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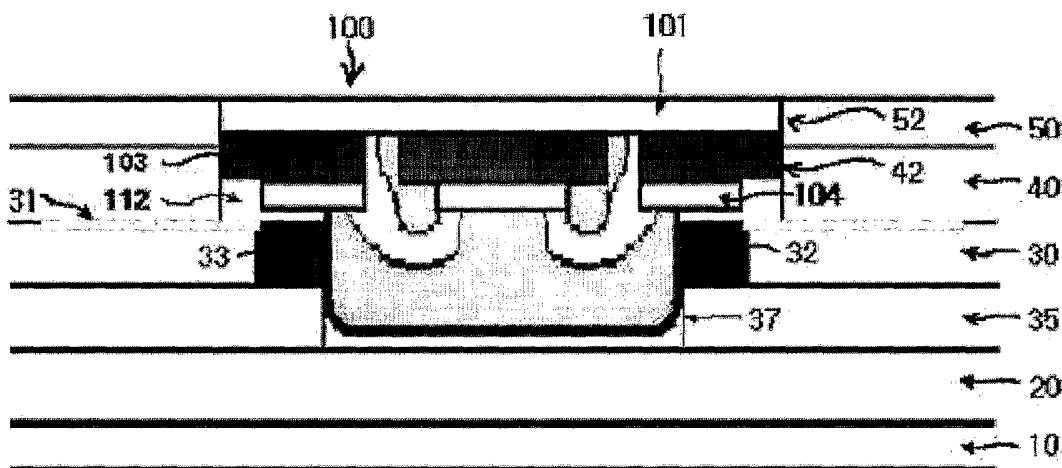
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(54) Title: COMBI-CARD AND METHOD FOR MAKING THE SAME



(57) Abstract: The present invention relates to a combi-card which can be used in a contact-type or noncontact-type fashion and a method for manufacturing the same. More particularly, this invention relates to a combi-card and a method for making the same, in which an inlay layer on which an antenna terminal made of a coil or conductive fiber is formed and a COB (chip on board) on which ACF (anisotropic conductor film) is applied, are pre-treated by a heating head and the like, the COB is attached to an antenna coil insertion layer, and an upper printing sheet with a protection film, and a lower printing sheet with a protection film, which are cut out to be suitable for the COB shape, are stacked to construct a combi-card.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**COMBI-CARD AND METHOD FOR MAKING THE SAME****Technical Field**

The present invention relates to a combinational card  
5 (hereinafter, referred to as "combi-card") which can be used in  
a contact-type or noncontact-type fashion and a method for  
manufacturing the same. More particularly, this invention  
relates to a combi-card and a method for making the same, in  
which an inlay layer on which an antenna terminal made of a coil  
10 or conductive fiber is formed and a COB(chip on board) on which  
ACF (anisotropic conductor film) is applied, are pre-treated by  
a heating head and the like, the COB is attached to an antenna  
coil insertion layer, and an upper printing sheet with a  
protection film, and a lower printing sheet with a protection  
15 film, which are cut out to be suitable for the COB shape, are  
stacked to construct a combi-card.

That is, in the present invention, the antenna coil  
insertion layer, on which the antenna terminal is formed by a  
coil contact or a conductive fiber contact, is attached to the  
20 COB with ACF coated thereon and the inlay layer on which a dam  
positioning opening is formed, by pre-treatment using a heating  
head and the like. The upper printing layer and the upper  
protection layer, which are cut out to fit the location of the  
COB to form an opening, are stacked. Downwards, a layer for  
25 adjusting an antenna coil thickness, on which a COB dam  
positioning opening is formed, and a lower printing layer and a  
lower protection layer are in turn stacked. Then, a stacked  
sheet body is made from the layers by heat-pressing at a  
temperature of 140-180°C and under a pressure of 5-25kg/cm<sup>2</sup>, and a

complete card body is manufactured by cutting out the stacked sheet body. In the card body of the present invention, excellent adhesion between the card body and the COB is maintained as well as excellent conductivity between the antenna coil terminal or  
5 the conductive fiber terminal and the COB terminal can be maintained.

### Background Art

In general, a smart card includes a contact-type integrated  
10 circuit (IC) card in which the data is transmitted and received via contacts exposed on a card surface, and a noncontact-type radio frequency (RF) card in which a built-in antenna coil deals with the data wirelessly.

In recent days, there is a need for a combi-card  
15 (combinational card), which can be used for both contact-type and noncontact-type because of its convenient usability and compatibility. The combi-card is provided with both the contacts of the contact-type IC card and the antenna coil of the noncontact-type RF card.

20 Typically, the combi-card is made of a transparent or opaque synthetic resin sheet such as PVC, ABS, PC, PETG, PET, etc. In the conventional combi-card, a lower protection layer 10, a lower printing layer 20, an antenna coil insertion layer 30 at which an antenna coil is inserted, an upper printing layer 40,  
25 and an upper protection layer 50 are sequentially stacked from the lower to the upper surface.

FIG. 1 shows a process for making the conventional combi-card.

As shown in FIG. 1, an antenna coil 31 is first wound along  
30 the edge of the antenna coil insertion layer 30, and an antenna

terminal 34, which is connected with the antenna coil, is formed on a part of the antenna coil.

After the antenna terminal 34 has been formed, the lower protection layer 10, the lower printing layer 20, the antenna  
5 coil insertion layer 30, the upper printing layer 40, and the upper protection layer 50 are sequentially stacked, and then they are heat-pressed, and cut out, to thereby form a layered card body 70.

After the card body 70 has been constructed, an opening 72  
10 is formed at the place where the antenna terminal 34 is located on the card body 70. Thereafter, a conductive viscous adhesive 108 is coated on the antenna terminal 34 exposed to the outside through the opening 72, and then a rectangular COB (Chip on Board) 100, on which an IC chip and its contacts are mounted, is  
15 inserted into the opening 72.

After the COB 100 has been inserted into the opening 72, heat and pressure is applied onto the COB 100 so that a Hot-Melt tape 111 which has been treated on the COB 100 is adhered to the  
20 card body 70. Simultaneously, as the conductive adhesive 108 is hardened, the antenna terminal 34 of the antenna coil and the contacts 104 of the COB 100 are electrically connected to one another. As a result, a complete combi-card is produced.

However, in the above conventional method, there arises a problem in that, if the bending or torsional force is applied to  
25 the combi-card, a crack occurs in the interface of the conductive adhesive 108 and so the contact failure is arisen between the contacts 104 of the COB and the antenna terminal 34 of the card body 70. This is because elongation and modulus of elasticity of material constituting the card, and adhesion of  
30 the Hot-Melt tape 111 or the thermosetting adhesive which is

used to attach the COB 100 to the card body 70 are insufficient. In addition, this is due to the difference of the physical properties between the antenna terminal 34 and the conductive adhesive 108 which establishes an electrical connection between the antenna terminal 34 and COB contacts 104.

This is the structural problem arisen from a conventional combi-card manufacturing process. The antenna terminal 34, which is embedded in the card body 70, is affected by the physical properties of the card body 70, such as elongation, modulus of elasticity and the like. Also, the COB contacts 104 are affected by the physical property of the base layer 103 of the COB 100. Since the adhesive strength of the Hot-Melt tape 111 or the thermosetting adhesive connecting the two layers is insufficient, and the combi-card deteriorates in its function by aging and fatigue of the conductive adhesive 108, a lot of defective products are created.

Korea Patent No. 10-385660 (issued on May 16, 2003) invented to overcome such problems, discloses a combi-card manufacturing method in which the exterior of the IC chip module is designed largely enough to be built-in the card body, and a stacked sheet suitable for the IC chip module is included therein.

However, in such a prior art, although the IC chip module embedded in the card body effectively, it is necessary that the design and manufacturing of the IC chip module should be specially performed, and all kinds of facilities relating to the IC chip module must be specially fabricated. In addition, since the IC chip module is not adhered by an adhesive, the durability becomes decreased and the manufacturing costs increase.

## Disclosure of Invention

### Technical Problem

Therefore, it is an object of the present invention to provide a combinational IC card (combi-card), which can overcome the problems occurring in the aforementioned conventional combi-  
5 card manufacturing method, augment reliability of the card product that currently have exhibited various failures and lack of durability, and provide the simpler manufacturing process, thereby ensuring low cost and high reliability.

It is another object of the present invention to provide a  
10 method of attaching the COB 100 to the card body 70.

### Advantageous Effects

According to the combi-card of the present invention, the COB 100 and the antennal coil insertion layer 30 are adhered by a simple way, i.e., ACF. In the conventional way, the adhesive  
15 strength has been insufficient, and hence electric conductivity has not been good, whereas in the present invention the adhesive strength of ACF is excellent.

The present invention has an advantageous effect in that owing to excellent adhesive strength, even though the card is  
20 deformed such as a bending or distortion, good electrical conductivity can be maintained between the COB contacts and the antenna terminal of conductive fiber.

### Description of Drawings

25 The above and other objects, features, and advantages of the present invention will become more apparent from the following description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 shows a conventional combi-card manufacturing process;

FIG. 2 shows the respective sheet forms necessary for manufacturing the combi-card according to the present invention;

5 FIG. 3 shows the combi-card manufactured by the layered structure of the present invention;

FIG. 4 is a plan view of a combi-card according to the present invention;

10 FIG. 5 is a cross-sectional view showing the attachment of the COB and the Hot-Melt tape in FIG. 1 of the conventional manufacturing process;

FIG. 6 is a cross-sectional view showing the pre-treatment of ACF on the COB according to the present invention;

15 FIG. 7 is a cross-sectional view showing an embodiment for a sheet for antenna coil insertion to which the COB and the antenna coil insertion layer are adhered, according to the present invention;

20 FIG. 8 is a cross-sectional view showing an embodiment for stack-wise assembly of the COB and the respective sheet layers, according to the present invention; and

FIG. 9 is a plan view and side view of an embodiment for a COB assembling die of the present invention.

\*Brief description of reference number\*

10 : lower protection layer	20 : lower printing layer
25 30 : antenna coil insertion layer	31 : antenna coil
32 : positioning opening	33 : antenna terminal
33a : structure of a conductive opening	
34 : antenna coil terminal	35 : thickness-adjusting later
37 : COB dam positioning opening	40 : upper printing layer
30 42 : COB positioning opening formed on upper printing layer	



50 : upper protection layer

52 : COB positioning opening formed on upper protection layer

70 : card body

72 : opening formed on card body

100 : COB(Chip On Board)

101 : external contacts of the COB

5 103 : base layer of the COB 104 : COB contact

106 : dam of the COB

108 : conductive adhesive

111 : Hot-Melt tape

112 : ACF

200 : COB assembling die

210 : pin bar

220 : insertion pit

10

### Best Mode for Invention

To achieve the above objects, according to the present invention, there is provided a combi-card comprising: an antenna coil insertion layer, lower and upper printing layers, and lower and upper protection layers, wherein the antenna coil insertion layer includes a conductive fiber antenna terminal, to which a COB contact with ACF coated thereon is directly attached by heat and pressure so that the conductive fiber antenna terminal and the COB contact are electrically connected with each other.

15 20 The conductive fiber antenna terminal may be formed in a circular shape of which the diameter,  $\Phi$ , is 2-5mm, a rectangular shape which is 2-4mm wide by 2-4mm long, or any other various shape of polygons.

25 In addition, the conductive fiber antenna terminal of the antenna coil insertion layer may be given electric conductivity by using a coil, a metal thin film, etc, and the plurality of sheets may be made of transparent synthetic resin of any one selected from the group consisting PVC, PC, PETG, PET, and ABS.

A method of manufacturing such a combi-card as above is comprised of the following steps of: a step of forming an antenna coil insertion layer, in which a COB insertion pit is formed in an inner surface of a metal die, for a correct positioning of the COB and the antenna coil insertion layer; a round-tipped pin bar is set up on a part of a top and a bottom surfaces of the metal die; the COB is inserted into the pit, so that an ACF pre-treated on the COB faces up; a dam positioning opening, on which the conductive fiber antenna terminal is formed, of the antenna coil insertion layer is aligned to be at regular position by using the pin bar; the COB is provisionally attached to the antenna coil insertion layer, by applying heat and pressure to the COB via the COB insertion pit, so that the ACF-applied COB contact is directly adhered to and electrically connected with the conductive fiber antenna terminal directly; a step of forming a stacked sheet body, in which an upper printing layer and an upper protection layer are stacked on the COB in the antenna coil insertion layer formed by the above step; a layer for adjusting the antenna coil thickness, which is appropriate to the thickness of the dam, a lower printing layer, and a lower protection layer are aligning under the antenna coil insertion layer; the stack-wise positioned layers are so fixed as not to move, by removing the static electricity; the respective layers are provisionally adhered by using a heating iron; and the provisionally adhered structure are put between polished plates of a laminator, and heat and pressure are applied to the structure so as to form a complete stacked sheet body; and a step of cutting out external contacts of the COB from the stacked sheet body, using a cutting machine.

In addition, a method of manufacturing the combi-card comprises the steps of: sequentially stacking a lower protection layer, a lower printing layer, a layer for adjusting the antenna coil thickness, on which a COB dam positioning opening is formed, an antenna coil insertion layer, on which the COB dam positioning opening and a conductive fiber antenna terminal are formed, an upper printing layer on which a COB positioning opening is formed, and an upper protection layer, on which a COB positioning opening is formed; removing the air and the static electricity between the respective layers by using a roller; inserting a COB, on which an ACF is pre-treated, into the opening to which the COB will be secured; attaching an ACF-applied COB contact to the conductive fiber antenna terminal by applying heat and pressure, to establish electric connection between the ACF-applied COB contact and conductive fiber antenna terminal; provisionally partially adhering the antenna coil insertion sheet to certain portions of the sheet of the card body, by applying heat and pressure; putting the provisionally adhered structure between polished plates of a laminator, and applying heat and pressure so as to form a complete stacked sheet body; and cutting out external contacts of the COB from the stacked sheet body, using a cutting machine.

The upper and lower printing layers are 100-200  $\mu\text{m}$  thick, the antenna coil insertion layer is 100-250  $\mu\text{m}$  thick, the layer for adjusting the antenna coil thickness is 100-250  $\mu\text{m}$  thick, and the upper and lower protection layers are 50-100  $\mu\text{m}$  thick. To form a complete stacked sheet body, the heat of 140-180°C and the pressure of 60-170 bar is applied to the laminated structure.

In the above method, the diameter of the pin bar is 5mm or less and its height is 5mm or less, and the COB insertion pit is polyhedrally formed at a depth of 160-230  $\mu\text{m}$ . Also, the COB is adhered to the antenna coil insertion layer, by applying heat  
5 and pressure to the COB via the COB insertion pit.

The stacked sheet body means a structure that stacked sheets are laminated from plastic sheets by applying heat and pressure to the sheets.

10 Hereinafter, the present invention will be described in detail with reference to the attached drawings.

Here, the same elements of the present invention as the conventional elements will be denoted by the same reference numerals and symbols.

15 First, the respective layers constituting the card body 70 will be discussed.

There is an upper protection layer 50 in which a COB positioning opening 52 is formed, and therebeneath is disposed an upper printing layer 40 in which an opening 42 is formed.

20 A conductive fiber antenna terminal 33 in an antenna coil insertion layer 30, on which an RF functional antenna coil 31 is mounted, is attached by ACF 112. The attaching process is as follows.

ACF 112 is provisionally pre-treated on the COB 100 by using  
25 a heating head and the like, and the COB is cut out. Then, the COB 100 is held in position onto a COB insertion pit 220 of a COB assembling die 200 in FIG. 9, and is upside down so that the ACF 112 faces up. Thereafter, the antenna coil insertion layer 30 having a dam positioning opening 32, through which a dam 106

of the COB 100 is penetrated, is aligned. By applying heat and pressure via a COB insertion pit 72, a COB contact 104 with ACF 112 coated thereon is conductively adhered to the conductive fiber antenna terminal 33 of the antenna coil insertion layer 30  
5 by the ACF 112, and then a sheet for antenna coil insertion is completed.

To the inside of the conductive fiber antenna terminal 33 of the antenna coil insertion layer 30, may be added any conductive material such as a coil, a metal thin film, etc. However, taking  
10 into consideration of reliability, the conductive fiber antenna terminal 33 is most preferable for the conductive material.

Like this, the antenna terminal 33 of the antenna coil insertion layer 30 is provided with a conductive fiber and is given electric conductivity. According to the workability and  
15 the easiness of heat pressing, such an antenna terminal may be formed of a circular shape whose diameter,  $\Phi$ , is 2-5mm, a rectangular shape which is 2-4mm wide by 2-4mm long, or other geometric shapes.

Under the antenna terminal 33, a layer for adjusting an antenna coil thickness 35, on which a COB chip positioning opening 37 is formed, is appropriately positioned, and in turn the lower printing layer 20 and the lower protection layer 10 is  
20 positioned.

Then, the respective stacked sheets are fixed by a certain  
25 tool so as not to be shaken and moved, and fixedly adhered to one another by heat and the like. Thereafter, the stacked sheets are formed integrally with one another by applying proper heat and pressure to form a stacked structure, which will be cut out at regular position, to complete the combi-card.

FIG. 4 shows a plan view of the card manufactured by the above process.

Again, the combi-card is characterized in that it is manufactured by applying ACF 112 to connect or attach the COB 100 and its contacts 104 to the antenna coil insertion layer 30 and the conductive fiber antenna terminal 33, and to give them the electrical conductivity.

In the conventional manufacturing process, as shown in FIG. 5, after the Hot-Melt tape 111 has been provisionally coated on the COB 100 by a heating head, etc., the COB contacts 104 and the antenna terminal 33 are directly attached by means of thermo compression bonding or soldering. Thereafter a sheet on which the COB positioning opening is formed is aligned at regular position, and then heat-pressed to make a stacked sheet. The card was completed by cutting out the stacked sheet at regular position.

In the present invention, the first process for constructing the combi-card is shown in FIG. 6. As shown in FIG. 6, ACF 112 is provisionally pre-treated on the COB 100 by using a heating head and the like. Then, the COB 100 is held in position onto a COB insertion pit 220 of a COB assembling die 200 (shown in FIG. 9), and is upside down so that the ACF 112 faces up. Thereafter, the antenna coil insertion layer 30 having a dam positioning opening 32 (shown in FIG. 7), through which a dam 106 of the COB 100 is penetrated, is aligned. By applying heat and pressure, a COB contact 104 with ACF 112 coated thereon is conductively adhered to the conductive fiber antenna terminal 33 of the antenna coil insertion layer 30 by the ACF 112, and then a sheet for antenna coil insertion is completed.

To the inside of the antenna terminal 33 of the antenna coil insertion layer 30, may be added any conductive material such as a coil terminal 34, a conductive fiber antenna terminal 33, a metal thin film, etc. However, taking into consideration of  
5 reliability, the conductive fiber antenna terminal 33 was most excellent for the conductive material.

Under the antenna terminal 33, a layer for adjusting an antenna coil thickness 35, on which a COB chip positioning opening 37 is formed, is appropriately positioned, and in turn  
10 the lower printing layer 20 and the lower protection layer 10 is positioned. Then, the respective stacked sheets are fixed by a tool so as not to be shaken and moved, and fixedly adhered to one another by heat and the like. Thereafter, the stacked sheets are formed integrally with one another by applying proper heat  
15 and pressure to form a stacked structure, which will be cut out at regular position, to complete the combi-card.

In the card body 70 for the combi-card of the present invention, the upper and lower printing layers 40 and 20, the antenna coil insertion layer 30 on which the antenna coil 31 is  
20 formed, and the upper and lower protection layers 50 and 10 are made of a transparent or opaque plastic material, such as PVC, PC, PETG, PET, ABS, etc.

The structure of the present invention is characterized in that, since sufficient heat and pressure is applied and so the  
25 adhesive strength of ACF 112 can be excellent, the chip would rather be broken than be detached from the card, and it exerts excellent electrical conductivity. On the contrary, in the conventional attachment process using a milling method, the sufficient adhesive strength could not be expected because of  
30 the short adhering time.

For a correct positioning of the COB 100 and the antenna coil insertion layer 30, like in FIG. 9, a round-tipped pin bar 210, whose diameter is 5mm or less and height is 5mm or less, is set up on the metal die 200, and a COB-shaped pit 220 is formed  
5 on a surface of the die 200 at a depth of 160-230  $\mu\text{m}$ . The COB 100 is inserted into the pit 220, so that the ACF 112 pre-treated on the COB 100 can face up.

Then, the dam positioning opening 32 of the antenna coil insertion layer 30 is aligned by using the pin bar 210, and  
10 thereafter, by applying heat and pressure via the pit 220, the COB 100 is provisionally adhered to the antenna coil insertion layer 30, which is 100-250  $\mu\text{m}$  thick and on which the conductive fiber antenna terminal 33 is formed. By doing so, the sheet for antenna coil insertion, in which the ACF-applied COB contact 104  
15 is adhered and electrically connected to the conductive fiber antenna terminal 33 directly, is formed as is shown in FIG. 7.

The upper printing layer 40 which is 100-200  $\mu\text{m}$  and the upper protection layer 50 which is 50-100  $\mu\text{m}$  are in turn positioned on the provisionally adhered sheet for antenna coil insertion; and  
20 the antenna coil thickness-adjusting layer 35, which is 100-250  $\mu\text{m}$  thick, appropriate to the thickness of the dam 106, the lower printing layer 20, which is 100-200  $\mu\text{m}$  thick, and the lower protection layer 10, which is 50-100  $\mu\text{m}$  thick, are in turn positioned under the provisionally adhered sheet for antenna  
25 coil insertion. The stacked sheets are so fixed as not to move by removing the static electricity, and then the respective layers are provisionally point-wise adhered by using a heating iron and the like. Thereafter, the provisionally adhered structure is put between polished plates of a laminator, and is



formed to a complete stacked sheet by applying the heat of 140-180°C and the pressure of 60-170bar.

Finally, the external contacts 101 of the COB 100 is cut out, so that their positions can meet the ISO7816-2 or KSX6507-2 requirements (both of which are for "the dimension and position of contacts"). As a result, the combi-card having excellent durability and electric conductivity is manufactured.

Hereafter, the preferred embodiments of the present invention will be described in detail. However, the scope of the present invention is not limited to these embodiments.

[Embodiment 1]

For a correct positioning of the COB 100 and the antenna coil insertion layer 30, as in FIG. 9, the respective two round-tipped pin bars 210 (each diameter is 5mm or less and height is 5mm or less) are set up on the top and bottom surfaces of the metal die 200, and the COB-shaped pit 220 is formed on a surface of the die 200, at a depth of 160-230  $\mu\text{m}$ . The COB 100 is inserted into the pit 220, so that the ACF 112 pre-treated on the COB 100 can face up. Then, the dam positioning opening 32 of the antenna coil insertion layer 30, which is 100-250  $\mu\text{m}$  thick and on which the conductive fiber antenna terminal 33 is formed, is aligned by using the pin bars 210, and thereafter, by applying heat and pressure, the COB 100 is provisionally adhered to the antenna coil insertion layer 30. By doing so, the sheet for antenna coil insertion, in which the ACF-applied COB contact 104 is adhered and electrically connected to the conductive fiber antenna terminal 33 directly, is formed as is shown in FIG. 7.

The upper printing layer 40 which is 100-200  $\mu\text{m}$  and the upper protection layer 50 which is 50-100  $\mu\text{m}$  are in turn positioned on

the provisionally adhered sheet for antenna coil insertion as above; and the antenna coil thickness-adjusting layer 35, which is 100-250  $\mu\text{m}$  thick, appropriate to the thickness of the dam 106, the lower printing layer 20, which is 100-200  $\mu\text{m}$  thick, and the  
5 lower protection layer 10, which is 50-100  $\mu\text{m}$  thick, are in turn positioned under the provisionally adhered sheet for antenna coil insertion. The stacked sheets are so fixed as not to move by removing the static electricity, and then the respective layers are provisionally point-wise adhered by using a heating  
10 iron and the like. Thereafter, the provisionally adhered structure is put between the polished plates of the laminator, and is formed to a complete stacked sheet by applying the heat of 140-180°C and the pressure of 60-170bar.

After the stacked sheet has been formed, the respective  
15 contacts of the external contacts 101 of the COB 100 are cut out, so that their positions may meet the ISO7816-2 or KSX6507-2 requirements (both of which are for "the dimension and position of contacts"). As a result, the combi-card having excellent durability and electric conductivity is manufactured.

20

[Embodiment 2]

As shown in FIG. 3, the lower protection layer 10, which is 50-100  $\mu\text{m}$  thick; the lower printing layer 20, which is 100-200  $\mu\text{m}$  thick; the antenna coil thickness-adjusting layer 35, which is  
25 100-250  $\mu\text{m}$  thick and on which the COB dam positioning opening 37 is formed; the antenna coil insertion layer 30, which is 100-200  $\mu\text{m}$  thick and on which the COB dam positioning opening 32 and the conductive fiber antenna terminal 33 are formed; the upper

printing layer 40 which is 100-200  $\mu\text{m}$  thick and on which the COB positioning opening 42 is formed; and the upper protection layer 50 which is 50-100  $\mu\text{m}$  thick and on which the COB positioning opening 52 is formed, are in turn stacked upward. After the air and the static electricity between the respective layers has been removed by a roller, the COB 100, on which the ACF 112 is pre-treated, is inserted into the opening 72 to which the COB 100 will be secured. Then, by applying heat and pressure, the ACF-applied COB contact 104 is adhered and electrically connected to the conductive fiber antenna terminal 33 directly. At this time, the sheet for antenna coil insertion is partially provisionally adhered to certain portions of the sheet of the card body 70, by the heat and pressure.

Thereafter, the provisionally adhered structure is put between the polished plates of the laminator, and is formed to a complete stacked sheet by applying the heat of 140°C-180°C and the pressure of 60-170bar.

After having been formed, the stacked sheet is cut out, so that the positions of the external contacts 101 of the COB 100 may meet the ISO7816-2 or KSX6507-2 requirements (both of which are for "the dimension and position of contacts"). As a result, the combi-card having excellent durability and electric conductivity is manufactured.

**Claims**

1. A combi-card including a plurality of stacked sheets, comprising:

5 an antenna coil insertion layer (30), lower and upper printing layers (20, 40), and lower and upper protection layers (10, 50),

wherein the antenna coil insertion layer (30) includes a conductive fiber antenna terminal (33), to which a COB contact  
10 (104) with ACF (112) coated thereon is directly attached by heat and pressure so that the conductive fiber antenna terminal and the COB contact are electrically connected with each other.

2. The combi-card according to claim 1, wherein the  
15 conductive fiber antenna terminal (33) is formed in a circular shape of which the diameter,  $\Phi$ , is 2-5mm.

3. The combi-card according to claim 1, wherein the conductive fiber antenna terminal (33) is formed in a  
20 rectangular shape which is 2-4mm wide by 2-4mm long.

4. The combi-card according to claim 1, wherein the conductive fiber antenna terminal of the antenna coil insertion layer (30) is given electric conductivity by using a coil or a  
25 metal thin film.

5. The combi-card according to claim 1, wherein the plurality of sheets are made of transparent synthetic resin of

any one selected from the group consisting of PVC, PC, PETG, PET, and ABS.

6. A method of manufacturing a combi-card, comprising the  
5 following steps of:

a step of forming an antenna coil insertion layer (30), in which a COB insertion pit (220) is formed in an inner surface of a metal die (200), for a correct positioning of the COB (100) and the antenna coil insertion layer (30); a round-tipped pin  
10 bar (210) is set up on a part of a top and a bottom surfaces of the metal die (200); the COB (100) is inserted into the pit (220), so that an ACF (112) pre-treated on the COB (100) faces up; a dam positioning opening (32), on which the conductive fiber antenna terminal (33) is formed, of the antenna coil  
15 insertion layer (30) is aligned to be at regular position by using the pin bar (210); the COB (100) is provisionally attached to the antenna coil insertion layer (30), by applying heat and pressure to the COB (100) via the COB insertion pit (220), so that the ACF-applied COB contact (104) is directly adhered to  
20 and electrically connected with the conductive fiber antenna terminal (33) directly;

a step of forming a stacked sheet body, in which an upper printing layer and an upper protection layer are stacked on the COB 100 in the antenna coil insertion layer formed by the above  
25 step; a layer for adjusting the antenna coil thickness (35), which is appropriate to the thickness of the dam 106, a lower printing layer (20), and a lower protection layer (10) are aligning under the antenna coil insertion layer; the stack-wise positioned layers are so fixed as not to move, by removing the  
30 static electricity; the respective layers are provisionally

adhered by using a heating iron; and the provisionally adhered structure are put between polished plates of a laminator, and heat and pressure are applied to the structure so as to form a complete stacked sheet body; and

- 5        a step of cutting out external contacts (101) of the COB (100) from the stacked sheet body, using a cutting machine.

7. A method of manufacturing a combi-card, comprising the steps of:

- 10        sequentially stacking a lower protection layer (10), a lower printing layer (20), a layer for adjusting the antenna coil thickness (35), on which a COB dam positioning opening (37) is formed, an antenna coil insertion layer (30), on which the COB dam positioning opening (32) and a conductive fiber antenna terminal (33) are formed, an upper printing layer on which a COB positioning opening (42) is formed, and an upper protection layer (50), on which a COB positioning opening (52) is formed;

removing the air and the static electricity between the respective layers by using a roller;

- 20        inserting a COB (100), on which an ACF (112) is pre-treated, into the opening (72) to which the COB (100) will be secured;

- attaching an ACF-applied COB contact (104) to the conductive fiber antenna terminal (33) by applying heat and pressure, to establish electric connection between the ACF-applied COB contact (104) and conductive fiber antenna terminal (33);
- 25

provisionally partially adhering the antenna coil insertion sheet to certain portions of the sheet of the card body, by applying heat and pressure;

putting the provisionally adhered structure between polished plates of a laminator, and applying heat and pressure so as to form a complete stacked sheet body; and

cutting out external contacts (101) of the COB (100) from  
5 the stacked sheet body, using a cutting machine.

8. The method according to claim 6, wherein the diameter of the pin bar (210) is 5mm or less and its height is 5mm or less, and the COB insertion pit (220) is polyhedrally formed at a  
10 depth of 160~230  $\mu\text{m}$ ; and

wherein the COB (100) is adhered to the antenna coil insertion layer (30), by applying heat and pressure to the COB (100) via the COB insertion pit (220).

Fig. 1

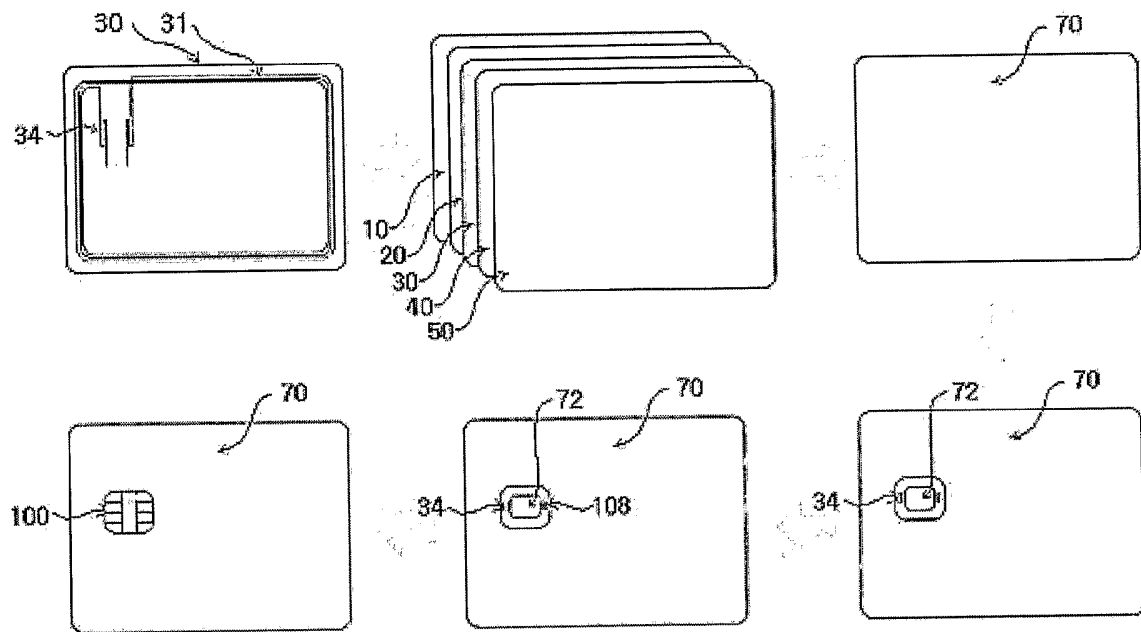




Fig. 2

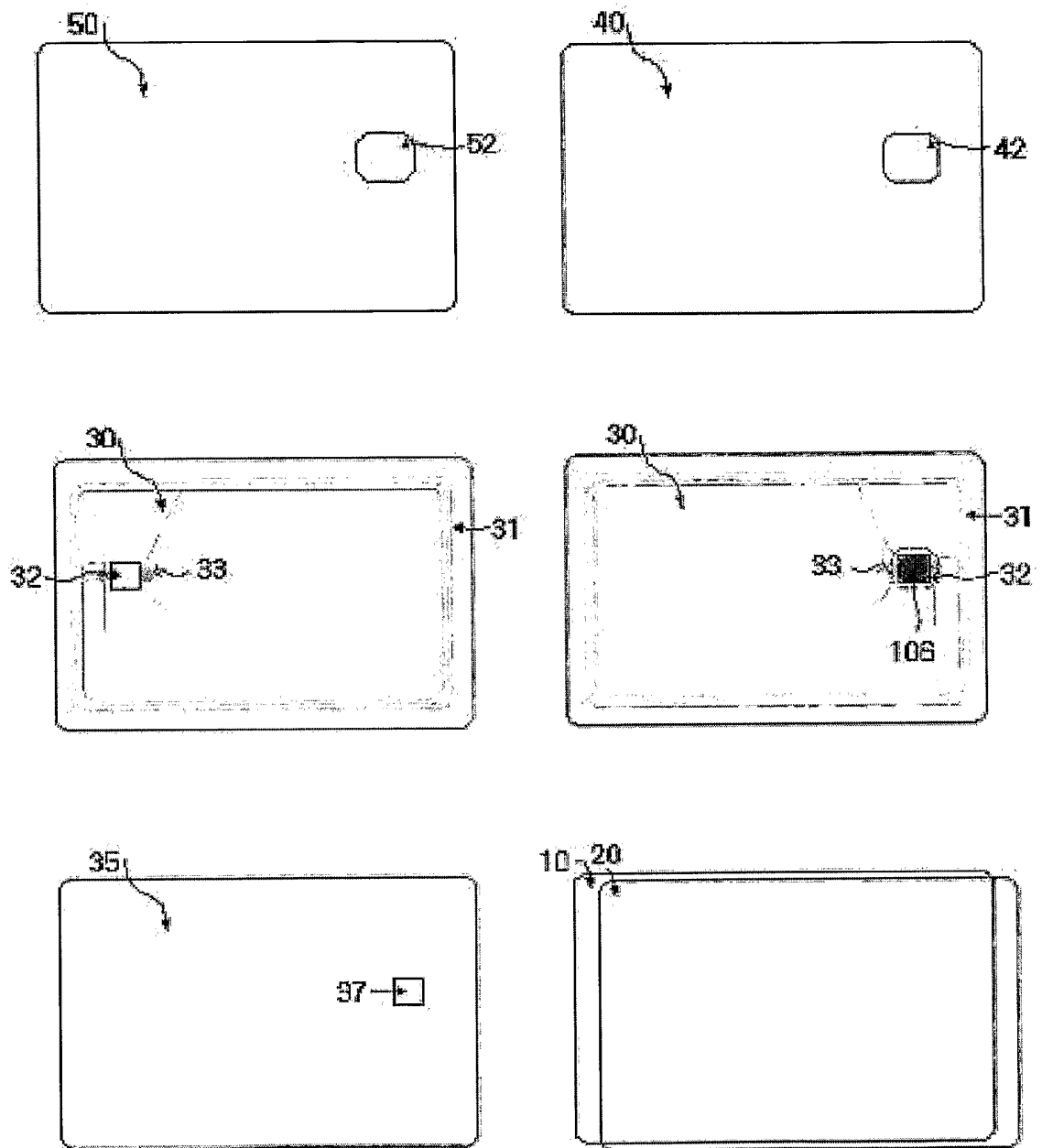
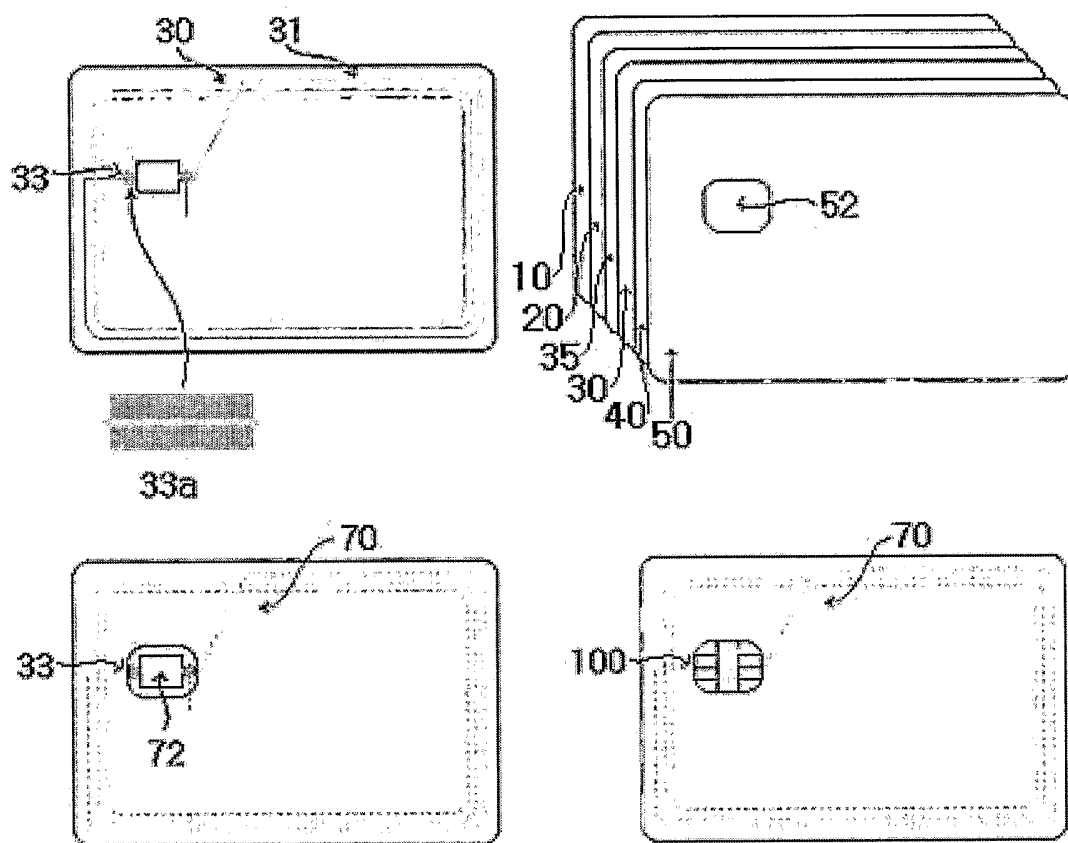
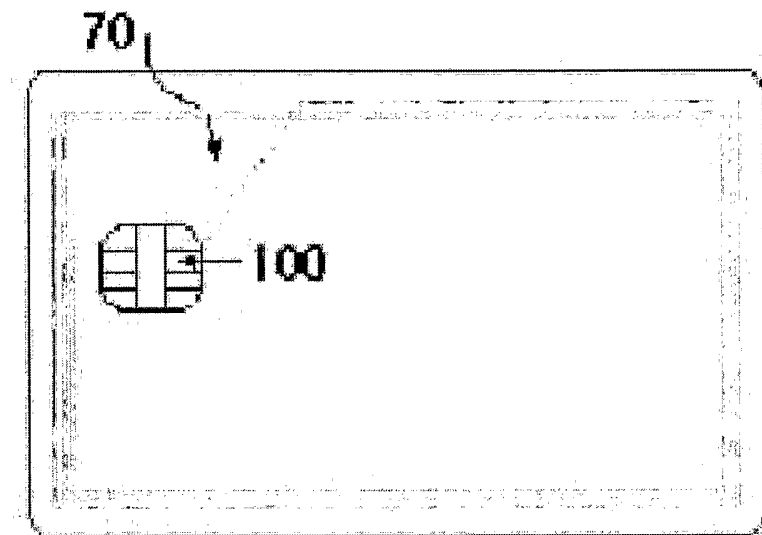


Fig. 3



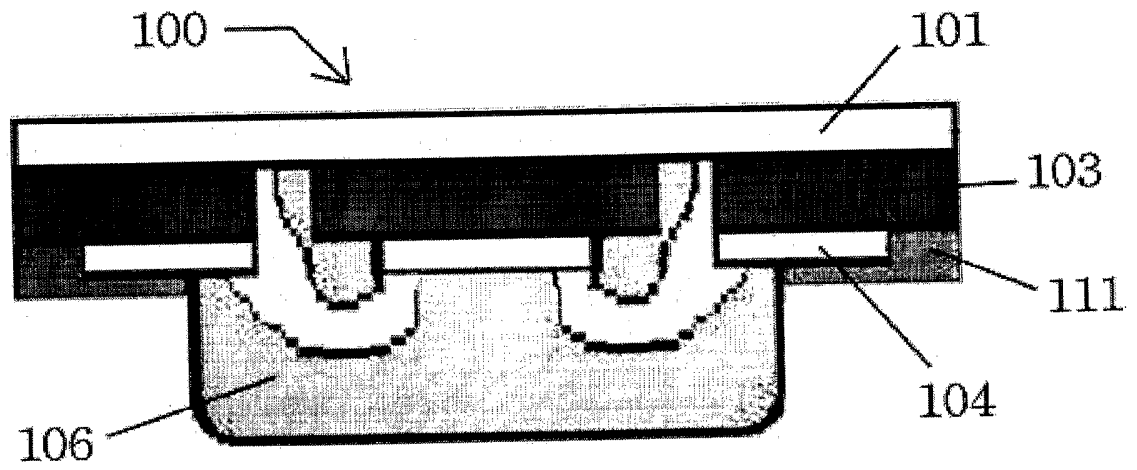
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Fig. 4



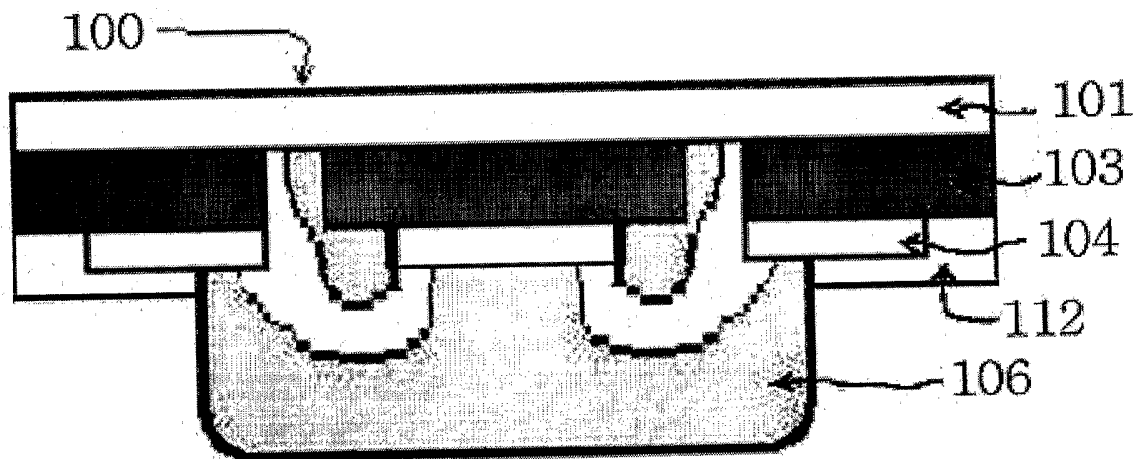
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Fig. 5



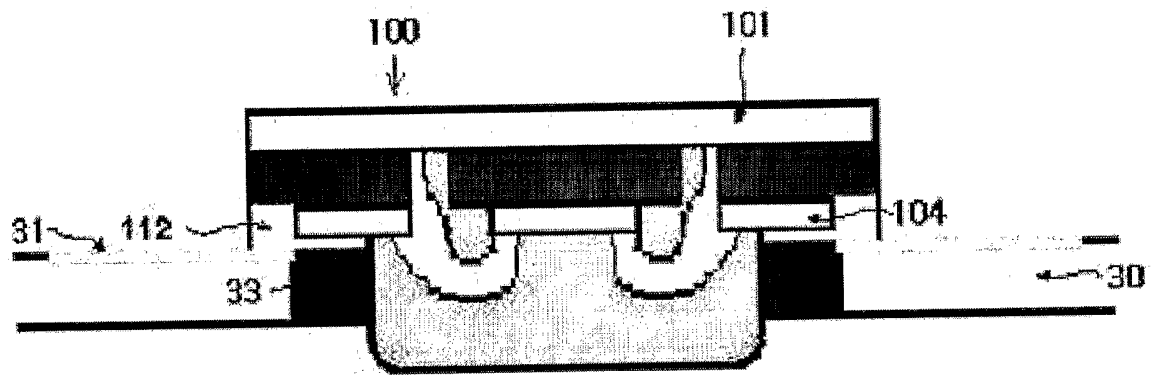
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Fig. 6



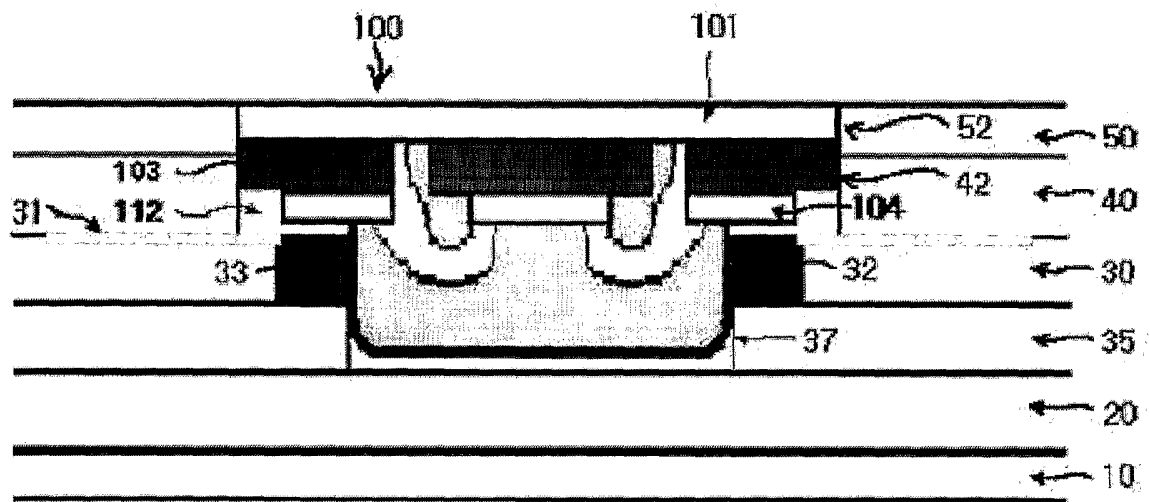
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Fig. 7



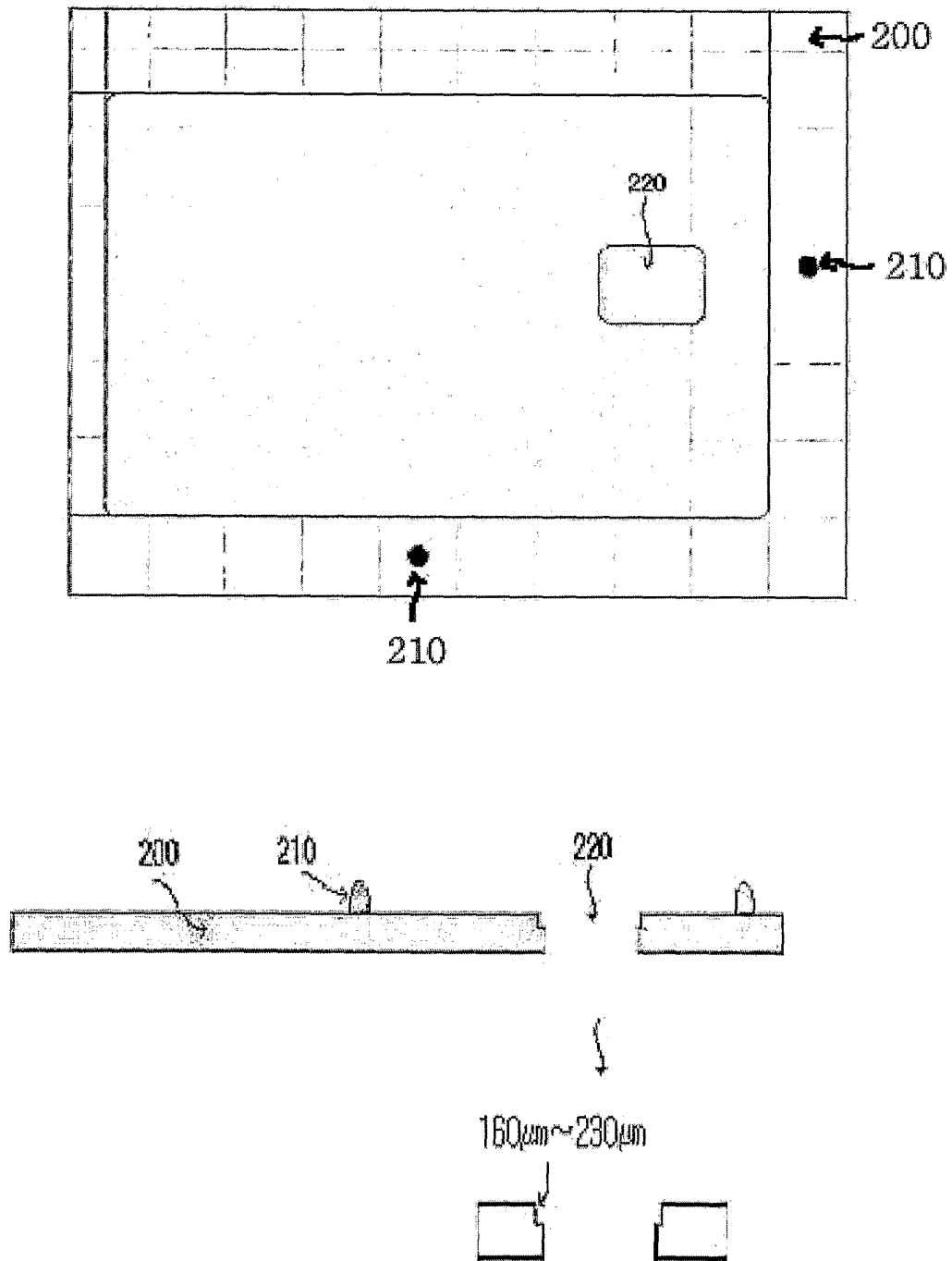
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Fig. 8



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Fig. 9





## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR2005/001828

**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 G06K 19/077**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC7 G06K, G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, PAJ "card", "combi\*", "hybrid\*", "ACF", "contact"

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y1	JP 2003-141486 A (AOYANAGI SHOJI) 16.05.2003 * See the whole document	1-5
A		6-8
Y2	JP2001-005934 A (HONDA SHIKO) 12.01.2001 * See the whole document	1-5
A		6-8



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

20 OCTOBER 2005 (20.10.2005)

Date of mailing of the international search report

**20 OCTOBER 2005 (20.10.2005)**

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