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(54) PLANAR ANTENNA HAVING RFID ELECTRIC TAGS

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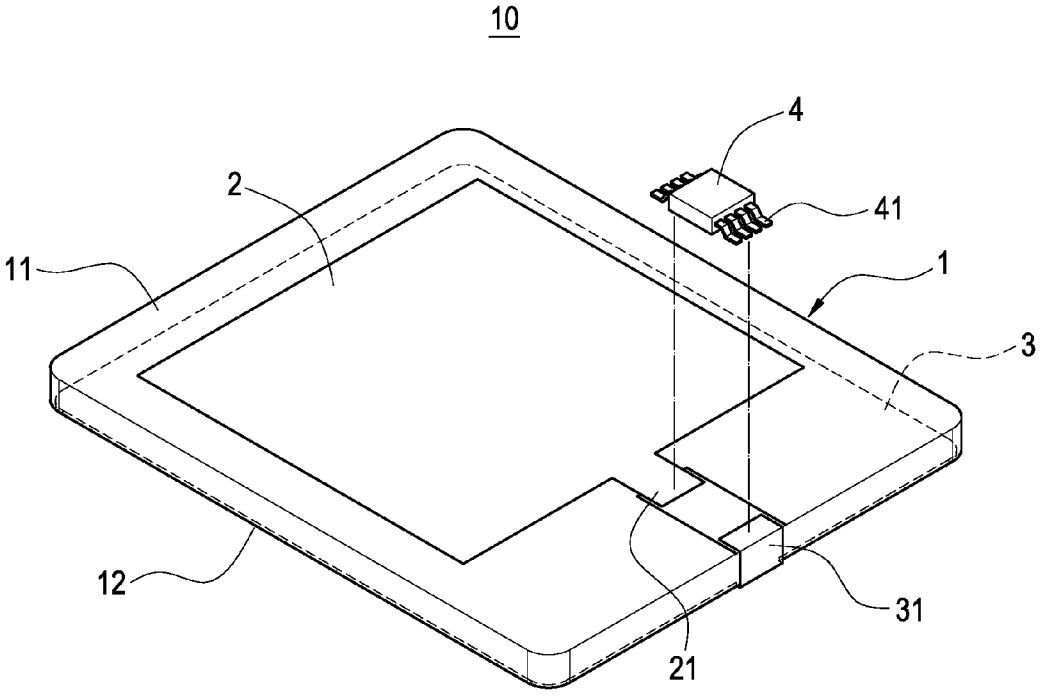
(57) **ABSTRACT**

A planar antenna having RFID electric tags comprises: a substrate (**1**), a radiating metal layer (**2**), a grounding metal layer (**3**) and a RFID chip (**4**). The substrate (**1**) has a front surface (**11**) and a rear surface (**12**) thereon. The radiating metal layer (**2**) is provided on the front surface (**11**) of the substrate (**1**). The grounding metal layer (**3**) is provided on the rear surface (**12**) of the substrate (**1**). The RFID chip (**4**) is provided on the front surface (**11**) of the substrate (**1**). The RFID chip (**4**) has a plurality of pins (**41**) on its two sides. The pins (**41**) electrically connect to the radiating metal layer (**2**) and the grounding metal layer (**3**). The planar antenna (**10**) having RFID electric tags of the invention may be used in the aspects of a metal surface and merchandise with a larger metal surface and liquid merchandise without interference when a RFID reader reads data.



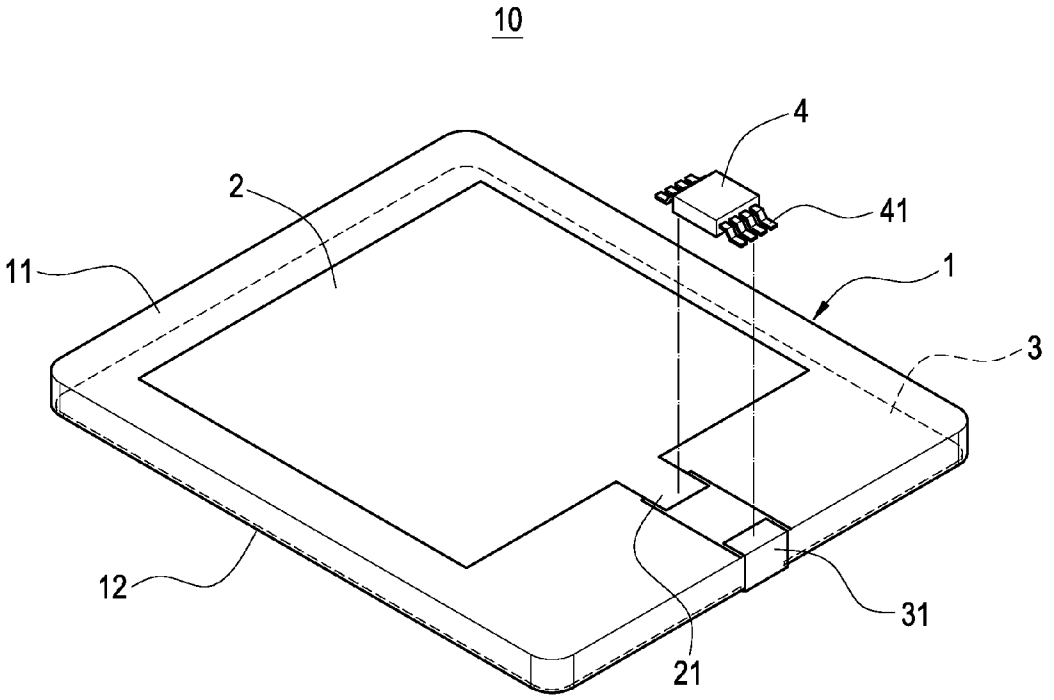


FIG.1

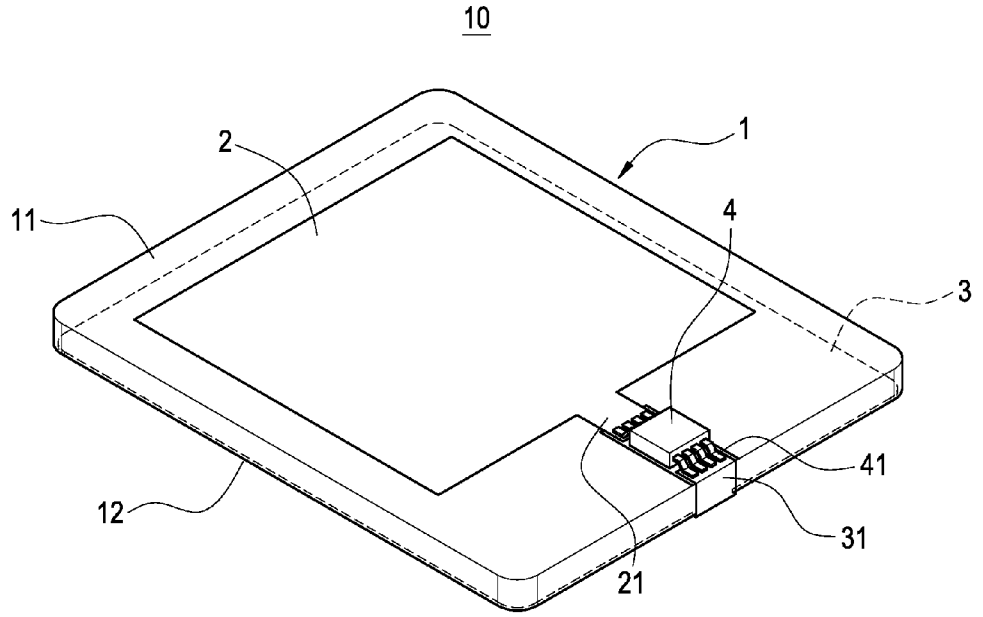


FIG.2

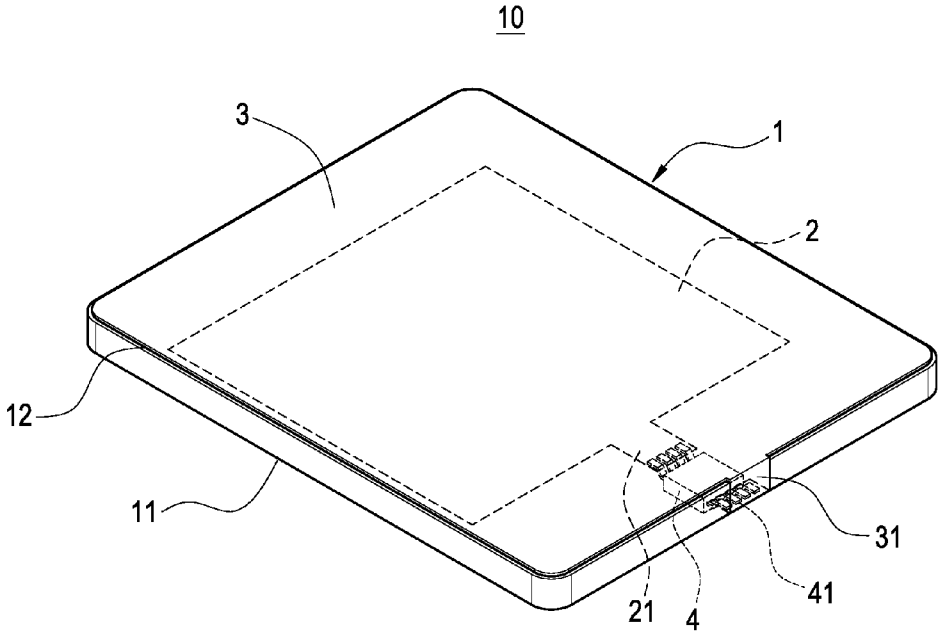


FIG.3

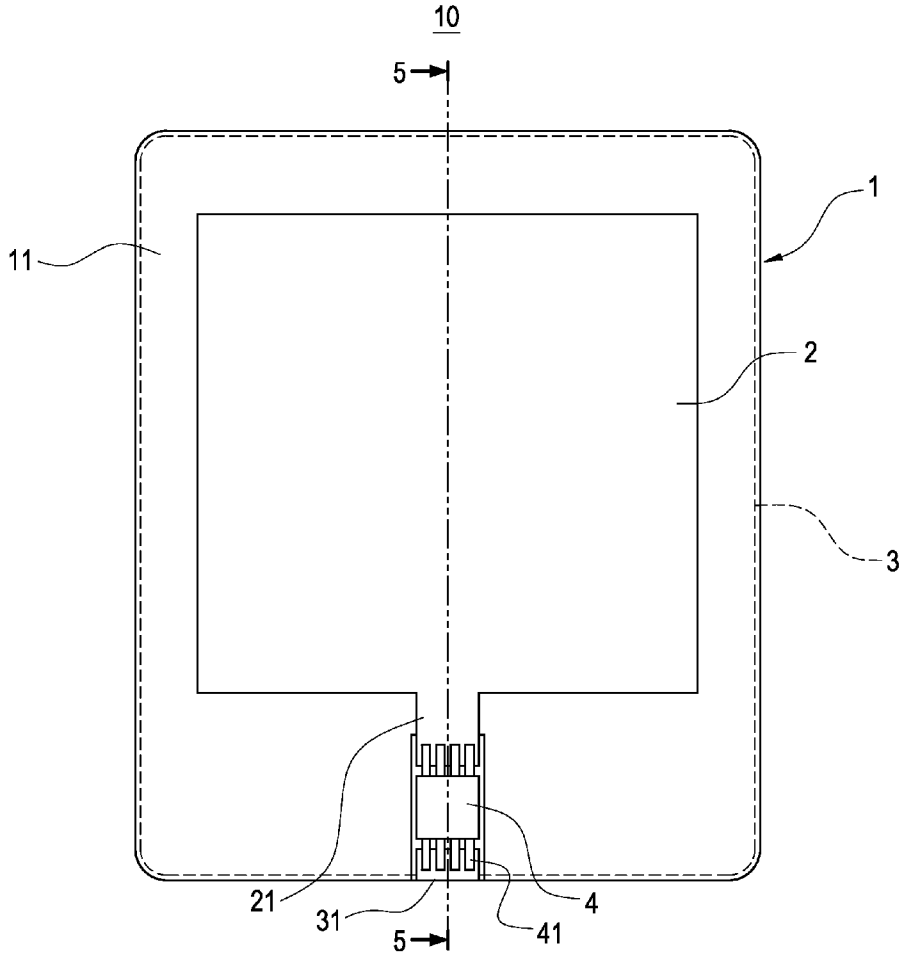


FIG.4

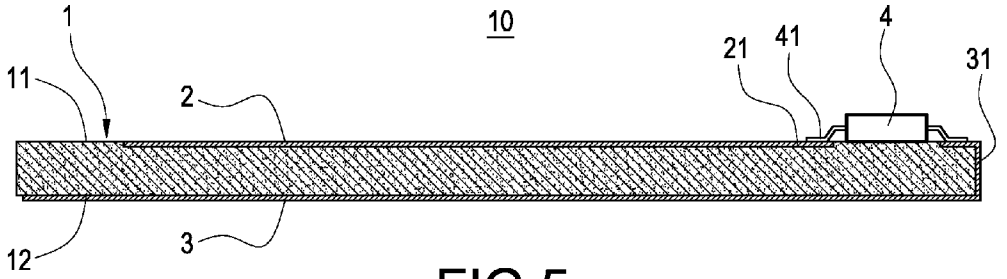


FIG.5

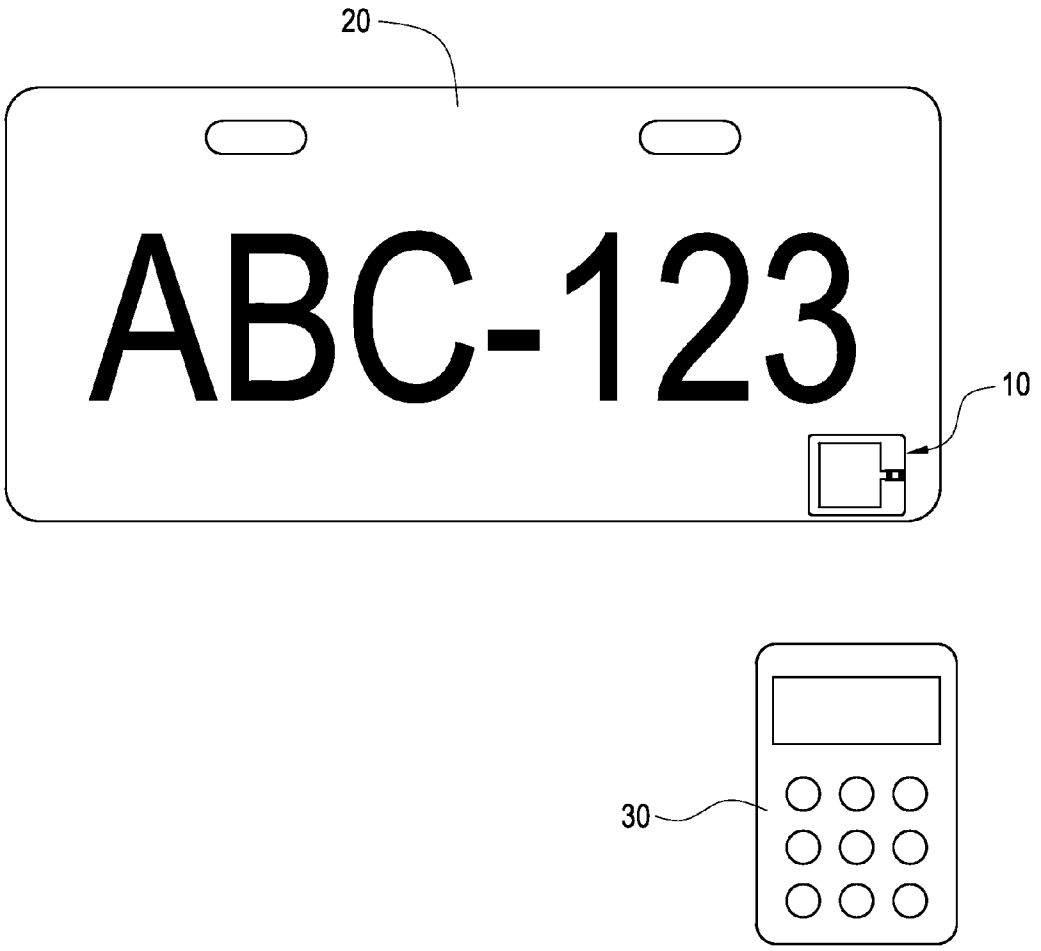


FIG.6

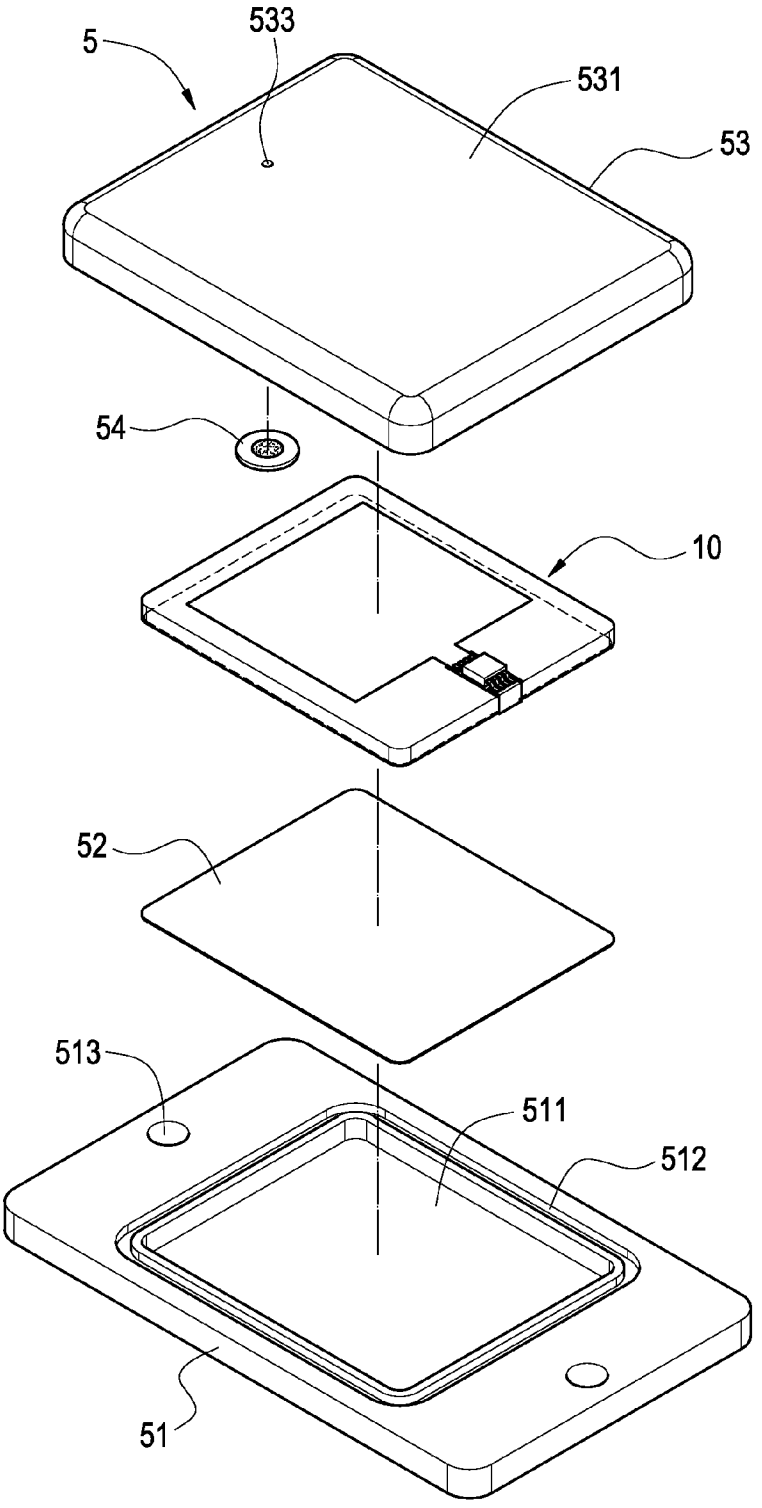


FIG.7

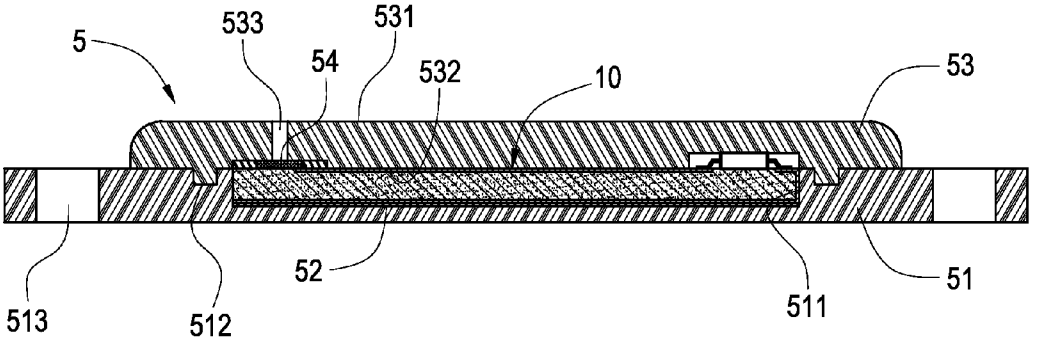


FIG.8

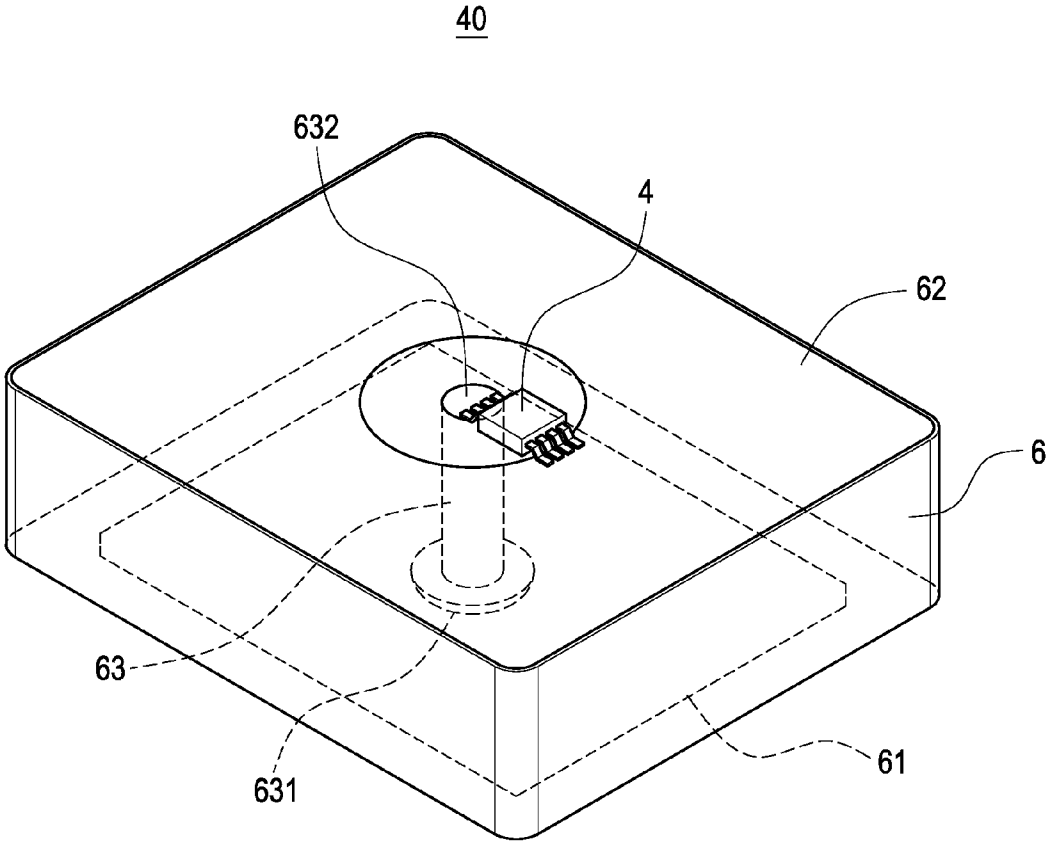


FIG.9

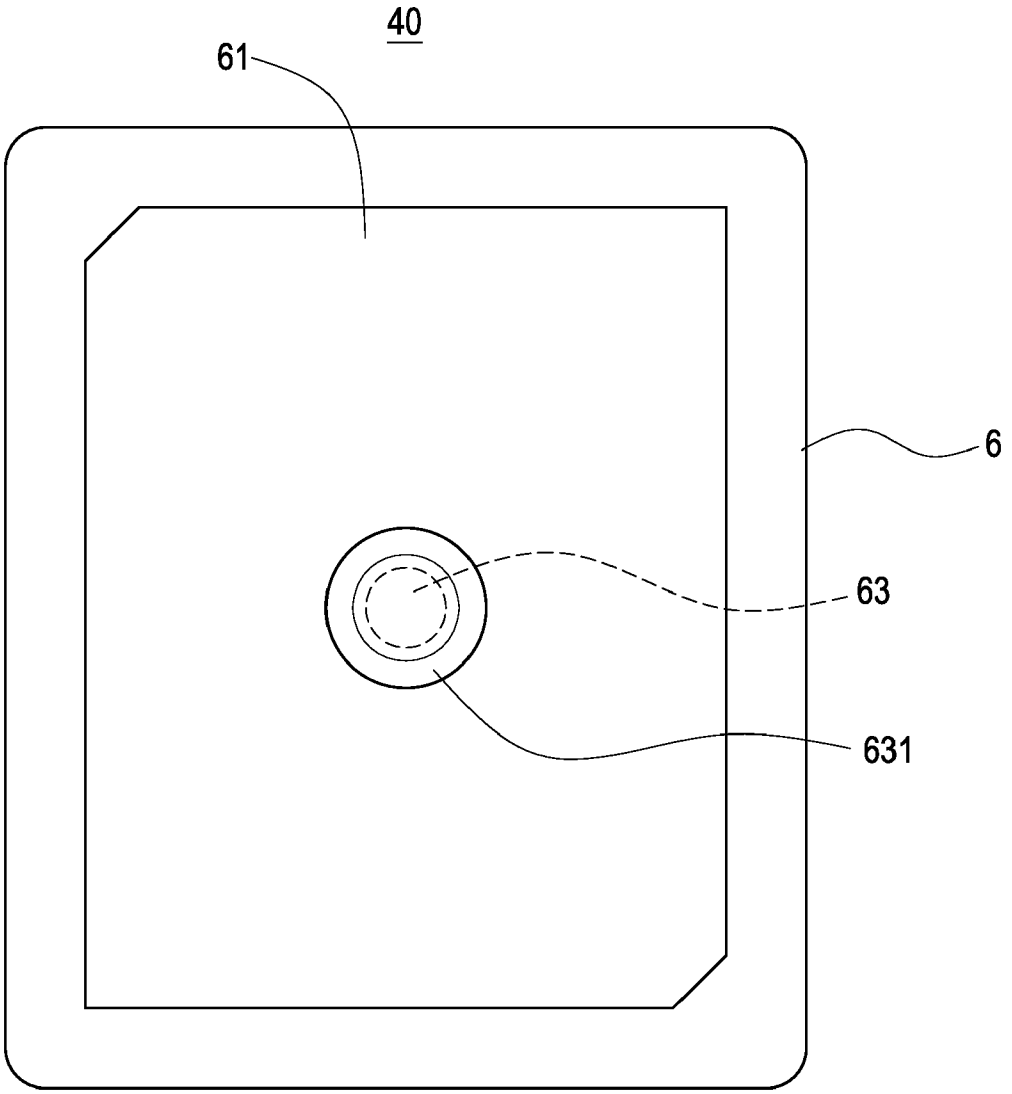


FIG.10

PLANAR ANTENNA HAVING RFID ELECTRIC TAGS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The invention relates to a RFID electric tag, and more particularly, to a planar antenna having a function of RFID electric tag.

[0003] 2. Description of Prior Art

[0004] RFID electric tags have been widely used in the logistics area. It may store data related to merchandise, credit card or access card on a RFID chip. When RFID reader reads the data, the action of merchandise payment, merchandise inventory management, credit card usage and identity identification, etc. can be finished.

[0005] A traditional method for manufacturing RFID electric tags comprises first preparing a plastic sheet, providing a reception and emission antenna on the plastic sheet, gluing a RFID chip on the plastic sheet and electrically connecting the pins and the antenna. When finishing the manufacture of the RFID electric tags, adhesives may be directly coated on a surface of plastic sheet having the antenna and RFID chip so that the RFID electric tags may be adhered to merchandise.

[0006] The traditional RFID electric tags have a deficiency of susceptible to ambient factors, such as usage in the water or liquid and high humid environment, easily causing interference and diffraction. Alternative, when providing traditional RFID electric tags on a surface of metal, it may cause high ratio of error of reading data.

SUMMARY OF THE INVENTION

[0007] It is a main object of the invention to improve the above deficiency of the traditional RFID electric tags by a combination of RFID chip and planar antenna. The larger the area of the grounding metal layer of the planar antenna is, the better reception the planar antenna is. Therefore, the planar antenna having a RFID electric tag can be used in the aspects of a metal surface and merchandise with a larger metal surface and liquid merchandise without interference when a RFID reader reads data.

[0008] The object described above is achieved by a planar antenna having a RFID electric tag of the invention. The planar antenna having a RFID electric tag comprises: a substrate made of ceramic material, the substrate having a front surface and a rear surface thereon; a radiating metal layer provided on the front surface of the substrate, the radiating metal layer having an area which is equal to or less than the area of the front surface of the substrate, the radiating metal layer having at least a first electrode on its one side; a grounding metal layer provided on the rear surface of the substrate, the grounding metal layer having an area which is equal to or less than the area of the rear surface of the substrate, the grounding metal layer having at least a second electrode on its one side which extends to the front surface of the substrate; a RFID chip provided on the front surface of the substrate, the RFID chip having a plurality of pins on its two sides, the pins electrically connecting to the first electrode and the second electrode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is an exploded view of planar antenna and RFID chip of the invention.

[0010] FIG. **2** is an assembly view of planar antenna and RFID chip of the invention.

[0011] FIG. **3** is a schematic rear view of the planar antenna.

[0012] FIG. **4** is a top view of the planar antenna of the invention.

[0013] FIG. **5** is a schematic cross-sectional view along line **5-5** of FIG. **4**.

[0014] FIG. **6** shows the usage state of the planar antenna of the invention.

[0015] FIG. **7** is another embodiment of the invention.

[0016] FIG. **8** is a schematic side-sectional view of FIG. **7**.

[0017] FIG. **9** is a schematic top view of a further embodiment of the planar antenna of the invention.

[0018] FIG. **10** is a schematic bottom view of a further embodiment of the planar antenna of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] A preferred embodiment of the present invention will be described with reference to the drawings.

[0020] Please refer to FIGS. **1**, **2** and **3**. FIG. **1** is an exploded view of planar antenna and RFID chip of the invention. FIG. **2** is an assembly view of planar antenna and RFID chip of the invention. FIG. **3** is a schematic rear view of the planar antenna. As shown in the drawings, the invention relates to a planar antenna **10** having RFID electric tags comprising: a substrate **1**, a radiating metal layer **2**, a grounding metal layer **3** and a RFID chip **4**.

[0021] The substrate **1** is made of ceramic material to present a square or rectangular body, and has a front surface **11** and a rear surface **12** thereon.

[0022] The radiating metal layer **2** is provided on the front surface **11** of the substrate **1**. The radiating metal layer **2** may be used for signal reception and emission. Also, the radiating metal layer **2** has an area which is equal to or less than the area of the front surface **11** of the substrate **1**. The radiating metal layer **2** has at least a first electrode (microstrip) **21** on its one side.

[0023] The grounding metal layer **3** is provided on the rear surface **12** of the substrate **1** for grounding. The grounding metal layer **3** has an area which is equal to or less than the area of the rear surface **12** of the substrate **1**. The grounding metal layer **3** has at least a second electrode **31** on its one side which extends to the front surface **11** of the substrate **1**.

[0024] The RFID chip **4** may be made by a well-known art. The RFID chip **4** is provided on the front surface **11** of the substrate **1**. The RFID chip **4** has a plurality of pins **41** on its two sides to electrically connect to the first electrode **21** and the second electrode **31**. The RFID chip **4** may receive a signal radiated from an external RFID reader (not shown in the drawings) by the radiating metal layer **2**, and transmitting the signal of RFID chip **4** to the RFID reader.

[0025] Please refer to FIGS. **4** and **5**. FIG. **4** is a top view of the planar antenna of the invention. FIG. **5** is a schematic cross-sectional view along line **5-5** of FIG. **4**. As shown in the drawings, the substrate **1** has the radiating metal layer **2** provided on the front surface **11**, and has the grounding metal layer **3** provided on the rear surface **12**. The RFID chip **4** connects a first electrode **21** of the radiating metal layer **2** and a second electrode **31** of the grounding metal layer **3**. Since the RFID chip **4** is provided on the planar antenna **10**, the larger the area of the grounding metal layer **3** of the planar antenna **10** is, the better reception the planar antenna **10** is. Therefore, the RFID electric tag can be used in the merchan-

dise with a larger metal surface (not shown in the drawings) without interference during reception and emission of signal. It is different with traditional RFID electronic tags which cannot be used in a metal merchandise with greater volume.

[0026] Please also refer to FIG. **6**, which shows that the planar antenna **10** having a RFID electric tag is provided on a metal license plate **20** of a vehicle. After the grounding metal layer **3** of the rear surface **12** of the substrate **1** contacts with the metal license plate **20**, the grounding area is enlarged to improve the reception and emission of the planar antenna **10** without interference from a metal object during reception and emission of signal. Therefore, the external RFID reader **30** can read the data stored in the RFID chip **4**.

[0027] Please also refer to FIGS. **7** and **8**. FIG. **7** is another embodiment of the invention. FIG. **8** is a schematic side-sectional view of FIG. **7**. As shown in the drawings, after finishing the manufacture of the planar antenna having a RFID electric tag of the invention, the planar antenna **10** can be provided in a housing **5** made of plastics. The housing **5** comprises a base **51**, a gummed tape **52**, a cover **53** and an adhesive tape **54** with waterproof property and vapor permeability.

[0028] The base **51** has a chamber **511** for receive the planar antenna **10** therein. The chamber **511** has a groove **512** around the edge for connecting the cover **53**. When connecting to the cover **53**, a sealing strip or glue coating can be provided in the groove **512** to have a waterproof effect. In addition, the base **51** has joint holes **513** on two sides of the chamber **511**, corresponding to each other. The joint holes **513** can be used for fastening the base **51** to the metal object. Alternative, a double-sided tape can be provided on the rear surface of the base **51** to adhere on the object directly.

[0029] The gummed tape **52** is a double-sided tape or an adhesive which is used for adhering the planar antenna **10** within the chamber **511**.

[0030] The cover **53** is inserted into the groove **512**. The cover **53** has an outer surface **531** and an inner surface **532**. The outer surface **531** has a vent **533** penetrating through the cover **53**.

[0031] The adhesive tape **54** with waterproof property and vapor permeability is provided on the inner surface **532** of the cover **53** to seal the vent **533**. The adhesive tape **54** can prevent the external moisture from entering the chamber **511**, while exhausting the moisture within the chamber **511** to keep the chamber **511** dry.

[0032] Please refer to FIGS. **9** and **10**. FIG. **9** is a schematic top view of a further embodiment of the planar antenna of the invention. FIG. **10** is a schematic bottom view of a further embodiment of the planar antenna of the invention. As shown in the drawings, another type of the planar antenna **40** of the invention has a cubic substrate **6** made of ceramic material. The substrate **6** has a radiating metal layer **61** on the front surface and a grounding metal layer **62** on the rear surface. The substrate **6** has a signal feeding body **63** penetrating through per se. The signal feeding body **63** has a first end **631** electrically connecting to the radiating metal layer **61** and a second end **632** penetrating through a bottom of the substrate **6**. The second end **632** may not contact with the grounding metal layer **62**. There is a RFID chip **4** electrically connecting the second end **632** to the grounding metal layer **62** to form another type of a planar antenna having RFID electric tags.

[0033] Although the present invention has been described with reference to the foregoing preferred embodiment, it will be understood that the invention is not limited to the details thereof Various equivalent variations and modifications can still occur to those skilled in this art in view of the teachings of the present invention. Thus, all such variations and equivalent modifications are also embraced within the scope of the invention as defined in the appended claims.

What is claimed is:

1. A planar antenna having RFID electric tags comprising:
- a substrate (**1**) having a front surface (**11**) and a rear surface (**12**) thereon;
- a radiating metal layer (**2**), provided on the front surface (**11**) of the substrate (**1**);
- a grounding metal layer (**3**) provided on the rear surface (**12**) of the substrate (**1**); and
- a RFID chip (**4**) provided on the front surface (**11**) of the substrate (**1**), the RFID chip (**4**) having a plurality of pins (**41**) on its two sides, the pins (**41**) electrically connecting to the radiating metal layer (**2**) and the grounding metal layer (**3**).

2. The planar antenna of claim **1** wherein the substrate (**1**) is made of ceramic material, and the substrate (**1**) is a square body or a rectangular body.

3. The planar antenna of claim **1** wherein the radiating metal layer (**2**) has an area which is equal to or less than the area of the front surface (**11**) of the substrate (**1**), the radiating metal layer (**2**) having at least a first electrode (**21**) on its one side, the first electrode (**21**) electrically connecting to the pins (**41**) on a side of the RFID chip (**4**).

4. The planar antenna of claim **1** wherein the grounding metal layer (**3**) has an area which is equal to or less than the area of the rear surface (**12**) of the substrate (**1**), the grounding metal layer (**3**) having at least a second electrode (**31**) on its one side, the second electrode (**31**) extending to the front surface (**11**) of the substrate (**1**), the second electrode (**31**) electrically connecting to the pins (**41**) on another side of the RFID chip (**4**).

5. The planar antenna of claim **1** further comprising a plastic housing (**5**) enclosing the planar antenna (**10**), the housing (**5**) comprising:
- a base (**51**) having a chamber (**511**) for receive the planar antenna (**10**) therein, the chamber (**511**) having a groove (**512**) around the edge; and
- a cover (**53**) inserted into the groove (**512**), the cover (**53**) having an outer surface (**531**) and an inner surface (**532**), the outer surface (**531**) having a vent (**533**) penetrating through the cover (**53**).

6. The planar antenna of claim **5** wherein when connecting the groove (**512**) to the cover (**53**), a sealing strip or glue coating can be provided in the groove (**512**) to have a waterproof effect.

7. The planar antenna of claim **5** wherein the base (**51**) has joint holes (**513**) on two sides of the chamber (**511**), corresponding to each other, a gummed tape (**52**) provided on the chamber (**511**) of the base (**51**), the gummed tape (**52**) is a double-sided tape or an adhesive which is used for adhering and fixing the planar antenna (**10**) within the chamber (**511**).

8. The planar antenna of claim **5** further comprising an adhesive tape (**54**) with waterproof property and vapor permeability, the adhesive tape (**54**) being provided on the inner surface (**532**) of the cover (**53**) to seal the vent (**533**).

9. A planar antenna having RFID electric tags comprising:
- a substrate (**6**) having radiating metal layer (**61**) on a front surface and a grounding metal layer (**62**) on a rear surface, the substrate (**6**) having a signal feeding body (**63**)

penetrating through per se, the signal feeding body (**63**) having a first end (**631**) electrically connecting to the radiating metal layer (**61**) and a second end (**632**) penetrating through a bottom of the substrate (**6**), the second end (**632**) not to contact with the grounding metal layer (**62**); and

a RFID chip (**4**) electrically connecting the second end (**632**) and the grounding metal layer (**62**).

10. The planar antenna of claim **9** wherein the substrate (**6**) is ceramic material, the substrate (**6**) is a cube.

* * * * *