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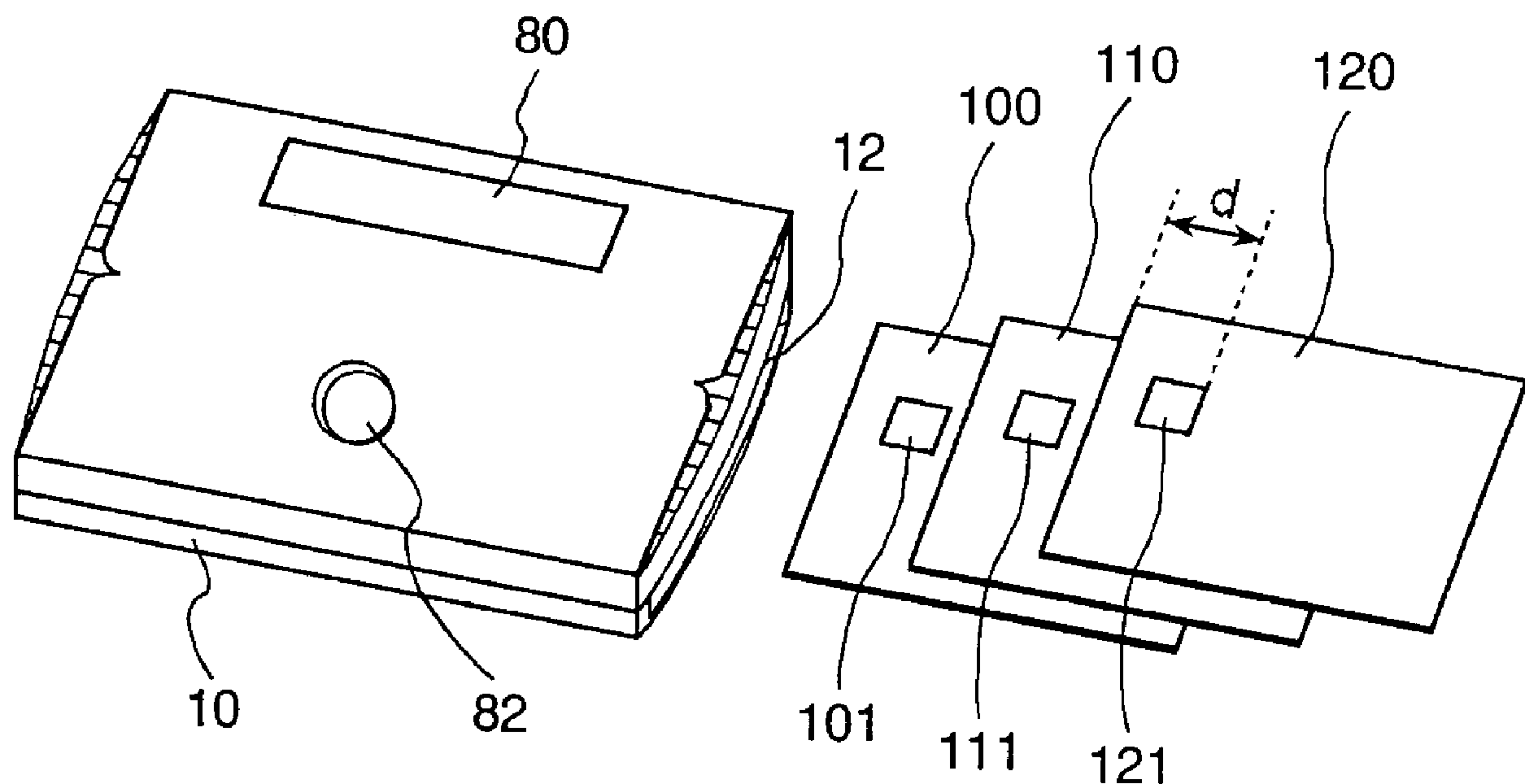
(73) HITACHI, LTD., JP

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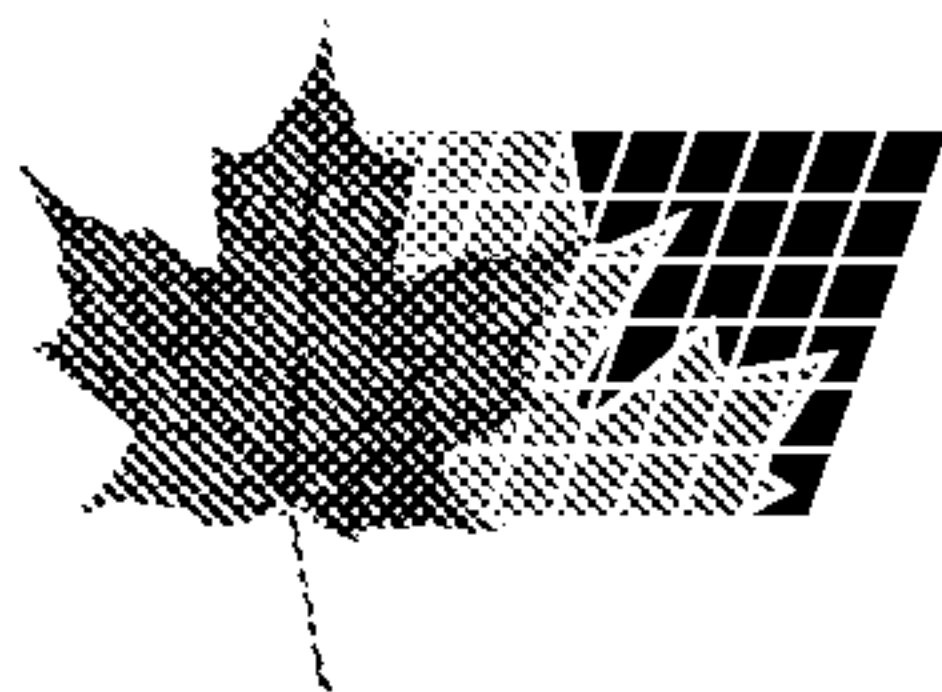
(54) **DISPOSITIF TERMINAL PORTATIF POUR CARTES DE  
MONNAIE ELECTRONIQUE**

(54) **A PORTABLE TERMINAL DEVICE FOR ELECTRONIC  
MONEY IC CARDS**



(57) Dispositif terminal portatif pour cartes à puces contenant des données pécuniaires. Comprend un corps principal (10); un logement pour carte (12, ou 12 et 13) où s'insèrent un certain nombre de cartes de monnaie électronique (100 et 110, ou 100, 110 et 120); des bornes de contact électrique (16 et 17, ou 16, 17 et 18) pour lire et enregistrer les données pécuniaires sur les cartes de monnaie électronique qui sont insérées dans le logement pour carte. Un visuel (80) est inclus pour l'affichage des données pécuniaires lues ou à enregistrer sur les cartes.

(57) A portable terminal device for electronic money IC cards containing monetary data therein. The device includes a main body (10); a card slot opening (12, or 12 and 13) into which a plurality of electronic money IC cards (100 and 110, or 100, 110 and 120) are inserted; electric contact terminals (16 and 17, or 16, 17 and 18) for reading and writing the monetary data from and into the electronic money IC cards that are inserted into the card slot opening. A display (80) is included for displaying the monetary data that is read from the IC



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Un bouton (82) permet de manipuler les opérations de lecture et d'écriture des données pécuniaires sur les cartes. Le logement pour carte (12, ou 12 et 13) est configuré de telle façon que lesdites cartes (100 et 110, ou 100, 110 et 120) s'insèrent et se positionnent en une pile serrée et peuvent se permuter afin de réduire l'épaisseur globale du dispositif.

cards or which is to be written into the IC cards. A button (82) is used for manipulating the reading and writing operations of the monetary data from and into the IC cards. The card slot opening (12, or 12 and 13) is so configured that the plurality of IC cards (100 and 110, or 100, 110 and 120) are inserted into and positioned in a closely packed stack and shifted relationship to reduce the overall thickness of the device.



Abstract of the Disclosure

A portable terminal device for electronic money IC cards containing monetary data therein. The device includes a main body (10); a card slot opening (12, or 12 and 13) into which a plurality of electronic money IC cards (100 and 110, or 100, 110 and 120) are inserted; electric contact terminals (16 and 17, or 16, 17 and 18) for reading and writing the monetary data from and into the electronic money IC cards that are inserted into the card slot opening. A display (80) is included for displaying the monetary data that is read from the IC cards or which is to be written into the IC cards. A button (82) is used for manipulating the reading and writing operations of the monetary data from and into the IC cards. The card slot opening (12, or 12 and 13) is so configured that the plurality of IC cards (100 and 110, or 100, 110 and 120) are inserted into and positioned in a closely packed stack and shifted relationship to reduce the overall thickness of the device.

-1-

**A PORTABLE TERMINAL DEVICE FOR ELECTRONIC MONEY IC CARDS**Field of the Invention

The present invention relates to a portable terminal device in which electronic money IC cards that store electronic monetary information are inserted, and with which the electronic monetary information is read out and/or written into the cards.

Description of Relevant Art

As an example of prior art relating to the present invention, a terminal device for an IC card is described in, for example, Japanese Utility Model Laying-Open No. Hei 1-144957 (1989) entitled "A Reader and Writer for an IC Card Having a Door Structure". However, in accordance with the terminal device for an IC card of the prior art, only one IC card can be inserted into one card slot opening thereof. Therefore, with this device, in order to insert a plurality of IC cards to transfer data between them, another card slot opening must be provided. In addition, another means or structure for establishing electrical connection between the device and the IC card inserted into the other slot opening, separately, must also be provided thereby causing a drawback of enlarging the size of the device itself.

Another example of prior art relating to the present invention, is described in Japanese Patent Laying-Open No. Hei 6-20106 (1994) entitled "A Data Transfer System and a

-2-

Data Transfer Terminal". The terminal device is provided with two card slot openings in which two IC cards can be inserted separately. However, in the conventional terminal device, as mentioned above, the device itself becomes large in size, due to the increase in the number of card slots and the interior structures thereof. The terminal device described in the prior art, however, is such a device which is inherently located in a store for the purpose of conducting electronic payments, therefore there is generally no consideration to portability of the device.

Another example of prior art relating to the present invention, is described in Japanese Patent Laying-Open No. Hei 9-50497 (1997) entitled "A Transfer Device of Electronic Monetary Information", in which two IC cards are inserted into two card slot openings respectively. In this conventional portable terminal device, the two slot openings for insertion of the IC cards are provided on a front edge portion and a rear edge portion of the device, respectively, and one of the two IC cards is inserted into the front edge slot opening, and the other thereof into the rear edge slot opening. The IC cards are inserted and positioned on the same plane with abutting the front edges to each other, thereby reducing the thickness of the device and obtaining superiority in the portableness.

However, in general, with the portable terminal device mentioned above, it is constructed with an assumption that the monetary information of one of the IC

-3-

cards is read out and transferred to the other IC card. However, the IC card that is inserted into the rear edge slot opening can be easily dropped from the slot because of a small degree of insertion (i.e., it is not deeply  
5 inserted into the slot), according to its construction. Further, regarding operability of the portable device, in particular in insertion of the IC cards, there is no difficulty for the slot opening that is positioned on the front edge portion of the device. However, since the  
10 other slot opening is located on the rear edge portion (reverse side) of the device, the operation of inserting the IC card into the other slot opening can be more difficult.

#### Summary of the Invention

15 An object of the present invention is to provide a portable terminal device for electronic money IC cards, into which at least two electronic money IC cards can be inserted and with which monetary data can be transferred to and/or exchanged with each other.

20 Another object of the present invention is to provide a portable terminal device for electronic money IC cards, the construction of which is suitable for obtaining a small-sized terminal device, and for obtaining the portable terminal device for electronic money IC cards  
25 having a superior operability including the insertion of electronic money IC cards.

In accordance with one aspect of the present invention, there is provided a portable terminal device

-4-

for electronic money IC cards containing monetary data therein, comprising: a card slot opening into which a plurality of electronic money IC cards are inserted; means for reading and writing the monetary data from and into  
5 said electronic money IC cards which are inserted into the card slot opening; means for displaying money amount of the monetary data which is read out from said inserted electronic money IC cards or which is to be written into said inserted electronic money IC cards; and means for  
10 manipulating the reading and writing operations of the monetary data from and/or into said electronic money IC cards which are inserted into the card slot opening; wherein said card slot opening is so configured that the plurality of said electronic money IC cards are inserted  
15 into and positioned with being closely piled up with each other and shifted to each other in a direction parallel to main surface thereof.

Further, in accordance with a preferred form of the present invention, there is provided the portable terminal  
20 device for electronic money IC cards mentioned in the above, wherein said means for reading and writing the monetary data from and into said electronic money IC cards which are inserted are in plural and are positioned separately on a surface of a same substrate which is  
25 positioned in parallel to the main surface of said inserted electronic money IC cards within said card slot opening of the device.

-5-

Furthermore, in accordance with a preferred form of the present invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein said card slot opening is a single slot opening.

Moreover, in accordance with a preferred form of the present invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein a convex portion is provided within said card slot opening so as to position said electronic money IC cards shifting to each other at an edge portion thereof.

In addition thereto, in accordance with a preferred form of the present invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein said card slot openings are provided in plural with being closely piled up with each other.

Furthermore, in accordance with a preferred form of the present invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein said plural card slot openings are provided on same side edge portions of the device.

Furthermore, in accordance with a preferred form of the present invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein said plural card slot openings are

-6-

provided on different side edge portions of the device which are perpendicular to each other.

Moreover, in accordance with a preferred form of the present invention, there is provided the portable terminal  
5 device for electronic money IC cards mentioned in the above, wherein said plural means for reading and writing the monetary data from and into said electronic money IC cards inserted into the card slot opening, are positioned at different heights on the surface of the substrate.

10 Moreover, in accordance with a preferred form of the present invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein said plural means for reading and writing the monetary data from and into said electronic money IC  
15 cards inserted into the card slot opening, are positioned at a same height on the surface of the substrate, and further is provided means for bending at least one of said electronic money IC cards within said card slot opening.

In accordance with a preferred form of the present  
20 invention, there is provided the portable terminal device for electronic money IC cards mentioned in the above, wherein at least an opening is provided in a portion of an outside surface wall of the device which defines said card slot opening of the device, so as to push out the  
25 electronic money IC cards inserted into said card slot opening.

-7-

Brief Description of the Drawings

Fig. 1 is a top perspective view showing an external configuration of a portable terminal device for electronic money IC cards in accordance with a first embodiment of  
5 the present invention;

Fig. 2 is a bottom perspective view showing an external configuration of the portable terminal device shown in Fig. 1;

Fig. 3 is a cross-section view of the portable  
10 terminal device for electronic money IC cards of the first embodiment in accordance with the present invention;

Fig. 4 is a cross-section view of the portable terminal device for electronic money IC cards of a second embodiment in accordance with the present invention;

15 Fig. 5 is a cross-section view of the portable terminal device for electronic money IC cards of a third embodiment in accordance with the present invention;

Fig. 6 is a cross-section view of the portable terminal device for electronic money IC cards of a  
20 variation of the third embodiment in accordance with the present invention;

Fig. 7 is a top plan view of the electronic money IC card;

Fig. 8 is an enlarged perspective view from below of  
25 the electric contact terminal of the portable terminal device for electronic money IC cards for showing the details thereof;

-8-

Fig. 9 is a perspective view showing an external configuration of a portable terminal device for electronic money IC cards of a fourth embodiment in accordance with the present invention;

5 Fig. 10 is a top plan view showing the positions of the electronic money IC cards inside of the portable terminal device for electronic money IC cards;

Fig. 11 is a perspective view showing an external configuration of a portable terminal device for electronic money IC cards of a fifth embodiment in accordance with the present invention; and

Fig. 12 is a perspective view showing an external configuration of a portable terminal device for electronic money IC cards of a sixth embodiment in accordance with the present invention.

#### Detailed Description of Preferred Embodiments

Fig. 1 shows the external view of a portable terminal device for electronic money IC cards in accordance with a first embodiment of the present invention. The portable terminal device for electronic money IC cards includes a main body 10 of a box type or shape, a display portion 80, a button for checking remaining amount of electronic money, i.e., monetary data. The main body 10 has a card slot opening 12 into which a plurality of electronic money IC cards (in this embodiment, for instance, three IC cards) can be inserted.

The electronic money IC cards 100, 110 and 120 as inserted into the card slot opening 12, and thereafter, by

-9-

pushing the button 82 the remaining money amount can be determined. In particular, a user can determine the remaining amount of electronic money held in the inserted electronic money IC card by pressing button 82 and reading  
5 the value on the display portion 80. The display portion 80 can be constructed, for example, as a liquid crystal device (LCD). The display 80 of the remaining amount on each inserted card is automatically and cyclically exchanged by every push of the check button 82.  
10 Alternatively, other push buttons can be added on the main body 10 of the portable terminal device for that purpose or operation.

In Fig. 1, there are shown a number (in this embodiment, three cards) of the electronic money IC cards  
15 100, 110 and 120, and on the respective main surface thereof are provided with contact portions 101, 111 and 121, for electrical connection. Further in Fig. 7, there is shown the structure of the electronic money IC cards 100 in more detail, and as is clear from the drawing, in  
20 the present embodiment, each of those contact portions 101, 111 and 121 is composed of a group of eight contacting points 101a through 101h. A reference numeral 102 shows an emboss portion, in which, for example, a name and/or a mark of a bank and/or a company that issues the  
25 electronic money IC card are/is pressed or formed in relief.

Further, though not shown in the drawings, a button (called a ten key) for money transfer operations and so on

-10-

can be provided on the main body 10 of the portable terminal device the user can then transfer a desired amount of the electronic money from one electronic money IC card to another electronic money IC card, by designating or inputting the amount with those buttons on the portable terminal device. For example, by inserting the respective electronic money IC cards owned by a father and his child or children into the slot opening 12 of the portable terminal device and by manipulating the above buttons thereof, it is possible to transfer the electronic money between them, i.e., the IC cards of a father and his child or children. Also, the transfer of electronic money between the electronic money IC card owned by a friend can be performed in the same manner. Further, the transfer of the electronic money is possible between the electronic money IC cards owned by the user himself, between the electronic money IC card for use in a savings account with a bank and that for consumption by him, for instance.

As is apparent from Fig. 2, on the reverse side surface wall of the main body 10 of the portable terminal device, there is provided an opening of an oval shape penetrating to the card slot opening 12. With this construction, when trying to take out the electronic money IC card(s) which is/are inserted into the slot opening 12, it/they can be easily slid out from the slot opening 12 by using a finger.

In Fig. 3 showing the cross-section view of the portable terminal device for electronic money IC cards in

-11-

accordance with the first embodiment of the present invention, only one substrate 19 is positioned inside of the main body 10 of the device, on the surface of which are provided a plurality of electric contact terminals 16, 17 and 18. On the surface of the substrate 19, not shown in the drawing, however, there are also mounted various circuitry elements including a micro-processor, memory device, etc., which are necessary for carrying out processing and displaying operations. The electronic money IC cards 100, 110 and 120 are inserted into the slot opening 12 of the main body 10 of the device, as depicted by broken lines, being closely piled up with each other and shifted relative to each other by a predetermined distance  $d$  in the longitudinal direction on the main surface of the IC card. Here, the predetermined distance  $d$  corresponds to the length from a front edge portion up to the contact portion 101 of the electronic money IC card 100.

On a bottom face of each of the electric contact terminals 16, 17 and 18, as clearly shown in Fig. 8, eight spring terminal pins of "U" shape are provided corresponding to the eight contact points 101a through 101h of the contact portion 101 of the electronic money IC card 100. Though the transfer of the information of electronic money between the electronic money IC card 100 is established through electrical connection therebetween in the embodiment mentioned above, not being restricted

-12-

only to this, however, it also can be established optically through an optical coupling therebetween.

In the construction of the portable terminal device for electronic money IC cards mentioned above, the electric contact terminals 16, 17 and 18 are connected with the electric contact portions 101, 111 and 121 of the plural IC cards 100, 110 and 120 that are inserted into the slot openings, respectively. Namely, those electric contact terminals 16, 17 and 18 of the substrate 19 are so constructed that the height of them are gradually decreased from a left-hand side to a right-hand side on the drawing. The portable terminal device is able to read out the respective contents of the electronic money IC cards inserted and to write into them. A guide member 20 that is bent or wound in "U" shape and made of spring material is provided in the main body 10, with which the IC cards 100, 110 and 120 being inserted from the slot opening 12 are guided in the order of the insertion to the predetermined positions 130, 140 and 150, i.e., from the bottom to the top in the slot opening 12.

In this manner, the electric contact terminals 16, 17 and 18 are positioned on the surface of the same substrate 19 within the card slot opening 12 and the plural IC cards are inserted under the condition that they are stacked with and shifted relative to each other. Using this arrangement, it is possible to reduce the thickness of the device and to obtain a small-sized portable terminal device for electronic money IC cards as a whole. However,

-13-

with the portable terminal device for electronic money IC cards of the present embodiment mentioned above, as shown in the drawing, the second IC card and the third IC card are inserted with projecting rear edge portions from the slot opening 12, and the length of the device is nearly equal to that of IC card in the direction of insertion thereof.

Fig. 4 is a cross-section view of the portable terminal device for electronic money IC cards of a second embodiment in accordance with the present invention. Only one substrate 19 is positioned on the surface of which the electric contact terminals 16 and 17 are provided in the main body 10 of the device. Also in the present second embodiment, the IC cards 100 and 110 are inserted in a similar stack and shifted arrangement in the slot opening 12 of the main body 10 of the device. The electric contact terminals 16 and 17 of the substrate 19 are connected with the electric contact portions 101 and 111 of the IC cards 100 and 110. This enables the portable terminal device to read out the respective contents of the inserted two pieces of the IC cards and/or write information to them.

Furthermore, with the present second embodiment, a portion of the wall surface of flexible plastic material (for example) that defines the bottom surface of the portable terminal device, is formed or wound in a "U" shape directed into the slot opening 12 to form the guide member 20. The guide member 20 can be separately

-14-

structured with other materials, as shown in Fig. 3 mentioned above. With the guide member 20, each inserted IC card is pushed upward thereby, the two IC cards 100 and 110 are guided into the slot opening 12, in the order of insertion, from the top to the bottom. The cards 100 and 110 are stacked and shifted relative to each other, as shown by the broken lines.

Further in the present second embodiment, in the slot opening 12 formed in the main body 10 of the device, a convex portion 125 is formed projecting into the opening with a height equal to the thickness of the IC card. Therefore, as shown by the broken lines in the drawing, the IC card 100 that is inserted first is guided into the upper portion by the guide member 20 and is stopped by abutting at the front end portion thereof with the convex portion 125 and positioned in the predetermined position 130. Next, when the second IC card 110 is inserted into the slot opening 12, as shown by the broken lines in the drawing, it proceeds along with the bottom surface of the IC card 100 mentioned above and rides over the convex portion 125 to be positioned in the predetermined position 140 with a slight bend.

In this manner, in accordance with the portable terminal device of the second embodiment, the electric contact terminals 16 and 17 are positioned on the surface of the same substrate 19 within the card slot opening 12 and the IC cards are positioned as previously discussed. In view of this arrangement, it is possible to reduce the

-15-

thickness of the device itself and to obtain a small-sized portable terminal device for electronic money IC cards as a whole. With the portable terminal device for electronic money IC cards of the present embodiment mentioned above,  
5 as shown in the drawing, the second IC card is inserted and positioned with a portion of the rear edge from the slot opening 12, and the length of the device is nearly equal to that of IC card in the direction of insertion thereof.

10 Fig. 5 is a cross-section view showing the internal construction of the portable terminal device for electronic money IC cards of a third embodiment in accordance with the present invention. The main body 10 of the portable terminal device has a plurality of (two)  
15 card slot openings 12 and 13 respectively for a plurality of (two) IC cards that are to be inserted therein. The second slot opening 13 is provided on the reverse side surface of the main body 10, and it is connected to the first slot opening 12. In the interior region of the main  
20 body 10 of the device is also positioned the substrate 19, on the surface of which the electric contact terminals 16 and 17 of the device side are provided. In accordance with the third embodiment, the IC cards, which are inserted into the first and second slot openings 12 and 13  
25 respectively, are positioned in the portable terminal device in a closely positioned stack and shifted relative to each other. The first IC card 100 inserted from the slot opening 12 is guided to the predetermined position

-16-

130 and stopped by abutting at the front edge thereof with the convex portion 125 mentioned above. . The second IC card 110 inserted from the slot opening 13 is guided at the front edge portion thereof by the IC card 100 that is  
5 already inserted into the slot opening 12, into the predetermined position 140.

In the portable terminal device for electronic money IC cards in accordance with the third embodiment, under the condition that the two IC cards 100 and 110 are  
10 inserted into the slot openings 12 and 13 in the manner as mentioned above, the contact portions 101 and 111 are connected with the contact terminals 16 and 17 on the substrate 19, thereby enabling the portable device to read out the contents of the two IC cards and to write  
15 information on them. With the portable terminal device of the third embodiment, only two slot openings 12 and 13 are provided, however, another slot opening also can be added.

In this manner, also in accordance with the portable terminal device for electronic money IC cards of the third  
20 embodiment, since the electric contact terminals 16 and 17 are positioned on the surface of the same substrate 19 within the card slot opening 12 and the IC cards are inserted under the condition that they are stacked and shifted relative to each other, it is possible to reduce  
25 the thickness of the device itself and to obtain a small-sized portable terminal device for electronic money IC cards as a whole. Especially, in accordance with the portable terminal device for electronic money IC cards of

-17-

the third embodiment, since the second IC card 110 that is inserted into the slot opening 13 does not extend outside of the device at the rear edge portion thereof. Therefore, it is very convenient for the user to operate  
5 and manipulate it.

Fig. 6 shows the portable terminal device for electronic money IC cards of a variation of the third embodiment mentioned above, in accordance with the present invention, the main body 10 of the portable terminal  
10 device has a plurality (two) of card slot openings 12 and 13 respectively for receiving the plurality of (two) IC cards that are inserted therein. However, the second slot opening 13 is provided on the reverse side surface of the main body 10 of the device of the box-type, and it is  
15 separately defined from the first slot opening 12 by a partition element 25. Therefore, there is no specific order of insertion of the IC cards 100 and 110 into the slots 12 and 13.

Although previously discussed embodiments show IC  
20 cards stacked in the same direction, it is also possible, in accordance with the present invention, as shown is Fig. 9, to provide the first slot opening 12 and the second slot opening 13 on the edge faces of the box-like terminal device which are perpendicular to each other.

25 With such a construction, in which the two IC cards 100 and 110 are inserted into the main body 10 of the device, in perpendicular orientation to each other, as shown in Fig. 10, the embossed portions 102 and 112 of

-18-

those two IC cards (see Fig. 7) do not overlap, therefore are protected from wear out by touching to each other and it is preferable for reducing the thickness of the device.

It is also possible to construct angled entry slots  
5 as shown in Fig. 11. The two IC cards 100 and 110 can then be inserted into the main body 10 of the device with a defining angle  $\theta$  less than  $90^\circ$  with each other and be stacked at an angle. It is also possible to construct offset entry slots as shown in Fig. 12. The two slot  
10 openings 102 and 103 for the IC cards 100 and 110 are offset in the direction perpendicular to that of insertion of the IC cards 100 and 110. With these constructions of the portable terminal devices, it is also possible to  
15 protect the IC cards from wear of the embossed portion thereof and that it is preferable for reducing the thickness of the device.

-19-

What is Claimed is:

1. A portable terminal device for electronic money IC cards containing monetary data therein, comprising:

a card slot opening into which a plurality of  
5 electronic money IC cards are inserted;

means for reading and writing the monetary data from and into said electronic money IC cards which are inserted into the card slot opening;

means for displaying money amount of the monetary data  
10 which is read out from said inserted electronic money IC cards or which is to be written into said inserted electronic money IC cards; and

means for manipulating the reading and writing operations the monetary data from and into said electronic  
15 money IC cards which are inserted into the card slot opening; wherein said card slot opening is so configured that the plurality of said electronic money IC cards are inserted into and positioned with being closely piled up with each other and shifted to each other in a direction parallel to  
20 main surface thereof.

2. A portable terminal device for electronic money IC cards as defined in Claim 1, wherein said means for reading and writing the monetary data from and into said electronic money IC cards which are inserted are in plural and are  
25 positioned separately on an surface of a same substrate which

-20-

is positioned in parallel to the main surface of said inserted electronic money IC cards within said card slot opening of the device.

3. A portable terminal device for electronic money  
5 IC cards as defined in Claim 1, wherein said card slot opening is a single slot opening.

4. A portable terminal device for electronic money  
IC cards as defined in Claim 3, wherein a convex portion is provided within said card slot opening so as to position  
10 said electronic money IC cards shifting to each other at an edge portion thereof.

5. A portable terminal device for electronic money  
IC cards as defined in Claim 1, wherein said card slot opening are provided in plural with being closely piled up with each  
15 other.

6. A portable terminal device for electronic money  
IC cards as defined in Claim 5, wherein said plural card slot opening are provided on same side edge portion of the device.

20 7. A portable terminal device for electronic money  
IC cards as defined in Claim 5, wherein said plural card slot opening are provided on different side edge portions of the device.

8. A portable terminal device for electronic money  
25 IC cards as defined in Claim 2, wherein said plural means

-21-

for reading and writing the monetary data from and into said electronic money IC cards which are inserted into the card slot opening, are positioned at different heights on the surface of the substrate.

5           9. A portable terminal device for electronic money IC cards as defined in Claim 2, wherein said plural means for reading and writing the monetary data from and into said electronic money IC cards which inserted are into the card slot opening, are positioned at a same height on the surface  
10 of the substrate, and further is provided means for bending at least one of said electronic money IC cards within said card slot opening.

          10. A portable terminal device for electronic money IC cards as defined in Claim 1, wherein at least an opening  
15 is provided in a portion of an outside surface wall of the device which defines said card slot opening of the device, so as to push out the electronic money IC cards inserted into said card slot opening.

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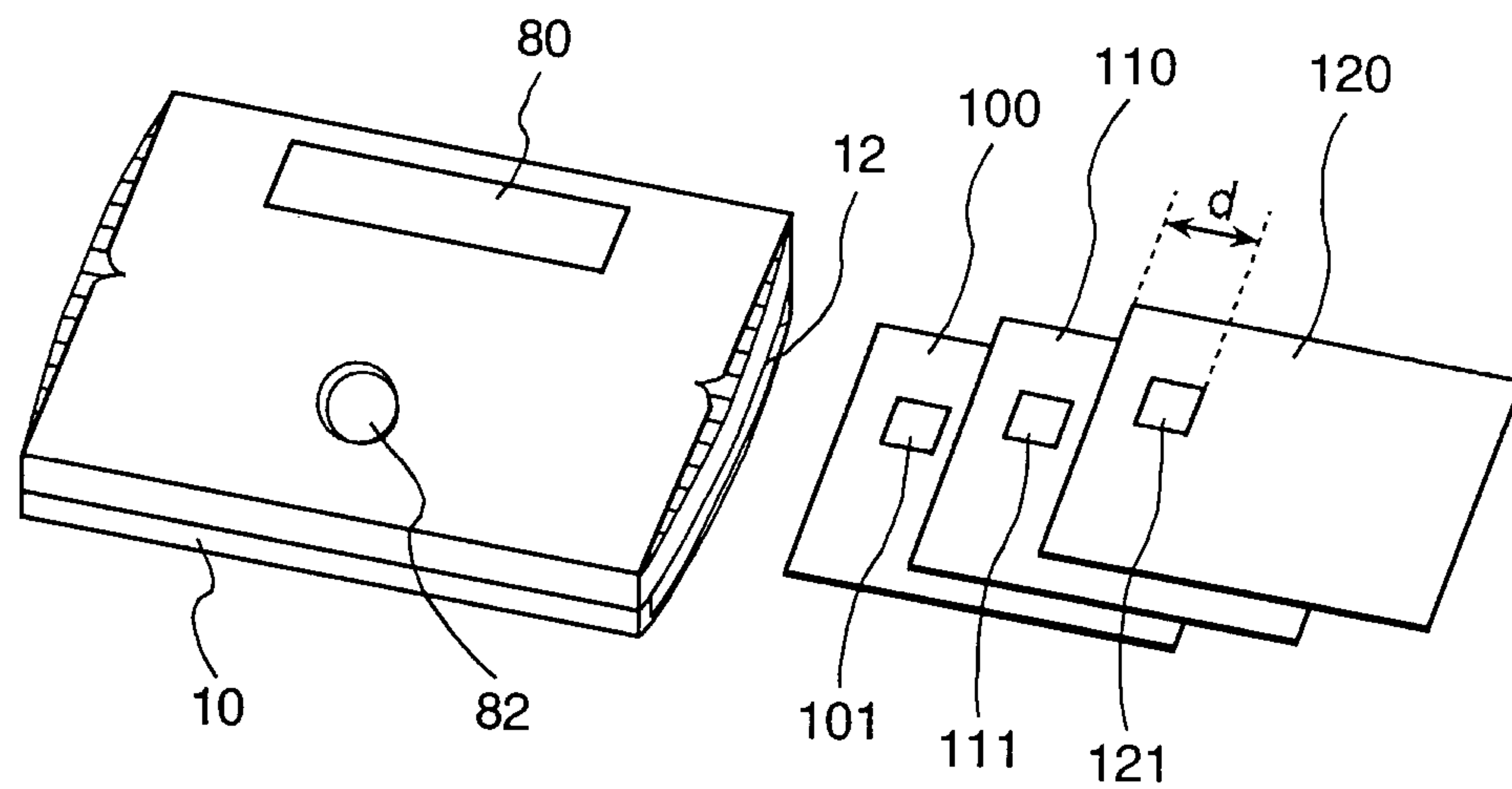
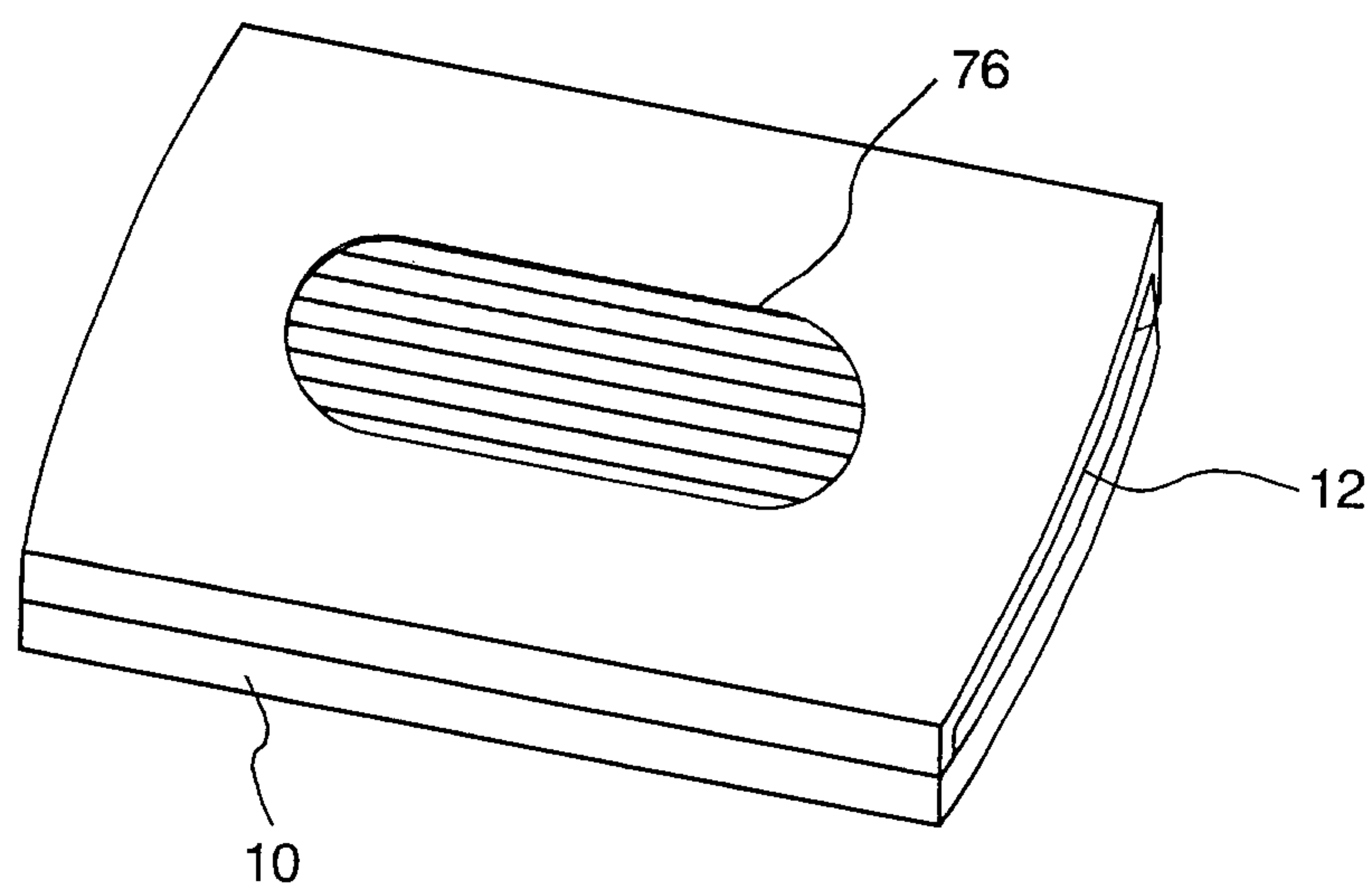
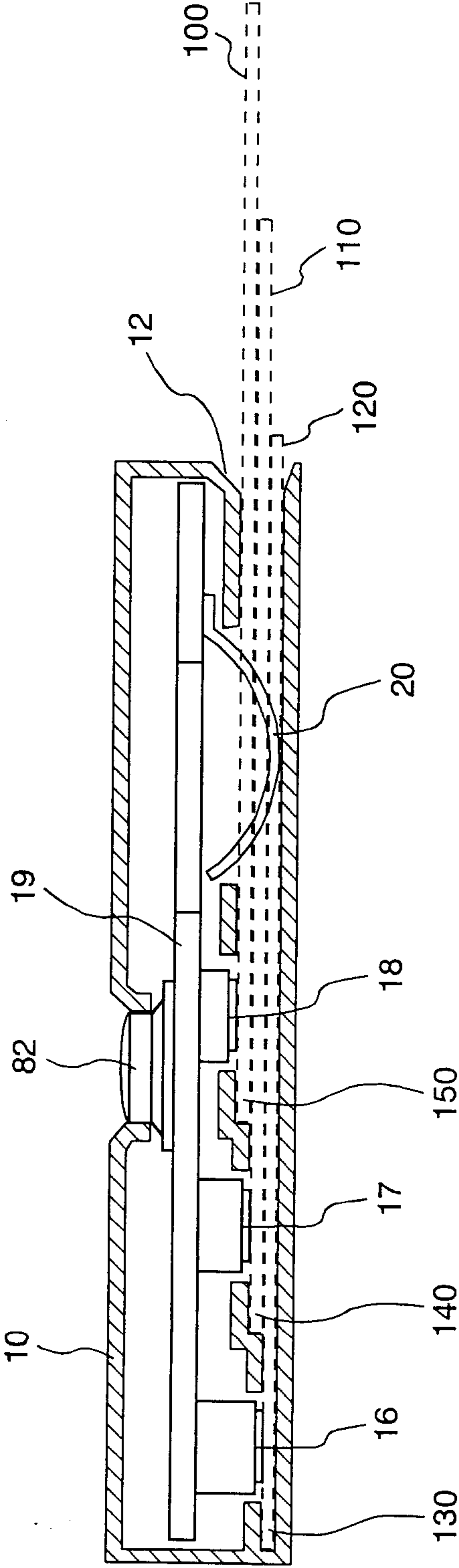
**FIG. 1****FIG. 2**

FIG. 3



3/10

FIG. 4

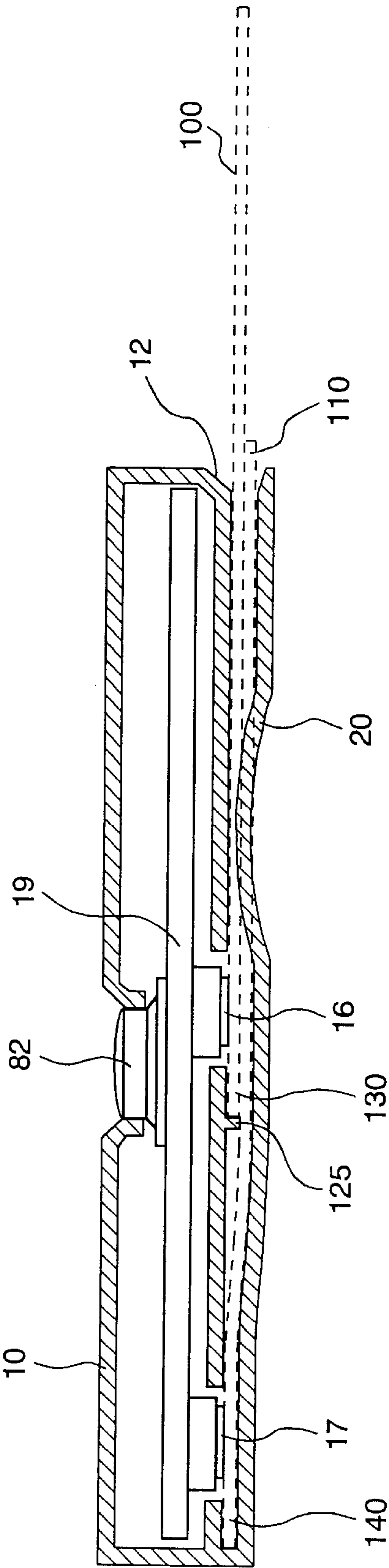
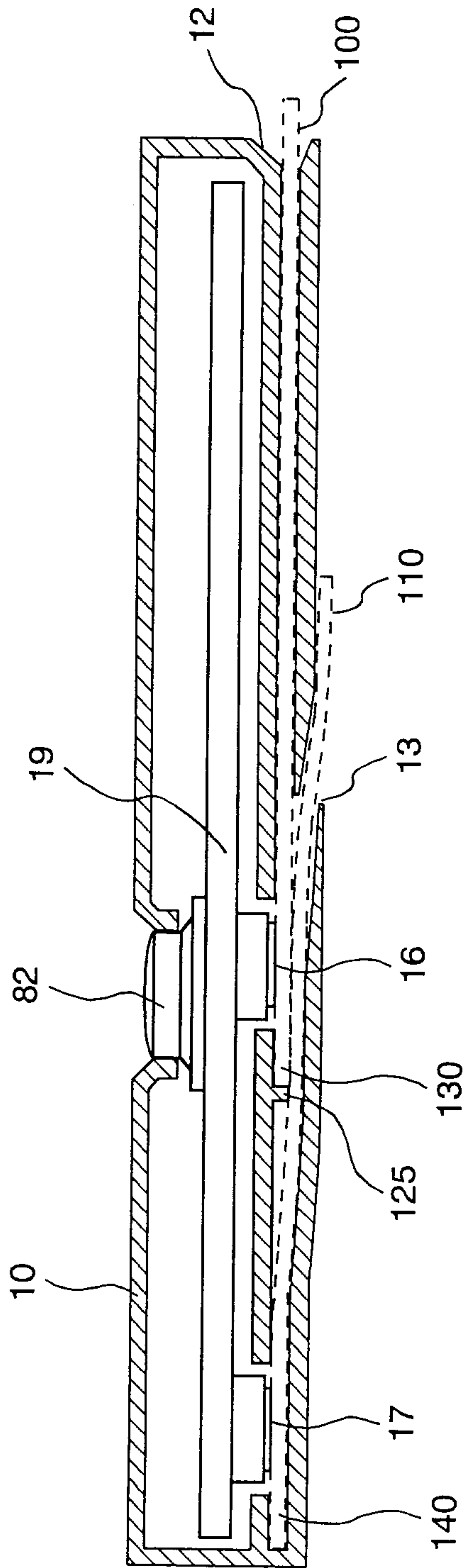


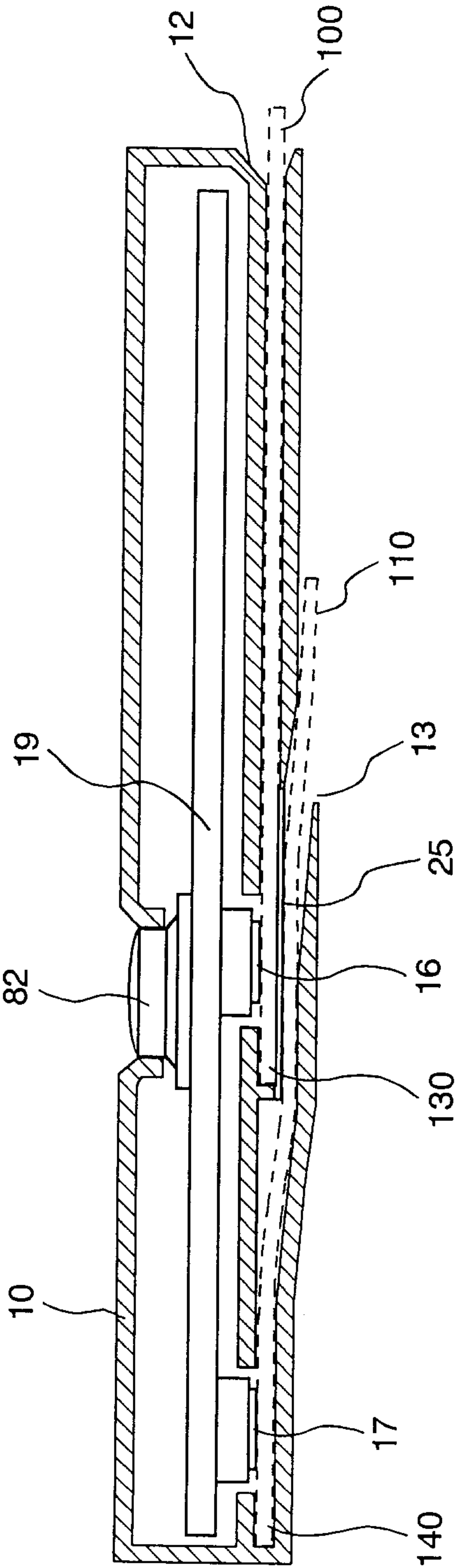
FIG. 5



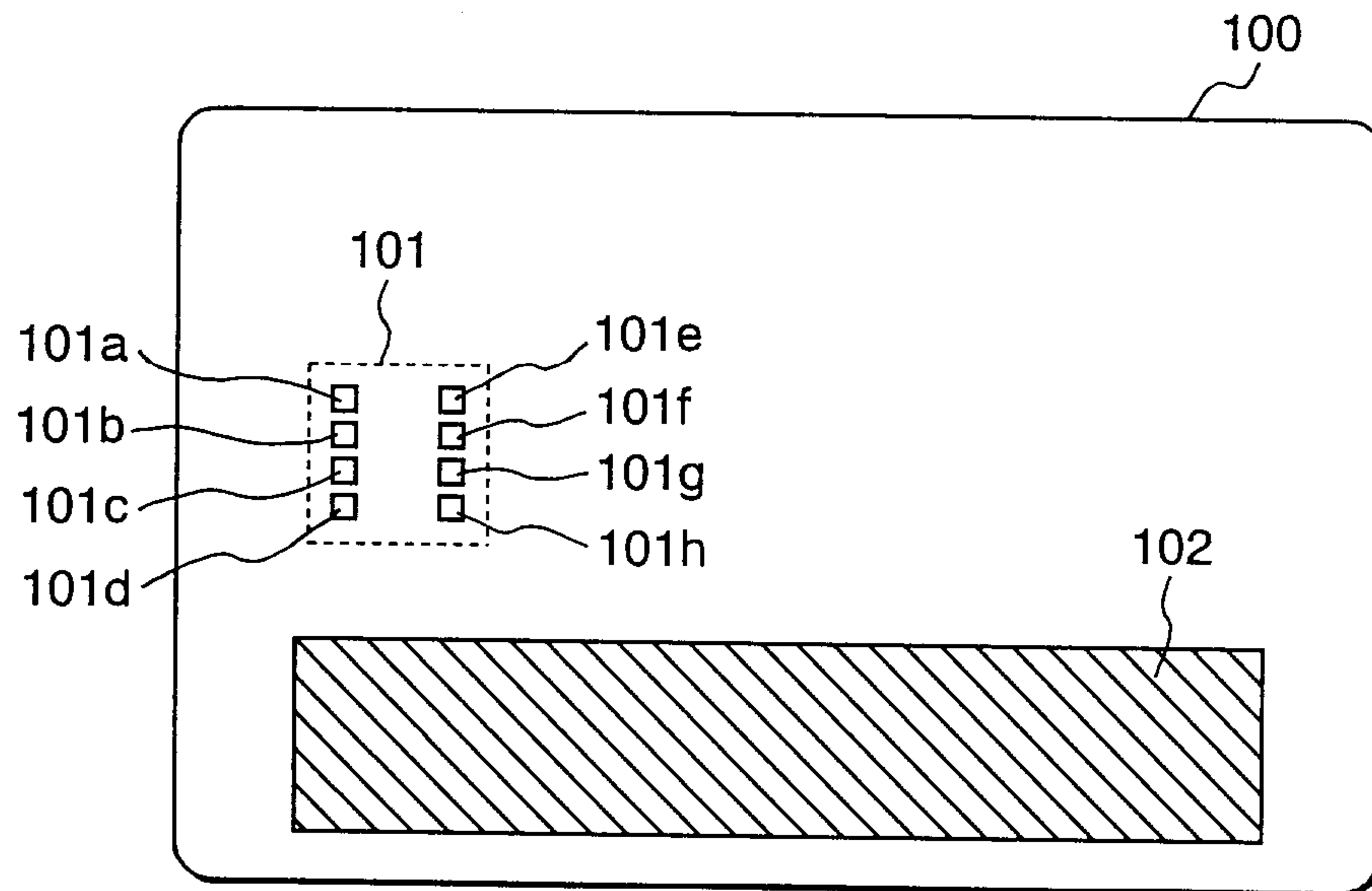
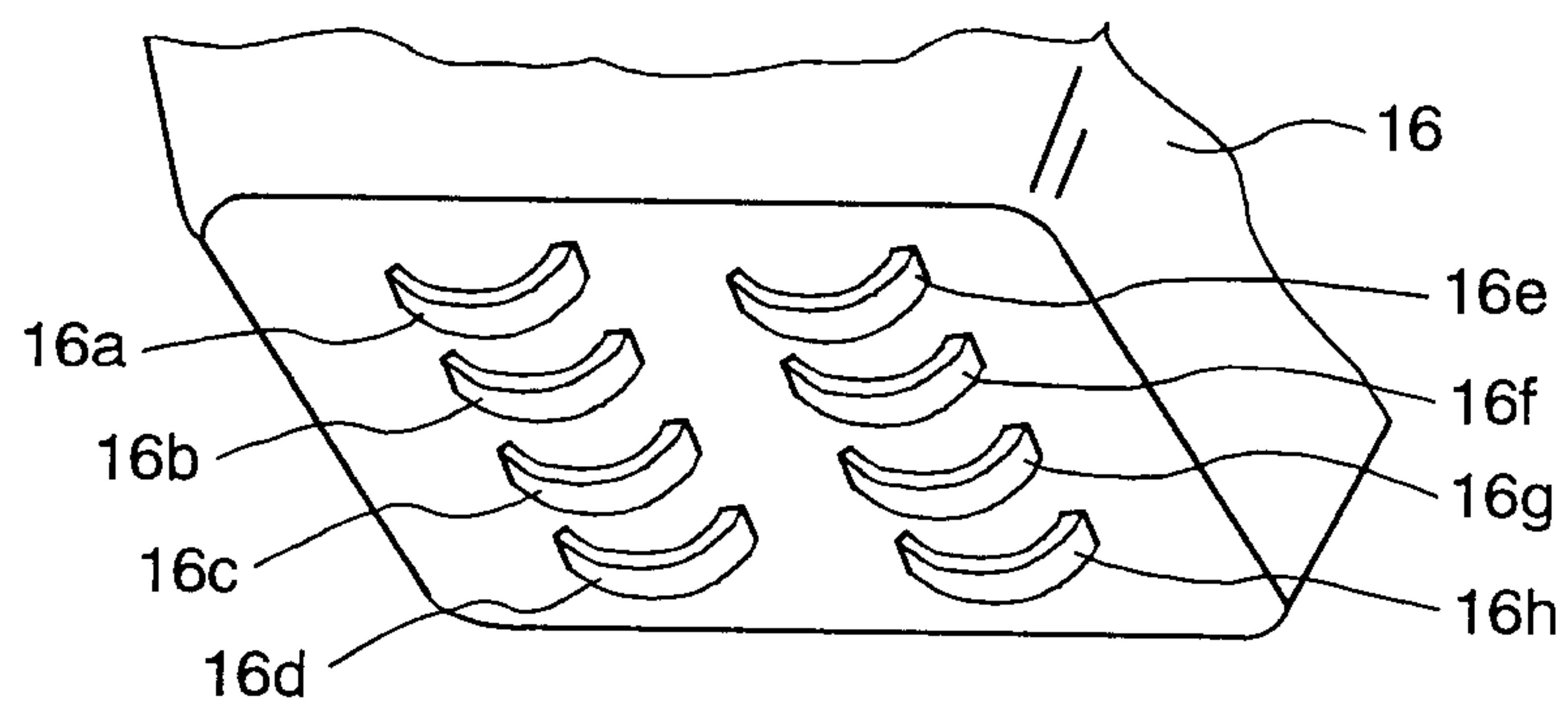
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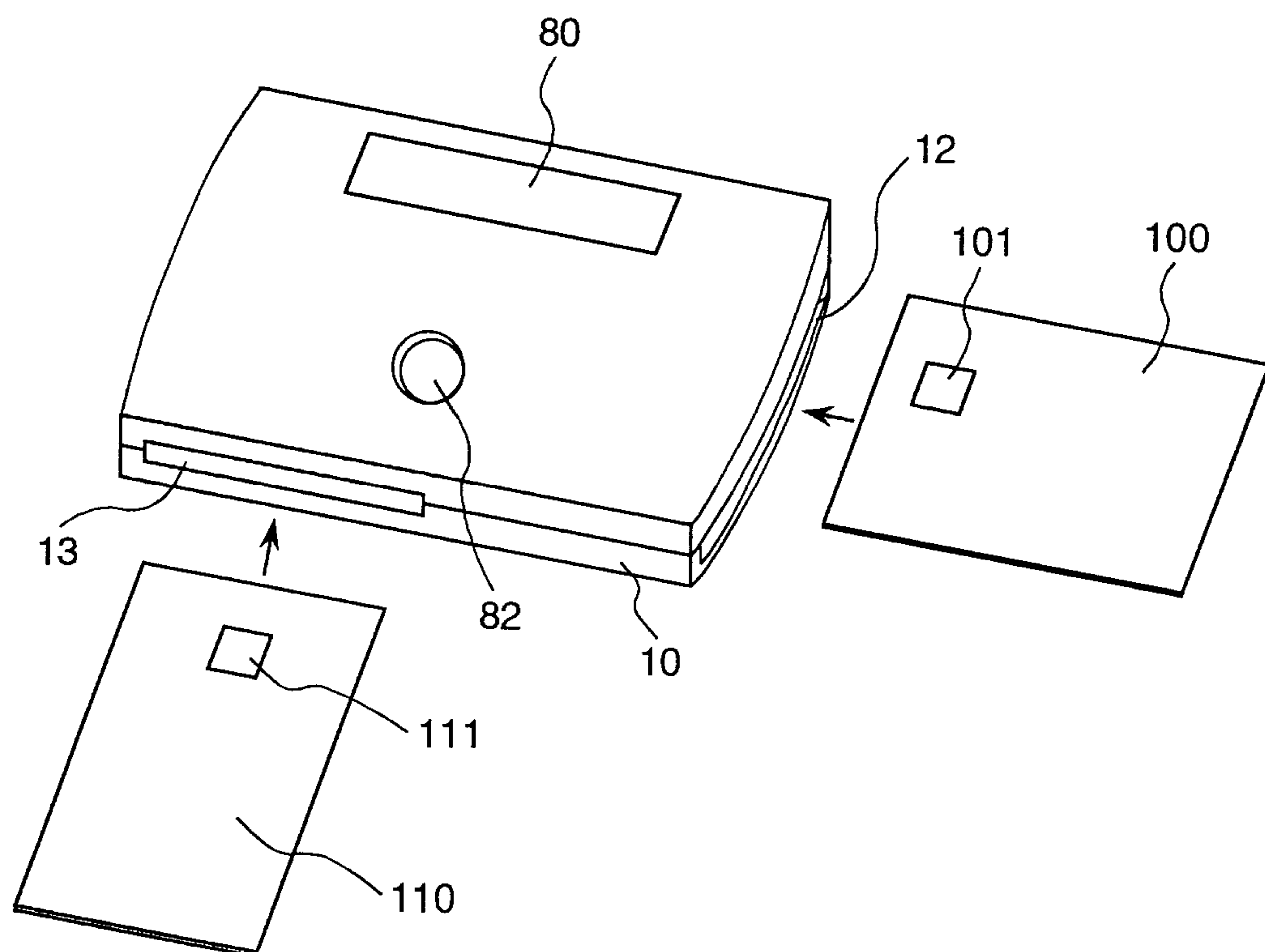
FIG. 6



6/10

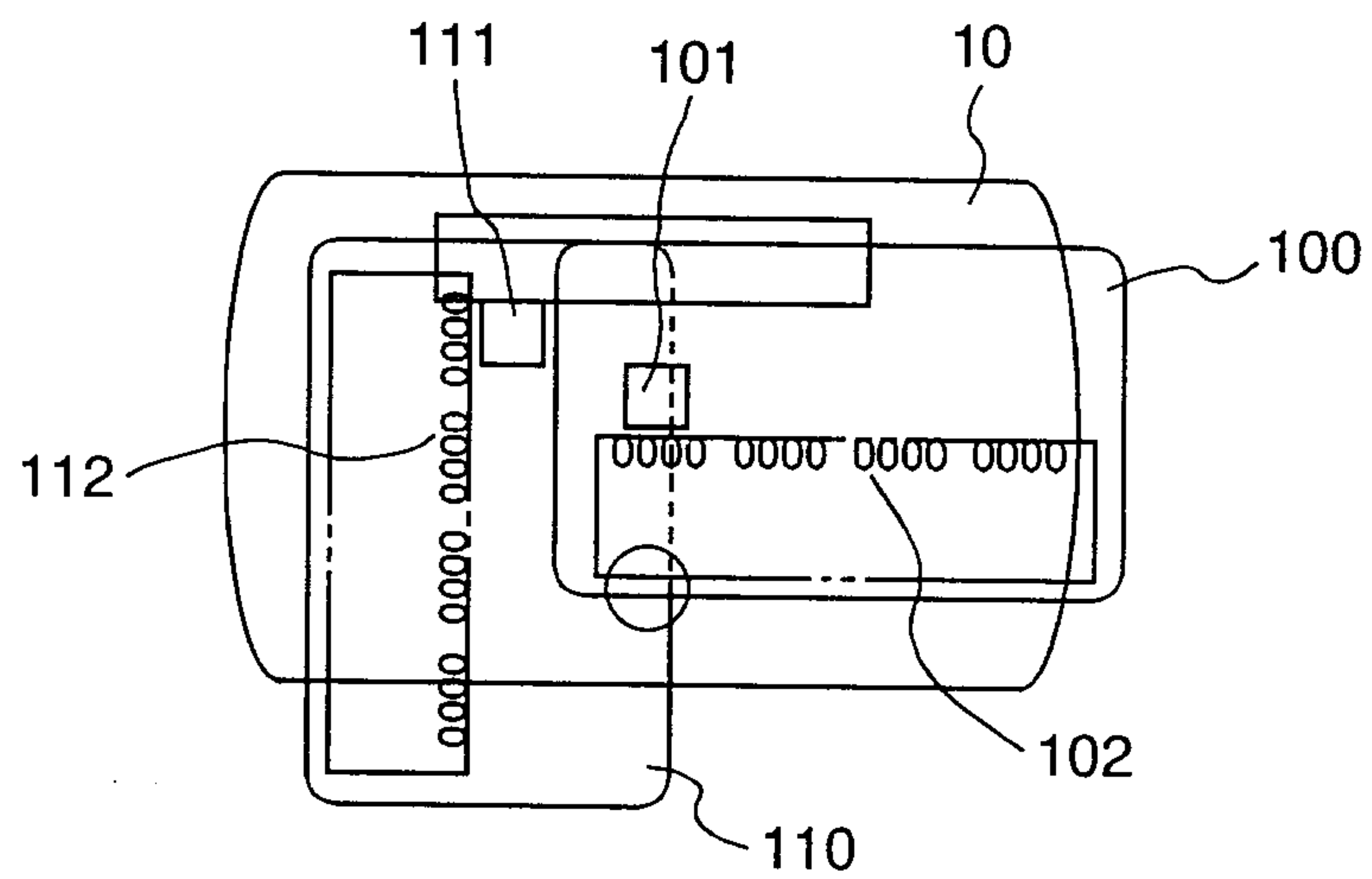
**FIG. 7****FIG. 8**

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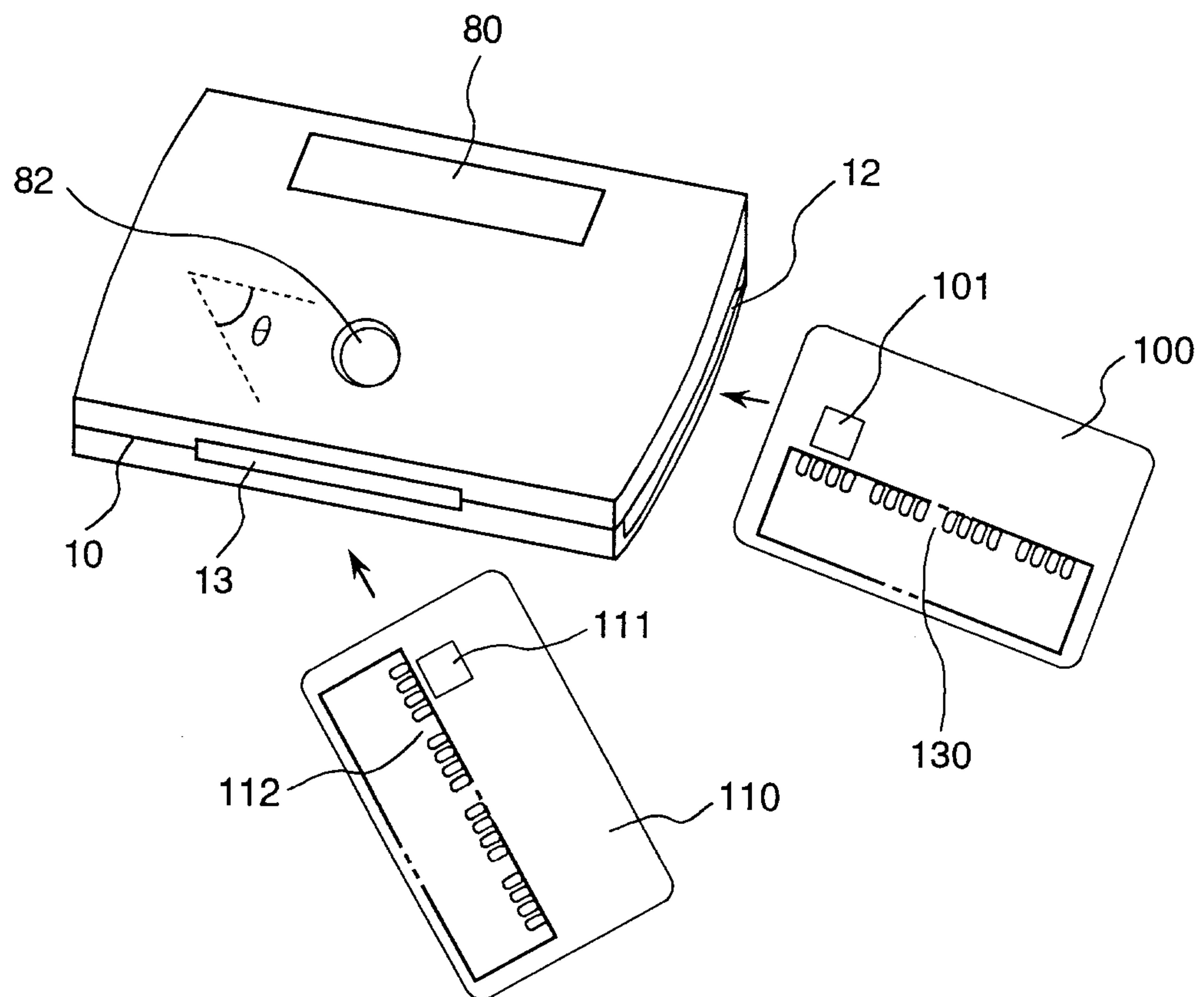
**FIG. 9**

8/10

**FIG. 10**



9/10

**FIG. 11**

10/10

**FIG. 12**