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

(11) EP 0 761 914 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
20.10.1999 Bulletin 1999/42

(51) Int Cl.[6]: **E05B 19/04**, E05B 49/00

(21) Application number: **96305742.7**

(22) Date of filing: **05.08.1996**

(54) **Key device with a built-in electronic circuit and a method of forming the key device**

Schlüssel mit eingebauter elektronischer Schaltungseinheit und Verfahren zu dessen Herstellung

Clé avec circuit électronique intégré et son procédé de fabrication

(84) Designated Contracting States:
DE FR GB NL

(30) Priority: **23.08.1995 JP 21501095**

(43) Date of publication of application:
12.03.1997 Bulletin 1997/11

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(56) References cited:
EP-A- 0 648 589

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EP 0 761 914 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF THE INVENTION

(1) Field of the Invention

[0001] The present invention relates to a key device with a built-in electronic circuit chip, and a method of forming the key device with the built-in electronic circuit chip, which is appropriate for use with a burglar prevention unit of automotive vehicle.

(2) Description of the Related Art

[0002] An electronic-circuit built-in key device for use in automotive vehicle is known. Japanese Laid-Open Patent Application No.3-279572 teaches such a key device.

[0003] The key device disclosed in the above publication includes a grip portion integrated with an electronic circuit. When forming the key device, a holder which holds the electronic circuit is placed at a grip portion of a metal key plate. The holder includes an upper holder and a lower holder both made of a resin material. A first molding process to cover the periphery of the electronic circuit, held in the holder, with a resin material is performed with a low molding pressure. A second molding process to form the grip portion of the key device having a desired shape and integrate the electronic circuit with the grip portion is performed with a high molding pressure.

[0004] The key device of the above publication is formed as described above. By performing the above-described method, the electronic circuit held in the holder can be secured to the grip portion without subjecting the electronic circuit to the high molding pressure.

[0005] However, when the method of the above publication is performed, the electronic circuit built in the key device suffers the thermal stress during the first and second molding processes. In particular, during the first molding process, the resin material heated to a high temperature is contacted to the periphery of the electronic circuit, and the electronic circuit suffers the thermal stress considerably. For this reason, the method of the above publication has a problem in that the electronic circuit may be damaged by the thermal stress during the process of forming the key device.

[0006] In order to prevent the electronic circuit of the key device from being damaged by the thermal stress, it is conceivable to form a case having an opening for inserting the electronic circuit with the resin material by the first molding process, instead of covering the periphery of the electronic circuit as taught by the above publication. After the electronic circuit is inserted into the case, the second molding process is performed to form the grip portion of the key device and integrate the electronic circuit with the grip portion. The electronic circuit is protected by the case against the thermal stress during the second molding process. By forming the key device in this manner, it is possible to prevent the electronic circuit of the key device from being damaged by the influence of the thermal stress.

[0007] It is desirable to form the above-mentioned case with a rigid resin material in order to protect the electronic circuit against the damages.

[0008] When the case of the rigid resin material having the opening for inserting the electronic circuit therein is formed at the grip portion, the electronic circuit may be subjected to mechanical stresses due to the thermal deformation of the case. In order to prevent the electronic circuit from being subjected to the mechanical stresses, it is necessary that the case has the opening whose dimensions are slightly greater than dimensions of the electronic circuit.

[0009] When the case having the opening with greater dimensions is formed, the electronic circuit included in the opening of the case is easily movable. If the second molding process is performed with no restriction of the electronic circuit included in the opening of the case, the electronic circuit may be separated from the case of the key device during the second molding process.

[0010] Accordingly, when the case of the rigid resin material having the opening for inserting the electronic circuit therein is formed, it is necessary to take any measure to prevent the separation of the electronic circuit from the key device during the second molding process.

[0011] If the opening of the case containing the electronic circuit is not closed during the second molding process, the heated resin material may enter the opening of the case so that the electronic circuit is damaged by the thermal stress due to the heated resin material.

[0012] In order to prevent the electronic circuit in the opening of the case from being damaged by the thermal stress, it is necessary to take, prior to the performance of the second molding process, any measure to avoid the heated resin material from entering the opening of the case.

[0013] The two requirements including the prevention of the separation of the electronic circuit and the prevention of the entering of the heated resin material mentioned above can be met by providing the key device with a lid portion which closes the opening of the case prior to the performance of the second molding process.

[0014] However, generally, the case, the electronic circuit and the lid portion have dimensional errors which are permissible when manufacturing the electronic circuit built-in key device. In order to prevent the electronic circuit, inserted into the opening of the case and enclosed by the lid portion, from being subjected to the mechanical stresses due to the thermal deformation, it is unavoidable to allow the electronic circuit to be loosely fitted to the opening of the case with a certain degree of play.

[0015] In the case of the conventional device of the above publication, it is difficult to meet both the require-

ment to snugly fit the electronic circuit into the opening of the case of the key device without play and the requirement to prevent the electronic circuit from being subjected to mechanical stresses due to thermal deformation.

[0016] As described above, it is difficult for the conventional device of the above publication to meet all the requirements including: (1) to avoid the separation of the electronic circuit from the key device during the process of forming the key device, (2) to avoid the influence of thermal stresses over the electronic circuit during the process of forming the key device, (3) to protect the periphery of the electronic circuit with a molded portion of a rigid resin material, (4) to snugly fit the electronic circuit into the opening of the case of the key device without play, and (5) to prevent the electronic circuit from being subjected to mechanical stresses due to thermal deformation of the case.

[0017] EP-A-0,648,589 discloses a key device and a method of making such a device, in accordance with the preambles of Claims 1 and 5.

SUMMARY OF THE INVENTION

[0018] An object of the present invention is to provide an improved electronic circuit built-in key device in which the above-described problems are eliminated.

[0019] Another object of the present invention is to provide an electronic circuit built-in key device which provides an integrated structure of a key and an electronic circuit chip covered with a non-rigid resin material and a rigid resin material wherein the grip portion is integrated with the electronic circuit chip without play.

[0020] Still another object of the present invention is to provide a key device forming method which provides an integrated structure of a key and an electronic circuit chip covered with a non-rigid resin material and a rigid resin material wherein the grip portion is integrated with the electronic circuit chip without play. The present invention provides a key device in accordance with Claim 1.

[0021] The present invention also provides a key device forming method in accordance with Claim 5.

[0022] The key device and the key device forming method of the present invention can prevent the separation of the electronic circuit chip from the key device during the process of forming the key device, and can prevent the entering of the heated resin material into the periphery of the electronic circuit chip during the process of forming the key device. In addition, the device and the method of the present invention provide the integrated structure in which the electronic circuit chip, included in the insertion opening of the first portion of the rigid resin material, is held without play by the lid portion which is resilient and thermoplastic. Accordingly, it is possible for the present invention to meet all the requirements including: (1) to avoid the separation of the electronic circuit chip from the key device during the process of forming the key device, (2) to avoid the influence of thermal stresses over the electronic circuit during the process of forming the key device, (3) to protect the periphery of the electronic circuit chip with a molded portion of a rigid resin material, (4) to snugly fit the electronic circuit chip into the insertion opening of the molded portion without play, and (5) to prevent the electronic circuit from being subjected to mechanical stresses due to thermal deformation of the molded portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] Other objects, features and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings in which:

FIG.1 is a front view of an electronic circuit built-in key device in a preferred embodiment of the present invention;
FIG.2 is a side view of the key device in FIG.1;
FIG.3 is a cross-sectional view of the key device taken along a line III-III shown in FIG.2;
FIG.4 is a cross-sectional view of the key device in which a transponder chip is inserted;
FIG.5 is a front view of a lid portion of the key device in FIG.2;
FIG.6 is a cross-sectional view of the lid portion taken along a line VI-VI shown in FIG.5; and
FIG.7 is a diagram showing the key device the grip portion of which is placed within a mold.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] A description will now be given of the preferred embodiment of the present invention with reference to the accompanying drawings.

[0025] FIG.1 shows an electronic circuit built-in key device 10 in the preferred embodiment of the prevent invention. Hereinafter, the electronic circuit built-in key device in the preferred embodiment will be referred to as the key device 10.

[0026] Referring to FIG.1, the key device 10 includes a key plate 12, a first portion 14 of a rigid resin material, an insertion opening 16, a transponder chip 18, a lid portion 20, and a second portion 22 of a non-rigid resin material.

[0027] The key plate 12 is made of a metal material. The key plate 12 has a grip portion by which the vehicle operator turns the key device 10. The grip portion is covered with the first portion 14 of the rigid resin material. The first portion 14 has the insertion opening 16, and the transponder chip 18 is inserted into the insertion opening 16.

[0028] The insertion opening 16 into which the transponder chip 18 is inserted is enclosed by the lid portion 20. The first portion 14 of the rigid resin material is cov-

ered with the second portion 22 of the non-rigid resin material.

[0029] The first portion 14 of the rigid resin material protects the transponder chip 18, contained in the insertion opening 16, against impact. The first portion 14 of the rigid resin material prevents the grip portion of the key plate 12 from being excessively deformed when the grip portion is subjected to torsional torque. In the present embodiment, the rigid resin material of the first portion 14 is polybutylene terephthalate (PBT).

[0030] The transponder chip 18 is an electronic circuit chip which contains an electronic circuit serially transmitting a signal indicative of a predetermined identification (ID) code of the vehicle owner. When the key device 10 is inserted into a key cylinder (not shown) of the vehicle, the transponder chip 18 transmits the signal to a burglar prevention unit (not shown) of the vehicle. When the ID code indicated by the signal from the transponder chip 18 is detected to be equal to a pre-recorded code of the burglar prevention unit, the burglar prevention unit enables the vehicle to start the operation.

[0031] The lid portion 20 closes the insertion opening 16 in which the transponder chip 16 is inserted. The lid portion 20 is made of a resin material which is resilient and thermoplastic. In the present embodiment, the resin material of the lid portion 20 is polyester elastomer having a melting point of 154°C.

[0032] The second portion 22 of the non-rigid resin material provides the vehicle operator with a soft feeling when the vehicle operator touches the grip portion of the key device 10. The second portion 22 protects the grip portion of the key device 10 against impact. To attain these purposes, the second portion 22 in the present embodiment must be elastic and flexible, and must have a thickness that is greater than 2 mm. In the present embodiment, the non-rigid resin material of the second portion 22 is flexible polyvinyl chloride (PVC).

[0033] Next, a description will be given of the construction of the electronic circuit built-in key device and the method of forming the electronic circuit built-in key device with reference to FIGS.2 through 7.

[0034] FIG.2 is a side view of the key device 10 in FIG. 1. FIG.3 is a cross-sectional view of the key device 10 taken along a line III-III shown in FIG.2.

[0035] As shown in FIG.3, the key plate 12 is an L-shaped metal member. The key plate 12 includes a longitudinal blade 12a and a base 12b. The blade 12a is notched or grooved to form a key groove. The base 12b is covered with the first portion 14 of the rigid resin material as shown in FIG.2. Since the key plate 12 is the L-shaped metal member, when the key device 10, inserted in the key cylinder of the vehicle, is turned, the rotational torque applied by the vehicle operator to the grip portion of the key device is effectively transmitted to the key cylinder via the longitudinal blade 12a.

[0036] The key plate 12 has a through hole 12c which is located at the center of the grip portion of the key device 10.

[0037] As shown in FIG.3, the first portion 14 of the rigid resin material is formed such that the through hole 12c is not closed by the rigid resin material.

[0038] As shown in FIGS.2 and 3, the first portion 14 has the insertion opening 16 on the side of the key plate 12. The insertion opening 16 has a width "W" and a height "H" which are slightly greater than a width and a height of the transponder chip 18 by a predetermined difference, respectively.

[0039] The difference between the width W of the opening 16 and the width of the chip 18, and the difference between the height H of the opening 16 and the height of the chip 18 are predetermined such that the transponder chip 18 does not interfere with the first portion 14 when the dimensions of the first portion 14 and the dimensions of the transponder chip 18 vary due to thermal deformation or degradation. The above dimensional differences avoid that excessively great stresses of the first portion 14 exert on the transponder chip 18 in the insertion opening 16.

[0040] When a first molding process to form the first portion 14 of the rigid resin material in the grip portion of the key plate 12 is completed, the transponder chip 18 is inserted into the insertion opening 16 of the first portion 14. FIG.4 is a cross-sectional view of the key device 10 in which the transponder chip 18 is inserted.

[0041] As shown in FIG.4, the insertion opening 16 has a slanting end surface 16a with which the transponder chip 18 is brought into contact. The transponder chip 18 has a slanting end surface 18a which is contacted with the slanting end surface 16a of the insertion opening 16. The shape of the slanting end surface 16a corresponds to the shape of the slanting end surface 18a.

[0042] When the transponder chip 18 is pushed inward until the slanting end surface 16a of the insertion opening 16 is reached, the position of the transponder chip 18 relative to the insertion opening 16 is adjusted so that the slanting end surface 18a and the slanting end surface 16a are fitted to each other. When the slanting end surface 18a and the slanting end surface 16a are fitted to each other, the transponder chip 18 is located at the center of the insertion opening 16 in the direction of the width W of the insertion opening 16.

[0043] When the insertion process to insert the transponder chip 18 into the insertion opening 16 is completed, the lid portion 20 is attached to the insertion opening 16. FIG.5 is a front view of the lid portion 20. FIG.6 is a cross-sectional view of the lid portion 20 taken along a line VI-VI shown in FIG.5.

[0044] Referring to FIG.5, the lid portion 20 is attached to the insertion opening 16 so that the lid portion 20 is contacted to the transponder chip 18. The lid portion 20 has a width and a height which are slightly greater than the width W and the height H of the insertion opening 16, respectively. Accordingly, when the lid portion 20 is attached to the insertion opening 16, the insertion opening 16 in which the transponder chip 18 is

inserted is enclosed by the lid portion 20.

[0045] As shown in FIGS.5 and 6, the lid portion 20 has a recess 20a which is located in the middle of a side surface of the lid portion 20 contacted to the transponder chip 18. The lid portion 20 has a peripheral edge 20b which is located on the periphery of the recess 20a.

[0046] Since the lid portion 20 has the recess 20a, the heat capacity of the lid portion 20 is reduced. The temperature of the lid portion 20 having the recess 20a can be increased by a smaller quantity of heat than a quantity of heat needed to increase the temperature of the solid lid portion having no recess. Since the lid portion 20 is formed with the peripheral edge 20b which surrounds the recess 20a, the resistance of the peripheral edge 20b to deformation is reduced. The peripheral edge 20b of the lid portion 20 is readily deformable to conform with the shape of the transponder chip 18 when the lid portion 20 is contacted to the transponder chip 18.

[0047] When the attaching process to attach the lid portion 20 to the insertion opening 16 is completed, a second molding process to form the second portion 22 of the non-rigid resin material which covers the first portion 14 is performed. FIG.7 shows the key device 10 in which the grip portion is placed within a mold 24.

[0048] Referring to FIG.7, the mold 24 is used for a second molding process to form the second portion 22 of the non-rigid resin material. As described above, the second portion 22 covers the first portion 14 and the lid portion 20 after the second molding process is performed.

[0049] In the present embodiment, when the second molding of the second portion 22 with the non-rigid resin material is performed, the heated non-rigid resin material (the PVC) is injected into the mold 24. Generally, it is difficult to avoid that the first portion 14 of the rigid resin material within the mold 24 be subjected to a high pressure and a high temperature of the heated non-rigid resin material injected in the second molding process.

[0050] In the present embodiment, the lid portion 22 is attached to the insertion opening 16 prior to the second molding process of the second portion 22. Accordingly, it is possible for the present embodiment to effectively prevent the transponder chip 18 from being separated from the insertion opening 16 due to the high pressure of the heated non-rigid resin material, although the size of the insertion opening 16 is greater than the size of the transponder chip 18.

[0051] Further, in the present embodiment, the lid portion 20 prevents the heated non-rigid resin material from entering the insertion opening 16 in which the transponder chip 18 is inserted. Accordingly, it is possible for the present embodiment to effectively reduce the influence of the thermal stress over the transponder chip 18 during the second molding process.

[0052] The second molding process of the second portion 22 in the present embodiment is performed with a molding temperature of 170°C. As described above, the resin material of the lid portion 20 is resilient and thermoplastic. In the present embodiment, the polyester elastomer having a melting point of 154°C which is below the molding temperature of the second molding process is used as the resin material of the lid portion 20. Accordingly, the lid portion 20 of the resin material becomes soft during the second molding process of the second portion 22.

[0053] As shown in FIG.7, the mold 24 has a gate 26 through which the heated non-rigid resin material is injected. The gate 26 of the mold 24 is arranged adjacent to the lid portion 20 of the key device 10. The non-rigid resin in the vicinity of the gate 26 which has just been injected to the mold 24 has a highest temperature. The greater the distance of the non-rigid resin from the gate 26 is, the lower the temperature of the non-rigid resin is. Since the gate 26 of the mold 24 is arranged adjacent to the lid portion 20, the non-rigid resin having the highest temperature can be contacted to the lid portion 20. Thus, it is possible that the lid portion 20 is made immediately soft when the non-rigid resin material is injected to the mold 24.

[0054] Further, in the present embodiment, the lid portion 20 has the recess 20a and the quantity of the resin material in the lid portion 20 is reduced. Thus, the heat capacity of the lid portion 20 is decreased by the reduction of the quantity of the resin material. Therefore, it is possible for the present embodiment to make the lid portion 20 soft enough when the second molding process of the second portion 22 is performed.

[0055] The lid portion 20 is pushed toward the insertion opening 16 due to the molding pressure during the process of the second molding of the second portion 22. Since the lid portion 20 is pushed against the transponder chip 18 and the lid portion 20 is made sufficiently soft, the lid portion 20 is bonded to the transponder chip 18. At the same time, the peripheral edge 20b is included in an internal space between the transponder chip 18 and a side wall of the insertion opening 16. Accordingly, when the second molding of the second portion 22 is completed, the transponder chip 22 can be snugly fitted to the insertion opening 16 of the first portion 14 without play.

[0056] As described above, the transponder chip 18 is pushed inward until the slanting end surface 16a of the insertion opening 16 is reached, the position of the transponder chip 18 relative to the insertion opening 16 is adjusted so that the slanting end surface 18a and the slanting end surface 16a are fitted to each other. When the slanting end surface 18a and the slanting end surface 16a are fitted to each other, the transponder chip 18 is located at the center of the insertion opening 16 in the direction of the width W thereof.

[0057] Since the molding pressure during the second molding of the second portion 22 is exerted on the lid portion 20, the transponder chip 18 is fixed at the center of the insertion opening 16 in the direction of the width W thereof, and at the same time there is no interference between the transponder chip 18 and the side wall of

the insertion opening 16.

[0058] In addition, since the polyester elastomer used as the resin material of the lid portion 20 is resilient at normal temperatures, the lid portion 20 absorbs the mechanical or thermal deformation of the first portion 14 of the rigid resin material, if occurred, and prevents the transponder chip 18 from being subjected to mechanical stresses due to such deformation of the first portion 14.

[0059] As shown in FIG.7, the mold 24 used for the second molding of the second portion 22 has no insert which is inserted into the through-hole 12c of the key plate 12. The non-rigid resin material, injected to the mold 24, can enter the through-hole 12c as well as the second portion 22. In the present embodiment, the PBT as the rigid resin material of the first portion 14 and the PVC as the non-rigid resin material of the second portion 22 do not easily adhere to each other. Generally, it is difficult to eliminate the deviation between the first portion 14 and the second portion 22 by covering the periphery of the first portion 14 of the rigid resin with the second portion 22 of the non-rigid resin.

[0060] However, in the present embodiment, the non-rigid resin injected to the mold 24 enters the through-hole 12c when the second molding of the second portion 22 is performed. Since the through-hole 12c passes through the first portion 14 and the key plate 12, it is possible that the non-rigid resin material contained in the through-hole 12c (which is located at the center of the grip portion of the key plate 12) adheres to both the first portion 14 (the PBT) and the second portion 22 (the PVC). Accordingly, it is possible for the present embodiment to prevent the deviation between the first portion 14 and the second portion 22 from becoming excessively great.

[0061] In the above-described embodiment, the polyester elastomer is used as the resin material of the lid portion 20. However, the present invention is not limited to this embodiment. The lid portion 20 according to the present invention may be made of a resin material which is resilient and thermoplastic enough to avoid the influence of mechanical stresses over the transponder chip 18 in the insertion opening 16 when the first portion 14 is subjected to thermal deformation.

[0062] In the above-described embodiment, the molding temperature of the second portion 22 is higher than the melting point of the resin material of the lid portion 20. However, the present invention is not limited to this embodiment. The molding temperature of the second portion 22 according to the present invention may be higher than a temperature at which the lid portion 20 readily becomes soft. The molding temperature of the second portion 22 is not necessarily higher than the melting point of the resin material of the lid portion 20.

Claims

1. A key device having a grip portion with a built-in electronic circuit chip, comprising:

a first portion (14) of a rigid resin material covering the grip portion, said first portion having an insertion opening (16) in which the electronic circuit chip (18) is inserted;
a lid portion (20) of a resin material closing said insertion opening of said first portion such that said lid portion is bonded to said electronic circuit chip, the resin material of the lid portion being resilient and thermoplastic; and
a second portion (22) of a resin material molded onto said first portion (14) to cover said first portion and said lid portion,

characterized in that
said second portion (22) is made of a non-rigid resin material, and said lid portion (20) is bonded to said electronic circuit chip (18), having been softened when said second portion (22) is molded on said first portion (14) by having a melting point below the molding temperature of said second portion (22) wherein said grip portion and said electronic circuit chip are integrated by said lid portion without play.

2. A device according to Claim 1,
characterized in that said lid portion (20) has a recess (20a) and a peripheral edge (20b) surrounding said recess, said lid portion being bonded to the electronic circuit chip by using said resilient and thermoplastic characteristics of said resin material.

3. A device according to Claim 1 or Claim 2,
characterized in that said insertion opening (16) of said first portion has an end surface (16a) which is snugly fitted with an end surface (18a) of the electronic circuit chip (18) when the electronic circuit chip is inserted into the insertion opening.

4. A device according to any one of Claims 1 - 3,
characterized in that the rigid resin material of the first portion (14) is polybutylene terephthalate, the non-rigid resin material of the second portion (22) is polyvinyl chloride, and the resin material of the lid portion (20) is polyester elastomer.

5. A method of forming an electronic circuit built-in key device, comprising the steps of:

molding a first portion (14) of a rigid resin material so that a grip portion is covered with the first portion, said first portion including an insertion opening (16);
inserting an electronic circuit chip (18) into the insertion opening of the first portion;
attaching a lid portion (20) to close the insertion

opening in which said electronic circuit chip is inserted, said lid portion being resilient and thermoplastic; and
molding a second portion (22) of a resin material so that the first portion and the lid portion are covered with the second portion,

characterized in that
said second portion (22) is made of a non-rigid resin material and is heated during the molding of the second portion so that the lid portion is bonded to the electronic circuit chip contained in the insertion opening, by having a melting point which is below a molding temperature used by said molding of the second portion (22), wherein said grip portion and said electronic circuit chip are integrated by said lid portion without play.

6. A method according to Claim 5,
characterized in that said molding of the second portion (22) is performed by placing the grip portion within a mold (24) having a gate (26), the non-rigid resin material of the second portion being injected from the gate into the mold, said gate being placed adjacent to the lid portion before said molding is performed.

7. A method according to Claim 5 or Claim 6,
characterized in that said insertion opening (16) of said first portion (14) has an end surface (16a) which is snugly fitted with an end surface (18a) of the electronic circuit chip (18) when the electronic circuit chip is inserted into the insertion opening.

8. A method according to any one of Claims 5 - 7,
characterized in that the rigid resin material of the first portion (14) is polybutylene terephthalate, the non-rigid resin material of the second portion (22) is polyvinyl chloride, and the resin material of the lid portion (20) is polyester elastomer.

Patentansprüche

1. Schlüsselvorrichtung mit einem Griffabschnitt mit eingebautem Elektronikschaltungschip, mit

einem ersten Abschnitt (14) eines harten Harzmaterials, das den Griffabschnitt bedeckt, wobei der erste Abschnitt eine Einsatzöffnung (16) hat, in die der elektronische Schaltungschip (18) eingesetzt ist;
einem Deckelabschnitt (20) eines Harzmaterials, das die Einsatzöffnung des ersten Abschnitts derart verschließt, daß der Deckelabschnitt mit dem Elektronikschaltungschip verbunden ist, wobei das Harzmaterial des Deckelabschnitts elastisch und thermoplastisch ist; und
einem zweiten Abschnitt (22) eines auf den ersten Abschnitt (14) geformten Harzmaterials, um den ersten Abschnitt und den Deckelabschnitt zu bedecken,

dadurch gekennzeichnet, daß
der zweite Abschnitt (22) aus einem nicht-harten Harzmaterial gemacht ist und der beim Formen des zweiten Abschnitts (22) auf dem ersten Abschnitt (14) aufgrund eines unter der Formgebungstemperatur des zweiten Abschnitts (22) liegenden Schmelzpunkts erweicht wordende Deckelabschnitt (20) mit dem elektronischen Schaltungschip (18) verbunden wird, wodurch der Griffabschnitt und der Elektronikschaltungschip durch den Dekkelabschnitt ohne Spiel einstückig ausgebildet werden.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
der Deckelabschnitt (20) eine Aussparung (20a) und eine die Aussparung umschließende Umfangskante (20b) hat, wobei der Deckelabschnitt unter Ausnutzung der elastischen und thermoplastischen Eigenschaften des Harzmaterials mit dem Elektronikschaltungschip verbunden wird.

3. Vorrichtung nach Anspruch 1 oder Anspruch 2,
dadurch gekennzeichnet, daß
die Einsatzöffnung (16a) des ersten Abschnitts eine Endfläche (16a) hat, die mit einer Endfläche (18a) des Elektronikschaltungschips (18) gut zusammenpaßt, wenn der Elektronikschaltungschip in die Einsatzöffnung eingesetzt ist.

4. Vorrichtung nach einem der Ansprüche 1-3,
dadurch gekennzeichnet, daß
das harte Harzmaterial des ersten Abschnitts (14) ein Polybutylenterephthalat ist, das nicht-harte Harzmaterial des zweiten Abschnitts (22) ein Polyvinylchlorid ist und das Harzmaterial des Deckelabschnitts (20) ein Polyesterelastomer ist.

5. Verfahren zum Ausbilden einer Schlüsselvorrichtung mit eingebauter Elektronikschaltung, mit den Schritten:

Formen eines ersten Abschnitts (14) aus einem harten Harzmaterial, so daß ein Griffabschnitt mit dem ersten Abschnitt bedeckt wird, wobei der erste Abschnitt eine Einsatzöffnung (16) umfaßt;
Einsetzen eines Elektronikschaltungschips (18) in die Einsatzöffnung des ersten Abschnitts;
Anbringen eines Deckelabschnitts (20) zum

Schließen der Einsatzöffnung, in die der Elektronikschaltungschip eingesetzt ist, wobei der Deckelabschnitt elastisch und thermoplastisch ist; und

Formen eines zweiten Abschnitts (22) aus einem Harzmaterial, so daß der erste Abschnitt und der Deckelabschnitt mit dem zweiten Abschnitt bedeckt sind,

dadurch gekennzeichnet, daß

der zweite Abschnitt (22) aus einem nicht-harten Harzmaterial gemacht ist und während des Formens des zweiten Abschnitts derart erhitzt wird, daß der aufgrund eines unter der Formgebungstemperatur des zweiten Abschnitts (22) liegenden Schmelzpunkts erweicht wordende Deckelabschnitt mit dem in der Einsatzöffnung enthaltenen Elektronikschaltungschip verbunden wird, wodurch der Griffabschnitt und der Elektronikschaltungschip durch den Deckelabschnitt ohne Spiel einstückig ausgebildet werden.

6. Verfahren nach Anspruch 5,
dadurch gekennzeichnet, daß

das Formen des zweiten Abschnitts (22) durchgeführt wird, indem der Griffabschnitt innerhalb einer Form (24) mit einem Anguß (26) angeordnet wird, wobei das nicht-harte Harzmaterial des zweiten Abschnitts von dem Anguß in die Form eingespritzt wird, wobei der Anguß angrenzend an den Deckelabschnitt angeordnet wird, bevor das Formen durchgeführt wird.

7. Verfahren nach Anspruch 5 oder Anspruch 6,
dadurch gekennzeichnet, daß

die Einsatzöffnung (16) des ersten Abschnitts (14) eine Endfläche (16a) hat, die mit einer Endfläche (18a) des Elektronikschaltungschips (18) gut zusammenpaßt, wenn der Elektronikschaltungschip in die Einsatzöffnung eingesetzt wird.

8. Verfahren nach einem der Ansprüche 5-7,
dadurch gekennzeichnet, daß

das harte Harzmaterial des ersten Abschnitts (14) ein Polybutylenterephthalat ist, das nicht-harte Harzmaterial des zweiten Abschnitts (22) ein Polyvinylchlorid ist und das Harzmaterial des Deckelabschnitts (20) ein Polyesterelastomer ist.

Revendications

1. Un dispositif de clé ayant une partie de prise avec une puce de circuit électrique intégré, comprenant :

une première partie (14) en matériau de résine rigide recouvrant la partie de prise, ladite première partie ayant une ouverture d'insertion (16) dans laquelle est insérée la puce de circuit électronique (18);

une partie de couvercle (20) en un matériau de résine fermant ladite ouverture d'insertion de ladite première partie, de manière que ladite partie de couvercle soit liée à ladite puce de circuit électronique, le matériau de résine de la partie de couvercle étant élastique et thermoplastique; et

une deuxième partie (22) en un matériau de résine, moulé sur ladite première partie (14) pour recouvrir ladite première partie et ladite partie de couvercle,

caractérisé en ce que

ladite deuxième partie (22) est réalisée en un matériau de résine non rigide et ladite partie de couvercle (20) est liée à ladite puce de circuit électronique (18) ayant été ramollie lorsque ladite deuxième partie (22) est moulée sur ladite première partie (14) en ayant un point de fusion inférieur à la température de moulage de ladite deuxième partie (22) dans lequel ladite partie de prise et ladite puce de circuit électronique sont intégrées sans jeu par ladite partie de couvercle.

2. Un dispositif selon la revendication 1, caractérisé en ce que ladite partie de couvercle (20) présente une cavité (20a) et un bord périphérique (20b) entourant ladite cavité, ladite partie de couvercle étant liée à la puce de circuit électronique en utilisant lesdites caractéristiques élastiques et thermoplastique dudit matériau de résine.

3. Un dispositif selon la revendication 1 ou la revendication 2, caractérisé en ce que ladite ouverture d'insertion (16) de ladite première parte présente une surface d'extrémité (16a) qui est installée avec affleurement avec une surface d'extrémité (18a) de la puce de circuit électronique (18), lorsque la puce de circuit électronique est insérée dans l'ouverture d'insertion.

4. Un dispositif selon l'une quelconque des revendications 1 à 3, caractérisé en ce que le matériau de résine rigide de la première partie (14) est du téréphthalate de polybutylène, le matériau de résine non rigide de la deuxième partie (22) et du chlorure de polyvinyle et le matériau résineux de la partie de couvercle (20) est un élastomère de polyester.

5. Un procédé de formation d'un dispositif de clé à circuit électronique intégré comprenant les étapes consistant à:

mouler une première partie (14) en matériau résineux rigide de manière qu'une partie de prise sera couverte par la première partie, ladite pre-

mière partie comprenant une ouverture d'insertion (16);
insérer une puce de circuit électronique (18) dans l'ouverture d'insertion de la première partie;
fixer une partie de couvercle (20) pour fermer l'ouverture d'insertion dans laquelle est insérée ladite puce de circuit électronique, ladite partie de couvercle étant élastique et thermoplastique; et
mouler une deuxième partie (22) en matériau résineux, de manière que la première partie et la partie de couvercle soit recouverte par la deuxième partie,

caractérisé en ce que

ladite deuxième partie (22) est réalisée en un matériau résineux non rigide et est chauffée durant le moulage de la deuxième partie, afin que la partie de couvercle soit liée à la puce de circuit électronique contenue dans l'ouverture d'insertion, en ayant un point de fusion qui est inférieur à la température de moulage utilisée par ledit moulage de la deuxième partie (22), dans lequel ladite partie de prise et ladite puce de circuit électronique sont intégrées sans jeu par ladite partie de couvercle.

6. Un procédé selon la revendication 5, caractérisé en ce que ledit moulage de la deuxième partie (22) est effectué en plaçant la partie de prise dans un moule (24) ayant une porte (26), le matériau résineux non rigide de la deuxième partie étant injecté depuis la porte dans le moule, ladite porte étant placée de manière adjacente à la partie de couvercle avant que ledit moulage soit effectué.

7. Un procédé selon la revendication 5 ou la revendication 6, caractérisé en ce que ladite ouverture d'insertion (16) de ladite première partie (14) présente une surface d'extrémité (16a) qui est installée avec effleurement avec une surface d'extrémité (18a) de la puce de circuit électronique (18) lorsque la puce de circuit électronique est insérée dans l'ouverture d'insertion.

8. Un procédé selon l'une quelconque des revendications 5 à 7, caractérisé en ce que le matériau résineux rigide de la première partie (14) est du téréphthalate de polybutylène, le matériau résineux non rigide de la deuxième partie (22) est du chlorure de polyvinyle, et le matériau résineux de la partie de couvercle (20) est un élastomère de polyester.

FIG. 1

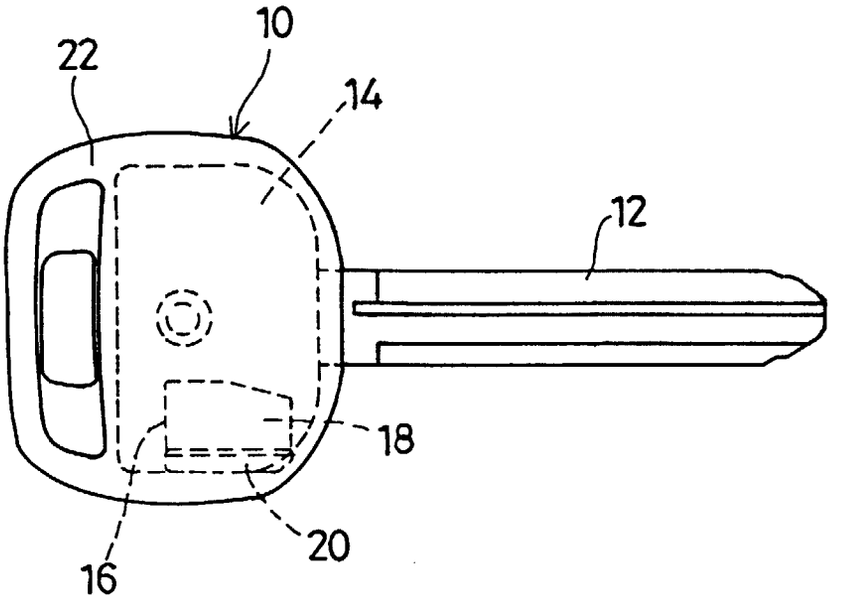


FIG. 2

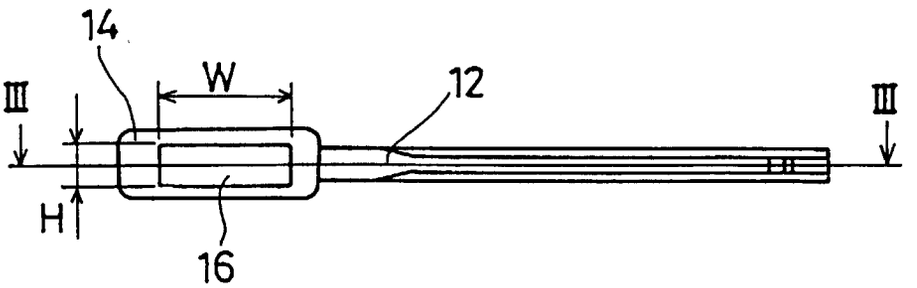


FIG. 3

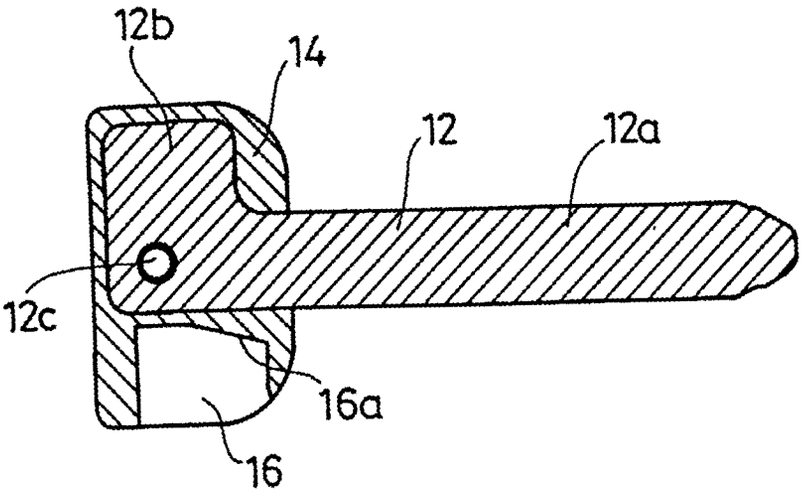


FIG. 4

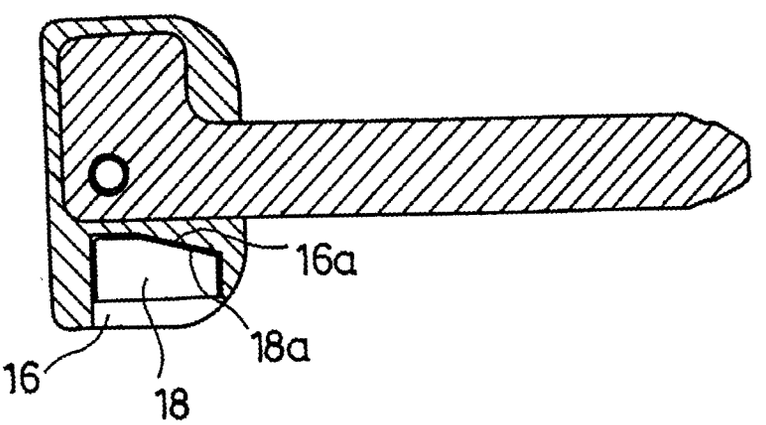


FIG. 5

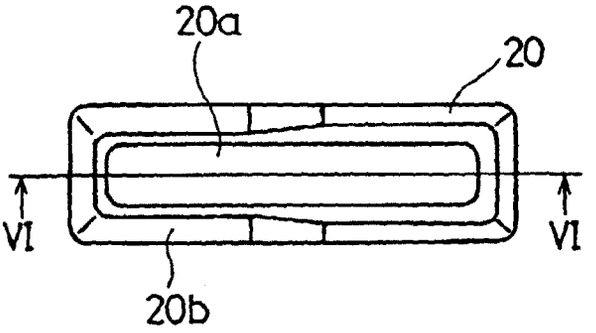


FIG. 6

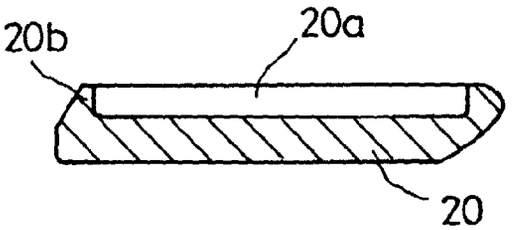


FIG. 7

