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

(11) EP 2 474 952 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.07.2012 Bulletin 2012/28

(51) Int Cl.:
G07C 9/00 *(2006.01)* ***E05B 19/00*** *(2006.01)*

(21) Application number: **11195590.2**

(22) Date of filing: **23.12.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **11.01.2011 JP 2011002845**

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

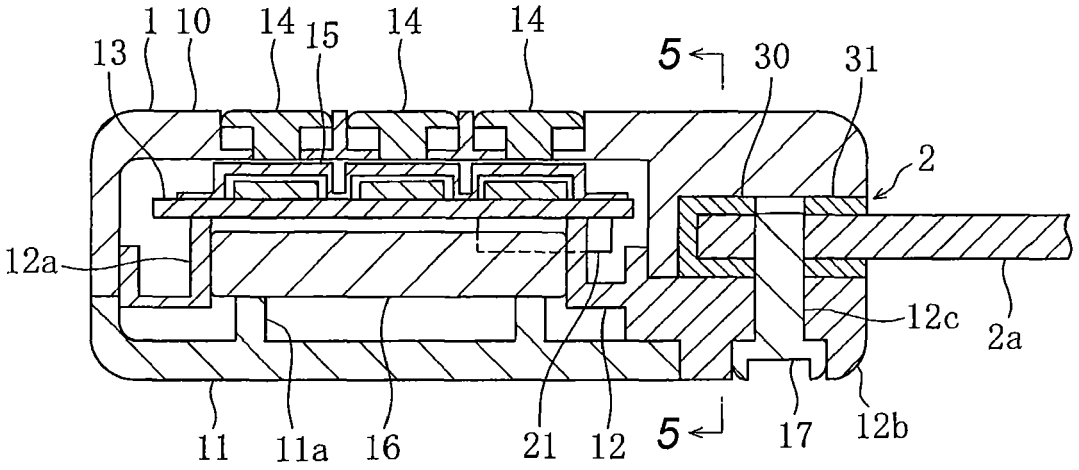
(72) Inventors:
- **Miyazawa, Akira**
  Tokyo, Tokyo 145-8501 (JP)
- **Takahashi, Ryo**
  Tokyo, Tokyo 145-8501 (JP)

(74) Representative: **Klunker . Schmitt-Nilson . Hirsch**
Destouchesstraße 68
80796 München (DE)

(54) Portable device

(57) A key plate (2) includes a holding portion (30) held by a case body (1) and a key portion (2a) protruding from the case body (1), and a transponder (21) is disposed on a substrate (13) at a side portion of the case body (1) in a width direction of the case body (1) that is orthogonal to an extending direction of the key portion (2a). The holding portion (30) includes a reinforcing portion (33) that extends in the width direction of the case body (1). The reinforcing portion (33) includes a stepped portion (32), continues to the key portion (2a) in the thickness direction of the case body (1), and extends to at least a position where the reinforcing portion (33) overlaps the transponder (21) in the width direction of the case body (1).

FIG. 3



EP 2 474 952 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a portable device including a transponder that is provided in a case body fixing a key plate and communicates with a vehicle, and more particularly, to a portable device where a key plate is provided with a holding portion fixed to a case body.

2. Description of the Related Art

[0002] A keyless entry system of a vehicle includes a device that is provided in a vehicle and performs communication, control, or the like; and a portable device that is carried by a user. The portable device includes a case body that includes switches, and a key plate that is made of metal and includes a key portion protruding from the case body and a holding portion holding the key portion at the case body. Communication is performed between the device provided in the vehicle and the portable device by the pressing operation of operation bodies that switch the switches provided in the case body. Accordingly, a control for locking and unlocking doors or the like is performed. Further, it is also possible to manually perform the locking and unlocking of the doors by rotating the key plate after inserting the key plate into a key hole of the vehicle.

[0003] Further, a key hole is also formed at a driver's seat, and it is also possible to start an engine by rotating the key plate after inserting the key plate into this key hole. In this case, contactless authentication communication is performed between a transponder provided in the case body and a coil provided near the key hole, and the key hole is unlocked and is allowed to rotate only when authentication is satisfied. Since the communication in this case is performed by the power of a signal transmitted from the vehicle, power is not supplied from the portable device. This immobilizer system is provided to prevent a vehicle from being stolen.

[0004] Metal, which is a material shielding magnetic flux between the transponder and the coil, needs to not be present in order to perform communication between the transponder and the coil while the key plate is inserted into the key hole of the driver's seat. Meanwhile, in order to increase the torsional strength of the key plate, the holding portion includes a base portion that is formed to extend from the key portion and a reinforcing portion that extends laterally from the base portion. If the reinforcing portion overlaps the transponder in the extending direction of the key portion, the communication between the transponder and the coil is interrupted.

[0005] In order to prevent this, in Japanese Unexamined Patent Application Publication No. 10-140900, for example, a reinforcing portion of a key plate is formed to extend only on one side so that the reinforcing portion is not disposed between a transponder and a coil. Further, in Japanese Unexamined Patent Application Publication No. 8-144589, a transponder is disposed at a position where a base portion of a key plate and a case body do not overlap each other in a thickness direction of the case body.

[0006] Since the reinforcing portion of the key plate is formed to extend only on one side in the structure disclosed in Japanese Unexamined Patent Application Publication No. 10-140900, it is not possible to sufficiently increase the torsional strength of the key plate. Further, the reduction of the thickness of the case body is hindered in the structure disclosed in Japanese Unexamined Patent Application Publication No. 8-144589. Specific description is as follows: first, switches, which are exposed to the surface of a case body, are disposed on one side of a substrate that is provided in the case body, and a battery and the like are disposed on the other side of the substrate. Since the height of a transponder is larger than those of the switches, the transponder is disposed on the other side of the substrate that is the same side as the side on which the battery and the like are disposed. Accordingly, the substrate is disposed at a position closer to the one side in the thickness direction of the case body.

[0007] Since the key plate is disposed at the middle position of the case body in the thickness direction of the case body, the position of the key plate overlap the position of the transponder in the thickness direction as it is. In this case, in order to set the holding portion of the key plate and the transponder so as not to overlap each other in the thickness direction of the case body as disclosed in Japanese Unexamined Patent Application Publication No. 8-144589, it is necessary to set one side of the case body to a sufficient thickness to hold the holding portion of the key plate by positioning the holding portion of the key plate on the extension line of the substrate. As a result, it is necessary to set the thickness of the case body to be large. Alternatively, disposing of the transponder and the switches on the same side of the substrate may also be considered. However, since the height of the transponder is larger than those of the switches as described above, the heights of the switches are increased. As a result, the case body needs to be made thick.

SUMMARY OF THE INVENTION

[0008] The present invention provides a portable device that sufficiently increases the torsional strength of a key plate and does not hinder the reduction of the thickness of a case body.

[0009] According to an aspect of the invention, there is provided a portable device. The portable device includes a case body that is thin in a thickness direction; a substrate which is received in the case body and on which an electronic component is disposed; and a key plate that is held by the case body, protrudes, and is

made of metal. The key plate includes a holding portion held by the case body and a key portion protruding from the case body, and a transponder is disposed on the substrate at a side portion of the case body in a width direction of the case body that is orthogonal to an extending direction of the key portion. The holding portion includes a reinforcing portion that extends in the width direction of the case body. The reinforcing portion includes a stepped portion, continues to the key portion in the thickness direction of the case body, and extends to at least a position where the reinforcing portion overlaps the transponder in the width direction of the case body.

[0010] Further, in the portable device according to the aspect of the invention, the holding portion may be formed of a holding body separate from the key portion, and a key holding portion holding the key portion and the reinforcing portion may be formed integrally with the holding body.

[0011] Furthermore, in the portable device according to the aspect of the invention, the reinforcing portion may not overlap the projection area of the transponder in the extending direction of the key portion.

[0012] Moreover, in the portable device according to the aspect of the invention, the substrate may be disposed at a position closer to one surface of the case body in the thickness direction of the case body, the holding portion may be disposed at a middle position of the case body in the thickness direction of the case body, and the stepped portion of the reinforcing portion may have a difference in level from the key portion toward the other surface of the case body in the thickness direction of the case body.

[0013] Further, in the portable device according to the aspect of the invention, switches may be disposed on one surface of the substrate in the thickness direction of the case body and the transponder and a battery may be disposed on the other surface of the substrate in the thickness direction of the case body.

[0014] Furthermore, in the portable device according to the aspect of the invention, the reinforcing portion may extend from the key portion to both sides in the width direction of the case body.

[0015] Moreover, in the portable device according to the aspect of the invention, the reinforcing portion may extend to a position closer to the side surface of the case body than a position where the transponder is disposed.

[0016] According to the portable device of the aspect of the invention, the key plate includes the holding portion held by the case body and the key portion; the holding portion includes the reinforcing portion that extends in the width direction of the case body; and the reinforcing portion includes the stepped portion, continues to the key portion in the thickness direction of the case body, and extends to at least a position where the reinforcing portion overlaps the transponder in the width direction of the case body. Accordingly, it is possible to sufficiently improve the torsional strength of the key plate by the reinforcing portion and to prevent the reinforcing portion from interrupting the communication between the transponder and a vehicle.

[0017] Further, according to the portable device of the aspect of the invention, the holding portion is formed of the holding body separate from the key portion, and the key holding portion and the reinforcing portion are formed integrally with the holding body. Accordingly, since it is possible to assemble the key portion by inserting and fixing the key portion to the holding body after the holding body is previously embedded in the case body, it is possible to easily manufacture the portable device.

[0018] Furthermore, according to the portable device of the aspect of the invention, the reinforcing portion does not overlap the projection area of the transponder in the extending direction of the key portion. Accordingly, it is possible to reliably prevent the reinforcing portion from interrupting the communication of the transponder.

[0019] Moreover, according to the portable device of the aspect of the invention, the substrate is disposed at a position closer to one surface of the case body in the thickness direction of the case body, the holding portion is disposed at a middle position of the case body in the thickness direction of the case body, and the stepped portion of the reinforcing portion has a difference in level from the key portion toward the other surface of the case body in the thickness direction of the case body. Accordingly, even though the case body is not formed so as to be thick, it is possible to form the stepped portion at the reinforcing portion. Therefore, it is possible to prevent the hindrance of reduction of the thickness of the case body.

[0020] Further, according to the portable device of the aspect of the invention, the switches are disposed on one surface of the substrate in the thickness direction of the case body and the transponder and a battery are disposed on the other surface of the substrate in the thickness direction of the case body. Accordingly, it is possible to efficiently dispose components in the case body.

[0021] Furthermore, according to the portable device of the aspect of the invention, the reinforcing portion extends from the key portion to both sides in the width direction of the case body. Accordingly, it is possible to sufficiently improve the torsional strength of the key plate by the reinforcing portion.

[0022] Moreover, according to the portable device of the aspect of the invention, the reinforcing portion extends to a position closer to the side surface of the case body than a position where the transponder is disposed. Accordingly, it is possible to further improve the strength of the key plate by the reinforcing portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a perspective view of a portable device according to this embodiment;

Fig. 2 is an exploded perspective view of a case

body;

Fig. 3 is a cross-sectional view of the portable device;

Fig. 4 is an exploded perspective view of an upper case and a holding body;

Fig. 5 is a cross-sectional view of the portable device taken along a line A-A shown in Fig. 3; and

Fig. 6 is a cross-sectional view of holding bodies including other types of stepped portions.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] An embodiment of the invention will be described in detail with reference to the drawings. Fig. 1 is a perspective view of a portable device according to this embodiment. The portable device forms a keyless entry system of a vehicle, and the keyless entry system has functions of locking and unlocking doors of the vehicle by communicating with the vehicle through the operation of the portable device.

[0025] As shown in Fig. 1, the portable device includes a box-like case body 1 that is thin in a thickness direction and a key plate 2 that extends so as to protrude from one surface of the case body 1. The case body 1 is made of a resin, and three operation bodies 14 are provided on the surface of the case body 1 so as to be freely pressed. Operations and the like, which communicate with the vehicle, are performed by the pressing operations of these operation bodies 14. The key plate 2 is made of metal, and includes a key portion 2a that can be inserted into a key hole formed at the vehicle. When the key portion 2a is inserted into the key hole of the vehicle, the portable device of the keyless entry system automatically performs wireless communication for authentication between a device of the vehicle and itself and operates to release the rotational locking of the key hole so that an engine can start only when authentication is satisfied.

[0026] Fig. 2 is an exploded perspective view of the case body 1. The case body 1 is formed of an upper case 10, a lower case 11, and a middle case 12 that are stacked in the thickness direction and integrated with each other. Further, a battery 16 and a substrate 13 on which switches 20 and a transponder 21 are mounted are received in the case body 1. Meanwhile, other various components other than the switches 20 and the transponder 21 are disposed on the substrate 13, but only the switches 20 and the transponder 21 are shown in Fig. 2 for simplification. The switches 20 are formed of push-button switches that are switched by the pressing operations of the operation bodies 14. The transponder 21 is provided to perform automatic communication when the key portion 2a is inserted into the key hole of the vehicle.

[0027] The upper case 10 includes three recessed operation body-receiving portions 10a in which the operation bodies 14 are received so as to be freely pressed. The operation bodies 14 are received in the operation body-receiving portions 10a, respectively. The lower case 11 includes a battery placing portion 11a on which a flat disc-shaped battery 16 is placed and which is formed on the inner surface of the lower case 11 facing the upper case 10.

[0028] The middle case 12 includes a battery holding portion 12a that holds the side surface of the battery 16 and is formed so as to pass through the surface of the middle case 12 facing the lower and upper cases 11 and 10. The middle case 12 includes a holding body placing portion 12b that has a surface corresponding to the outer shape of a holding body (holding portion) 30 to be described below and is formed on the side on which the key plate 2 is provided. A screw hole 12c, which is used to fix the key plate 2, is also formed at the holding body placing portion 12b. Further, an edge portion 12d is formed so as to protrude from the portion of the middle case 12, which faces the upper case 10, except for the holding body placing portion 12b. The substrate 13 is placed on the battery holding portion 12a and held. Meanwhile, the lower case 11 is disposed so as to correspond to a position on the middle case 12 except for the holding body placing portion 12b, and forms the outer shell of the case body 1 together with the upper case 10 and the holding body placing portion 12b.

[0029] The three switches 20 are disposed in parallel on the surface of the substrate 13 facing the upper case 10. Each of the switches 20 is formed of a push-button switch. Meanwhile, the transponder 21 is disposed on the surface of the substrate 13, which faces the lower case 11, at a side portion of the case body 1 in a width direction that is a direction orthogonal to the extending direction of the key portion 2a.

[0030] A pressing sheet 15, which is made of rubber, is provided so as to cover the substrate 13. Pressing protrusions 15a, which protrude toward the upper case 10, are formed on the pressing sheet 15 so as to correspond to the positions of the switches 20, respectively. The operation bodies 14 are adapted to press the pressing protrusions 15a. Accordingly, it is possible to impart appropriate operating feel to the pressing operations of the operation bodies 14.

[0031] Fig. 3 is a cross-sectional view of the portable device. As shown in Fig. 3, the operation bodies 14 face the switches 20 with the pressing protrusions 15a of the pressing sheet 15 interposed between the operation bodies 14 and the switches 20, respectively. Accordingly, it is possible to press the switches 20 by the pressing operations of the operation bodies 14. The switches 20, which are disposed on one surface of the substrate 13, are formed in a relatively thin shape, and the transponder 21 and the battery 16, which are disposed on the other surface of the substrate 13, have a relatively large height. For this reason, the substrate 13 is disposed closer to the surface of the case body 1, on which the operation bodies 14 are disposed, in the thickness direction of the case body 1.

[0032] The key plate 2 includes the key portion 2a that protrudes from the case body 1 and the holding body 30 that is held by the case body 1. The holding body 30, which holds the key portion 2a, is made of a metal ma-

terial and held by the upper case 10. The holding body 30 includes a key holding portion 31 that holds the end portion of the key portion 2a. The screw hole 12c is formed at the middle case 12 and a screw 17 is inserted into the screw hole 12c, so that the key portion 2a and the holding body 30 are fixed to the case body 1. The key portion 2a, which is held as described above, is disposed at the middle position of the case body 1 in the thickness direction of the case body 1.

[0033] Fig. 4 is an exploded perspective view of the upper case 10 and the holding body 30. In Fig. 4, the upper and lower sides are reversed to the upper and lower sides in Fig. 2. That is, the upper surface of the upper case 10 in Fig. 4 is the surface of the upper case that abuts against the lower case 11. A holding body receiving portion 10b in which the holding body 30 can be received is formed on the side of the upper case 10 that holds the key plate 2.

[0034] The holding body 30 includes a box-like key holding portion 31 that holds the key portion 2a and reinforcing portions 33 that extend from the key holding portion 31 to both sides. Each of the reinforcing portions 33 is formed so as to include a stepped portion 32 that has an inclined shape and is formed between the key holding portion 31 and itself. The stepped portion 32 is formed so as to have a difference in level in the thickness direction of the case body 1.

[0035] Fig. 5 is a cross-sectional view of the portable device taken along a line A-A shown in Fig. 3. Since the substrate 13 is disposed closer to one surface of the case body 1 in the thickness direction of the case body 1 as described above, the transponder 21 is disposed substantially at the middle position of the case body 1 in the thickness direction of the case body 1. The transponder 21 faces a coil, which is provided in the vehicle, at this position in the extending direction of the key portion 2a, so that communication is performed between the transponder 21 and the coil. Further, it is also necessary to dispose the key holding portion 31 of the holding body 30 at the middle position of the case body 1 in the thickness direction of the case body 1 in order to dispose the key portion 2a at the middle position of the case body 1 in the thickness direction of the case body 1.

[0036] Here, since the stepped portions 32 of the reinforcing portions 33 of the holding body 30 have a difference in level toward the other side of the case body 1 opposite to one side of the case body 1 to which the substrate 13 is closer and extend to both sides at the positions closer to the lower case 11, the reinforcing portion 33 does not overlap the projection area of the transponder 21 in the extending direction of the key plate 2 (a direction perpendicular to the plane of Fig. 5). Accordingly, magnetic flux is not shielded by the reinforcing portion 33 during the communication between the transponder 21 and the coil provided in the vehicle, such that it is possible to perform reliable communication between the transponder 21 and the coil. Meanwhile, since the reinforcing portions 33 extend to both sides, it is possible to increase the torsional strength of the key plate 2.

[0037] The reinforcing portion 33 has only to extend to at least a position where the reinforcing portion overlaps the transponder 21 in the width direction of the case body 1. However, in this embodiment, the reinforcing portion 33 extends to a position closer to the side surface of the case body 1 than the surface of the transponder 21 facing the side surface of the case body 1. Accordingly, the strength of the key plate can be further increased. Further, the reinforcing portion 33 has only to be formed so as to extend from the key holding portion 31 to at least the transponder 21. However, if the reinforcing portions 33 extend to both sides as in this embodiment, it is possible to sufficiently secure the strength of the key plate. Furthermore, the reinforcing portion 33 and the transponder 21 may partially overlap each other in the extending direction of the key plate 2. However, the reinforcing portion 33 and the transponder 21 may be completely separated from each other as in this embodiment, such that it is possible to perform reliable communication.

[0038] Further, the shape of the stepped portion 32 of the reinforcing portion 33 is not limited to the inclined shape shown in Fig. 5. Fig. 6 is a cross-sectional view of holding bodies 30, which include other types of stepped portions 32, corresponding to Fig. 5. Meanwhile, in Fig. 6, only one reinforcing portion 33 is shown and the other reinforcing portion is not shown. As shown in Fig. 6A, a stepped portion 32 may be formed so as to continue to the side surface of a key holding portion 31. Furthermore, as shown in Fig. 6B, a stepped portion 32 may be formed so as to extend downward from the bottom of a key holding portion 31. In addition, as shown in Fig. 6C, a stepped portion 32 may be formed so as to extend laterally and downward from the side surface of a key holding portion 31.

[0039] Since the reinforcing portions 33, which include the stepped portions 32 and extend from the key holding portion 31 of the key plate 2, are formed and the reinforcing portion 33 extends to at least the position of the transponder 21 as described above, it is possible to sufficiently improve the torsional strength of the key plate 2 by the reinforcing portions 33 and to prevent the reinforcing portion 33 from overlapping the projection area of the transponder 21 in the direction of the communication between the transponder 21 and a vehicle that is the extending direction of the key plate 2. Accordingly, it is possible to prevent the reinforcing portion 33 from interrupting communication. Meanwhile, the key portion 2a is inserted into the key holding portion 31, so that the key portion 2a and the key holding portion 31 are integrated with each other. Accordingly, it may be possible to form the reinforcing portions 33 that include the stepped portions 32 and extend from the key portion 2a. Further, in the structure where the substrate 13 is disposed in the case body 1 so as to be closer to one surface of the case body 1 in the thickness direction, the stepped portions 32 are formed so as to have a difference in level toward the other surface of the case body 1 in the thickness

direction and the reinforcing portions 33 extend to both sides. Accordingly, it is not necessary to make the case body 1 thick in order to embed the reinforcing portions 33 including the stepped portion 32 in the case body 1, and the reduction of the thickness of the case body 1 is not hindered.

[0040] The embodiment of the invention has been described above.

[0041] However, the application of the invention is not limited to this embodiment, and the invention is applied in various ways within the technical scope of the invention. For example, the aspect, such as the shape of the case body 1 or the number or shape of the operation bodies 14, is variously changed according to need. Other structures may also be changed according to functions or size required for a portable device. Further, in this embodiment, the key plate 2 has been formed of two members, that is, the key portion 2a and the holding body 30. However, the key portion 2a and the holding body 30 may be formed integrally with each other so that the key plate 2 is formed. Furthermore, the reinforcing portions 33 are interposed between the upper case 10 and the middle case 12, so that the key plate 2 is held in the case body 1. However, the case body 1 may be formed of one member and the key plate 2 may be embedded and held by insert molding.

[0042] It should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims of the equivalents thereof.

Claims

1. A portable device comprising:

a case body (1) that is thin in a thickness direction;
a substrate (13) which is received in the case body (1) and on which an electronic component is disposed; and
a key plate (2) that is held by the case body (1), protrudes, and is made of metal,
wherein the key plate (2) includes a holding portion (30) held by the case body (1) and a key portion (2a) protruding from the case body (1), and a transponder (21) is disposed on the substrate (13) at a side portion of the case body (1) in a width direction of the case body (1) that is orthogonal to an extending direction of the key portion (2a),
the holding portion (30) includes a reinforcing portion (33) that extends in the width direction of the case body (1), and
the reinforcing portion (33) includes a stepped portion (32), continues to the key portion (2a) in the thickness direction of the case body (1), and extends to at least a position where the reinforcing portion (33) overlaps the transponder (21) in the width direction of the case body (1).

2. The portable device according to Claim 1, wherein the holding portion (30) is formed of a holding body separate from the key portion (2a), and a key holding portion (31) holding the key portion (2a) and the reinforcing portion (33) are formed integrally with the holding body.

3. The portable device according to Claim 1 or 2, wherein the reinforcing portion (33) does not overlap the projection area of the transponder (21) in the extending direction of the key portion (2a).

4. The portable device according to any one of Claims 1 to 3,
wherein the substrate (13) is disposed at a position closer to one surface of the case body (1) in the thickness direction of the case body (1), the holding portion (30) is disposed at a middle position of the case body (1) in the thickness direction of the case body (1), and the stepped portion (32) of the reinforcing portion (33) has a difference in level from the key portion (2a) toward the other surface of the case body (1) in the thickness direction of the case body (1).

5. The portable device according to Claim 4, wherein switches (20) are disposed on one surface of the substrate (13) in the thickness direction of the case body (1), and
the transponder and a battery are disposed on the other surface of the substrate (13) in the thickness direction of the case body (1).

6. The portable device according to any one of Claims 1 to 5,
wherein the reinforcing portion (33) extends from the key portion (2a) to both sides in the width direction of the case body (1).

7. The portable device according to any one of Claims 1 to 6,
wherein the reinforcing portion (33) extends to a position closer to the side surface of the case body (1) than a position where the transponder (21) is disposed.

FIG. 1

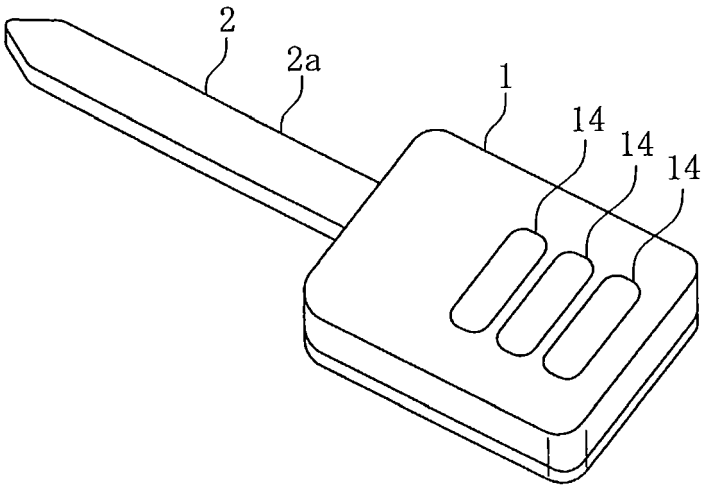


FIG. 2

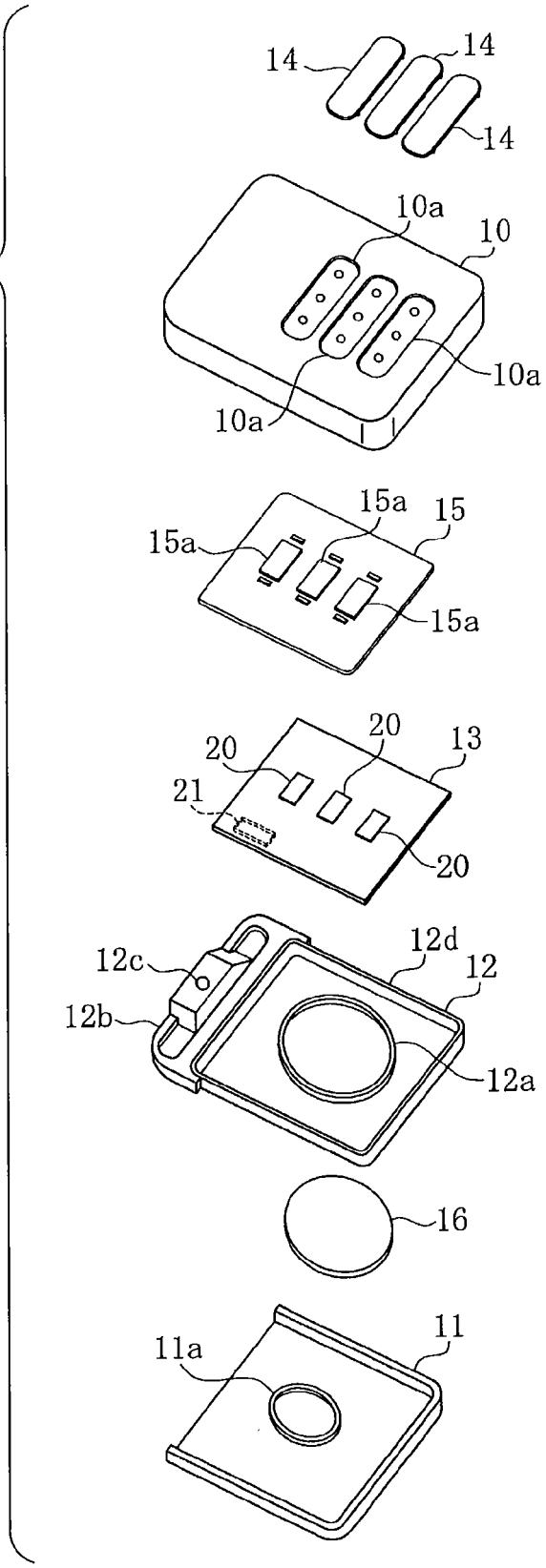

14
14
14
10a
10
10a
10a
15a
15
15a
15a
20
20
13
21
20
12d
12c
12
12b
12a
16
11
11a

FIG. 3

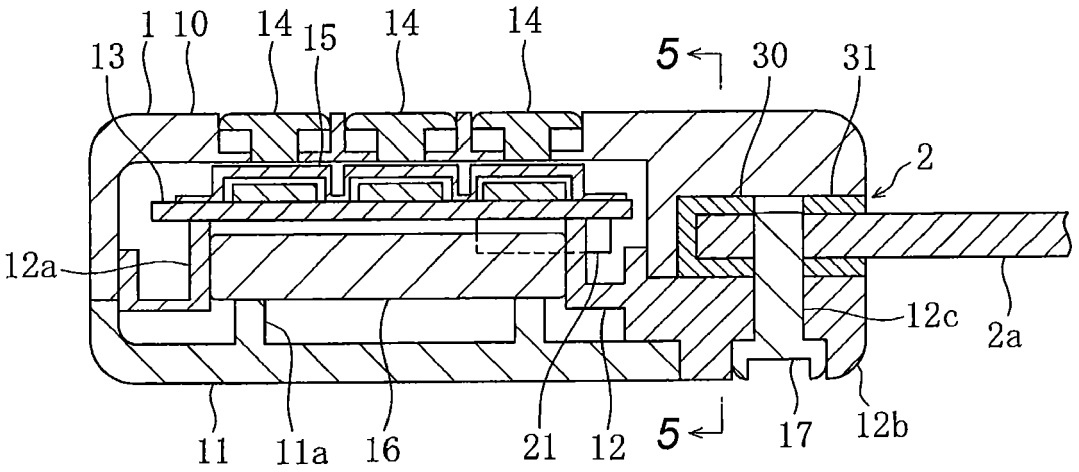


FIG. 4

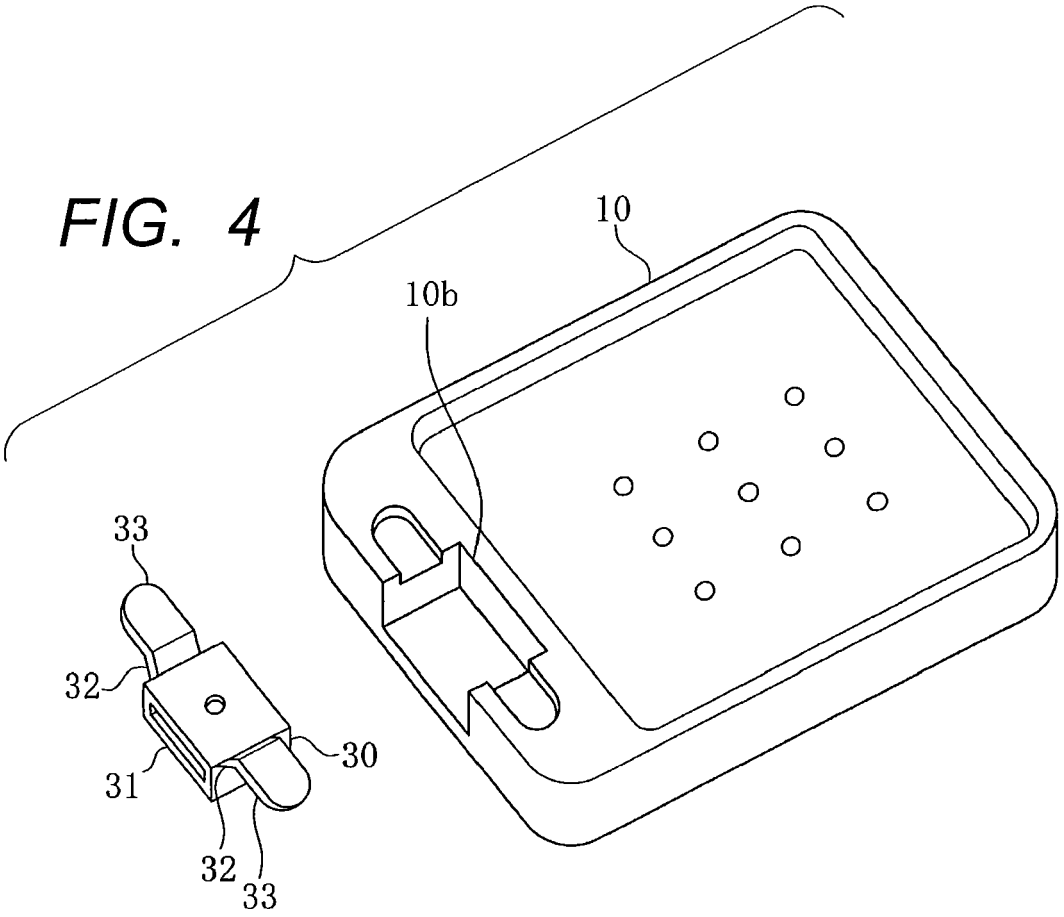


FIG. 5

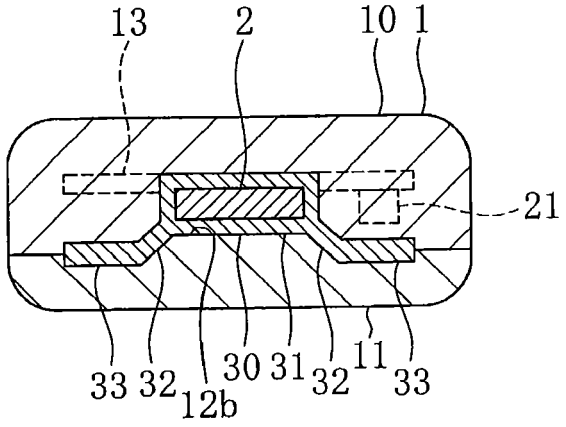
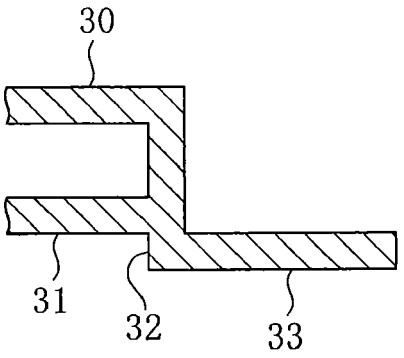
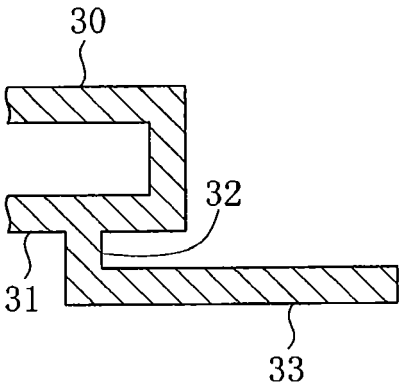


FIG. 6

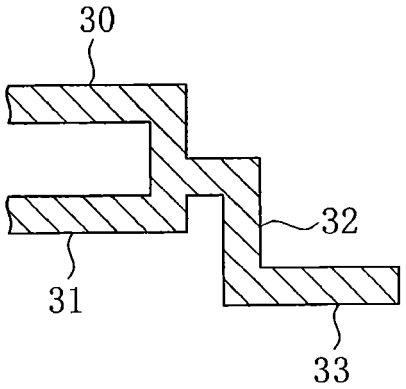
(a)



(b)



(c)



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 10140900 A **[0005] [0006]**
- JP 8144589 A **[0005] [0006] [0007]**