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(71) Applicant: **Taiwan Secom Co. Ltd.**
Hsichih, Taipei (TW)

(72) Inventors:
• **Chen, Conrad**
Hsichih, Taipei (TW)

• **Wu, Wen-Tsung**
Hsichih, Taipei (TW)

(74) Representative: **Boydell, John Christopher**
Stevens, Hewlett & Perkins,
Halton House
20/23 Holborn
London EC1N 2JD (GB)

(54) **Electronic door lock and key module mechanism thereof**

(57) Disclosed is a key module mechanism for an electronic door lock, comprising: a key, a key receiving assembly, and a first circuit board. The key includes an upper and a lower planar surface, wherein the lower surface has two linear, parallel, distant, and raised guide rails. The key is provided with an IC circuit for storing a password therein. The IC circuit extends to form two contacts that are connected to a front end of the key. The key receiving assembly includes a key socket and a socket frame. The key socket is formed with a key opening. The key opening is formed along an inner bottom thereof with two guide grooves that accommodate the guide rails, such that the key opening adapts to allow precise insertion of the key. The first circuit board is placed next to a rear end of the key socket. The first circuit board is provided with circuits for processing password signals received from the key, and two conductive plates secured to the first circuit board. Each of the conductive plates includes a contact located out of a tail end of the key opening, such that when the key is inserted into the key opening and the contacts located at its front end protrude out of the tail end of the key opening, the contacts may be in contact with the contacts of the conductive plates for signal transmission. The above key module mechanism allows for precise unlocking/locking operations between the key and key socket without damaging the electrical contacts due to inadvertently reversed insertion. Furthermore, because the two conductive plates are provided at the tail end of the key opening, it is less likely to damage the electronic components due to environmental static. Further disclosed is an electronic door lock incorporating the above

key module mechanism with a lid, a case, and a second circuit board.

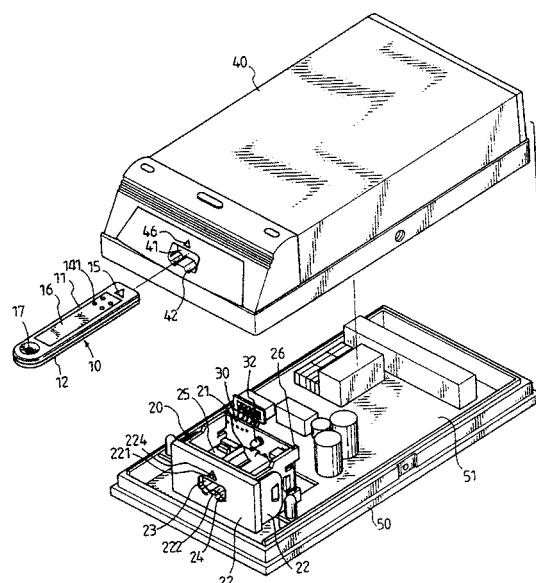


FIG.1

Description

FIELD OF INVENTION

[0001] This invention is related to an electronic door lock mechanism, in particular to a key module mechanism for an electronic door lock, comprising a key, a key receiving assembly, and a first circuit board so as to allow effective unlocking/locking. This invention is further related to an electronic door lock, comprising the above key module mechanism, a lid, a case, and a second circuit board.

BACKGROUND OF INVENTION

[0002] There exist numerous structural designs for electronic door locks with specific objectives and functions. For example, Patent Application No. 86208307 (Patent Publication No. 335084) discloses a "Three-Level Door Lock Connecting Card Type Electronic Lock Device," having a magnetic switch provided in a three-level door lock body. The magnetic switch includes an actuating latch connecting to an engagement card pivotally provided in the lock body. The engagement card includes another end portion that is located within the rotational range of the latch of the lock body while actuating the magnetic switch so as to inhibit a circumferential rotation of the latch whereby a key cannot unlock the door lock prior to unlocking the electronic lock by means of insertion of a smart card into the three-level door lock so as to prevent conventional key intrusion and to enhance lock safety.

[0003] Furthermore, Patent Application No. 86211442 (Patent Publication No. 330627) discloses a "Chip Type Electronic Door Lock Structure," having an identification chip implanted in a key portion, which includes an internal controller and accommodates a reading head provided on a door leaf so as to allow unlocking and locking. Such an electronic door lock structure comprises a chip key, a reading head, and a controller. When the chip key lightly contacts the reading head, the controller will transmit communication protocol signals of a specific code during their contact, and the reading head will transmit the communication password stored in the chip to the controller. The controller then affirms whether the communication password is correct by means of the programs and processors provided within the controller so as to determine whether the relay should be activated to allow unlocking of the electronic lock.

SUMMARY OF INVENTION

[0004] It is a primary object of this invention to provide a key module mechanism for an electronic door, which implements two parallel, distant guide rails and guide grooves, respectively, provided on a key and a key socket so as to allow precise unlocking/locking without damaging electrical contacts.

[0005] It is another object of this invention to provide a key module mechanism for an electronic door, which includes conductive plates each having projective insertion tabs provided at staggered locations of opposing sides and a tail end thereof. The tabs are inserted into openings formed at corresponding locations of a first circuit board and then secured by soldering to attain a solid construction.

[0006] It is a further object of this invention to provide a key module mechanism for an electronic door, which includes a retaining plate provided within a key opening such that an appropriate included angle is formed at its triangular protrusion of the retaining plate, such that the forces required for insertion and withdrawal of the key are substantially equivalent.

[0007] It is a further object of this invention to provide a key module mechanism for an electronic door, where the two contacts within the key are inwardly withdrawn from a front end of the key so as to prevent damaging or staining the contacts while bearing the key.

[0008] In general, this invention is related to a key module mechanism for an electronic door lock, comprising: a key, a key receiving assembly, and a first circuit board. The key includes an upper and a lower planar surface, wherein the lower surface is provided with two linear, parallel, distant, and raised guide rails. The key is provided with an IC circuit for storing a password therein. The IC circuit extends to form two contacts that are connected to a front end of the key. The key receiving assembly includes a key socket and a socket frame. The key socket is formed with a key opening. The key opening is formed along an inner bottom thereof with two guide grooves that accommodate the guide rails, such that the key opening adapts to allow precise insertion of the key. The first circuit board is placed next to a rear end of the key socket. The first circuit board is provided with circuits to process password signals received from the key, and two conductive plates secured to the first circuit board. Each of the conductive plates includes a contact located out of a tail end of the key opening, such that when the key is inserted into the key opening and the contacts located at its front end protrude out of the tail end of the key opening, the contacts may be in contact with the contacts of the conductive plates for signal transmission. The above key module mechanism allows precise unlocking/locking operations between the key and key socket without damaging the electrical contacts due to inadvertently reverse insertion of the key into the key socket. Furthermore, because the two conductive plates are provided at the tail end of the key opening, it is less likely to damage the electronic components due to environmental static.

[0009] This invention further discloses an electronic door lock incorporating the above key module mechanism with a lid, a case, and a second circuit board.

[0010] The advantages and features of this invention can be easily comprehended by persons skilled in the art in accompaniment with the drawings and detailed ex-

planations.

BRIEF DESCRIPTION OF DRAWINGS

[0011]

Fig. 1 is a perspective view showing an electronic door lock of this invention with a lifted lid and a withdrawn key;

Fig. 2 is a perspective view showing an electronic door lock of this invention with a withdrawn key;

Fig. 3 is an exploded view showing a key module mechanism of an electronic door of this invention ;

Fig. 3A is bottom perspective view of a key of this invention;

Fig. 4 is a cross-sectional view taking along lines 4-4 of Fig. 2 illustrating the state prior to insertion of the key into the key receiving assembly;

Fig. 5 is a cross-sectional view showing the engagement between the key and key receiving assembly, wherein the contacts of the key press against the contacts of the conductive plates;

Fig. 6 is a cross-sectional view of a key receiving assembly of this invention illustrating the state of the key prior to insertion;

Fig. 7 is another cross-sectional view of the key receiving assembly of this invention illustrating the state of the key of Fig. 6 after insertion into the key assembly; and

Fig. 8 illustrates the angular relationship of the retaining plate of the engagement portion.

DETAILED DESCRIPTIONS OF EMBODIMENTS

[0012] With reference to Figs. 1, 2, 3, and 3A, an embodiment of a key module mechanism A for an electronic door is illustrated. The mechanism A comprises a key 10, a key receiving assembly 20, and a first circuit board 30. The key 10 includes an upper and a lower planar surface 11, 12, wherein the lower surface 12 has two linear, parallel, distant, and raised guide rails 13. The key 10 is provided with an IC circuit (not shown) for storing a password therein. The upper surface 11 may be provided with four encoding apertures at, but not limited to, locations 141 to allow writing the password into the IC circuit of the key. The IC circuit extends to form two contacts 14 that are connected to an inwardly drawn front end of the key 10 (see Fig. 5) so as to prevent damaging or staining the contacts 14 while bearing the key 10. The upper surface 11 of the key 10 is provided with

triangular, indent arrow 16 adjacent a front end thereof to indicate the insertion direction of the key 10 while performing unlocking. The upper surface 11 is provided with a label indent 16 at a central portion thereof to allow adherence of an identification label (such as company name and lock serial number, not shown). The upper surface 11 may be further provided with a pendent opening 17 adjacent a rear end thereof.

[0013] The key receiving assembly 20 includes a key socket 21 and a socket frame 22 which can be integrally formed by injection molding and joined by flaps 25. The key socket 21 is formed with a penetrative key opening 23. The key opening 23 is formed along an inner bottom thereof with two guide grooves 24 that accommodate the guide rails 13, such that the key opening 23 adapts to allow insertion of the key 10. The key socket 21 is formed with a block 211 at a location corresponding to a midway point of the two contacts 14 of the key 10 to prevent the key 10 from colliding with the first circuit board 30 due to over-insertion of the key 10 into the socket 23. The socket 21 further extends rearwards to form two vertically aligned locating pins 212 which adapt to be inserted into holes formed between the two conductive plates 31 of the first circuit board 30. The socket frame 22 is provided to support and secure the key socket 21. In this embodiment, the socket frame 22 is in a C-shaped configuration and is provided at a front side thereof with an opening 222 and guide grooves 223 corresponding to the key opening 23 and guide grooves 24, respectively.

[0014] The first circuit board 30 is placed next to a rear end of the key socket 21 and is secured by hooks 26 provided on a tail end of the socket frame 22. The first circuit board 30 is provided with circuits (not shown) for processing password signals received from the key 10. In addition, the two conductive plates 31 are secured to the first circuit board 30, where each of the conductive plates 31 is formed by bending a copper sheet with projective insertion tabs 312 provided at staggered locations of opposing sides and a tail end thereof, wherein the tabs 312 are inserted into openings 313 formed at corresponding locations of the first circuit board 30 and then secured by soldering to attain a solid construction. Each of the conductive plates 31 includes a contact 311 at the top end thereof. After the conductive plates 31 are secured to the circuit board 30, the contacts 311 are located within the key opening 23, such that the key contacts 14 may be in contact with the contacts 311 of the conductive plates 14 upon insertion of the key 10 into the key opening 23 to allow unlocking/locking by means of electronic signals. The first circuit board 30 is provided with an LED indicator 32 at an appropriate location to indicate the status of the unlocking or locking. The lighting signal is guided by a light transmitting plate 221 secured above the key socket 21 so as to be illuminated at the front end of the key socket 21. As shown in Figs. 1 and 3, the light transmitting plate 221 projects through an opening 224 formed on the socket frame 22.

[0015] As shown in Figs. 6, 7, and 8, within the key socket 23 a sidewall with a cavity 27 is formed for containing a retaining plate 28 by means of a pin 281. The retaining plate 28 includes a triangular, projecting engaging portion 282. Correspondingly, the key 10 is formed at a right side edge thereof with a V-shaped notch 18 that matches the triangular configuration of the engaging portion 282 of the retaining plate so as to provide the feel of the key 10 being in place. Furthermore, as shown in Fig. 8, an incident angle θ_1 and a reflected angle θ_2 , preferably 35.85° and 48.37° respectively, are formed between a tip of the triangular engaging portion 282 and a vertical line VL, such that the forces required for insertion and withdrawal of the key 10 are substantially equivalent.

[0016] In addition, in an embodiment for an electronic door lock B of this invention (see Figs. 1, 2, 4, and 5), the key module mechanism 1 is installed within a lid 40 and a case 50. The lid 40 is formed at a front edge thereof with an opening 41 dimensioned to correspond to the key opening 23. The opening 41 is formed at a bottom thereof with two parallel guide grooves 42 to allow insertion of the key 10. The case 50 is further provided with a second circuit board 51 including circuits for decoding the password signals transmitted by the key 10, and incorporating the key receiving assembly 20 and the first circuit board 30 thereon. The lid 40 is then joined above the case 50. With reference to Figs. 4 and 5, the lid 40 includes a cover plate 45 at the opening 41, wherein the cover plate 45 is pivotally connected to and biases against a front end of the lid 40 by means of a pin 43 and a spring 44. Prior to insertion of the key 10 into the key opening 23 through the opening 41, the cover plate 45 is in a closed state due to biasing of the spring 44 so as to shut the opening 41 (see Fig. 4); after insertion of the key 10 into the key opening 23 through the opening 41, the cover plate 45 is toppled to assume an open state (see Fig. 5). The lid 40 is further provided with a light permeating plate 46 at a location corresponding to the light transmitting plate 221 such that the lighting signal of the light transmitting plate 221 is guided and emitted through the light permeating plate 46 for a user's detection.

[0017] From the invention thus described, it will be obvious that the embodiment of the key module mechanism for an electronic door as described above is provided for explanation and that the invention may be varied in many ways, such as the configurations of the key and guide grooves, or the arrangement and disposition between the retaining plate and the V-shaped notch of the key. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended for inclusion within the scope of the following claims.

Claims

1. A key module mechanism for an electronic door lock, comprising:

a key, including an upper and a lower planar surface, wherein the lower surface is provided with two linear and parallel guide rails, and the key is provided with an IC circuit for storing a password therein; the IC circuit extending to form two contacts that are located of a front end of the key;

a key receiving assembly, including:

a key socket formed with a key opening adapted to allow insertion of the key;

wherein the key opening is formed along an inner bottom of the socket with two guide grooves that accommodate the guide rails of the key;

a socket frame supporting the key socket and having an opening configured to substantially comply with a cross-section of the key; and

a first circuit board, being placed next to a rear end of the key socket and secured to the socket frame, wherein the first circuit board is provided with circuits for processing password signals transmitted from the IC circuit of the key, and secured with two conductive plates each having a contact that extends into an interior of the key opening, the two contacts of the two conductive plates being correspond to the two contacts of the IC circuit of the key so as to be in contact with the two contacts located at the front end of the key upon insertion of the key into the key opening.

2. The key module mechanism for an electronic door lock according to Claim 1, further comprising a retaining plate which is disposed at a side of the key opening, wherein the key is formed at a side edge corresponding to the retaining plate with a notch.
3. The key module mechanism for an electronic door lock according to Claim 2, wherein the retaining plate includes a triangular, projecting engaging portion projecting into the key opening, and the notch of the key is formed as a V-shaped configuration that matches the triangular configuration of the engaging portion of the retaining plate.
4. The key module mechanism for an electronic door

lock according to Claim 3, wherein the triangular engaging portion includes an incident angle and a reflected angle of 35.85° and 48.37° , respectively, such that forces required for insertion and withdrawal of the key are substantially equivalent.

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5. The key module mechanism for an electronic door lock according to Claim 1, wherein the socket is provided with hooks at the rear end thereof for securing the first circuit board. 10
6. The key module mechanism for an electronic door lock according to claim 1, wherein the conductive plates are each formed with projective insertion tabs provided at opposing sides and a tail end thereof; the first circuit board formed with openings which are located to correspond to the tabs for the insertion tabs inserting thereinto for engagement. 15
7. The key module mechanism for an electronic door lock according to Claim 1, further comprising a light transmitting plate secured above the key socket for guiding a light signal indicating unlocking or locking operations of the first circuit board to be illuminated at an front end of the key socket. 20 25
8. The key module mechanism for an electronic door lock according to Claim 1, wherein the contacts of the key are slightly, inwardly drawn from the front end of the key. 30
9. The key module mechanism for an electronic door lock according to Claim 1, wherein the key socket is provided with a block at a location that urges against a midway point of the two contacts. 35
10. An electronic lock, comprising:

a key module mechanism, including:

a key, including an upper and a lower planar surface, wherein the lower surface is provided with two linear and parallel guide rails, and the key is provided with an IC circuit for storing a password therein, and extends to form two contacts that are located at a front end of the key; 40 45

a key receiving assembly, including:

a key socket formed with a key opening, wherein the key opening is formed along an inner bottom of the socket with two guide grooves that accommodate the guide rails of the key, and adapted to allow insertion of the key; and a socket frame supporting the key socket and having an opening configured to substantially comply with a cross-sectional configuration of the key; and 50 55

a first circuit board, being placed next to a rear end of the key socket and secured to the socket frame, wherein the first circuit board is provided with circuits for processing password signals transmitted from the IC circuit of the key, and secured with two conductive plates each having a contact that extends into an interior of the key opening, the two contacts of the two conductive plates being located to correspond to the two contacts of the IC circuit of the key so as to be in contact with the two contacts located at the front end of the key upon insertion of the key into the key opening;

a lid having an opening of a proper dimension, wherein the opening is formed at a front edge thereof with two parallel guide grooves, which correspond to the guide grooves of the key opening of the key socket to allow insertion of the key; and

a case having a second circuit board, wherein the second circuit board includes circuits for decoding the password signals transmitted from the key, and incorporates the key receiving assembly and the first circuit board thereon, and wherein the lid is joined above the case.

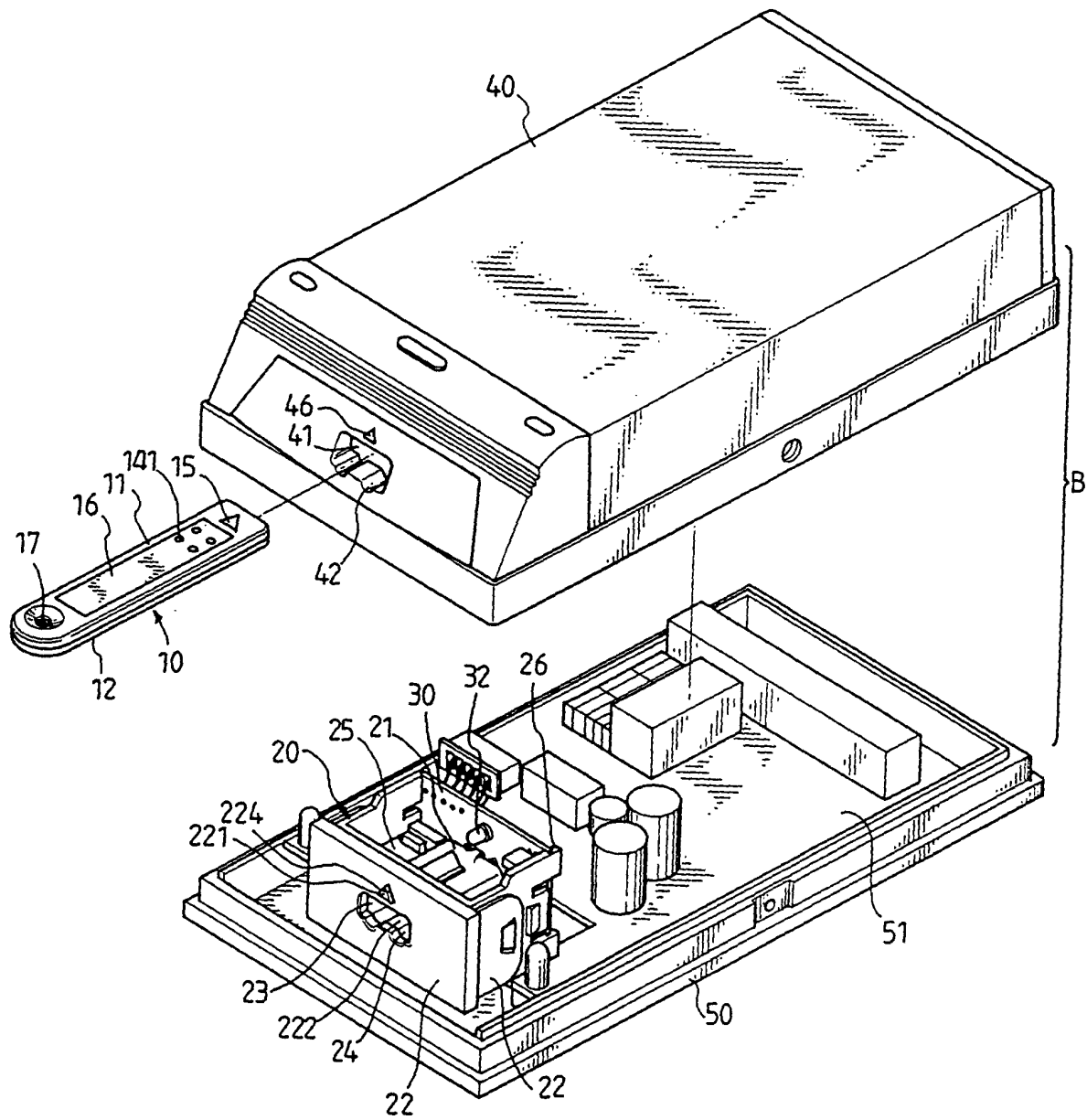


FIG.1

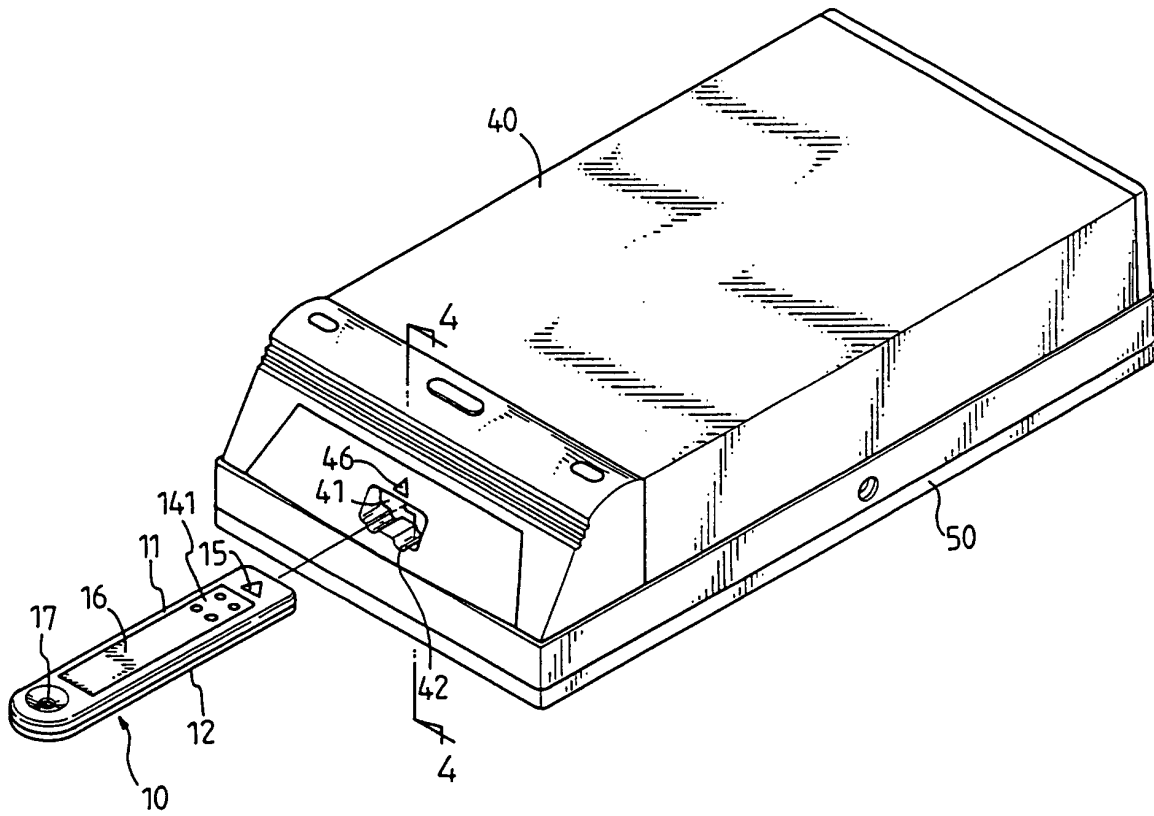


FIG.2

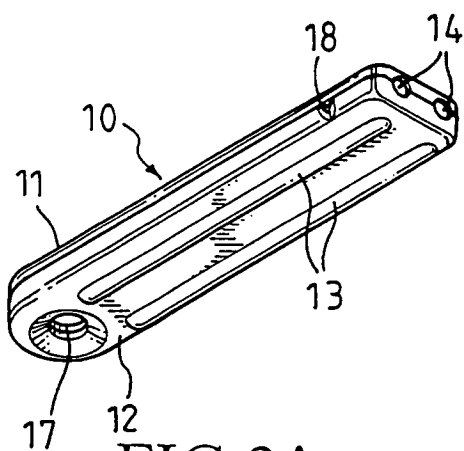


FIG. 3A

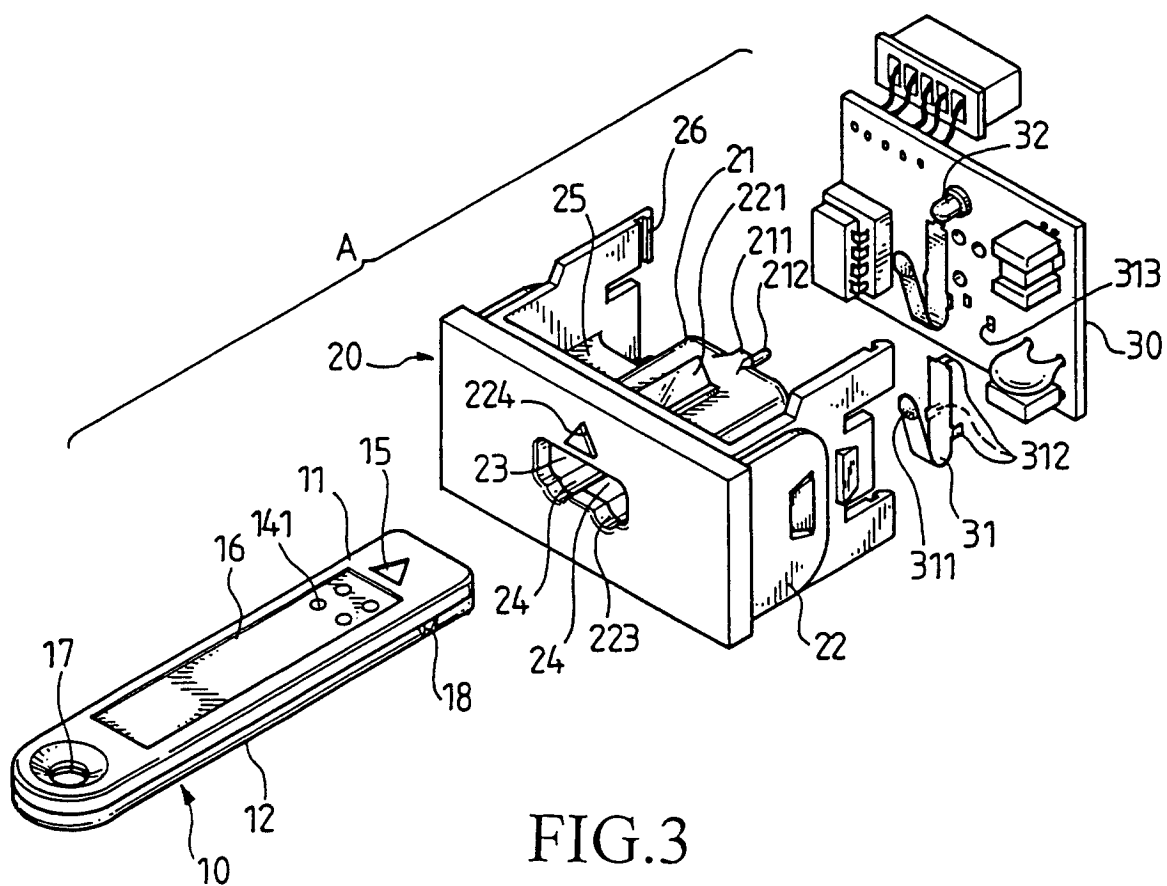


FIG. 3

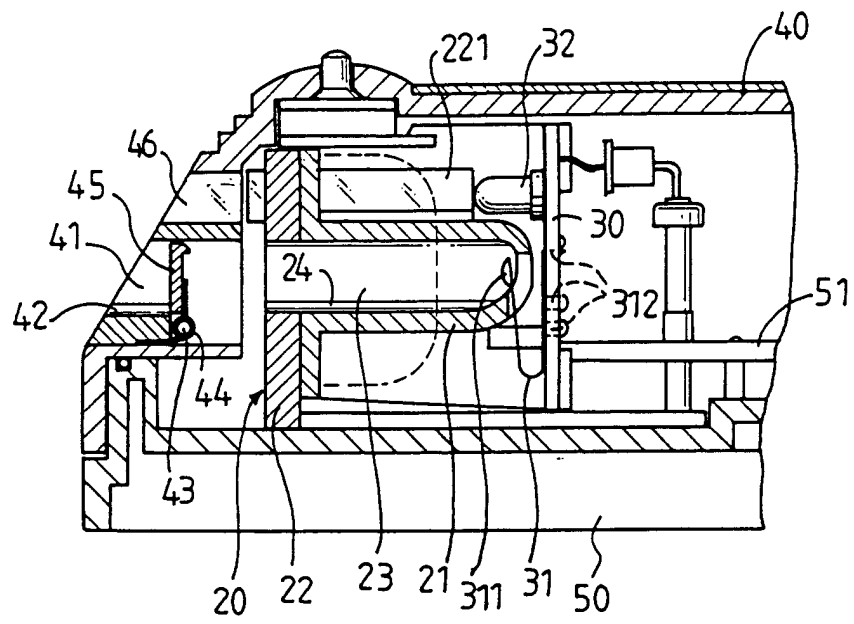


FIG. 4

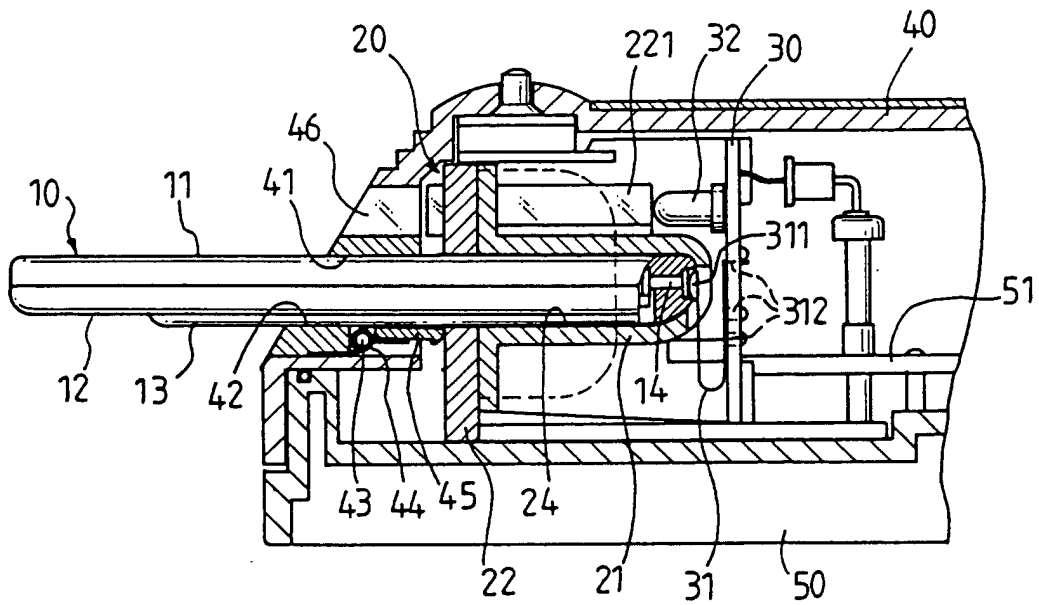


FIG. 5

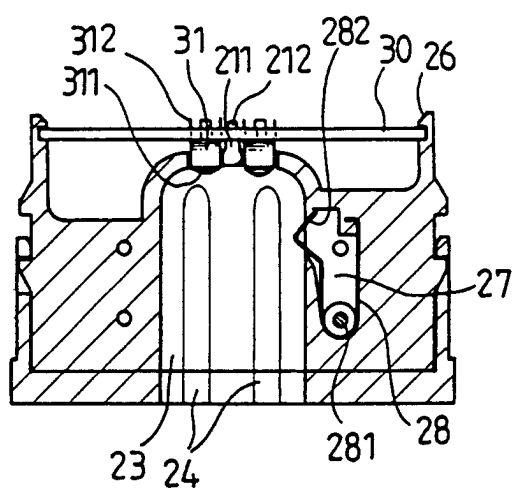


FIG. 6

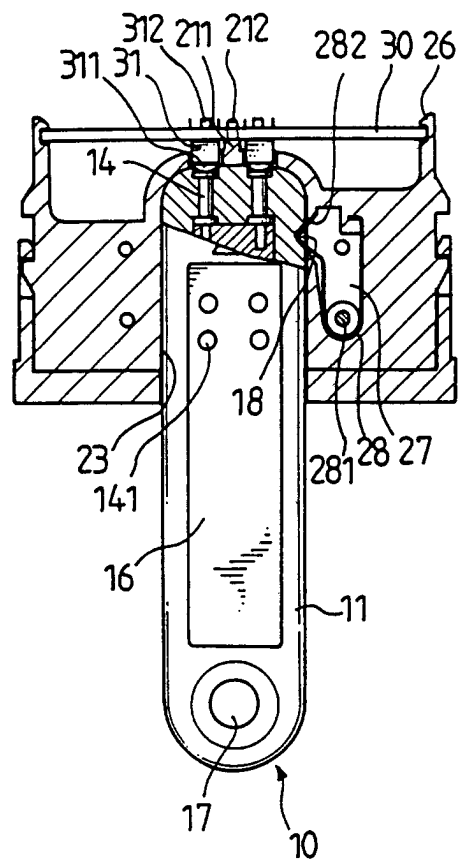


FIG. 7

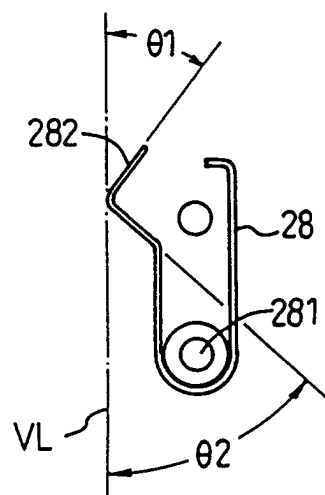


FIG. 8



European Patent
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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search		Date of completion of the search	Examiner
THE HAGUE		16 August 2000	Buron, E
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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