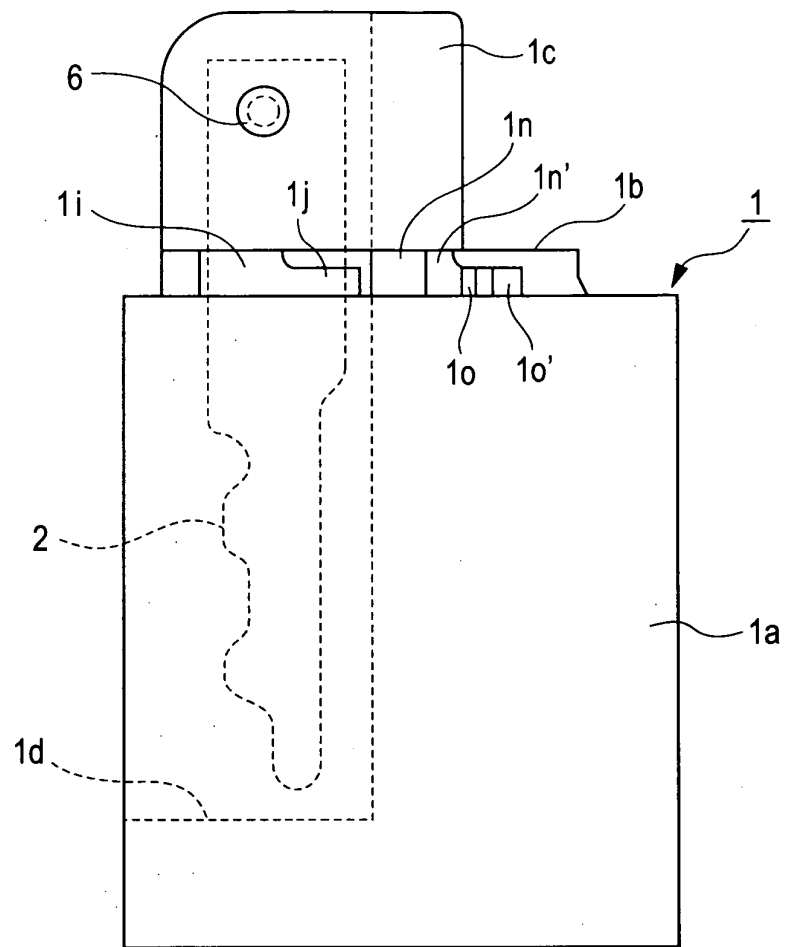


FIG. 3

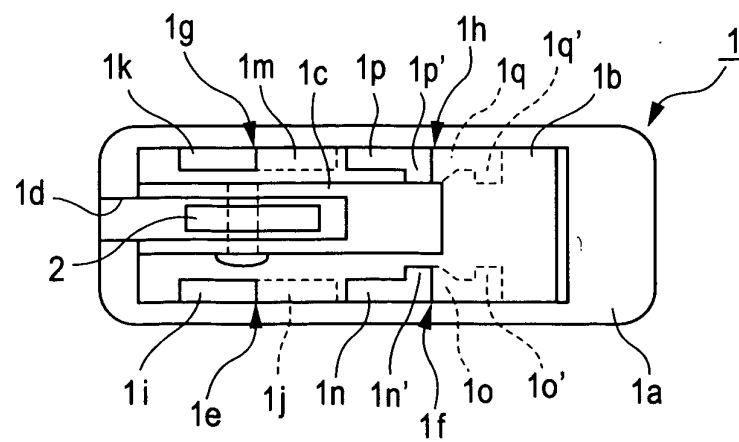


FIG. 4

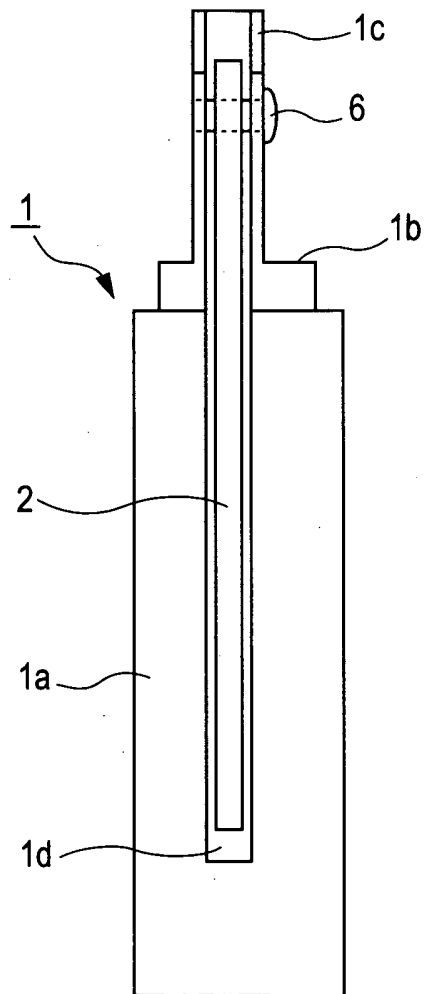
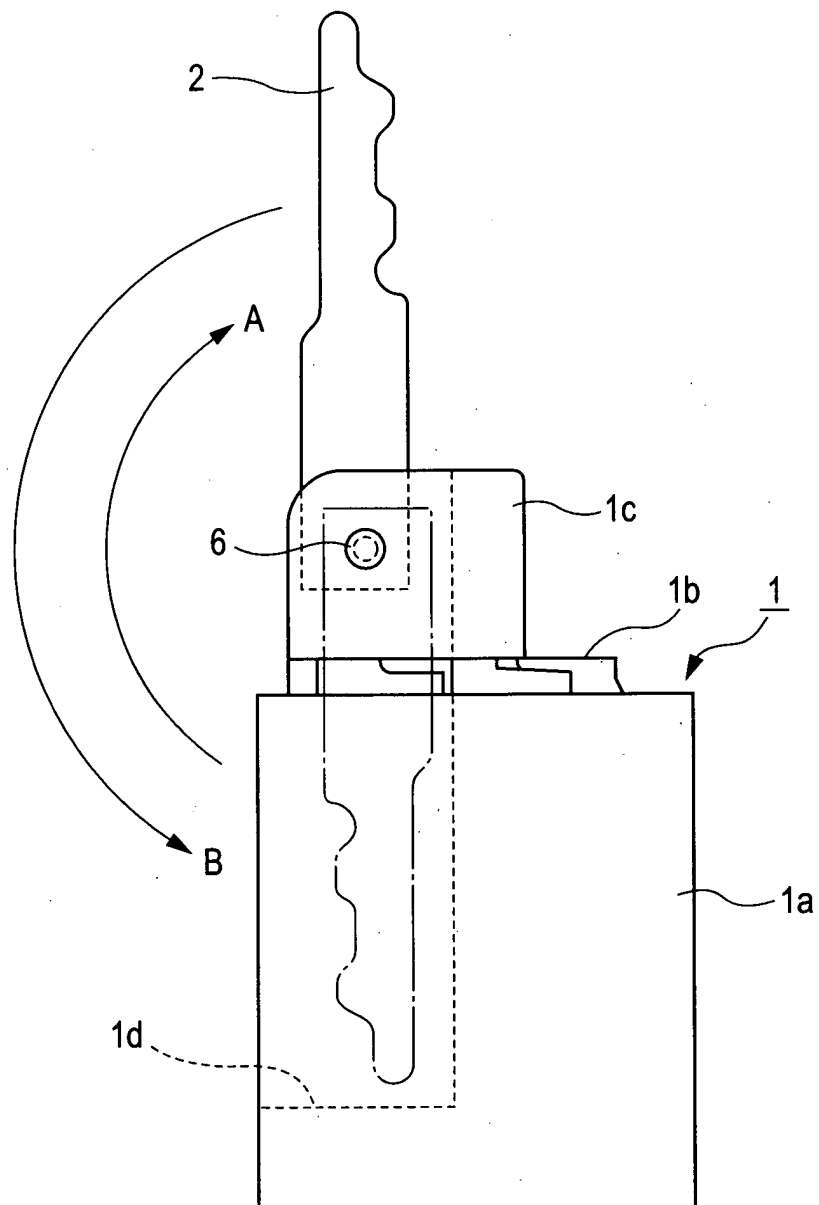


FIG. 5



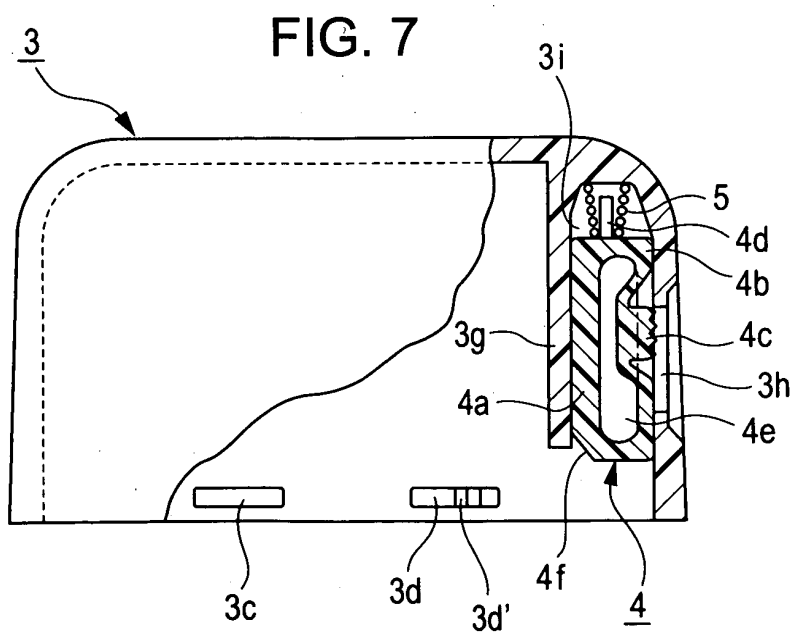
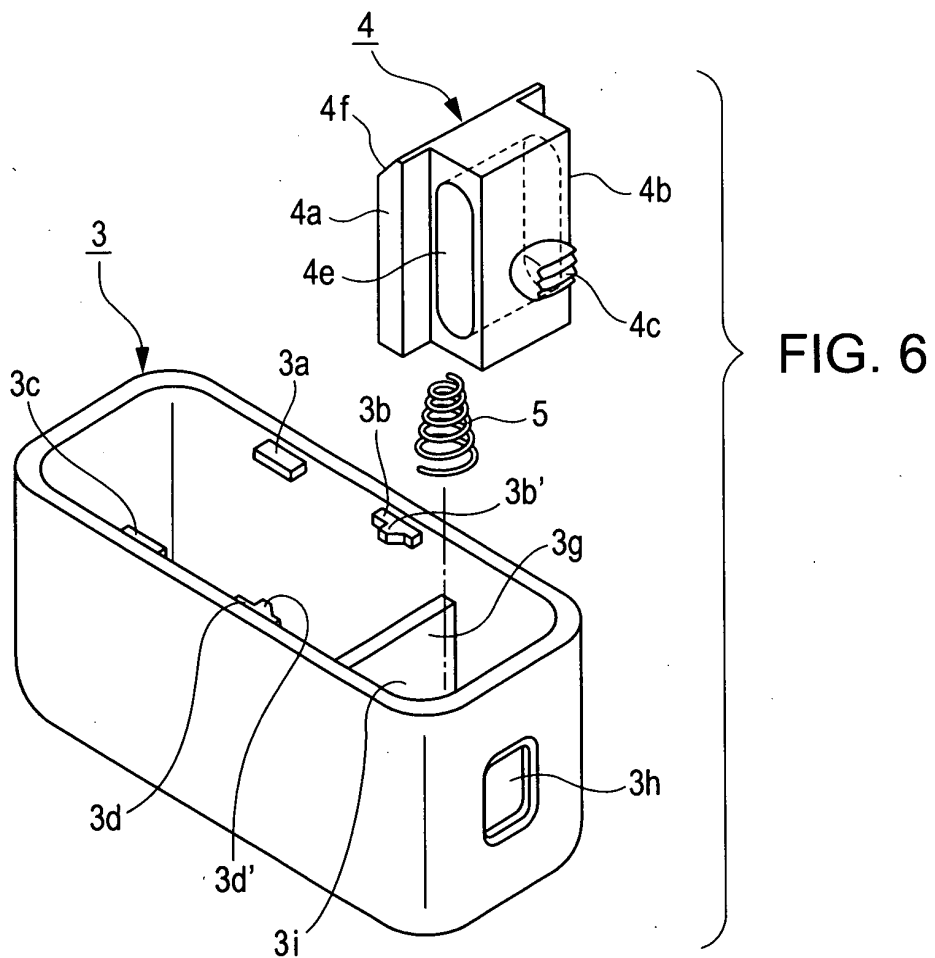


FIG. 8

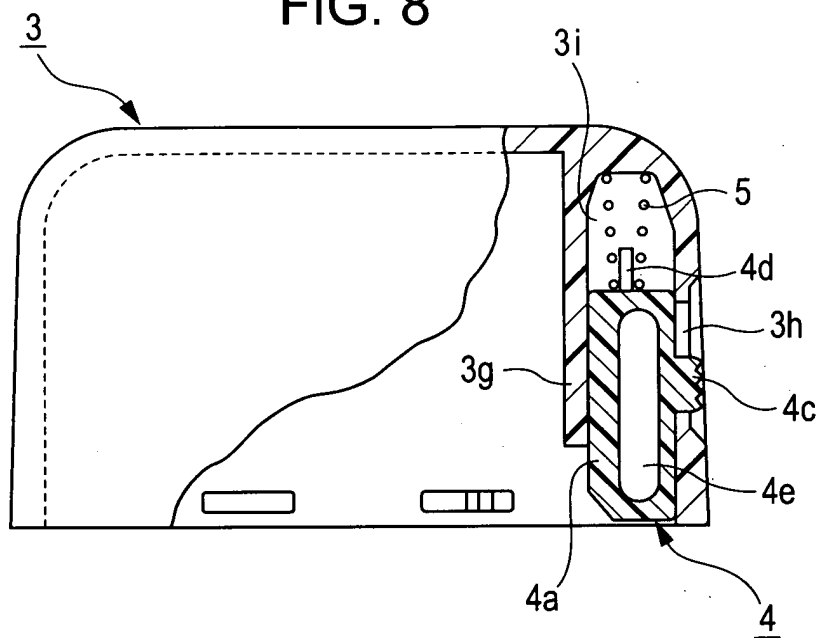


FIG. 9

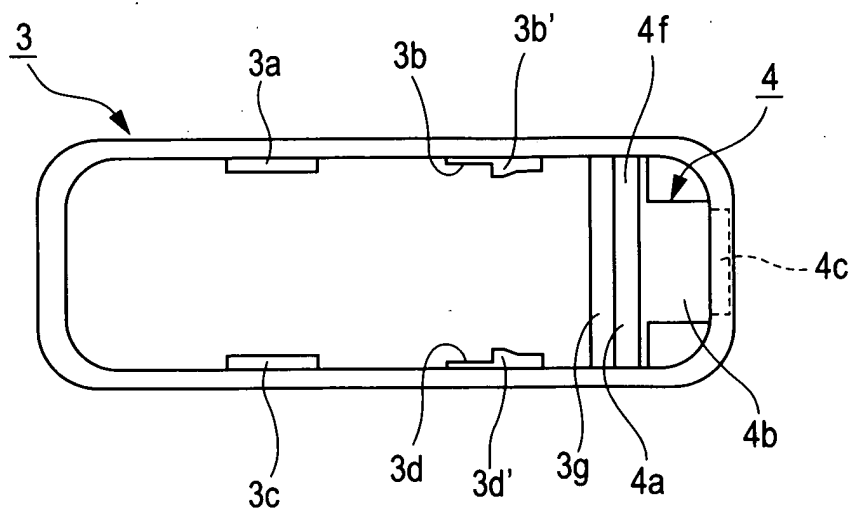


FIG. 10

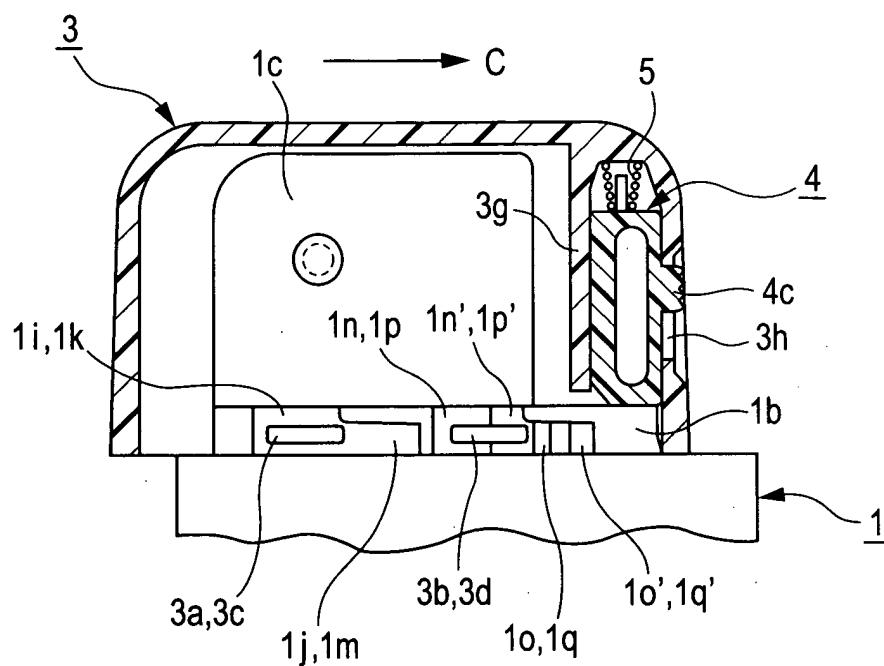


FIG. 11

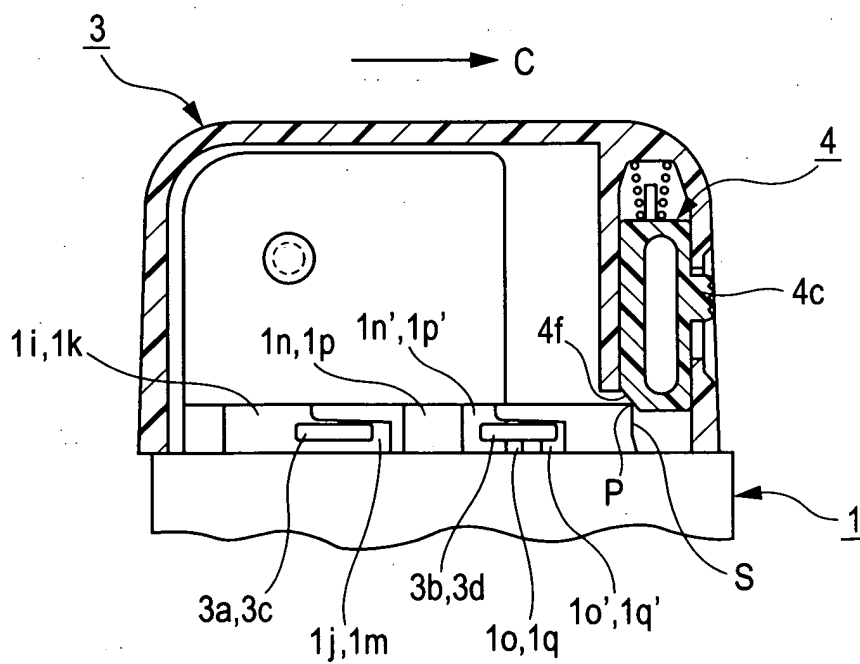


FIG. 12

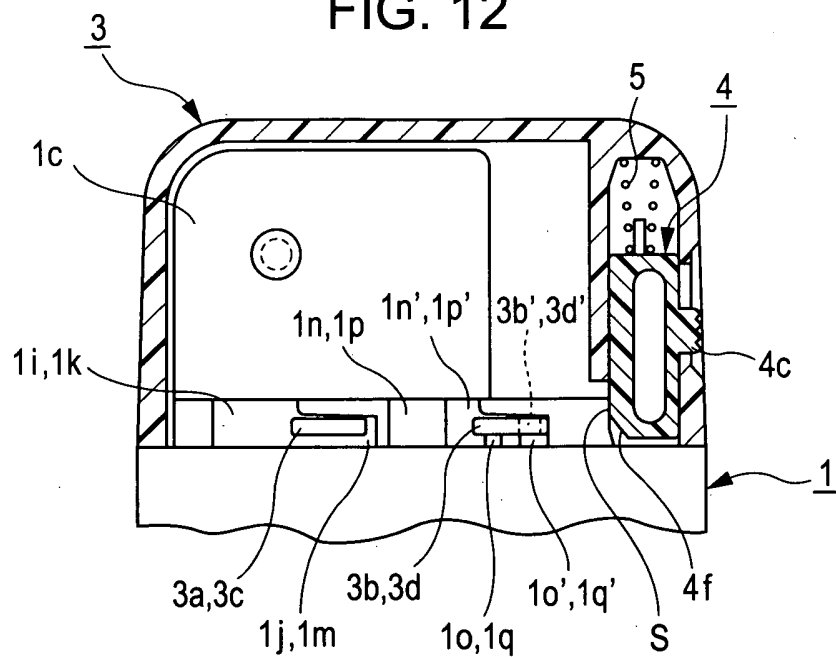
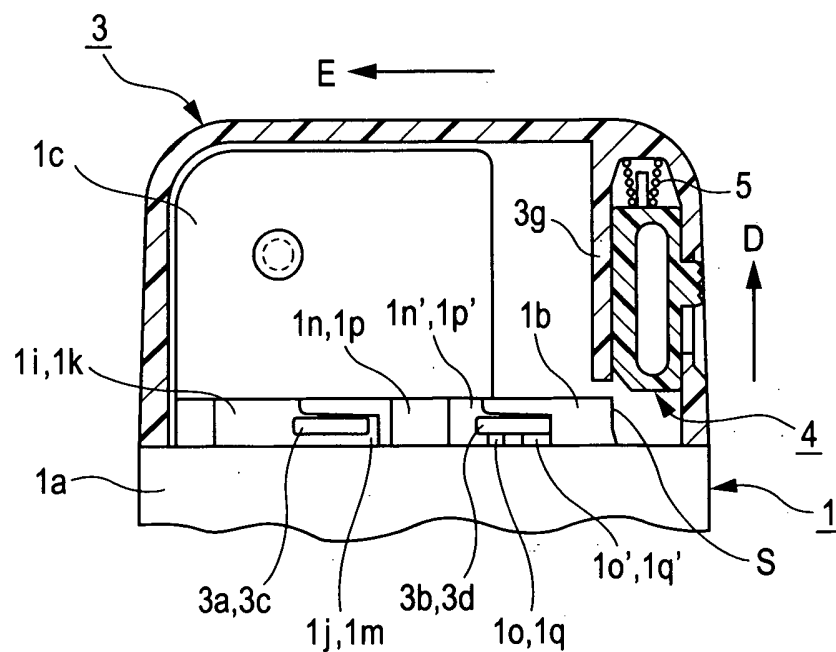


FIG. 13





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Application Number
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