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(54) **IMAGING CARTRIDGE AND CHIP APPLIED TO SAME**

(57) This application provides an imaging cartridge and a chip for an imaging cartridge. The imaging cartridge is removably installed on an imaging apparatus. A plurality of contact pins are disposed on the imaging apparatus. Specifically, the imaging cartridge includes a cartridge body. A first positioning cavity is provided on the cartridge body. An opening of the first positioning cavity is located on a first surface of the cartridge body. A plurality of contact portions configured for contact with the

contact pins are further disposed on the cartridge body. When the imaging cartridge is installed on the imaging apparatus, at least two of the plurality of contact pins extend into the first positioning cavity. The contact portions are respectively disposed on two sides of the first positioning cavity. Terminals of the imaging cartridge provided in this application can be in stable electrical contact with the contact pin.

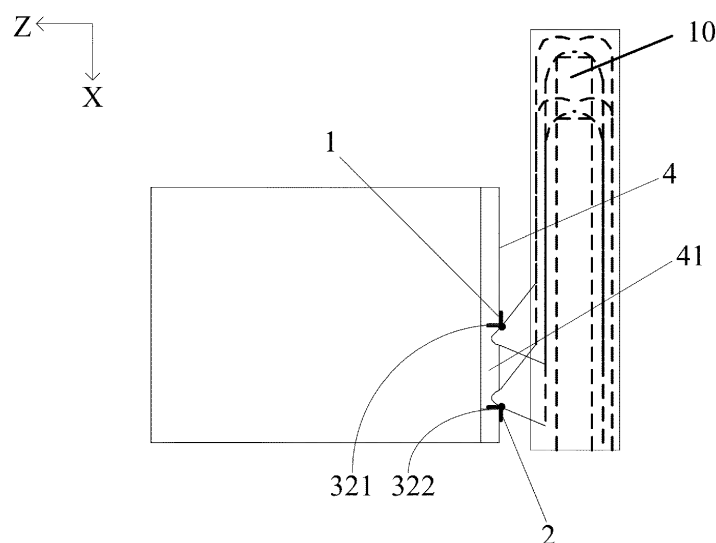


FIG. 4

## Description

[0001] This application claims priority to Chinese Patent Application No. 201910604136.6 entitled "IMAGING CARTRIDGE AND CHIP FOR IMAGING CARTRIDGE" and filed with the China National Intellectual Property Administration, PRC on July 5, 2019, which is incorporated herein by reference in its entirety.

## TECHNICAL FIELD

[0002] This application relates to the field of the printing imaging, and in particular, to an imaging cartridge and a chip for an imaging cartridge.

## BACKGROUND

[0003] A replaceable printing consumable such as a toner cartridge, an ink cartridge, or the like is installed in an imaging apparatus. A chip is usually configured in the printing consumable. The chip may store consumable-related information such as ink volume information, color information, a production date, and the like. When the printing consumable is installed in the imaging apparatus, the chip is electrically connected to the imaging apparatus. The imaging apparatus reads related information in the chip, and determines a status of the printing consumable by using the information in the chip. Therefore, stability of the electrical connection between the chip in the printing consumable and the imaging apparatus is of great significance.

[0004] The patent CN106864040 discloses an inkjet printer chip and a method for a connection between the chip and the printer. The connection method enhances the stability of the electrical connection between the chip and the printer to a specific extent. However, after the chip is installed on the printer, a hollow part on the chip comes into contact with a contact pin on the printer and compresses the contact pin downward, and a reaction force of the contact pin pushes the chip upward. In this case, the chip is very likely to be pushed away upward, resulting in poor contact between the chip and the contact pin of the printer.

[0005] The patent DE102013113039A1 discloses a printer chip. Two rows of slender holes are provided on a chip substrate. Electrical contact points of the chip are disposed at a lower part of the upper row of holes and at an upper part of the lower row of holes. The contact pins of the printer extend into the holes of the chip and are respectively connected to the lower part of the upper row of holes and the upper part of the lower row of holes. One contact portion is disposed in one hole. The connection between the chip and the printer is very stable. However, it is very difficult to process the chip having the elongated holes provided on the chip substrate. In addition, since the upper row of holes and the lower row of holes have a very small distance therebetween and partially overlap, the two rows of holes have a great risk of a direct short

circuit. A middle part of the chip is very fragile. As a result, the substrate between two holes is very likely to break, causing scrapping of the chip.

## SUMMARY

[0006] This application aims to provide an imaging cartridge and a chip for an imaging cartridge, so as to alleviate a technical problem such as poor stability of contact between a terminal and a contact pin of an imaging cartridge in the prior art.

[0007] This application provides an imaging cartridge. The imaging cartridge is removably installed on an imaging apparatus. A plurality of contact pins are disposed on the imaging apparatus. The imaging cartridge includes:

a cartridge body, where a first positioning cavity is provided on the cartridge body, and  
an opening of the first positioning cavity is located on a first surface of the cartridge body.

[0008] A plurality of contact portions configured for contact with the contact pins are further disposed on the cartridge body.

[0009] When the imaging cartridge is installed on the imaging apparatus, at least two of the plurality of contact pins extend into the first positioning cavity. The contact portions are respectively disposed on two sides of opening of the first positioning cavity.

[0010] Further, when the imaging cartridge is installed in the imaging apparatus, no substrate is disposed between any two adjacent ones of the contact pins that are located in the first positioning cavity.

[0011] Further, the plurality of contact pins of the imaging apparatus include first contact pins and second contact pins, and the plurality of contact portions include first contact portions and second contact portions.

[0012] The first contact portions are configured to come into contact with the first contact pins, and the second contact portions are configured to come into contact with the second contact pins.

[0013] Further, inner surfaces of the first positioning cavity all are planes, and intersections of the opening of the first positioning cavity and the first surface form first edges.

[0014] Further, the opening of the first positioning cavity is configured as a rectangle. A first direction is parallel to one of the first edges. In the first direction, the first contact portions are disposed on either of two sides of the opening of the first positioning cavity.

[0015] The first contact portions include third contact portions and fourth contact portions. The third contact portions are located on the first edge perpendicular to the first direction, and the fourth contact portions are located on the first surface. In the first direction, the third contact portions are in front of the fourth contact portions.

[0016] The second contact portions are located on the

first edges and are parallel to the third contact portions. In the first direction, the second contact portions are at a forefront. Alternatively, in a second direction perpendicular to the first direction, the second contact portions are located on the two sides of the opening of the first positioning cavity and on the first surface.

**[0017]** Further, the opening of the first positioning cavity is configured as a rectangle. The first direction is parallel to one of the first edges. The first contact portions are located on two of the first edges that are perpendicular to the first direction.

**[0018]** In the second direction perpendicular to the first direction, the second contact portions are located on the two sides of the opening of the first positioning cavity.

**[0019]** Further, the imaging cartridge includes first terminals and second terminals.

**[0020]** The first contact portions are located on the first terminals, and the second contact portions are located on the second terminals.

**[0021]** Further, the imaging cartridge includes: a first substrate. A memory and the first terminals are disposed on the first substrate.

**[0022]** The memory is electrically connected to at least some of the first terminals. The first substrate is located on the first surface or in the first positioning cavity.

**[0023]** Further, the imaging cartridge includes: a second substrate. The second terminals and at least one circuit are disposed on the second substrate. The circuit is connected to at least two of the second terminals. The second substrate is located on the first surface or in the first positioning cavity.

**[0024]** This application has the following beneficial effects:

This application provides the imaging cartridge removably connected to the imaging apparatus. By means of the structural feature of the first positioning cavity on the imaging cartridge, the contact pins and the first positioning cavity are engaged with each other in a limited way, to limit movement of the contact pins, so as to ensure stability and reliability of the electrical contact between the contact portions and the contact pins, thereby avoiding poor contact. In addition, since the first positioning cavity is provided on the first surface of the imaging cartridge, acting forces generated after the contact pins are assembled are all exerted on the imaging cartridge, so that a chip on the imaging cartridge does not move under the acting forces generated by the contact pins, thereby ensuring normal connection of a circuit.

**[0025]** This application provides a chip removably installed on an imaging cartridge of an imaging apparatus. A plurality of contact pins are disposed on the imaging apparatus. The chip includes:

a chip substrate, where a first positioning opening is provided on the chip substrate, and the first positioning opening runs through surfaces of the chip substrate that are parallel to each other;

**[0026]** A plurality of contact portions configured for contact with the contact pins are further disposed on the

chip substrate.

**[0027]** When the chip is installed on the imaging apparatus, at least two of the plurality of contact pins extend into the first positioning opening. The contact portions are disposed on two sides of the first positioning opening.

**[0028]** Further, when the chip is installed in the imaging apparatus, no substrate is disposed between any two adjacent ones of the contact pins that are located in the first positioning opening.

**[0029]** Further, the plurality of contact pins of the imaging apparatus include first contact pins and second contact pins, and the plurality of contact portions include first contact portions and second contact portions.

**[0030]** The first contact portions are configured to come into contact with the first contact pins, and the second contact portions are configured to come into contact with the second contact pins.

**[0031]** Further, the first positioning opening is configured as a rectangle. Intersections of the first positioning opening and the chip substrate form second edges. A first direction is parallel to one of the second edges. In the first direction, the first contact portions are disposed on either of the two sides of the first positioning opening.

**[0032]** The first contact portions include third contact portions and fourth contact portions. The third contact portions are located on the second edge perpendicular to the first direction, and the fourth contact portions are located on the first surface. In the first direction, the third contact portions are in front of the fourth contact portions.

**[0033]** The second contact portions are located on the second edges and are parallel to the third contact portions. A second notch is further provided on the chip. In the first direction, the second notch is in front of the second contact portions. Alternatively, in a second direction perpendicular to the first direction, the second contact portions are located on the two sides of the first positioning opening and on the second surface.

**[0034]** Further, the first positioning opening is configured as a rectangle. Intersections of the first positioning opening and the chip substrate form second edges. A first direction is parallel to one of the second edges. In the first direction, the first contact portions are located on the second edges on the two sides of the first positioning opening.

**[0035]** In a second direction perpendicular to the first direction, the second contact portions are located on the two sides of the first positioning opening.

**[0036]** This application has the following beneficial effects:

This application provides the chip removably installed on the imaging cartridge of the imaging apparatus. By integrating the first positioning opening and the contact portions on the chip, the imaging cartridge of the imaging apparatus requires no excessive designs, which simplifies a manufacturing process of the imaging cartridge. During assembling, connection of all circuits and information may be completed merely by installing the chip on the imaging cartridge, which simplifies a composition

structure. In addition, the contact pins and the first positioning opening are engaged with each other in a limited way, so that movement of the contact pins can be limited, ensuring stability and reliability of the electrical contact between the contact portions and the contact pins, thereby avoiding poor contact.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0037]** To describe the technical solutions in the specific embodiments of the present utility model or in the prior art more clearly, the following briefly describes the accompanying drawings required for describing the specific embodiments or the prior art. Apparently, the accompanying drawings in the following description show some embodiments of the present utility model, and a person of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts.

FIG. 1 is a schematic structural diagram of an imaging cartridge according to an embodiment of this application.

FIG. 2 is a front view of FIG. 1.

FIG. 3 is a schematic structural diagram of a contact pin according to an embodiment of this application.

FIG. 4 is a schematic structural diagram in which the imaging cartridge in FIG. 1 is engaged with the contact pin in FIG. 3.

FIG. 5 is a schematic structural diagram of another imaging cartridge according to an embodiment of this application.

FIG. 6 is a schematic structural diagram in which the imaging cartridge in FIG. 5 is engaged with the contact pin in FIG. 3.

FIG. 7 is a schematic structural diagram of another imaging cartridge according to an embodiment of this application.

FIG. 8 is a schematic structural diagram of another contact pin according to an embodiment of this application.

FIG. 9 is a schematic structural diagram during engagement of the imaging cartridge in FIG. 7 with the contact pin in FIG. 8.

FIG. 10 is a front schematic structural diagram of a first substrate according to an embodiment of this application.

FIG. 11 is a back schematic structural diagram of

the first substrate according to an embodiment of this application.

FIG. 12 is a schematic structural diagram of a cartridge body having a first electrode according to an embodiment of this application.

FIG. 13 is a schematic structural diagram in which the first substrate is engaged with the imaging cartridge according to an embodiment of this application.

FIG. 14 is a schematic structural diagram in which a first terminal is disposed on the first substrate according to an embodiment of this application.

FIG. 15 is another schematic structural diagram in which the first terminal is disposed on the first substrate according to an embodiment of this application.

FIG. 16 is a schematic structural diagram of a second substrate according to an embodiment of this application.

FIG. 17 is a schematic structural diagram in which the first substrate and a second substrate are engaged with the imaging cartridge according to an embodiment of this application.

FIG. 18 is a schematic structural diagram in which the imaging cartridge in FIG. 17 is engaged with the contact pin in FIG. 3 according to an embodiment of this application.

FIG. 19 is a schematic structural diagram of another imaging cartridge according to an embodiment of this application.

FIG. 20 is a schematic structural diagram of a chip according to an embodiment of this application.

FIG. 21 is a schematic structural diagram of another chip according to an embodiment of this application.

FIG. 22 is a schematic structural diagram of another chip according to an embodiment of this application.

FIG. 23 is a schematic structural diagram of another chip according to an embodiment of this application.

FIG. 24 is a schematic structural diagram of another chip according to an embodiment of this application.

Reference numerals:

**[0038]**

1-first terminal;  
 2-second terminal;  
 3-contact pin;  
     31-base body;  
     32-contact pin body;  
         321-first contact portion;  
             3211-third contact portion;  
             3212-fourth contact portion;  
         322-second contact portion;  
 4-cartridge body;  
     41-first positioning cavity;  
         411-first edge;  
     42-first surface;  
 5-memory;  
 6-first electrode;  
 7-second electrode;  
 8- first substrate;  
     81-first upper end face;  
     82-first cross section;  
 9-second substrate;  
     91-second upper end face;  
     92-second cross section;  
     93. first notch;  
 10-contact pin support;  
 11-chip substrate;  
     111- second notch;  
     112-first positioning opening;  
         1121-second edge;  
     113-second surface.

## DETAILED DESCRIPTION

**[0039]** The technical solutions in the present utility model are clearly and completely described below with reference to the accompanying drawings. Apparently, the described embodiments are merely some of rather than all of the embodiments of the present utility model. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of the utility model without creative efforts shall fall within the protection scope of the utility model.

**[0040]** In the description of the utility model, it is to be noted that orientation or position relationships indicated by terms such as "inner", "outer" are based on orientation or position relationships shown in the accompanying drawings, are merely for facilitating the description of the utility model and simplify the description, instead of indicating or implying that the indicated apparatus or element needs to have particular orientations or be constructed and operated in particular orientations, and therefore cannot be construed as a limitation on the utility model.

**[0041]** In the description of the present utility model, it should be noted that unless otherwise explicitly specified or defined, the terms such as "mount", "connect", and "connection" should be understood in a broad sense. For example, the connection may be a fixed connection, a detachable connection, or an integral connection; or the connection may be a mechanical connection or an electrical connection; or the connection may be a direct connection, an indirect connection through an intermediary, or internal communication between two components. A person of ordinary skill in the art can understand specific meanings of the terms in the utility model according to specific situations.

**[0042]** It should be noted herein that an imaging apparatus may be a printer, a copier, a facsimile machine, or the like, which is not specifically limited in the embodiments.

**[0043]** As shown in FIG. 1 to FIG. 9, FIG. 12, FIG. 13, and FIG. 17 to FIG. 20, the embodiments provide an imaging cartridge removably connected to an imaging apparatus. The imaging apparatus has a contact pin support 10 and a plurality of contact pins 3. The plurality of contact pins 3 extend out along an end face of the contact pin support 10. Specifically, the imaging cartridge includes a cartridge body 4, first terminals 1, and second terminals 2. At least one first positioning cavity 41 is provided on a first surface 42 of the cartridge body 4. Specifically, inner surfaces of the first positioning cavity 41 are all planes. Intersections of an opening of the first positioning cavity 41 and the first surface 42 form first edges 411. A single terminal may be disposed on the first surface 42, or may be disposed such that the single terminal extends from the first surface 42 to the inner surfaces by passing through the first edges 411. An X axis is a first direction, a Y axis is a second direction, and a Z axis is a third direction. The three axes X, Y and Z are perpendicular to each other two by two. The X axis and the Y

axis are respectively parallel to the edges of the first surface 42. When the imaging cartridge is installed on the imaging apparatus, the first positioning cavity 41 and the contact pins 3 are engaged with each other in a limited way. The first positioning cavity 41 accommodates at least two of the contact pins 3. The first terminals 1 and the second terminals 2 respectively come into contact with corresponding ones of the contact pins 3 to form first contact portions 321 and second contact portions 322. In the first direction, the first contact portions 321 and the second contact portions 322 are located on the first edges 411 of the first positioning cavity 41. By means of the structural feature of the positioning cavity in the designed structure, the contact pins 3 and the positioning cavity are engaged with each other in a limited way, to limit movement of the contact pins 3, so as to ensure stability and reliability of the electrical contact between the first terminals 1 and the second terminals 2 and the contact pins 3, thereby avoiding poor contact. In addition, since the positioning cavity is provided on the first surface 42 of the imaging cartridge, acting forces generated after the contact pins 3 are assembled are all exerted on the imaging cartridge, so that the chip on the imaging cartridge does not move under the acting forces generated by the contact pins 3, thereby ensuring normal connection of a circuit.

**[0044]** Further, when the imaging cartridge is installed in the imaging apparatus, no substrate is disposed between any two adjacent ones of the contact pins 3 that are located in the first positioning cavity 41. Since the first positioning cavity 41 configured to be engaged with the contact pins 3 in a limited way is provided on the imaging cartridge, the first positioning cavity 41 accommodates at least two of the contact pins 3, and no substrate is disposed between any two adjacent ones of the contact pins 3 that are located in the first positioning cavity 41 during installation, structural strength of the chip is ensured, and a problem such as a breakage of the substrate as a result of a structure such as a groove or a cavity provided on the chip is avoided, thereby by improving a service life and quality of the chip.

**[0045]** As shown in FIG. 5, this embodiment provides another imaging cartridge. At least some of the terminals are disposed such that the terminals extend from the first surface 42 to the inner surfaces by passing through the first edges 411. By means of the structural design, when the terminals come into contact with the contact pins 3, some of the terminals come into contact with the contact pins to form contact portions on the first edges 411. Compared with a terminal disposed on a plane, at least areas of contact between some of the terminals and the contact pins 3 are reduced, and areas of scratching on the first terminals 1 or the second terminals 2 caused by the contact pins 3 are reduced during installation of the contact pins 3. In addition, the first terminals 1 and the second terminals 2 are disposed on end faces adjacent to the first edges 411, which means that only some of the contact pins 3 need to be engaged with the positioning cavity

in a limited way. In this way, assembling is easily realized. Further, in order to ensure the stability of the contact pins 3 more desirably, preferably, two first positioning cavities may be provided. The first terminals 1 are located on the first surface 42, and the second terminals 2 are located on a second positioning cavity. In the first direction, the first terminals 1 are located above the second terminals 2. Since the second terminals 2 are located on the first positioning cavity and below the first terminals 1, during the installation of the imaging cartridge, the first contact portions formed by the first terminals 1 when coming into contact with the contact pins are located on the first surface, and the second contact portions formed by the second terminals 2 when coming into contact with the contact pins are located on the first edge. Therefore, when the ink drop onto the first terminals 1, the edge of the first positioning cavity provided between the first terminals 1 and the second terminals 2 guides the ink, to avoid a short circuit between the first terminals and the second terminals as a result of the ink directly sliding onto the second terminals 2. In this way, not only the areas of the scratching on some of the terminals caused by the contact pins are reduced, but also a risk of a short circuit between the terminals can be reduced, thereby more desirably ensuring the stability and the reliability of the contact pins 3.

**[0046]** As shown in FIG. 2 and FIG. 4, specifically, in this embodiment, in order to more desirably ensure the stability of the electrical contact and reduce the areas of the scratching on the first terminals 1 and the second terminals 2 during the installation of the contact pins 3, preferably, all of the terminals are disposed such that the terminals extend from the first surface 42 to the inner surfaces of the first positioning cavity 41, so that the first contact portions 321 and the second contact portions 322 are respectively located on opposite ones of the first edges 411, thereby reducing the areas of contact between the contact pins 3 and the positioning cavity. In this way, during the installation of the contact pins 3, the scratching on the first terminals 1 or the second terminals 2 caused by the contact pins 3 can be reduced, avoiding poor contact as a result of wear of copper attached to the first terminals 1 or the second terminals 2. In addition, in this embodiment, the contact pins are snapped into two ends of the first positioning cavity. Compared with the previous embodiment in which the contact pins are snapped into only one end of the first positioning cavity, this embodiment has a more desirable fixing effect and further improves the stability of the electrical contact.

**[0047]** It should be noted herein that the end faces adjacent to the first edges 411 may be end faces of the cartridge body 4 or end faces of the first substrate. The end faces of the first substrate 8 may be surfaces or edges of the first substrate 8. As shown in FIG. 3 and FIG. 8, specifically, each of the contact pins 3 includes a base body 31 and a contact pin body 32. The contact pin body 32 is disposed on the base body 31. The contact pin body 32 is located in the positioning cavity and is engaged with

the positioning cavity in a limited way. The first terminals 1 and the second terminals 2 are correspondingly electrically connected to the contact pin bodies 32, to correspondingly form the first contact portions 321 and the second contact portions 322.

**[0048]** Further, in order to perform corresponding operations after the terminals on the imaging cartridge are electrically connected to the contact pins 3 and enable normal working of the imaging apparatus, in all the embodiments of this application, the first terminals 1 and the second terminals 2 respectively receive a different voltage, that is, the contact pins 3 can provide different voltages. The first terminals 1 come into contact with the contact pins 3 to receive a low voltage, and the second terminals 2 come into contact with the contact pins 3 to receive a high voltage. The low voltage is less than or equal to 3 V, and the high voltage is about 42 V.

**[0049]** The contact pins 3 may be snapped into the positioning cavity to realize limited engagement. In this embodiment, in order to facilitate the engagement between the contact pins 3 and the positioning cavity so as to facilitate the assembling of the contact pins 3, a shape feature of the positioning cavity matches those of the contact pins 3 located in the positioning cavity, to limit the movement of the contact pins 3.

**[0050]** As shown in FIG. 2, FIG. 5, FIG. 7, FIG. 12, FIG. 13, and FIG. 17, the first terminals 1 may include one first terminal, two first terminals, three first terminals, four first terminals, or the like, and the second terminals 2 may include one second terminal, two second terminals, three second terminals, four second terminals, or the like. In this embodiment, in order to realize a plurality of functions of the imaging cartridge, the first terminals 1 and the second terminals 2 both include a plurality of terminals. Further, in order to facilitate the assembling of the contact pins 3, the first terminals 1 and the second terminals 2 are disposed on the first surface 42 of the cartridge body 4. In addition, the first terminals 1 are all arranged in the second direction, the second terminals 2 are all arranged in the second direction, and the first terminals 1 and the second terminals 2 are parallel to each other, thereby facilitating designing and arrangement of the contact pins 3.

**[0051]** As shown in FIG. 2, FIG. 5, FIG. 7, FIG. 12, FIG. 13, and FIG. 17, during working of the imaging apparatus, the ink drops onto the contact pin 3. In order to avoid a short circuit between the first terminals 1 and the second terminals 2, the first terminals 1 and the second terminals 2 are respectively disposed on two sides of the opening of the first positioning cavity in the first direction, and any of the first terminals 1 and any of the second terminals 2 are not on the same straight line in the first direction. Therefore, during the installation of the cartridge body, arranging the first terminals 1 and the second terminals 2 on different straight lines in the first direction can reduce or even avoid a possibility that a sliding track of the ink dropping onto the first terminals 1 along the contact pin 3 passes through the second terminals 2, improving func-

tionality of the imaging cartridge and ensuring normal connection of the circuit.

**[0052]** As shown in FIG. 10 to FIG. 13, in this embodiment, in order to improve the functionality of the imaging cartridge, the imaging cartridge further includes a first substrate 8 on which a memory 5 is disposed. The first substrate 8 is installed on the first surface 42. Specifically, the memory 5 is electrically connected to at least some of the first terminals 1. The memory 5 may store data information related to the imaging cartridge, such as ink volume information, color information, a production date, and the like. Since the memory 5 is electrically connected to at least some of the first terminals 1, when the contact pins 3 are electrically connected to the first terminals 1, communication with the memory 5 can be realized, thereby realizing read and write operations of the memory 5 by the imaging apparatus.

**[0053]** As shown in FIG. 11 and FIG. 12, in this embodiment, a first electrode 6 electrically connected to at least some of the first terminals 1 is disposed on the cartridge body 4. The memory 5 is disposed on one face of the first substrate 8, and a second electrode 7 is disposed on an other face of the first substrate. Specifically, the first electrode 6 is electrically connected to the memory 5 by means of contact with the second electrode 7, so as to realize the electrical connection between some of the first terminals 1 and the memory 5. Since the first terminals 1 are electrically connected to the first electrode 6, and the first electrode 6 is electrically connected to the memory 5 by using the second electrode 7, when the contact pins 3 are electrically connected to the first terminals 1, the communication with the memory 5 can be realized, thereby realizing read and write operations of the memory 5 by the imaging apparatus.

**[0054]** Further, as shown in FIG. 14, specifically, in this embodiment, the first substrate 8 has a first upper end face 81 and a first cross section 82 perpendicular to the first upper end face 81. The first upper end face 81 and the first cross section 82 intersect to form the edges of the first substrate 8. Further, the first substrate 8 is provided with the memory 5 and the first terminals 1, and the cartridge body 4 is not provided with the first terminals 1. The memory 5 is disposed on the first end face 81. All of the first terminals 1 are disposed such that the terminals extend from the first upper end face 81 to the first cross section 82 by passing through the edges of the first substrate 8. The first substrate 8 is installed on the first surface 42, and the first cross section 82 is aligned to one of the inner surfaces of the first positioning cavity 41. The first substrate and the inner surface are located on the same plane. Alternatively, the first substrate 8 is installed in the first positioning cavity 41, and the first cross section 82 is located at the opening of the first positioning cavity 41. When the imaging cartridge is installed on the imaging apparatus, the contact pins 3 configured for contact with the first terminals 1 extend into the first positioning cavity 41, and the first contact portions 321 formed by the first terminals 1 and the contact pins 3 are located

on the edge of the first substrate 8. By disposing all of the first terminals 1 on the first substrate 8, only the first substrate 8 needs to be installed on the imaging cartridge during use, thereby reducing processing of the imaging cartridge.

**[0055]** As shown in FIG. 15, further, in this embodiment, some of the first terminals 1 may be disposed on the first upper end face 81 of the first substrate 8, and others of the first terminals 1 may be disposed such that the terminals extend from the first upper end face 81 to the first cross section 82 by passing through the edges of the first substrate 8. In this case, the first substrate 8 is installed on the first surface 42. When the imaging cartridge is installed on the imaging apparatus, some of the contact pins 3 configured for contact with the first terminals 1 extend into the first positioning cavity 41, and others of the contacts pins 3 are outside the first positioning cavity 41. The first contact portions 321 formed by the first terminals 1 and the contact pins 3 are located on the edge of the first substrate 8 and in the upper end face 81. By means of the structural design in which some of the first terminals 1 are disposed in the first upper end face 81, first terminals 1 disposed on the first cross section 82 can be spaced apart by a larger distance, avoiding a working failure of the memory 5 as a result of faulty alignment between the contact pins 3 and the first terminals 1.

**[0056]** Specifically, the first substrate 8 may be installed in the first positioning cavity 41 or onto the first surface 42 of the cartridge body. At least some of the first contact portions formed by the first terminals 1 and the contact pins 3 is located at the opening of the first positioning cavity 41.

**[0057]** As shown in FIG. 16, in this embodiment, the imaging cartridge further includes a second substrate 9 and at least one functional circuit. Specifically, the second substrate 9 has a second upper end face 91 and a second cross section 92 perpendicular to the second upper end face 91. The second upper end face 91 and the second cross section 92 intersect to form an edge of the second substrate 9. When the second substrate 9 is disposed in the first positioning cavity 41, the second contact portions 322 are formed on the edge of the second substrate 9 and are located at the opening of the first positioning cavity 41. When the second substrates are disposed on the first surface 42, the second contact portions 322 are formed on the second upper end face 91. Further, the functional circuit is connected to at least two of the second terminals 2. In this embodiment, different functional circuits are used to realize different functions of the imaging cartridge. For example, a resistor is disposed on the second substrate 9, and the two of the second terminals 2 are electrically connected to the resistor. In this embodiment, when the imaging apparatus includes a plurality of imaging cartridges, a resistor in each of the imaging cartridges has a different resistance value. A voltage is inputted to a second terminal 2 on each of the imaging cartridges, whether there is a current signal and

a magnitude of the current are detected at another second terminal 2, and whether each of the imaging cartridges has been installed in place is detected according to the magnitude of the current. Since the functional circuit is disposed on the second substrate 9, and the second substrate 9 is removably installed on the imaging cartridge, only the second substrate 9 needs to be replaced if the functional circuit is damaged. If the functional circuit is disposed on the imaging cartridge, the entire imaging cartridge needs to be replaced when the functional circuit is damaged, which is more cumbersome than replacing the second substrate 9 and may waste remaining inks in the imaging cartridge.

**[0058]** It should be supplemented herein that a sensor circuit, a short-circuit detection circuit, and the like may be further disposed on the second substrate 9, and this application is not limited to the installation detection circuit of the imaging cartridge.

**[0059]** As shown in FIG. 17, further, since the circuit disposed on the second substrate 9 requires a relatively high driving voltage, the contact pins 3 on the imaging apparatus input high voltages to the second terminals 2. Therefore, in order to avoid influence on the memory 5 receiving a low voltage to work during inputting of the high voltages, in the first direction, the first substrate 8 is disposed on an upper side of the first positioning cavity 41, the second substrate 9 is disposed on a lower side of the first positioning cavity 41, the second cross section 92 is aligned to the inner surface of the first positioning cavity 41 that is located on the lower side, and the second cross section and the inner surface are located in the same plane, or the second cross section 92 is located at the opening of the positioning cavity to increase the distances between the second terminals 2 and the first terminals 1, thereby reducing the risk of a short circuit between the two terminals. A first notch 93 is further provided on the second substrate 9. The first notch 93 is provided such that the contact pins 3 configured for contact with the first terminals 1 on the upper side of the first positioning cavity 41 extend through the first notch. FIG. 18 is an effect drawing of the imaging cartridge of FIG. 17 installed on the imaging apparatus along the imaging cartridge. A lower row of contact pins 3 are closer to the first positioning cavity 41 than an upper row of contact pins 3. Specifically, the lower row of contact pins 3 first extend into the first positioning cavity 41 and respectively come into contact with the first terminals 1 on the first substrate 8 and the second terminals 2 on the second substrate 9. Further, after the lower row of contact pins 3 extend into the first positioning cavity 41, the lower row of contact pins 3 respectively form first contact portions 321 and second contact portions 322 with the edge of the first substrate 8 and the edge of the second substrate 9. Finally, the upper row of contact pins 3 come into contact with the first substrate 8, and the first terminals 1 on the first upper end face 81 of the first substrate 8 press the upper row of contact pins 3 to form the first contact portions 321.

**[0060]** When the imaging cartridge is installed on or removed from the imaging apparatus, an installation direction of the imaging cartridge is at an angle to an insertion direction of the contact pins 3. The imaging cartridge is usually perpendicular or at an angle of 45° to the contact pins 3. When structures of the contact pins 3 are configured as free, the contact pins may be deformed into a surface of the support of the contact pins 3 under pressure, but cannot be deformed outside the support of the contact pins 3. In this case, when the imaging cartridge needs to be removed from the imaging apparatus, the design in which the contact pins 3 cannot be deformed outside the surface of the support of the contact pins 3 impedes movement of the lower side of the first positioning cavity 41, resulting in a difficulty in removing the imaging cartridge from the imaging apparatus. In addition, the second terminals 2 rub against the contact pins 3 in the free status at a specific angle, and therefore the contact pins 3 receive a force pushing the contact pins outside the surface of the support of the contact pins 3. After a plurality of times of installation and removal of the imaging cartridge, the contact pins 3 are likely to break. In order avoid the situation, in this embodiment, an elastic member is disposed between the second substrate 9 and the first positioning cavity 41. When the imaging cartridge is removed from the imaging apparatus, the second terminals 2 receive pressing forces from the contact pins 3, causing the elastic member to contract, and the second substrate 9 is moved into the first positioning cavity 41 in the third direction or moved in the second direction, so as to avoid the positions of the contact pins 3, so that the imaging cartridge can be smoothly removed. After the imaging cartridge is smoothly removed, the second substrate 9 is restored to an original position under an elastic force generated by the elastic member.

**[0061]** As shown in FIG. 19, this embodiment further provides an imaging apparatus. The contact pins 3 of the imaging apparatus are disposed opposite to each other on the contact pin support 10. In the first direction where the imaging cartridge is installed on the imaging apparatus, the opening of the first positioning cavity 41 on the imaging cartridge is located on a bottom end face of the imaging cartridge, the first substrate 8 and the second substrate 9 are installed on two parallel ones of the inner end faces in the first positioning cavity 41, and the first terminals 1 on the first substrate 8 and the second terminals 2 on the second substrate 9 are disposed opposite to each other. When the imaging cartridge is installed in the imaging apparatus, the contact pin support 10 enters the first positioning cavity 41, and the first substrate 8 and the second substrate 9 press the contact pins 3 to contract into the contact pin support 10. When the imaging cartridge is installed in place, the first terminals 1 and the second terminals 2 come into contact with the contact pins 3. Since the contact pins 3 are disposed opposite to each other and are in contact with the first terminals 1 and the second terminals 2 respectively, the high-voltage

second terminals 2 and the low-voltage first terminals 1 are isolated by the contact pin support 10, which greatly reduces the risk of a short circuit between the high-voltage terminals and the low-voltage terminals.

**[0062]** As shown in FIG. 20, this embodiment further provides a chip removably installed on an imaging cartridge of an imaging apparatus. Specifically, the chip includes a chip substrate 11, first terminals 1, and second terminals 2. At least one first positioning opening 112 is provided on the chip substrate 11. The first positioning opening 112 runs through two parallel surfaces of the chip substrate 11, and the first positioning opening 112 and the two parallel surfaces correspondingly form second edges 1121. Further, when the imaging cartridge is installed on the imaging apparatus, the contact pins 3 and the two parallel end faces of the chip substrate 11 are disposed corresponding to each other, the first positioning opening 112 accommodates at least two of the contact pins 3, and the first terminals 1 and the second terminals 2 respectively come into contact with corresponding ones of the contact pins 3 to form first contact portions 321 and second contact portions 322. At least some of the first contact portions 321 are located on the second edge 1121, and the second contact portions 321 are located on the second edge 1121 or on the surface of the chip substrate 11. By means of the structural design in which the positioning opening, the first terminals 1, and the second terminals 2 all integrated on the same chip, the imaging cartridge of the imaging apparatus requires no excessive designs, which simplifies a manufacturing process of the imaging cartridge. During assembling, connection of all circuits and information may be completed merely by simply installing the chip on the imaging cartridge, which simplifies a composition structure. In addition, the contact pins 3 and the positioning cavity are engaged with each other in a limited way, so that movement of the contact pins 3 can be limited, ensuring stability and reliability of the electrical contact between the first terminals 1 and the second terminals 2 and the contact pins 3, thereby avoiding poor contact. Furthermore, since no substrate is disposed between any two adjacent ones of the contact pins that are located in the first positioning opening during installation, structural strength of the chip is ensured, and a problem such as a breakage of the substrate as a result of excessive structures provided on the chip is avoided, thereby by improving a service life and quality of the chip.

**[0063]** FIG. 21 shows a first type of chip structure according to this embodiment. Specifically, an opening of a first positioning opening 112 is configured as a rectangle, and first terminals 1 and second terminals 2 are respectively disposed on two opposite sides of the first positioning opening 112. In the first direction, the second terminals 2 are in front of the first terminals 1. When the chip comes into contact with the contact pins 3, first contact portions 321 and second contact portions 322 are formed. Specifically, each of the first contact portions 321 includes third contact portions 3211 and fourth contact

portions 3212. The third contact portions 3211 are located on a second edge 1121 perpendicular to the first direction, and the fourth contact portions 3212 are located on the first surface. In the first direction, the third contact portions 3211 are in front of the fourth contact portions 3212, the second contact portions 322 are located on the second edge 1121 and are parallel to the third contact portions 3211, and the second contact portions 322 are at a foremost. Since the chip is usually installed in the first direction, when the ink drop onto the first terminals, the first positioning opening interrupts flowing of the ink, which avoids a short circuit as a result of the ink flowing from the first terminals to the second terminals. Furthermore, a second notch 111 is further provided on the chip to help the lower row of contact pins extend into the first positioning opening.

**[0064]** FIG. 22 shows a second type of chip structure according to this embodiment. Specifically, the first positioning opening 112 is configured as a rectangle. Compared with the first type of chip structure, the third contact portions 3211 in this embodiment are located on the second edge 1121 perpendicular to the first direction, the fourth contact portions 3212 are located on the first surface, and the second contact portions 322 are respectively disposed on the two sides of the first positioning opening 112 in the second direction, so that any of the first terminals 1 and any of the second terminals 2 are not on the same straight line in the first direction, further reducing the risk of a short circuit between the first terminals and the second terminals.

**[0065]** FIG. 23 shows a third type of chip structure according to this embodiment. Specifically, the first positioning opening 112 is configured as a rectangle. Compared with the second chip structure, first contact portions 321 in this embodiment are disposed in parallel on the two second edges 1121, that is, in the first direction, third contact portions 3211 are in front of fourth contact portions 3212, and second contact portions 322 are respectively disposed on the two sides of the first positioning opening 112 in the second direction. In this embodiment, both rows of contact pins 3 extend into the first positioning opening 112 to come into contact with the terminals and to be engaged with two opposite sides of the first positioning opening, which has a better fixing effect compared with the second type of chip structure in which the contact pins are engaged with only one side.

**[0066]** FIG. 24 shows a fourth type of chip structure according to this embodiment. Specifically, compared with the third type of chip structure, in the first direction, third contact portions 3212 and fourth contact portions 3211 in this embodiment are respectively disposed in parallel on the two second edges 1121, the second contact portions 322 are at middle positions between the third contact portions 3212 and the fourth contact portions 3211, and the second contact portions 322 are also disposed on the edge. In this embodiment, all of the contact pins 3 extend into the first positioning opening 112 to come into contact with the terminals. In addition, since

the second contact portions are engaged with two sides of the first positioning opening in the second direction, four sides of the first positioning opening are fixed by the contact pins, which further strengthens the fixing effect compared to the third type of chip structure.

**[0067]** As shown in FIG. 20 to FIG. 24, the chip that is provided further includes a memory 5 and at least one functional circuit. The memory 5 and the functional circuit are also both disposed on the chip substrate 11. The memory 5 is electrically connected to at least some of the first terminals 1. The functional circuit is electrically connected to at least two of the second terminals 2. Further, by integrating the memory 5 and the functional circuit on the chip substrate 11, the imaging cartridge of the imaging apparatus requires no excessive designs. Since the functions are integrated together, a manufacturing process of the imaging cartridge is simplified. During assembling, connection of all circuits and information may be completed merely by installing the chip on the imaging cartridge, which simplifies a composition structure.

**[0068]** It should be noted herein that the functional circuit may be a sensor circuit, a short-circuit detection circuit, an installation detection circuit, or the like, which is not specifically limited herein.

**[0069]** Referring to FIG. 20 to FIG. 24, in this embodiment, the chip is installed on the first surface 42 of the imaging cartridge, at least one first positioning cavity 41 is provided on the first surface 42. The first positioning opening 112 and the opening of the first positioning cavity 41 are provided corresponding to each other. When the imaging cartridge is installed on the imaging apparatus, at least two of the contact pins 3 extend into the first positioning cavity 41 through the first positioning opening 112.

**[0070]** This embodiment provides a printer. The printer includes the imaging cartridge described in any of the foregoing embodiments, and the imaging cartridge is removably installed on the printer.

**[0071]** The printer has the same advantages as the imaging cartridge described in any of the foregoing embodiments, which have been clearly described above. Therefore, details are not described herein again.

**[0072]** This embodiment provides a printer. The printer includes the chip described in any of the foregoing embodiments, and the chip is removably installed on the imaging cartridge of the printer.

**[0073]** The printer has the same advantages as the chip described in any of the foregoing embodiments, which have been clearly described above. Therefore, details are not described herein again.

**[0074]** Finally, it should be noted that the foregoing embodiments are merely used for describing the technical solutions of the present utility model other than limiting the disclosure. Although the present utility model is described in detail with reference to the foregoing embodiments, a person of ordinary skill in the art should understand that they may still make modifications to the technical solutions described in the foregoing embodiments

or make equivalent replacements to some or all technical features thereof, without departing from the scope of the technical solutions of the embodiments of the present utility model.

## Claims

1. An imaging cartridge, removably installed on an imaging apparatus, a plurality of contact pins being disposed on the imaging apparatus, **characterized in that** the imaging cartridge comprises:

a cartridge body, wherein a first positioning cavity is provided on the cartridge body, and an opening of the first positioning cavity is located on a first surface of the cartridge body; a plurality of contact portions configured for contact with the contact pins are further disposed on the cartridge body; and wherein when the imaging cartridge is installed on the imaging apparatus, at least two of the plurality of contact pins extend into the first positioning cavity, and the contact portions are respectively disposed on two sides of the opening of the first positioning cavity.

2. The imaging cartridge according to claim 1, wherein when the imaging cartridge is installed in the imaging apparatus, no substrate is disposed between any two adjacent ones of the contact pins that are located in the first positioning cavity.

3. The imaging cartridge according to claim 1, wherein the plurality of contact pins of the imaging apparatus comprise first contact pins and second contact pins, the plurality of contact portions comprise first contact portions and second contact portions, the first contact portions are located on first terminals, and the second contact portions are located on second terminals; and the first contact portions are configured to come into contact with the first contact pins, and the second contact portions are configured to come into contact with the second contact pins.

4. The imaging cartridge according to claim 3, wherein inner surfaces of the first positioning cavity are all planes, and intersections of the opening of the first positioning cavity and the first surface form first edges.

5. The imaging cartridge according to claim 4, wherein a first direction is parallel to one of the first edges, and in the first direction, the first contact portions and the second contact portions are respectively disposed on the two sides of the opening of the first positioning cavity;

the first contact portions are disposed on the first edges and/or the first surface; and the second contact portions are disposed on the first edges or the first surface.

6. The imaging cartridge according to claims 3 to 5, further comprising: a first substrate, wherein a memory and the first terminals are disposed on the first substrate, the memory is electrically connected to at least some of the first terminals, and the first substrate is located on the first surface or in the first positioning cavity.

7. The imaging cartridge according to claims 3 to 5, further comprising: a second substrate, wherein the second terminals and at least one circuit are disposed on the second substrate, the circuit is connected to at least two of the second terminals, and the second substrate is located on the first surface or in the first positioning cavity.

8. A chip, removably installed on an imaging cartridge of an imaging apparatus, a plurality of contact pins being disposed on the imaging apparatus, **characterized in that** the chip comprises:

a chip substrate, wherein a first positioning opening is provided on the chip substrate, and the first positioning opening extends through surfaces of the chip substrate that are parallel to each other; a plurality of contact portions configured for contact with the contact pins are further disposed on the chip substrate; and when the chip is installed on the imaging apparatus, at least two of the plurality of contact pins extend into the first positioning opening, and the contact portions are respectively disposed on two sides of the first positioning opening.

9. The chip according to claim 8, wherein when the imaging cartridge is installed in the imaging apparatus, no substrate is disposed between any two adjacent ones of the contact pins that are located in the first positioning opening.

10. The chip according to claim 8, wherein the plurality of contact pins of the imaging apparatus comprise first contact pins and second contact pins, the plurality of contact portions comprise first contact portions and second contact portions, the first contact portions are located on first terminals, and the second contact portions are located on second terminals; and the first contact portions are configured to come into contact with the first contact pins, and the second contact portions are configured to come into contact

with the second contact pins.

11. The chip according to claim 10, wherein the first positioning opening is configured as a rectangle, intersections of the first positioning opening and the chip substrate form second edges, a first direction is parallel to one of the second edges, and in the first direction, the first contact portions are disposed on either of the two sides of the first positioning opening; 5
- the first contact portions comprise third contact portions and fourth contact portions, wherein the third contact portions are located on the second edge perpendicular to the first direction, and the fourth contact portions are located on a first surface, and in the first direction, the third contact portions are in front of the fourth contact portions; 10
- the second contact portions are located on the second edges and are parallel to the third contact portions, a second notch is further provided on the chip, and in the first direction, the second notch is in front of the second contact portions; or in a second direction perpendicular to the first direction, the second contact portions are located on the two sides of the first positioning opening and on a second surface. 15 20 25
12. The chip according to claim 10, wherein the first positioning opening is configured as a rectangle, intersections of the first positioning opening and the chip substrate form second edges, a first direction is parallel to one of the second edges, and in the first direction, the first contact portions are respectively located on two of the second edges on the two sides of the first positioning opening; and 30 35
- in a second direction perpendicular to the first direction, the second contact portions are respectively located on the two sides of the first positioning opening. 40
13. The chip according to claim 10, wherein intersections of the first positioning opening and the chip substrate form second edges, a first direction is parallel to one of the second edges, and in the first direction, the first contact portions are respectively located on two of the second edges on the two sides of the first positioning opening; and 45
- the second contact portions are also located on the second edges, and in the first direction, the second contact portions are located between two rows of the first contact portions. 50

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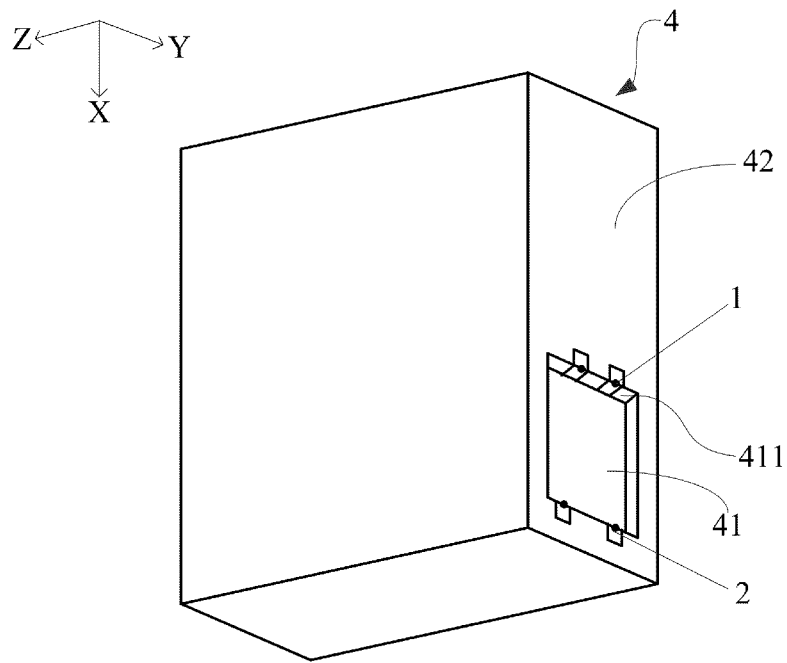


FIG. 1

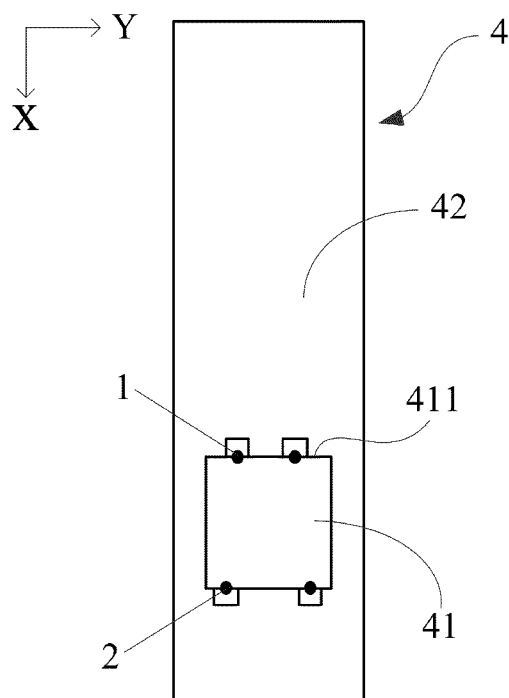


FIG. 2

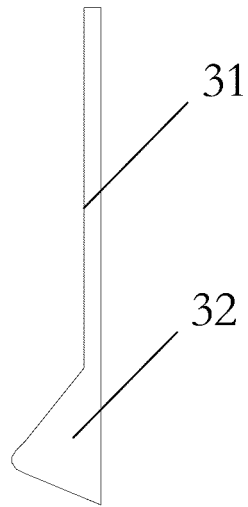


FIG. 3

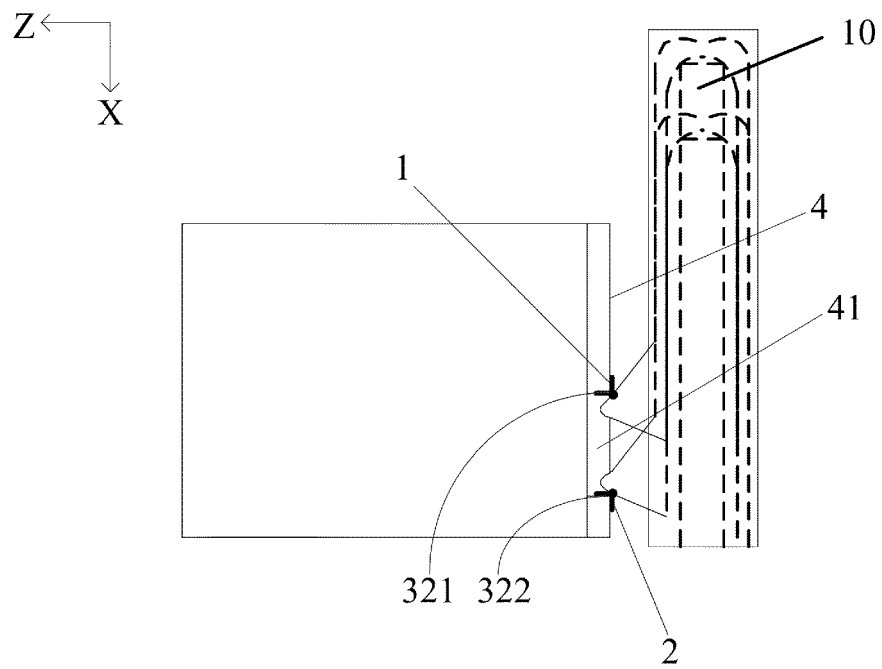


FIG. 4

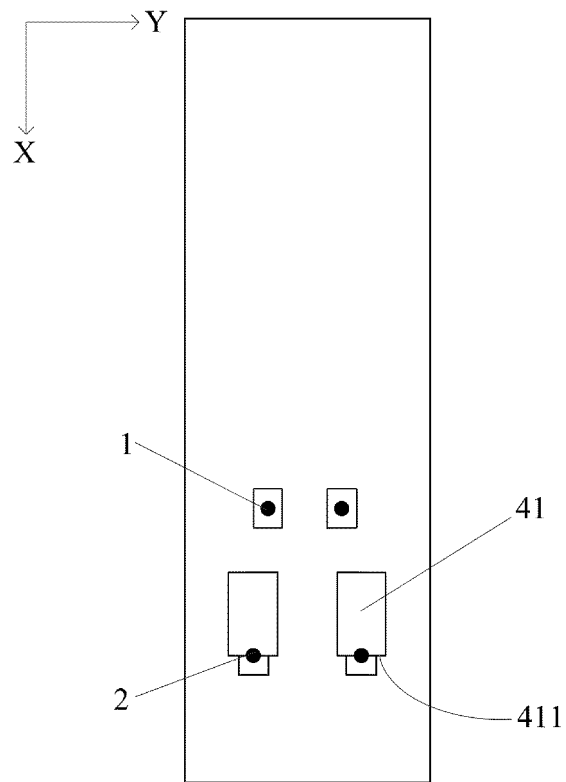


FIG. 5

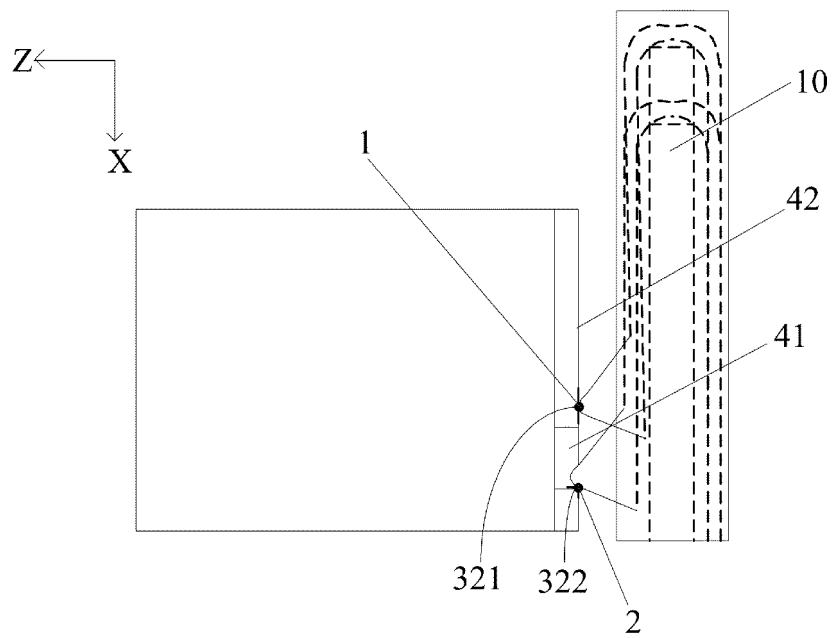


FIG. 6

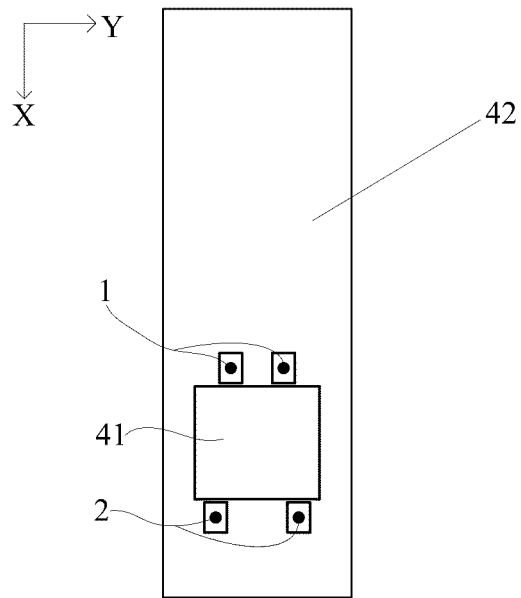


FIG. 7

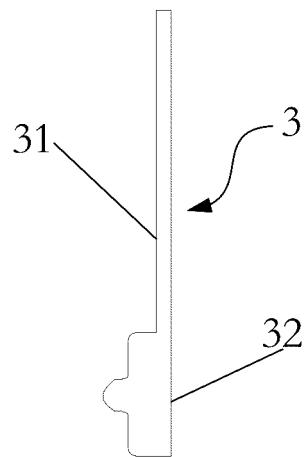


FIG. 8

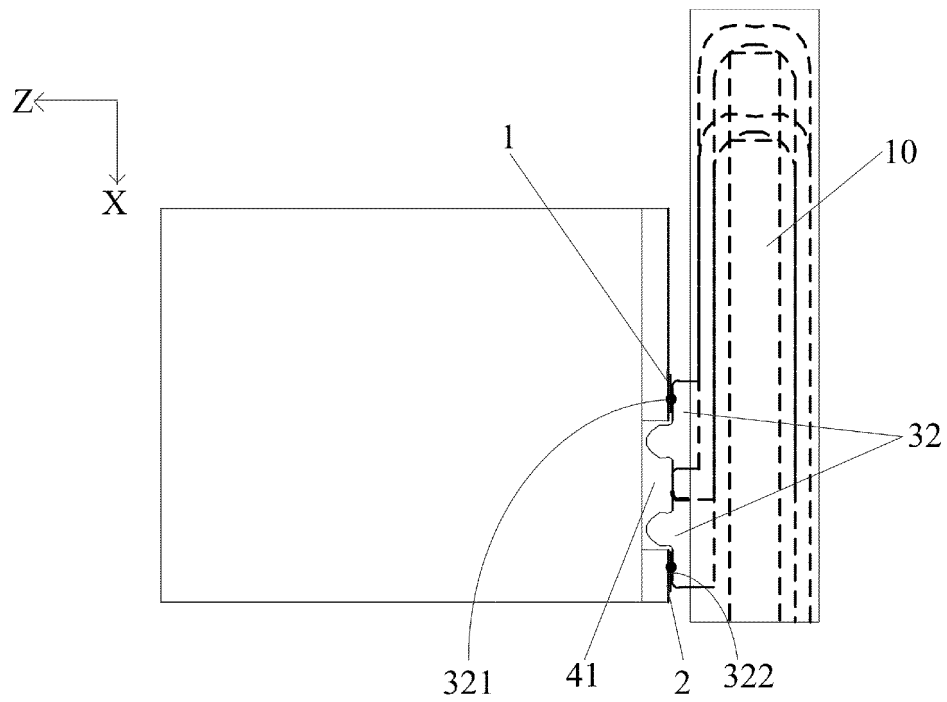


FIG. 9

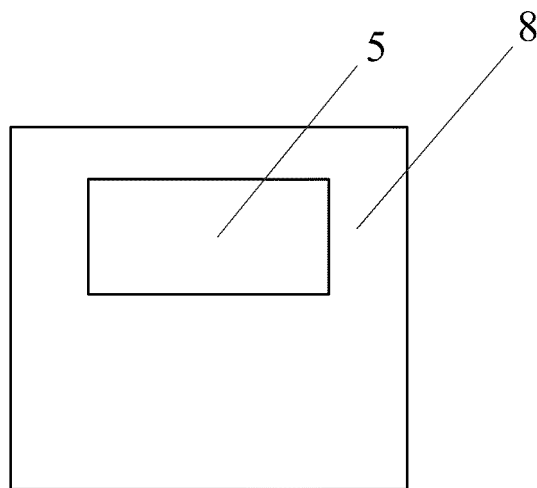


FIG. 10

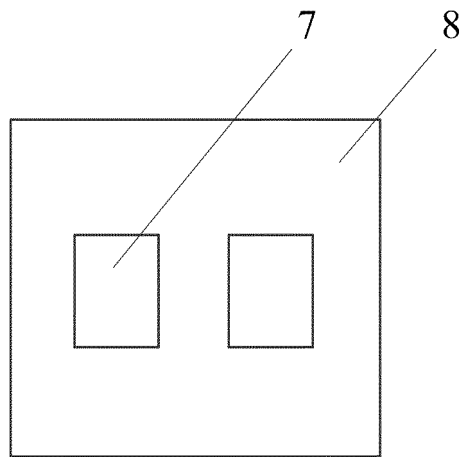


FIG. 11

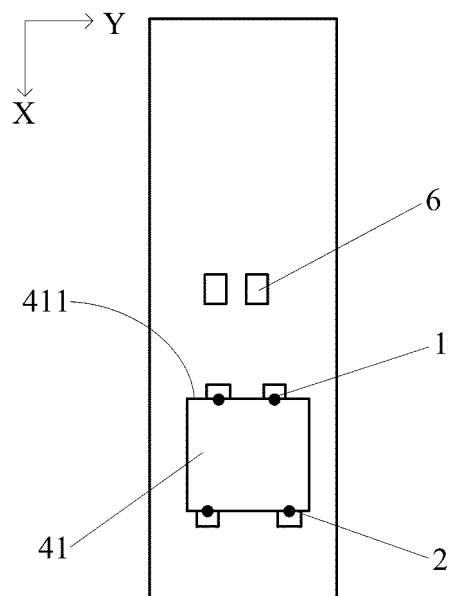


FIG. 12

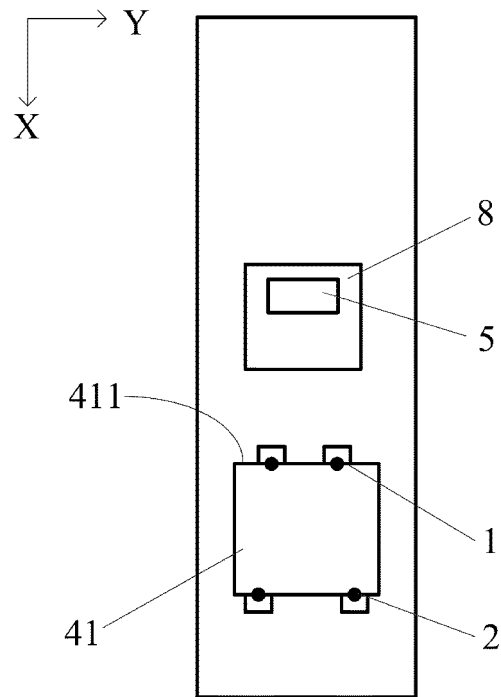


FIG. 13

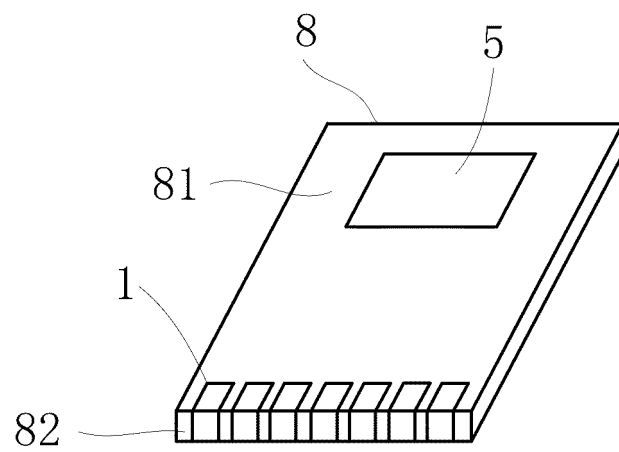


FIG. 14

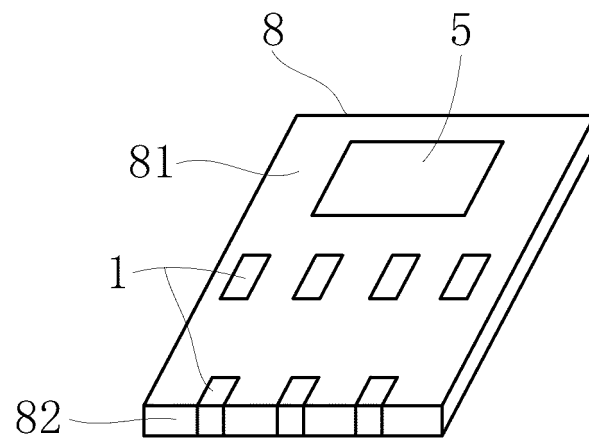


FIG. 15

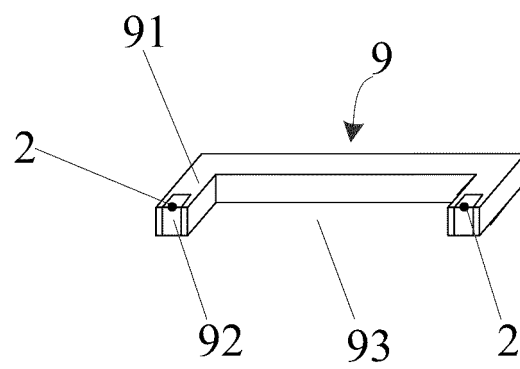


FIG. 16

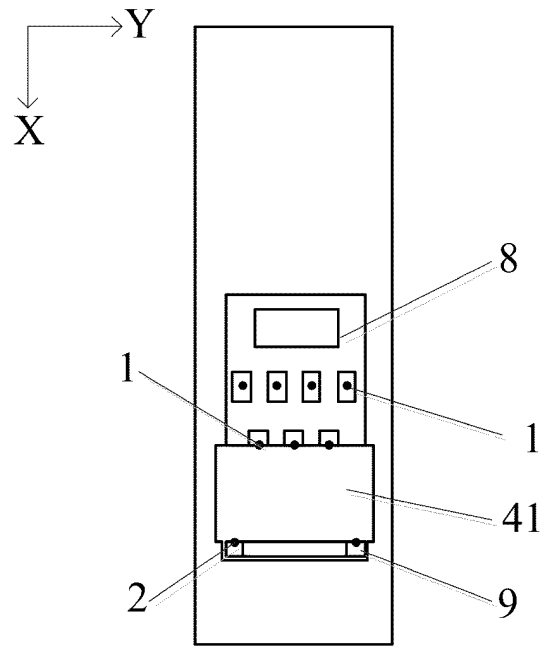


FIG. 17

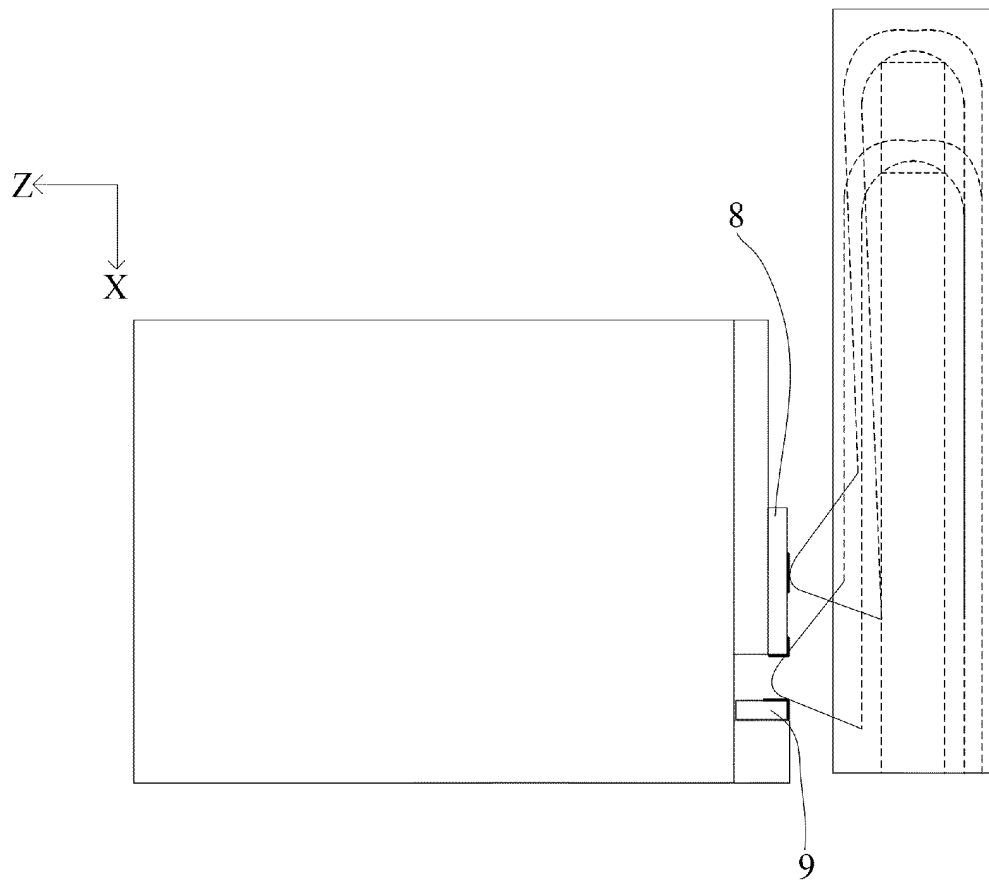


FIG. 18

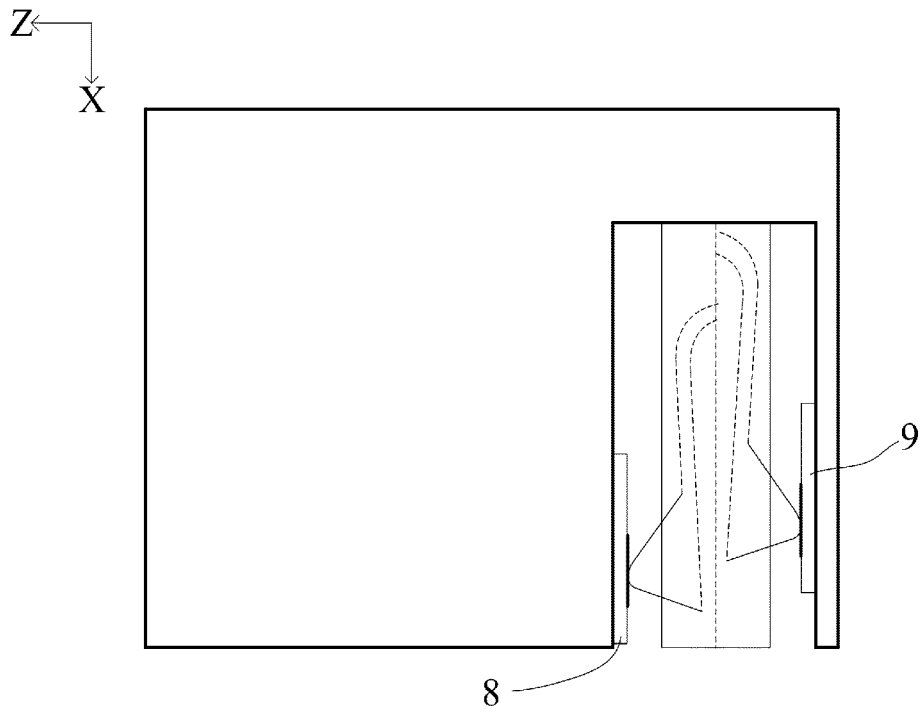


FIG. 19

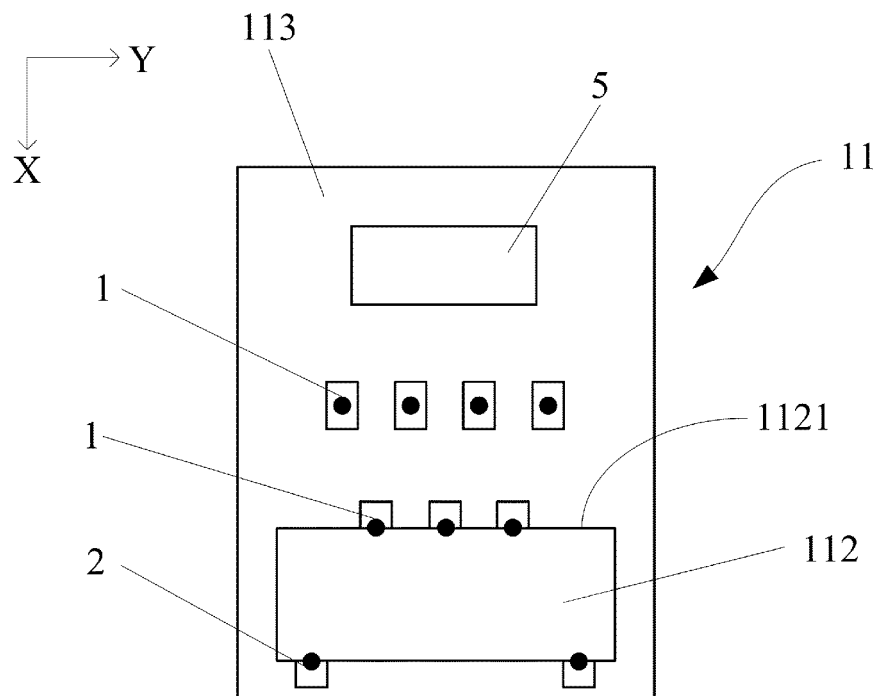


FIG. 20

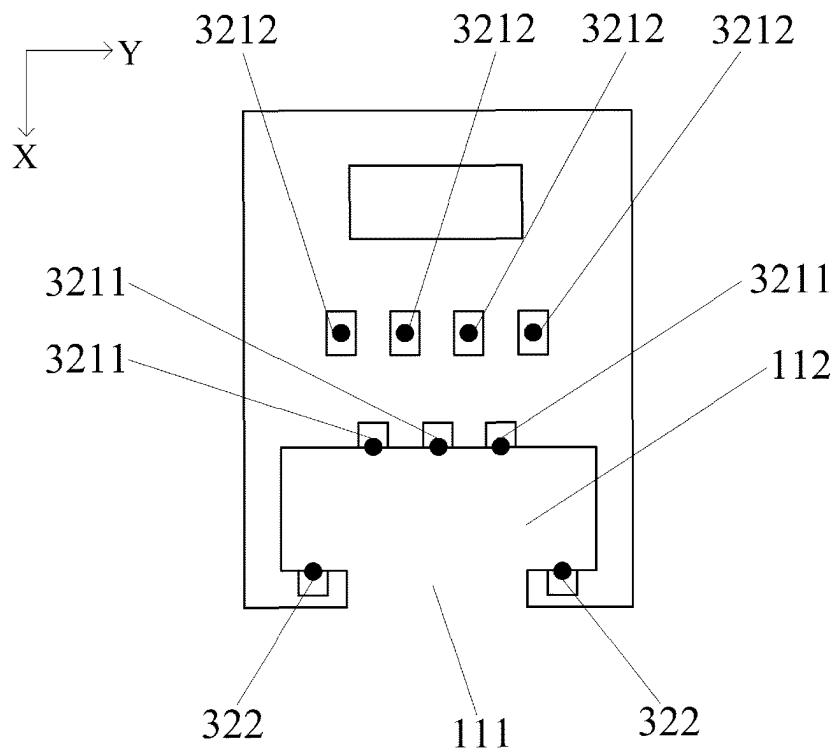


FIG. 21

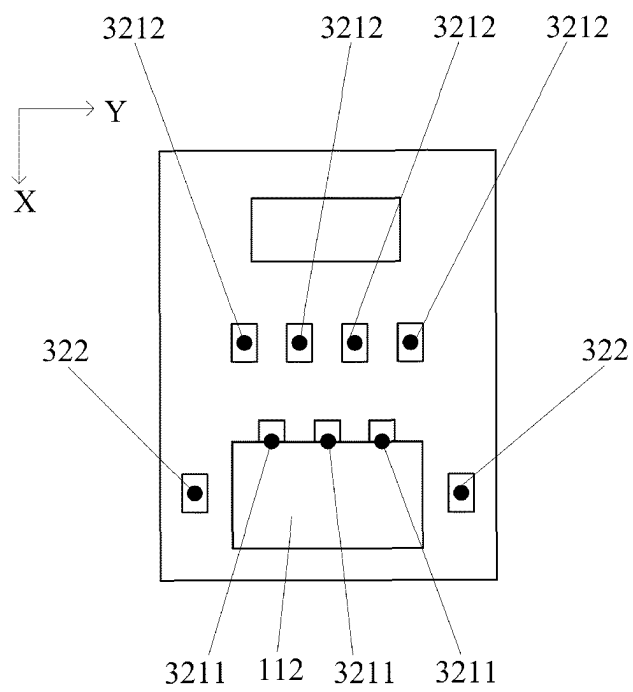


FIG. 22

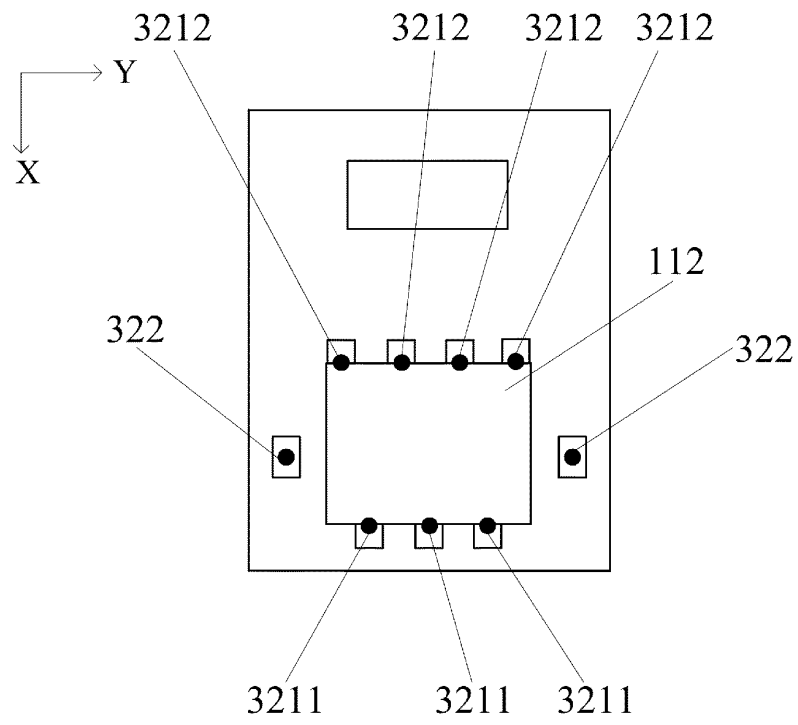


FIG. 23

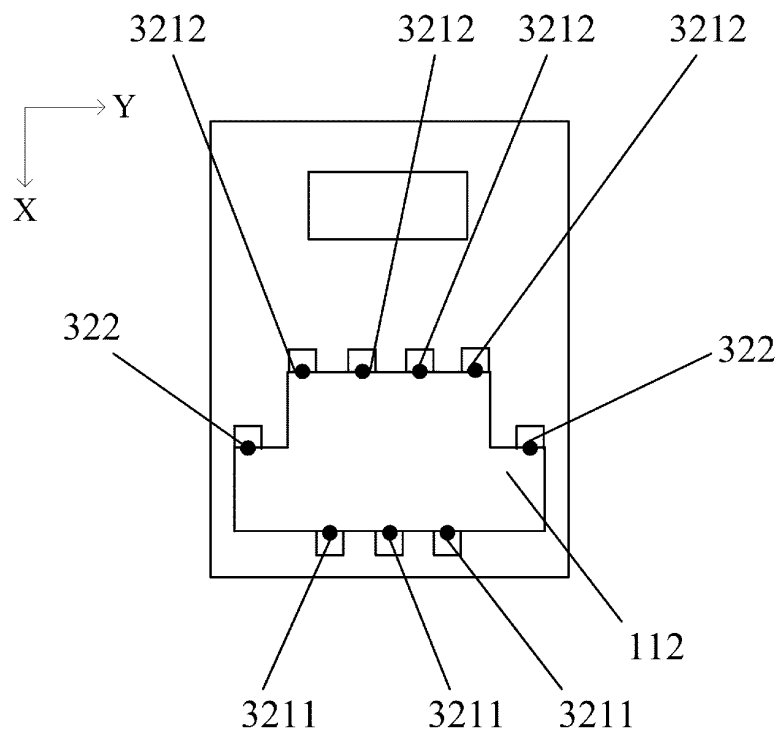


FIG. 24

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/096366

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>B41J 2/175(2006.01)i<br><br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------|------|---|---------------------------------------------------------------------------------------------------------------------------------------|------|---|-----------------------------------------------------------------------------------|------|---|--------------------------------------------------------------------------------------------------|------|---|----------------------------------------------------------------------------------|------|---|---------------------------------------------------------------------------------------------|------|
| <b>B. FIELDS SEARCHED</b><br><br>Minimum documentation searched (classification system followed by classification symbols)<br>B41J<br><br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>CNABS, SIPOABS, TWABS, VEN, CNTXT, CNKI: 成像, 盒, 触针, 触点, 端子, 凹, 腔, 槽, 芯片, 电路板, imag+, box?, cartridge?, container+, terminal?, pin?, groove?, recession?, chip?, ic,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |
| <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 110202942 A (APEX MICROELECTRONICS CO., LTD.) 06 September 2019 (2019-09-06)<br/>description, paragraphs [0002]-[0121], and figures 1-20</td> <td>1-13</td> </tr> <tr> <td>X</td> <td>CN 203282859 U (ZHUHAI APEX MICROELECTRONICS) 13 November 2013 (2013-11-13)<br/>description, paragraphs [0019]-[0045], and figures 1-7</td> <td>1-13</td> </tr> <tr> <td>A</td> <td>CN 1529657 A (BENQ CORPORATION) 15 September 2004 (2004-09-15)<br/>entire document</td> <td>1-13</td> </tr> <tr> <td>A</td> <td>CN 103600587 A (ZHUHAI KINGWAY IMAGE CO., LTD.) 26 February 2014 (2014-02-26)<br/>entire document</td> <td>1-13</td> </tr> <tr> <td>A</td> <td>GB 2424997 A (SEIKO EPSON CORP.) 11 October 2006 (2006-10-11)<br/>entire document</td> <td>1-13</td> </tr> <tr> <td>A</td> <td>JP 2000334975 A (CASIO COMPUTER CO., LTD.) 05 December 2000 (2000-12-05)<br/>entire document</td> <td>1-13</td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                   | Category*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Relevant to claim No. | PX | CN 110202942 A (APEX MICROELECTRONICS CO., LTD.) 06 September 2019 (2019-09-06)<br>description, paragraphs [0002]-[0121], and figures 1-20 | 1-13 | X | CN 203282859 U (ZHUHAI APEX MICROELECTRONICS) 13 November 2013 (2013-11-13)<br>description, paragraphs [0019]-[0045], and figures 1-7 | 1-13 | A | CN 1529657 A (BENQ CORPORATION) 15 September 2004 (2004-09-15)<br>entire document | 1-13 | A | CN 103600587 A (ZHUHAI KINGWAY IMAGE CO., LTD.) 26 February 2014 (2014-02-26)<br>entire document | 1-13 | A | GB 2424997 A (SEIKO EPSON CORP.) 11 October 2006 (2006-10-11)<br>entire document | 1-13 | A | JP 2000334975 A (CASIO COMPUTER CO., LTD.) 05 December 2000 (2000-12-05)<br>entire document | 1-13 |
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| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |
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| Date of the actual completion of the international search<br><b>14 August 2020</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Date of mailing of the international search report<br><b>22 September 2020</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |
| Name and mailing address of the ISA/CN<br><b>China National Intellectual Property Administration (ISA/CN)<br/>         No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing<br/>         100088<br/>         China</b><br><br>Facsimile No. (86-10)62019451                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Authorized officer<br><br><br><br><br><br>Telephone No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |    |                                                                                                                                            |      |   |                                                                                                                                       |      |   |                                                                                   |      |   |                                                                                                  |      |   |                                                                                  |      |   |                                                                                             |      |

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**INTERNATIONAL SEARCH REPORT**  
**Information on patent family members**

International application No.

**PCT/CN2020/096366**

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