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(54) INK CARTRIDGE AND INSTALLATION METHOD THEREFOR

(57) The present invention provides an ink cartridge and a method for installing same. The ink cartridge includes at least a housing (11) and a handle (12). The housing includes an ink supply port (111), a plane in which the ink supply port (111) is located is a first plane, and another plane of the ink cartridge opposite to the first plane is a second plane. A direction along a longer side on the first plane is an X-axis, a direction along a shorter side on the first plane is a Y-axis; and an axis that is perpendicular to both the X-axis and the Y-axis is a Z-axis. The handle (12) includes: an operation portion (121), an engagement portion (122), and a support portion (123). The support portion (123) is connected to the operation portion (121). A distance from the engagement portion (122) to the support portion (123) and a distance from the operation portion (121) to the support portion (123) should meet the following formula: $2/3t < d < t$, where t is the distance from the operation portion to the support portion in a Z-axis direction, and d is the distance from the engagement portion to the support portion in the Z-axis direction. The ink cartridge is easy to install, is stable in operation, is easy to take out, and has a long service life.

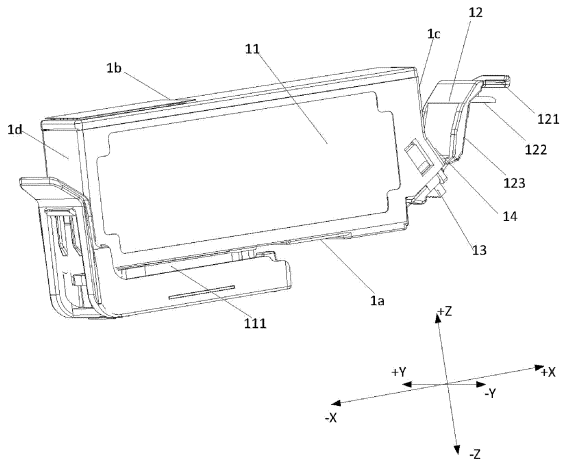

FIG. 1

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Description

Technical Field

[0001] The present invention relates to the field of printers, and specifically, to an accessory ink cartridge of an ink-jet printer, and in particular, to an ink cartridge and a method of installing same.

Related Art

[0002] Ink-jet printers are relatively commonly used printing tools. Although laser printers are popularized currently, maintenance costs of the laser printers are relatively high. Therefore, the ink-jet printers still account for a large market share, and especially, are used in locations such as homes, shops, and offices.

[0003] An ink-jet printer has an ink cartridge and an ink cartridge holder. Currently, for the ink-jet printer, there are many manners for engaging the ink cartridge with the ink cartridge holder. For example, commonly used manners include jointing and snap-fit. For example, as shown in FIG. 30 in Chinese Patent CN201510060960.1, an ink cartridge is fixed by engaging a first apparatus side engagement portion on a movable lever of a printer holder with a first ink cartridge side engagement portion of the ink cartridge. When the ink cartridge needs to be taken out, a push portion of the movable lever is pushed, so that the first ink cartridge side engagement portion of the ink cartridge is separated from the first apparatus side engagement portion, to take out the ink cartridge from the holder. However, such an engagement manner has some technical problems.

[0004] First, because a rotating shaft of the movable lever is located between the push portion and the first apparatus side engagement portion, a distance between the first apparatus side engagement portion and the rotating shaft is denoted by d, and a distance between the push portion and the rotating shaft is denoted by t. Based on the structure, to keep miniaturization of the ink cartridge and the printer, the size of the movable lever needs to be reduced, and $d \geq t$ may occur. When the ink cartridge is taken out, according to the torque balance principle, a relatively large force needs to be applied to the push portion. Consequently, it is difficult to take out the ink cartridge.

[0005] Second, in a process of taking out the ink cartridge, the lever needs to rotate counterclockwise. During the counterclockwise rotation, the first apparatus side engagement portion moves towards a -Z-axis direction at the same time. Consequently, the ink cartridge needs to move downward first, to enable the first ink cartridge side engagement portion to be separated from the first apparatus side engagement portion. This manner causes damage to a stylus or a chip. The -Z-axis direction described herein is a direction that points from another plane opposite to a plane in which an ink supply port is located to the plane in which the ink supply port is located. To successfully take out the ink cartridge, space in the -Z-axis direction needs to be reserved in the ink cartridge, and this is unfavorable for the miniaturization of the ink cartridge and the printer. In addition, because the space in the -Z-axis direction is reserved in the ink cartridge, the ink supply port of the ink cartridge and an ink supply tube of the holder may probably not be sealed tightly, causing ink leakage.

[0006] Third, because the ink cartridge needs to move in the -Z-axis direction before the ink cartridge is taken out, a compression force of the ink cartridge on an elastic stylus of the ink cartridge holder becomes larger. When the ink cartridge is taken out, because an elastic force provided by the elastic stylus to the ink cartridge is excessively large, the ink cartridge bounces high from the ink cartridge holder, and the ink supply port may be separated from the bottom of the ink cartridge holder. Consequently, ink splashes out from the ink supply port, polluting the ink cartridge holder, the printer, a user, or a bench.

[0007] Fourth, the first ink cartridge side engagement portion is close to a second ink cartridge side engagement portion on a Z-axis, a center spin axis that passes through the first ink cartridge side engagement portion and the second ink cartridge side engagement portion and that is perpendicular to a YZ plane is easily formed. In addition, in a printing process of the printer, a moving direction of the ink cartridge holder is a Y-axis direction. In a moving process of the ink cartridge holder, a force that is provided in the Y-axis direction by flowing air is applied to the ink cartridge. Consequently, the ink cartridge may shake around the center spin axis that is perpendicular to the YZ plane, causing unstable fixation of the ink cartridge, poor contact of the chip, or incomplete sealing of the ink supply port.

[0008] Currently, there is no technical solution to the foregoing problems.

SUMMARY

[0009] For the disadvantages in the prior art, according to an aspect of the present invention, an ink cartridge is provided. The ink cartridge includes at least a housing 11 and a handle 12, and the housing includes an ink supply port 111, where a plane in which the ink supply port 111 is located is a first plane 1a, and another plane of the ink cartridge opposite to the first plane is a second plane 1b; a direction along a longer side on the first plane is an X-axis; a direction along a shorter side on the first plane is a Y-axis; and an axis that is perpendicular to both the X-axis and the Y-axis is a Z-axis.

[0010] The handle 12 includes: an operation portion 121, an engagement portion 122, and a support portion 123 that are disposed in sequence in a Z-axis direction, and a distance from the engagement portion 122 to the support portion 123 and a distance from the operation portion 121 to the support portion 123 should meet the following formula: $2/3t < d < t$, where t is the distance

from the operation portion 121 to the support portion 123 in the Z-axis direction, and d is the distance from the engagement portion 122 to the support portion 123 in the Z-axis direction.

[0011] Preferably, the ink cartridge further includes a chip 13, a direction in which the ink supply port 111 faces towards the chip 13 is a +X-axis, and a direction in which the first plane 1a faces towards the second plane 1b is a +Z-axis direction, where a surface of the ink cartridge on a -X-axis side is a fourth plane 1d, and a surface opposite to the fourth plane 1d is a third plane 1c.

[0012] An inclined area 14 connecting the third plane 1c and the first plane 1a is disposed in -Z-axis and +X-axis directions of the third plane 1c; and the handle 12 is located on a +X-axis side of the housing 11, and is disposed on the inclined area 14, where the handle 12 includes the support portion 123, the operation portion 121, and the engagement portion 122 in sequence in the +Z-axis direction, and the operation portion 121 and the engagement portion 122 extend towards the +X-axis and +Z-axis directions relative to the support portion 123.

[0013] Preferably, the handle 12 further includes a guiding portion 124, where the guiding portion 124 is disposed in the +X-axis direction of the support portion 123, and the guiding portion 124 is located in the -Z-axis direction of the engagement portion 122.

[0014] Preferably, at least one guiding surface 1242 extending towards the +X-axis direction is disposed in a Y-axis direction of the guiding portion 124, at least one compression surface 1241 extending towards the Y-axis direction is disposed in the +X-axis direction of the guiding surface 1242, and the compression surface 1241 is connected to the guiding surface 1242.

[0015] Preferably, the compression surface 1241 is any one of the following structures: two or more strip areas that are disposed in parallel; a plane; a plane inclined at an angle to the handle; a serrated area; a wavy area; or an irregularly shaped area.

[0016] Preferably, the handle further includes a support rib 125, the support rib 125 is disposed between the operation portion 121 and the engagement portion 122, and the support rib 125 is connected to the operation portion 121 and the engagement portion 122 separately.

[0017] Preferably, an outer edge of the support rib 125 retreats into outer edges of the operation portion 121 and the engagement portion 122.

[0018] Preferably, an upper part of the engagement portion 122 is connected to the support rib 125, and the engagement portion 122 is neither connected to the operation portion 121 nor connected to the support portion 123.

[0019] Preferably, the handle 12 is capable of deflecting by using an end of the support portion 123 in the -Z-axis direction as a shaft, and a deflection angle meets the following formula: $-25° < a < 25°$, where a is the deflection angle.

[0020] Preferably, the support portion 123 is bent and extends in the +Z-axis and +X-axis directions to form a first extension portion 1231, the first extension portion 1231 is bent and extends again in the +Z-axis and +X-axis directions to form a second extension portion 1232, and the operation portion 121 and the engagement portion 122 are disposed on a combination of the first extension portion 1231 and the second extension portion 1232.

[0021] Preferably, an acute angle a1 formed between the first extension portion 1231 and the support portion 123 is between 16° and 36°, and an acute angle a2 formed between the second extension portion 1232 and the first extension portion 1231 is between 39° and 69°.

[0022] Preferably, the ink cartridge further includes a protective cover 16, the protective cover 16 has a restriction portion 163 on the +X-axis side, and the housing 11 has a restricted portion 163'; and when the protective cover 16 is installed on the housing 11, the restriction portion 163 and the restricted portion 163' are jointed to each other, and the restriction portion 163 and the restricted portion 163' are located between the ink supply port 111 and the chip 13.

[0023] According to of another aspect of the present invention, an ink cartridge with a replaceable portion is provided, including the ink cartridge according to any one of the foregoing descriptions, where the ink cartridge further includes a replaceable portion 2, the replaceable portion 2 is detachably connected to the housing 11, and the replaceable portion 2 is located in the +X-axis direction of the housing 11; and the handle 12 and the chip 13 are disposed on the replaceable portion 2.

[0024] According to of another aspect of the present invention, an ink cartridge connected to an ink cartridge holder is provided, where the ink cartridge is connected to an ink cartridge holder 3, the ink cartridge holder 3 is disposed in a printer, and a handle of the ink cartridge includes: an operation portion 121, an engagement portion 122, and a support portion 123 that are disposed in sequence in a Z-axis direction. A distance from the engagement portion 122 to the support portion 123 and a distance from the operation portion 121 to the support portion 123 meets a formula: $2/3t < d < t$; and the engagement portion 122 and the ink cartridge holder 3 are engaged with each other, where the ink cartridge holder 3 includes at least a lever body 31, a rotating shaft 32, and a lever opening 33, the engagement portion 122 and the lever opening 33 are engaged with each other, and a sectional area of the engagement portion 122 is less than or equal to an opening size of the lever opening 33. In a variation, the handle 12 is located on a +X-axis side of the housing 11, and is disposed on an inclined area 14, where the handle 12 includes the support portion 123, the operation portion 121, and the engagement portion 122 in sequence in a +Z-axis direction, and the operation portion 121 and the engagement portion 122 extend towards +X-axis and +Z-axis directions relative to the support portion 123.

[0025] Preferably, the handle 12 of the ink cartridge connected to the ink cartridge holder further includes a

support rib 125, the support rib 125 is disposed between the operation portion 121 and the engagement portion 122, and the support rib 125 is connected to the operation portion 121 and the engagement portion 122 separately. More preferably, an outer edge of the support rib 125 retreats into outer edges of the operation portion 121 and the engagement portion 122.

[0026] Preferably, the handle 12 of the ink cartridge connected to the ink cartridge holder is capable of deflecting by using an end of the support portion 123 in a -Z-axis direction as a shaft, and a deflection angle is $-25° < a < 25°$.

[0027] Preferably, the support portion 123 of the handle 12 of the ink cartridge connected to the ink cartridge holder is bent and extends in the +Z-axis and +X-axis directions to form a first extension portion 1231, the first extension portion 1231 is bent and extends again in the +Z-axis and +X-axis directions to form a second extension portion 1232, and the operation portion 121 and the engagement portion 122 are disposed on a combination of the first extension portion 1231 and the second extension portion 1232. An acute angle a1 formed between the first extension portion 1231 and the support portion 123 is between 16° and 36°, and an acute angle a2 formed between the second extension portion 1232 and the first extension portion 1231 is between 39° and 69°.

[0028] Preferably, the ink cartridge connected to the ink cartridge holder further includes a protective cover 16, the protective cover 16 has a restriction portion 163 on the +X-axis side, and the housing 11 has a restricted portion 163'; and when the protective cover 16 is installed on the housing 11, the restriction portion 163 and the restricted portion 163' are jointed to each other, and the restriction portion 163 and the restricted portion 163' are located between an ink supply port 111 and a chip 13.

[0029] Preferably, at least one guiding rib 311 is disposed on the lever body 31, a guiding surface 1242 of the ink cartridge is attached to an inner surface of the guiding rib 311, and a compression surface 1241 of the ink cartridge is in contact with the lever body 31, and drives the lever body 31 to rotate around the rotating shaft 32.

[0030] Preferably, the ink cartridge holder 3 further includes a slot 34, and the slot 34 and a latching portion 15 of the ink cartridge are engaged with each other.

[0031] According to another aspect of the present invention, a method for installing an ink cartridge is provided, used to fix the ink cartridge to an ink cartridge holder, and including the following steps:

a. jointing a latching portion 15 of the ink cartridge into a slot 34 on the ink cartridge holder;

b. pressing a second plane 1b of the ink cartridge, so that the ink cartridge gradually compresses the ink cartridge holder; and

c. engaging a lever opening 33 on the ink cartridge holder with an engagement portion 122 in the ink cartridge.

[0032] Preferably, the step b further includes the following steps:

b1. causing a guiding surface 1242 of the ink cartridge to come into contact with a guiding rib 311 of the ink cartridge holder, and start guiding;

b2. pressing the second plane 1b, so that a compression surface 1241 of the ink cartridge is in contact with a lever body 31, and compresses the lever body 31 to rotate around a rotating shaft 32; and

b3. causing a lever opening 33 of the lever body 31 to approach the engagement portion 122 of the ink cartridge.

[0033] Preferably, before the step a, the method further includes step a': removing a protective cover from the ink cartridge, and moving the ink cartridge to the ink cartridge holder.

[0034] According to the present invention, the handle is disposed on the ink cartridge, and the engagement portion is disposed at a corresponding position of the handle. Especially, configuration of the engagement portion meets a technical specification, so that the ink cartridge and an ink cartridge holder suitable for the ink cartridge are stably fixed, and the ink cartridge is easily taken out, thereby reducing damage to a stylus and a chip of the ink cartridge, and avoiding ink leakage and ink splashing. Moreover, the ink cartridge is precisely positioned by using the guiding portion on the ink cartridge, to prevent installing the ink cartridge at an incorrect position. The ink cartridge provided in the present invention is easy to operate, has a long service life and a simple production process, and can be manufactured in batches.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Other features, objectives, and advantages of the present invention will become more apparent with reference to detailed descriptions of non-limiting embodiments in the accompanying drawings:

FIG. 1 is a schematic structural diagram of an ink cartridge according to a first specific implementation of the present invention;

FIG. 2 is a schematic structural diagram of a handle according to an embodiment of the present invention;

FIG. 3 is a schematic structural diagram of a handle according to an embodiment of the present invention;

FIG. 4 is a schematic structural diagram of an ink cartridge provided with a guiding portion according to an embodiment of the present invention;

FIG. 5 is a schematic structural diagram of an ink cartridge provided with a protective cover according to an embodiment of the present invention;

FIG. 6 is a schematic structural diagram of an ink cartridge provided with a replaceable portion according to a second specific implementation of the present invention;

FIG. 7 is a schematic diagram of an ink cartridge holder according to a third specific implementation of the present invention;

FIG. 8 is a schematic diagram of an ink cartridge holder provided with a slot according to an embodiment of the present invention;

FIG. 9 is a schematic structural diagram of a lever body, a lever opening, a rotating shaft, and a guiding rib according to an embodiment of the present invention;

FIG. 10 is a schematic diagram of a protective cover provided with a restriction portion according to an embodiment of the present invention;

FIG. 11 is a schematic flowchart of installing an ink cartridge according to a fourth specific implementation of the present invention; and

FIG. 12 is a schematic flowchart of installing an ink cartridge having a guiding portion according to an embodiment of the present invention.

DETAILED DESCRIPTION

[0036] FIG. 1 is a schematic structural diagram of an ink cartridge according to a first specific implementation of the present invention. It is understood by a person skilled in the art that the figure is only a schematic diagram showing the entire effect of the ink cartridge. To better describe specific implementations of the present invention, other parts are not shown in the figure, but this does not mean that the parts do not exist in the present invention. Details are not described herein. Specifically, as shown in FIG. 1, FIG. 1 is a three-dimensional structural effect diagram of the ink cartridge. The ink cartridge includes at least a housing 11 and a handle 12. The housing includes an ink supply port 111. It is understood by a person skilled in the art that the ink cartridge is used to store ink and is an apparatus used for printing in cooperation with a printer device. The housing 11 is of a cuboid shape. However, in another variation, to adapt to and cooperate with a printer device or to achieve the aesthetic appearance, the housing 11 may alternatively be of a polygonal shape, an elliptical shape, or the like. This does not affect the technical solution of the present invention, and details are not described herein. The ink cartridge further includes the handle 12, and the handle 12 is located on a side of the ink cartridge. All these will be described in detail in the specific implementations below.

[0037] Furthermore, to better describe each part of the ink cartridge of the present invention, a concept of X, Y and Z-axes is introduced. Three space axes that are orthogonal to each other are an X-axis, a Y-axis, and a Z-axis. A plane in which the ink supply port 111 is located is a first plane, and another plane of the ink cartridge opposite to the first plane is a second plane. However, in the figure, it may be understood that the first plane is the bottom of the ink cartridge, and the second plane is the top of the ink cartridge. Further, a direction along a longer side on the first plane is an X-axis, a direction along a shorter side on the first plane is a Y-axis, and an axis that is perpendicular to both the X-axis and the Y-axis is a Z-axis.

[0038] Further, FIG. 2 and FIG. 3 are detailed views of the handle 12. The handle 12 includes: an operation portion 121, an engagement portion 122, and a support portion 123. The operation portion 121 is used to push the handle 12 when a user takes out the ink cartridge, to drive the handle 12 to rotate. Specifically, it is understood by a person skilled in the art that the ink cartridge is finally installed on an ink cartridge holder 3, and the engagement portion 122 is used to fix the ink cartridge when the ink cartridge is installed onto the ink cartridge holder 3, to prevent the ink cartridge from moving vertically. The handle 12 rotates by using an end of the support portion 123 close to the chip 13 as a shaft, so that the ink cartridge is conveniently installed or taken out.

[0039] Further, a distance from the engagement portion 122 to the support portion 123 and a distance from the operation portion 121 to the support portion 123 should meet the formula: $2/3t < d < t$, where t is the distance from the operation portion to the support portion in a Z-axis direction, and d is the distance from the engagement portion to the support portion in the Z-axis direction. It is understood by a person skilled in the art that, as shown in FIG. 1, the engagement portion 122 is located under the operation portion 121 in the Z direction. According to data analysis and simulation experiments made by a person skilled in the art, it is proved that, by using the foregoing distance relationship, when the operation portion 121 is pushed, the ink cartridge can be taken out by using a small force, to implement miniaturization of the ink cartridge and a printer and reduce the difficulty in taking out the ink cartridge.

[0040] Further, as shown in FIG. 1, t is defined as a distance from a center line of the operation portion 121 perpendicular to the Z-axis to a lowermost end of the support portion 123 in the Z-axis direction, and d is defined as a distance from a center line of the engagement portion 122 perpendicular to the Z-axis to the lowermost

end of the support portion 123 in the Z-axis direction. Preferably, d = 0.825t. In a specific embodiment, the distance d from the operation portion 121 to the support portion 123 in the Z-axis direction is 15.47 mm, and the distance from the engagement portion 122 to the support portion 123 in the Z-axis direction is 12.77 mm. Further, in the Z-axis direction, a distance between the engagement portion 122 and the operation portion 121 is 2.7 mm. It may be learned from the foregoing specific values that the distance between the engagement portion 122 and the operation portion 121 is very small. During actual use, the engagement portion 122 can be easily controlled by using the operation portion 121. In addition, the operation portion 121 is further away from the support portion 123. According to the torque balance principle, pushing the operation portion 121 is more effort-saving than directly pushing the engagement portion 122.

[0041] The following describes a first embodiment of the present invention in detail with reference to FIG. 1. The ink cartridge further includes a chip 13. The chip 13 is used to record an ink volume of the ink cartridge, monitor usage frequency of the ink cartridge, and the like. It is understood by a person skilled in the art that, the ink cartridge may be provided with the chip 13, or may not be provided with the chip 13. This does not affect the technical solution of the present invention, and details are not described herein.

[0042] Further, in this embodiment, a position relationship between the parts of the ink cartridge is further described by specifically defining +X, -X, +Y, -Y, +Z, and -Z. Specifically, as shown in FIG. 1, the housing 11 includes a first plane 1a, a second plane 1b, a third plane 1c, and a fourth plane 1d. The first plane 1a is opposite to the second plane 1b, and the third plane 1c is opposite to the fourth plane 1d. As shown in FIG. 1, a plane in which the ink supply port 111 is located is the first plane 1a, a direction in which the ink supply port 111 faces towards the chip 13 is a +X-axis, a direction in which the first plane 1a points to the second plane 1b is a +Z-axis direction, and a direction that is formed by rotating a +X-axis direction counterclockwise by 90° in an XY plane is a +Y-axis direction. A plane located on a -X-axis side of the ink cartridge is the fourth plane 1d, and a plane opposite to the fourth plane 1d is the third plane 1c. An inclined area 14 connecting the third plane 1c and the first plane 1a is disposed in -Z-axis and +X-axis directions of the third plane 1c. An end of the support portion 123 is disposed on the inclined area 14, so that the handle 12 is disposed on the inclined area 14. Further, the handle 12 is located on a +X-axis side of the housing 1, the operation portion 121 and the engagement portion 122 are located in +Z-axis direction of the support portion 123, and the engagement portion 122 and the operation portion 121 extend towards the +X-axis and +Z-axis directions relative to the support portion 123. As shown in FIG. 2, preferably, the engagement portion 122 and the operation portion 121 are disposed in parallel. However, in another variation, the engagement portion 122 and the operation portion 121 may not be disposed in parallel. Further, parts of the handle 12 in the +Z-axis direction are the support portion 123, the engagement portion 122, and the operation portion 121 in sequence.

[0043] In a second embodiment of the present invention, as shown in FIG. 4, the handle 12 further includes a guiding portion 124. The guiding portion 124 is disposed in the +X-axis direction of the support portion 123, and the guiding portion 124 is located in the -Z-axis direction of the engagement portion 122. It is understood by a person skilled in the art that the guiding portion 124 can fix the ink cartridge more easily. Specifically, as shown in FIG. 4, the guiding portion 124 has a guiding surface 1242 and compression surface 1241. The guiding surface 1242 has a guiding function during installation of the cartridge, and the compression surface 1241 can apply, during installation of the cartridge, a compression force to a part that cooperates with the guiding portion 1242. Preferably, the guiding portion 124 may be an independent part, or may be an integral part that is formed with the handle 12 by means of integral injection molding. Details are not described herein.

[0044] In a preferred embodiment, at least one guiding surface 1242 extending towards the +X-axis direction is disposed in a Y-axis direction of the guiding portion 124, at least one compression surface 1241 extending towards the Y-axis direction is disposed in the +X-axis direction of the guiding surface 1242, and the compression surface 1241 is connected to the guiding surface 1242. Specifically, as shown in FIG. 4, three protruded strip structures are disposed on the guiding portion 124. One of the three protruded strip structures is used as an example. The strip structure extends in the -Z-axis direction of the guiding portion 124, and the strip structure has two side areas in the Y-axis direction.

[0045] The two side areas are two guiding surfaces 1242, and the two guiding surfaces 1242 is connected to one compression surface 1241 in the +X direction. More specifically, the two guiding surfaces 1242 are two areas of the guiding portion 124 in an XZ plane, and the compression surface 1241 is an area of the guiding portion 124 in a YZ plane. It is understood by a person skilled in the art that there are three strip structures in total in FIG. 4. That is, the guiding portion includes a total of six guiding surfaces 1242 and three compression surfaces 1241. In some other variations, of the number of strip structures may be changed, or the shape of the strip structure may be changed, thereby changing the number of guiding surfaces 1242 and compression surfaces 1241.

[0046] Further, the shape of the compression surface 1241 is not only limited to the shape shown in FIG. 2. The compression surface 1241 may alternatively be two or more strip areas that are disposed in parallel, an integral plane, a plane inclined at an angle to the handle, a serrated area, a wavy area, or an irregularly shaped area.

[0047] In a third embodiment of the present invention, as shown in FIG. 4, the handle 12 further includes a sup-

port rib 125, and the support rib 125 is disposed between the operation portion 121 and the engagement portion 122. It is understood by a person skilled in the art that the support rib 125 is considered as a part for strengthening fixation. The support rib 125 is connected and fixed between the operation portion 121 and the engagement portion 122, so that the strength of the engagement portion is strengthened. Further, the service life of the engagement portion is increased.

[0048] Furthermore, an outer edge of the support rib 125 retreats into outer edges of the operation portion 121 and the engagement portion 122. It is understood by a person skilled in the art that, as shown in FIG. 4, the support rib 125 is preferably a cuboid structure. The length of the support rib 125 relative to the support portion 123 in the +X-axis direction is less than the lengths of the operation portion 121 and the engagement portion 122 relative to the support portion 123 in the +X-axis direction. The support rib 125 is located on the -X-axis side of the outer edge of the operation portion 121 in the +X-axis direction, and the support rib 125 is located on the -X-axis side of the outer edge of the engagement portion 122 in the +X-axis direction. In this way, an integral structure formed by the support rib 125, the operation portion 121, and the engagement portion 122 has the aesthetic appearance and a long service life, and the support rib 125 does not affect work of the engagement portion 122. However, in another variation, the support rib 125 may alternatively be of a cylinder or another shape. This does not affect essential content of the present invention, and details are not described herein again.

[0049] In a variation, the engagement portion 122 is not directly connected to the operation portion 121 and the support portion 123, and the engagement portion 122 is connected to the operation portion 121 by using the support rib 125. That is, the operation portion 121, the support rib 125, and the engagement portion 122 are disposed in sequence in the -Z-axis direction. Specifically, FIG. 4 shows one support rib 125. In some variations, there may be a plurality of support ribs 125. All of those can achieve the objective of the present invention, and details are not described herein.

[0050] In a fourth embodiment of the present invention, the handle 12 is capable of deflecting by using an end of the support portion 123 in the -Z-axis direction as a shaft. A deflection angle a meets the following formula: $-25° < a < 25°$. When the handle 12 is at ease, the deflection angle a is defined as 0°. Specifically, the deflection may be implemented in various manners. For example, a rotating shaft is disposed at an end of the support portion 123 in the -Z-axis direction, and the handle may deflect about the rotating shaft of the support portion 123.

[0051] The handle 12 may be made of a deformable material. The handle 12 is deflected by applying an external force. Further, to deflect the handle 12 more easily by pushing the operation portion 121, and to increase the service life of the handle 12, preferably, the deflection angle a is most appropriately between -10° and 10°. The deflection angle is defined based on that the deflection angle is 0° when the handle 12 is at ease.

[0052] Further, preferably, the handle 12 is in a "⅂" shape. However, in another variation, the handle may be in a "γ" shape. In such an embodiment, a deformable part or a rotating shaft may be correspondingly disposed below the handle. Correspondingly, the handle may alternatively be in a "√" shape, a "⟍" shape, a "⌒" shape, or another shape. Correspondingly, the engagement portion may be disposed at different positions according to different shapes of the handle. For example, one side of a Y-shaped handle is connected to the housing by using two points, and the other side in the +X-axis and +Z-axis directions is provided with the engagement portion. However, this does not affect the technical solution of the present invention, and details are not described herein.

[0053] In a fifth embodiment of the present invention, as shown in FIG. 2, the support portion 123 of the handle 12 is bent and extends in the +Z-axis and +X-axis directions to form a first extension portion 1231, the first extension portion 1231 is bent and extends again in the +Z-axis and +X-axis directions to form a second extension portion 1232, and the operation portion 121 and the engagement portion 122 are disposed on a combination of the first extension portion 1231 and the second extension portion 1232. It is understood by a person skilled in the art that, as shown in FIG. 2, the handle 12 is preferably divided into three sections, which are respectively the support portion 123, the first extension portion 1231, and the second extension portion 1232. The first extension portion 1231 is connected to the support portion 123 and the second extension portion 1232 separately. In such an embodiment, the handle 12 is not divided into three independent parts. To better describe the shape of the handle in the present invention, the handle is preferably divided into three smooth parts. The operation portion 121 and the engagement portion 122, serving as a part of the handle 12, are preferably disposed on the combination of the first extension portion 1231 and the second extension portion 1232. It is understood by a person skilled in the art that, the handle 12 is provided with the first extension portion 1231 and the second extension portion 1232 that are bent and extend in the +Z-axis and +X-axis directions, and compared with an ink cartridge in the prior art, the handle 12 can better save space, and better match the ink cartridge holder 3, to implement miniaturization of the ink cartridge and the printer using same.

[0054] In a preferred embodiment, as shown in FIG. 3, an acute angle a1 formed between the first extension portion 1231 and the support portion 123 is between 16° and 36°, and an acute angle a2 formed between the second extension portion 1232 and the first extension portion 1231 is between 39° and 69°. In a specific embodiment, the acute angle formed between the first extension portion 1231 and the support portion 123 is 26°, and the

acute angle between the second extension portion and the first extension portion 1231 is 54°. In such an embodiment, the second extension portion 1232 is preferably parallel to a horizontal plane. Preferably, the engagement portion 122 is parallel to the second extension portion 1232. However, in some variations, an angle formed between the second extension portion 1232 and the horizontal plane varies according to different acute angles formed between the first extension portion 1231 and the support portion 123 and different acute angles formed between the second extension portion 1232 and the first extension portion 1231. For example, the acute angle formed between the first extension portion 1231 and the support portion 123 is 20°, and the acute angle formed between the second extension portion 1232 and the first extension portion 1231 is 45°. This does not affect the technical solution of the present invention, and details are not described herein.

[0055] In a sixth embodiment of the present invention, as shown in FIG. 5, the ink cartridge further includes a protective cover 16, and the protective cover 16 is located in -Z-axis and -X-axis directions of the first plane 1a of the housing 11. It is understood by a person skilled in the art that the protective cover 16 is fixed in the -Z-axis and -X-axis directions of the first plane 1a of the housing 11 before the ink cartridge is installed onto an ink cartridge installation portion 3. In such an embodiment, the ink supply port 111 is disposed in the +Z-axis direction of the protective cover 16, and the ink supply port 111 is located in the -Z-axis direction of the first plane 1a of the housing 11. Further, the protective cover 16 is used to seal the ink supply port 111, to avoid ink leakage when the ink cartridge is not installed. Further, as shown in FIG. 3, the ink supply port 111 is preferably disposed towards the -X-axis direction and far away from the chip 13, so that ink accidentally leaked from the ink supply port 111 can be prevented from polluting the chip 13.

[0056] The protective cover 16 includes at least a protective cover body (not shown in the figure), a protective cover hand-held portion (not shown in the figure), and a rubber gasket (not shown in the figure). The rubber gasket may be detachably installed on the protective cover body. The rubber gasket of the protective cover body may cover the ink supply port 111. The protective cover hand-held portion is used to provide the user with an operation part for pushing the protective cover 16, so that the protective cover 16 is separated from the housing 11, and the protective cover body is connected to the protective cover hand-held portion.

[0057] It is understood by a person skilled in the art that, as shown in FIG. 5, the protective cover 16 covers the ink supply port 111 on the first plane 1a of the housing 11, thereby reducing the length of the protective cover 16, saving resources, and reducing wastes. However, in another embodiment, the protective cover 16 may be disposed to cover all or a large part of the first plane 1a of the housing 11. Further, the position and shape of the protective cover 16 vary as the position of the ink supply port 111 changes. Furthermore, the protective cover may be of another shape, provided that the ink can be prevented from spilling out from the ink supply port 111. Such changes do not affect the implementation solution of the present invention, and details are not described herein.

[0058] Further, the ink cartridge further includes a latching portion 15. The latching portion 15 is a long-strip object, protrudes from an outer surface of the fourth plane 1d, and is located in the middle of the fourth plane 1d. It is understood by a person skilled in the art that, preferably, as shown in FIG. 4, the latching portion 15 is used to fix the protective cover 16 to the ink cartridge when the ink cartridge is not installed.

[0059] Further, it may be learned with reference to FIG. 4, FIG. 5, and FIG. 10 that, the protective cover 16 has a restriction portion 163 on a side in the +X-axis direction, and the housing 11 has a restricted portion 163' in the +X-axis direction of the ink supply port 111. When the protective cover 16 is installed onto the housing 11, the restriction portion 163 and the restricted portion 163' are jointed to each other, to fix the protective cover 16 to the housing 11. The restriction portion 163 and the restricted portion 163' are located between the ink supply port 111 and the chip 13. It is understood by a person skilled in the art that, the restriction portion 163 is disposed between the ink supply port 111 and the chip 13 to separate the ink supply port 111 from the chip 13, achieving a separation function. Specifically, it is understood by a person skilled in the art that a rib 18 is further disposed on the ink cartridge. The rib 18 and the chip 13 are away from the ink supply port 111, and the restriction portion 163 and the restricted portion 163' have ink storage capabilities, to prevent ink accidentally leaked from the ink supply port 111 from approaching the rib 18 and the chip 13, causing pollution to the rib 18 and the chip 13.

[0060] Further, the protective cover 16 is preferably in a "⌟" shape. In such an embodiment, as shown in FIG. 3, when the ink cartridge is not installed, the latching portion 15 of the ink cartridge is used to fix the protective cover 16 on the ink cartridge. In another variation, the protective cover 16 may alternatively be in a "⊥" shape, a wavy shape, or another shape having a protection function.

[0061] Further, a top cover is disposed in the +Z-axis direction of the second plane 1b of the housing 11. The shape and size of the top cover are appropriate to the shape and size of the second plane 1b of the housing 11, and the top cover and the second plane 1b are engaged with each other.

[0062] In a second specific implementation manner of the present invention, as shown in FIG. 6, the ink cartridge further includes a replaceable portion 2. The replaceable portion 2 is detachably connected to the housing 11, and the replaceable portion 2 is located in the +Z-axis direction of the first plane 1a of the housing 11 and in the -X-axis direction of the third plane 1c. The handle 12, and the chip 13 are disposed on the replaceable portion 2, and a shaded portion shown in FIG. 6 is the re-

placeable portion. To reuse the chip, a replaceable portion with a chip is usually installed on the ink cartridge in a simple and quick detachable manner on the market. When ink inside the ink cartridge is run out, the user only needs to remove the replaceable portion, and install the replaceable portion onto a new ink bag. In addition, the chip automatically resets information to an original state. That is, a new ink cartridge is formed. In this solution, the handle 12 and the chip 13 are simultaneously located on the replaceable portion 2. The handle 12 and the chip 13 are located on a same part, thereby reducing costs and ensuring the connection stability of the chip 13.

[0063] FIG. 7 and FIG. 8 are schematic diagrams of an ink cartridge holder 3 according to a third specific implementation of the present invention. When the ink cartridge is installed on the ink cartridge holder 3, X-axis, Y-axis, and Z-axis directions of the ink cartridge are also X-axis, Y-axis, and Z-axis directions of the ink cartridge holder 3. Specifically, after the ink cartridge is connected to the ink cartridge holder 3, the ink cartridge holder 3 is disposed in a printer. As shown in FIG. 7, six grooves for placing the ink cartridge are disposed on the ink cartridge holder 3. After the ink cartridge is installed onto the grooves on the ink cartridge holder 3, a firmly fixed printing apparatus is formed.

[0064] Further, as shown in FIG. 9, the ink cartridge holder 3 includes at least a lever body 31, a rotating shaft 32, and a lever opening 33. The lever body 31 may be rotated around the rotating shaft 32, and the lever opening 33 is used to cooperate with the engagement portion 122 of the ink cartridge to fix a side of the ink cartridge. Further, the lever body 31 rotates to drive the lever opening 33 to rotate.

[0065] The lever body 31 is rotatable. In this case, when the ink cartridge has a manufacturing error, the lever body 31 can achieve a buffer function and a self-regulating function in a process of installing the ink cartridge, to protect the ink cartridge. Further, in a specific installation process, the engagement portion 122 and the lever opening 33 are engaged with each other, and a sectional area of the engagement portion 122 is less than or equal to an opening size of the lever opening 33. It is understood by a person skilled in the art that, according to the fourth specific embodiment of the present invention, in a process of installing the ink cartridge, as shown in FIG. 8, the ink cartridge holder is provided with a slot 34. After the latching portion 15 is in contact with the slot 34 on the ink cartridge holder, the ink cartridge is placed at ease inside the ink cartridge holder 3. The second plane 1b is pressed, and the guiding surface 1242 in the guiding portion 124 of the ink cartridge starts guiding. As the second plane 1b is compressed, the compression surface 1241 of the ink cartridge compresses the lever body 31, so that the lever body 31 rotates counterclockwise in the XZ plane. During the rotation, the lever body 31 drives the lever opening 33 to perform similar circular motion. Specifically, when the lever body 31 rotates, the lever opening 33 moves towards the +Z-axis and -X-axis directions, and approaches the engagement portion 122 during the movement. Finally, the lever opening 33 is snap-fitted on the engagement portion 122. During the foregoing movement, the engagement portion 122 moves towards the -Z-axis and +X-axis directions at the same time. When the lever opening 33 and the engagement portion 122 are located in a same horizontal plane, the lever opening 33 is also exactly snap-fitted on the engagement portion 122. In the process of installing the ink cartridge, the compression surface 1241 compresses the lever opening 33 to rotate around the rotating shaft 32, so that the lever opening 33 approaches the ink cartridge, to reduce the length of the engagement portion 122, and avoid fracture or breakage of the engagement portion 122 caused when the length of the engagement portion 122 is extremely long and an engagement force is applied to an edge of the engagement portion 122. On the other hand, the compression surface 1241 compresses the lever body 31 to rotate around the rotating shaft 32, so that the lever opening 33 moves towards the +Z-axis and -X-axis directions. The ink cartridge has no large-sized part in the +Z-axis and -X-axis directions. Therefore, only a relatively small force is required, so that the pressing force on the second plane 1b is relatively small, the deformation degree of the stylus is small, and the ink cartridge is installed more easily and conveniently.

[0066] More specifically, with reference to this embodiment, in a process of taking out the ink cartridge in the prior art, the ink cartridge needs to first move towards the -Z-axis direction. During actual installation in the prior art, the stylus and the chip 13 are easily damaged. Therefore, in the prior art, sufficient space needs to be reserved in the ink cartridge in the -Z-axis direction, to avoid damage to the stylus and the chip 13. However, excessive space allowance in the -Z-axis direction may result in the problem of ink leakage. However, in this embodiment, in the process of installing the ink cartridge, the entire ink cartridge tends to move in the -Z-axis direction. In this case, when the ink cartridge is taken out, the entire ink cartridge tends to move in the +Z-axis direction. That is, the movement direction is contrary to that of the ink cartridge in the prior art, so that the stylus and the chip can be prevented from being damaged, and the problem of ink leakage caused by the space allowance of the ink cartridge in the -Z-axis direction can be avoided while miniaturization of the ink cartridge and the printer using same is implemented.

[0067] Further, this embodiment is described with reference to FIG. 5. As shown in FIG. 5, the latching portion 15 and the engagement portion 122 are respectively located on the fourth plane 1d and the third plane 1c of the housing, so that the ink supply port 111 and the chip 13 are better fixed while stable fixation of the ink cartridge is implemented. Specifically, the latching portion 15 is located in a middle part of the fourth plane 1d of the ink cartridge in the Z-axis direction, and the engagement portion 122 is located in an upper part of the third plane 1c in the Z-axis direction. In this case, during movement of

the lever body 31 and the lever opening 33, the ink cartridge does not tend to rotate due to a force provided by flowing air in the Y-axis direction, thereby preventing the ink cartridge from shaking around a center spin axis that is perpendicular to the YZ plane.

[0068] In a seventh embodiment of the present invention, a guiding rib 311 is disposed on the lever body 31, the guiding surface 1242 of the ink cartridge is attached to an inner surface of the guiding rib 311, and the compression surface 1241 of the ink cartridge is in contact with the lever body 31, and drives the lever body 31 to rotate around the rotating shaft 32. In a process of installing the ink cartridge onto the ink cartridge holder, the guiding rib 311 is used for guiding. Further, the guiding surface 1242 moves in attachment to the inner surface of the guiding rib 311. It is understood by a person skilled in the art that, a guiding process of the guiding surface 1242 and the guiding rib 311 is earlier than engagement of the engagement portion 122 to the lever opening 33, so that the ink cartridge is guided before positioned, thereby implementing precise positioning of the ink cartridge and preventing installing the ink cartridge at an incorrect position. Further, the compression surface 1241 of the ink cartridge is in contact with the lever body 31, and drives the lever body 31 to rotate around the rotating shaft 32.

[0069] Further, as shown in FIG. 9, the rotating shaft 32 is located at a position adjacent to a middle part of the lever body 31 in Z-axis direction. Preferably, the rotating shaft 32 and the lever body 31 are an integral structure, and the lever opening 33 is located above the lever body 31 in the +Z-axis direction. The lever body 31 is further provided with guiding ribs 311. Two guiding ribs 311 are separately disposed on the lever body 31 in the -Z-axis and +Y-axis directions and in the -Z-axis and +Y-axis directions. The guiding ribs 311 protrude from the lever body 31, and a part of the lever body 31 located between the two guiding ribs forms an inner surface. In the process of installing the ink cartridge, the compression surface 141 is in contact with the inner surface of the lever body 31.

[0070] In an eighth embodiment of the present invention, with reference to FIG. 5 and FIG. 8, the ink cartridge holder 3 further includes a slot 34, and the slot 34 and the latching portion 15 of the ink cartridge are engaged with each other. Specifically, the slot 34 is a concave slot, and the shape of the latching portion 15 of the ink cartridge is appropriate to a hollow portion in a concave surface of the slot 34. In such an embodiment, a side of the ink cartridge having the latching portion 15 is fixed first, and the ink cartridge is fixed to the ink cartridge holder 3 by means of a connection between the engagement portion 122 and the lever opening 33.

[0071] In a preferred embodiment, the latching portion 15 may be a cone, and the slot 34 is correspondingly set to a shape that is appropriate to the size and shape of the cone. In another preferred embodiment, the latching portion 15 may be a long-strip object. In such an embodiment, the slot 34 is correspondingly set to a shape that is appropriate to the size and shape of the long-strip object. In other special variations, between the ink cartridge and the ink cartridge holder 3, a connection that is opposite to the connection between the engagement portion and the lever opening is not merely limited to the connection of the latching portion and the slot. However, currently, this belongs to the prior art, and details are not described herein.

[0072] FIG. 11 is a schematic flowchart of installing an ink cartridge according to a fourth specific implementation of the present invention. Specifically, the process is described with reference to FIG. 4 to FIG. 9, and includes the following steps:

[0073] First, step S101 is performed. The latching portion 15 of the ink cartridge is jointed into the slot 34 on the ink cartridge holder 3. It is understood by a person skilled in the art that, one end of the ink cartridge needs to be tightly fixed to the ink cartridge holder 3, and further, the ink cartridge is controlled by operating the other end of the ink cartridge. In such an embodiment, the latching portion 15 is disposed on the ink cartridge, the corresponding slot 34 is disposed on the ink cartridge holder 3, and the latching portion 15 and the slot 34 should be located on a same horizontal line during the installation. Buckling of the latching portion 15 of the ink cartridge with the slot 34 on the ink cartridge holder should neither be excessively loose nor be excessively tight. Excessively loose jointing causes infirm fixation of the ink cartridge, and excessive tight jointing makes it difficult to take out the ink cartridge.

[0074] Subsequently, step S102 is performed. The second plane 1b of the ink cartridge is pressed, and the ink cartridge gradually compresses the ink cartridge holder 3. After the step S101 is performed, the other end of the ink cartridge is not fixed. It is understood by a person skilled in the art that, the stylus is disposed on at a lower end of the ink cartridge holder 3 on a side adjacent to the lever body 31. The stylus can cause the ink cartridge to be in an inclined state when the stylus is at ease. Further, under the action of an external force, the ink cartridge gradually compresses the ink cartridge holder.

[0075] Finally, step S103 is performed. The lever opening 33 on the ink cartridge holder and the engagement portion 122 in the ink cartridge are engaged with each other. The lever opening 33 is disposed on the ink cartridge holder, and the engagement portion 122 is disposed on the ink cartridge. After the step S102 is performed, the ink cartridge gradually compresses the ink cartridge holder. At a critical point, the lever opening 33 and the engagement portion 122 are engaged with each other, and the ink cartridge is tightly fixed by means of a connection between left and right sides of the ink cartridge and the ink cartridge holder.

[0076] In a preferred embodiment, before the step S101, the protective cover 16 is preferably removed from the ink cartridge, so that the protective cover is separated from the ink cartridge. Further, the ink cartridge is moved

to the ink cartridge holder.

[0077] FIG. 12 is a schematic flowchart of installing an ink cartridge having a guiding portion according to a preferred embodiment. It is understood by a person skilled in the art that FIG. 12 is a preferred implementation solution based on the fourth specific implementation of the present invention. Further, FIG. 12 is merely a schematic flowchart of mutual engagement of the guiding portion 124 and the lever body 31. In a specific process of installing the ink cartridge, it does not represent that the process includes only the steps in FIG. 11. It is understood by a person skilled in the art that, in this embodiment, a whole installation process of the ink cartridge may be implemented with reference to the fourth specific implementation, and details are not described herein.

[0078] First, step S1021 is performed. The guiding surface 1242 of the ink cartridge is in contact with the guiding rib 311 of the ink cartridge holder, and starts guiding. The guiding surface 1242 of the ink cartridge is attached to the inner surface of the guiding rib 311. This step is performed, and the guiding surface 1242 is attached to the guiding rib 311, to provide correct guiding and prevent installing the ink cartridge at an incorrect position.

[0079] Subsequently, step S1022 is performed. The second plane 1b is pressed. The compression surface 1241 of the ink cartridge is in contact with the lever body 31, and compresses the lever body 31 to rotate around the rotating shaft 32. This step is performed to cause the lever body 31 to deflect by pressing the second plane 1b, and the lever opening 33 is further caused to move and approach the engagement portion 122.

[0080] The rotating shaft 32 is fixed on the ink cartridge holder 3. Under the action of an external force, the ink cartridge compresses the lever body 31, and the lever body 31 rotates, and drives the lever opening 33 to deflect.

[0081] Finally, step S1023 is performed. The lever opening 33 of the lever body approaches the engagement portion 122 of the ink cartridge. It is understood by a person skilled in the art that, in the process of installing the ink cartridge, the ink cartridge is horizontally placed inside the ink cartridge holder 3. The second plane 1b is pressed. The guiding portion 124 of the ink cartridge starts guiding. The compression surface 1241 of the ink cartridge compresses the lever body 31, so that the lever body 31 rotates counterclockwise in the XZ plane. During the rotation, the lever body 31 drives the lever opening 33 to perform similar circular motion. Specifically, when the lever body 31 rotates, the lever opening 33 moves towards the +Z-axis and -X-axis directions, and approaches the engagement portion 122 during the movement. Finally, the lever opening 33 is snap-fitted on the engagement portion 122. During the foregoing movement, the engagement portion 122 moves towards the -Z-axis and +X-axis directions at the same time. When the lever opening 33 and the engagement portion 122 are located on a same horizontal plane, the lever opening 33 is also exactly snap-fitted on the engagement portion 122.

[0082] Furthermore, it is understood by a person skilled in the art that, in a process of taking out the ink cartridge, the operation portion 121 is pushed first, so that the operation portion 121 moves in the +Z-axis and -X-axis directions. In this process, because the operation portion 121 is connected to the engagement portion 122 by using the support rib 125, the engagement portion 122 also moves towards the +Z-axis and -X-axis directions. At the same time, a direction of a force applied by the compression surface 1241 to the lever body 31 is exactly contrary to that of a force applied during installation. Therefore, the lever body 31 rotates clockwise in the XZ plane. When the lever body 31 rotates, the lever opening 33 moves towards the -Z-axis and +X-axis directions. In this case, a movement direction of the engagement portion 122 is exactly contrary to that of the lever opening 33. The engagement portion 122 is finally separated from the lever opening 33, and then the ink cartridge is taken out in the +Z-axis direction.

[0083] The foregoing describes the specific embodiments of the present invention. It should be understood that, the present invention is not limited the foregoing particular implementations, and a person skilled in the art may make various variations or modifications within the scope of the claims, which do not affect essential content of the present invention.

Claims

1. An ink cartridge, wherein the ink cartridge comprises at least a housing (11) and a handle (12), and the housing (11) comprises an ink supply port (111), wherein
   a plane in which the ink supply port (111) is located is a first plane (1a), and another plane opposite to the first plane is a second plane (1b);
   a direction along a longer side on the first plane is an X-axis;
   a direction along a shorter side on the first plane is a Y-axis; and
   an axis that is perpendicular to both the X-axis and the Y-axis is a Z-axis, wherein
   the handle (12) comprises: an operation portion (121), an engagement portion (122), and a support portion (123) that are disposed in sequence in a Z-axis direction, and a distance from the engagement portion (122) to the support portion (123) and a distance from the operation portion (121) to the support portion (123) should meet the following formula:

$$2/3t < d < t,$$

   wherein t is the distance from the operation portion (121) to the support portion (123) in the Z-axis direc-

tion, and d is the distance from the engagement portion (122) to the support portion (123) in the Z-axis direction.

2. The ink cartridge according to claim 1, wherein the ink cartridge further comprises a chip (13), a direction in which the ink supply port (111) faces towards the chip (13) is a +X-axis direction, and a direction in which the first plane (1a) faces towards the second plane (1b) is a +Z-axis direction, wherein
a surface of the housing (11) on a -X-axis side is a fourth plane (1d), and a surface opposite to the fourth plane (1d) is a third plane (1c);
an inclined area (14) connecting the third plane (1c) and the first plane (1a) is disposed in -Z-axis and +X-axis directions of the third plane (1c); and
the handle (12) is located on a +X-axis side of the housing (11), and is disposed on the inclined area (14), wherein the handle (12) comprises the support portion (123), the operation portion (121), and the engagement portion (122) in sequence in the +Z-axis direction, and the operation portion (121) and the engagement portion (122) extend towards the +X-axis and +Z-axis directions relative to the support portion (123).

3. The ink cartridge according to claim 1 or 2, wherein the handle (12) further comprises a guiding portion (124), wherein the guiding portion (124) is disposed in the +X-axis direction of the support portion (123), and the guiding portion (124) is located in the -Z-axis direction of the engagement portion (122).

4. The ink cartridge according to claim 3, wherein at least one guiding surface (1242) extending towards the +X-axis direction is disposed in a Y-axis direction of the guiding portion (124), at least one compression surface (1241) extending towards the Y-axis direction is disposed in the +X-axis direction of the guiding surface (1242), and the compression surface (1241) is connected to the guiding surface (1242).

5. The ink cartridge according to claim 4, wherein the compression surface (1241) is any one of the following structures:

two or more strip areas that are disposed in parallel;
a plane;
a plane inclined at an angle to the handle;
a serrated area;
a wavy area; or
an irregularly shaped area.

6. The ink cartridge according to any one of claims 1 to 5, wherein the handle further comprises a support rib (125), the support rib (125) is disposed between the operation portion (121) and the engagement portion (122) in the Z-axis direction, and the support rib (125) is connected to the operation portion (121) and the engagement portion (122) separately.

7. The ink cartridge according to claim 6, wherein an outer edge of the support rib (125) retreats into outer edges of the operation portion (121) and the engagement portion (122).

8. The ink cartridge according to claim 7, wherein an upper part of the engagement portion (122) is connected to the support rib (125), and the engagement portion (122) is neither connected to the operation portion (121) nor connected to the support portion (123).

9. The ink cartridge according to any one of claims 1 to 8, wherein the handle (12) is capable of deflecting by using an end of the support portion (123) in the -Z-axis direction as a shaft, and a deflection angle meets the following formula: $-25° < a < 25°$, wherein a is the deflection angle.

10. The ink cartridge according to any one of claims 1 to 9, wherein the support portion (123) is bent and extends in the +Z-axis and +X-axis directions to form a first extension portion (1231), the first extension portion (1231) is bent and extends again in the +Z-axis and +X-axis directions to form a second extension portion (1232), and the operation portion (121) and the engagement portion (122) are disposed on a combination of the first extension portion (1231) and the second extension portion (1232).

11. The ink cartridge according to claim 10, wherein an acute angle a1 formed between the first extension portion (1231) and the support portion (123) is between 16° and 36°, and an acute angle a2 formed between the second extension portion (1232) and the first extension portion (1231) is between 39° and 69°.

12. The ink cartridge according to claim 11, wherein the ink cartridge further comprises a protective cover (16), the protective cover (16) has a restriction portion (163) on the +X-axis side, and the housing (11) has a restricted portion (163'); and when the protective cover (16) is installed on the housing (11), the restriction portion (163) and the restricted portion (163') are jointed to each other, and the restriction portion (163) and the restricted portion (163') are located between the ink supply port (111) and the chip (13).

13. An ink cartridge with a replaceable portion, comprising the ink cartridge according to any one of claims 1 to 12, wherein the ink cartridge further comprises a replaceable portion (2), the replaceable portion (2)

is detachably connected to the housing (11), and the replaceable portion (2) is located in a -X-axis direction of the third plane and in the +Z-axis direction of the first plane; and the handle (12) and the chip (13) are disposed on the replaceable portion (2).

14. An ink cartridge connected to an ink cartridge holder, comprising the ink cartridge according to any one of claims 1 to 13, wherein the ink cartridge is connected to an ink cartridge holder (3), the ink cartridge holder (3) is disposed in a printer, and the engagement portion (122) and the ink cartridge holder (3) are engaged with each other, wherein the ink cartridge holder (3) comprises at least a lever body (31), a rotating shaft (32), and a lever opening (33), the engagement portion (122) and the lever opening (33) are engaged with each other, and a sectional area of the engagement portion (122) is less than or equal to a sectional area of the lever opening (33).

15. The ink cartridge according to claim 14, wherein at least one guiding rib (311) is disposed on the lever body (31), the guiding surface (1242) of the ink cartridge is attached to the guiding rib (311), and the compression surface (1241) of the ink cartridge is in contact with the lever body (31), and drives the lever body (31) to rotate around the rotating shaft (32).

16. The ink cartridge according to claim 14 or 15, wherein the ink cartridge holder (3) further comprises a slot (34), and the slot (34) and a latching portion (15) of the ink cartridge are engaged with each other.

17. A method for installing an ink cartridge, used to fix the ink cartridge to an ink cartridge holder, and comprising the following steps:

a. jointing a latching portion (15) of the ink cartridge into a slot (34) on the ink cartridge holder;
b. pressing a second plane (1b) of the ink cartridge, so that the ink cartridge gradually compresses the ink cartridge holder; and
c. engaging a lever opening (33) on the ink cartridge holder with an engagement portion (122) in the ink cartridge.

18. The method according to claim 17, wherein the step b further comprises the following steps:

b1. causing a guiding surface (1242) of the ink cartridge to come into contact with a guiding rib (311) of the ink cartridge holder, and to start guiding;
b2. pressing the second plane (1b), so that a compression surface (1241) of the ink cartridge is in contact with a lever body (31), and compresses the lever body (31) to rotate around a rotating shaft (32); and
b3. causing a lever opening (33) of the lever body (31) to approach the engagement portion (122) of the ink cartridge.

19. The method according to claim 17 or 18, wherein before the step a, the method further comprises step a': removing a protective cover from the ink cartridge, and moving the ink cartridge to the ink cartridge holder.

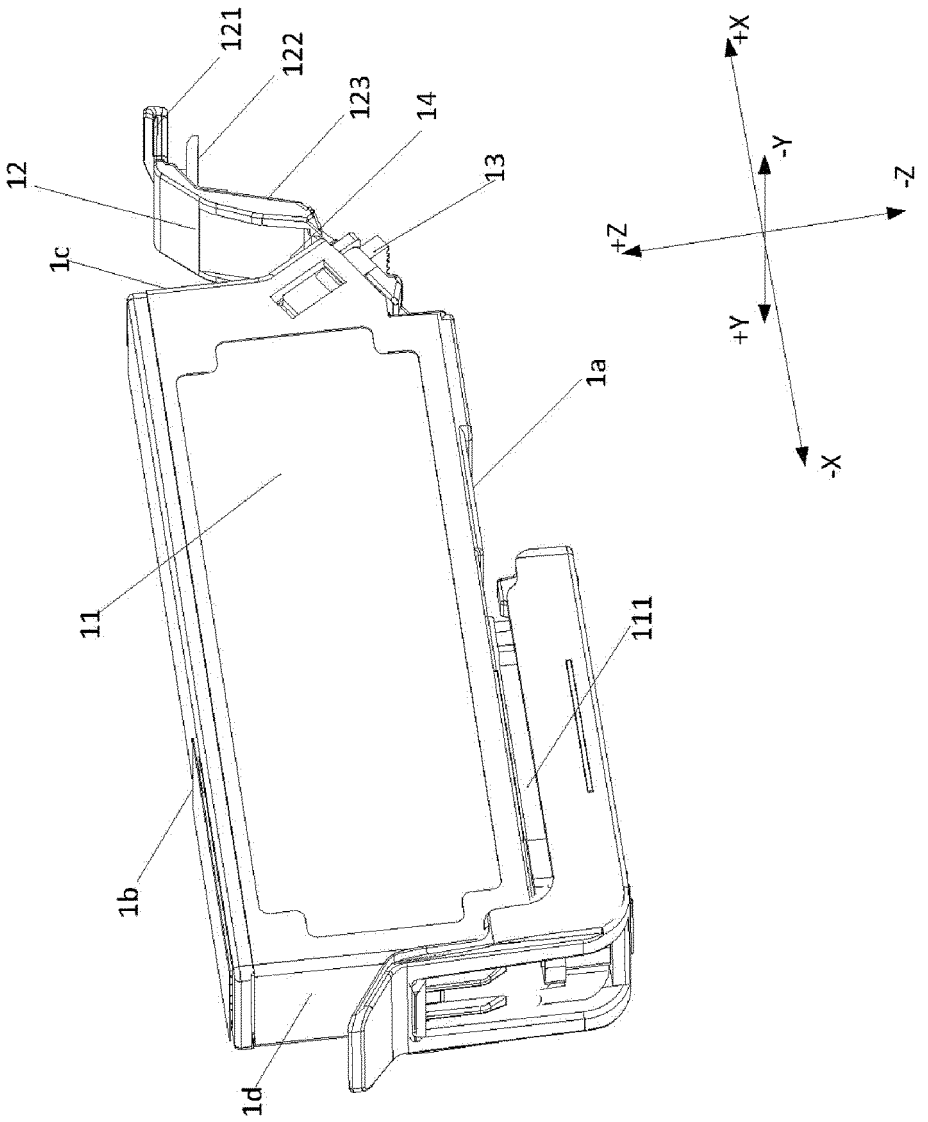
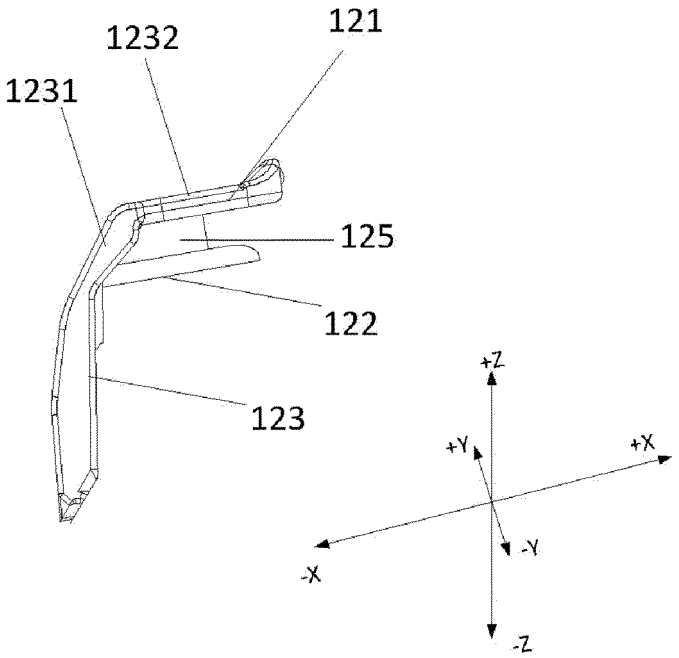


FIG. 1


1232
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122
123
+Z
+Y
+X
-Y
-X
-Z

FIG. 2

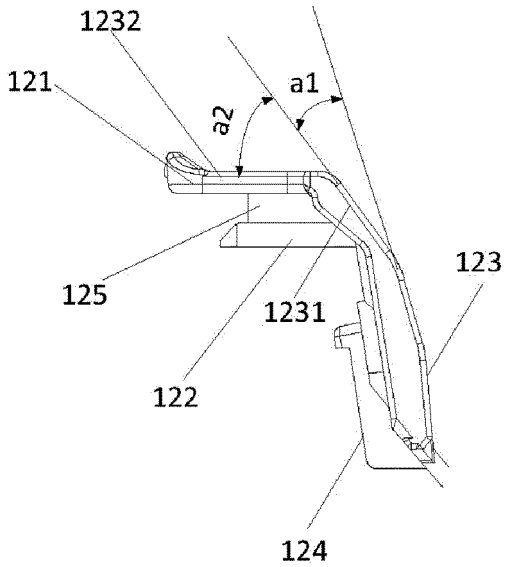
1232
121
a1
a2
125
123
1231
122
124

FIG. 3

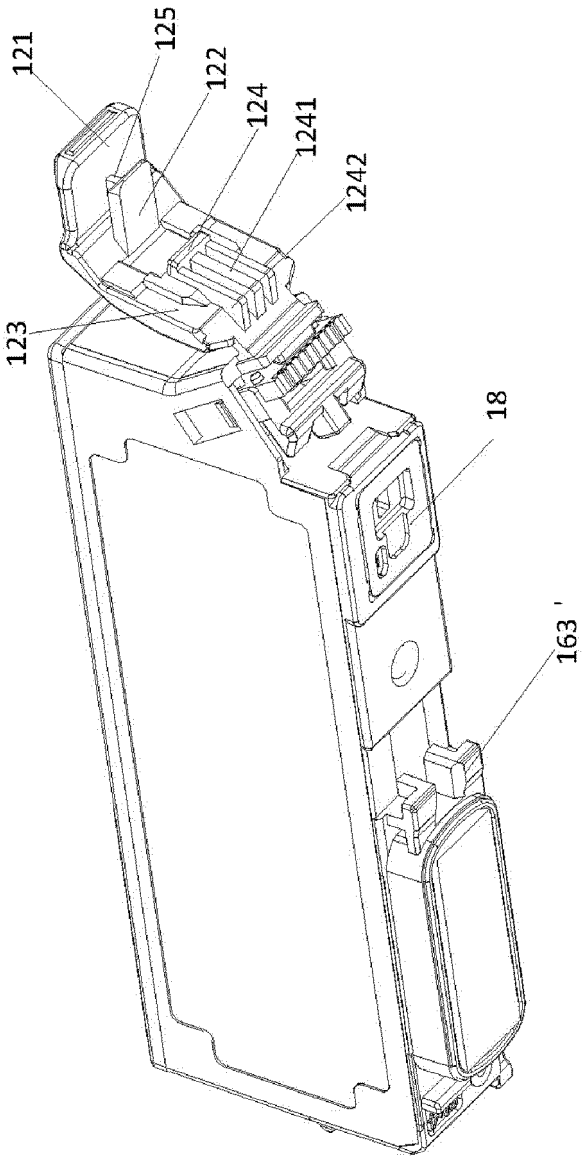

FIG. 4

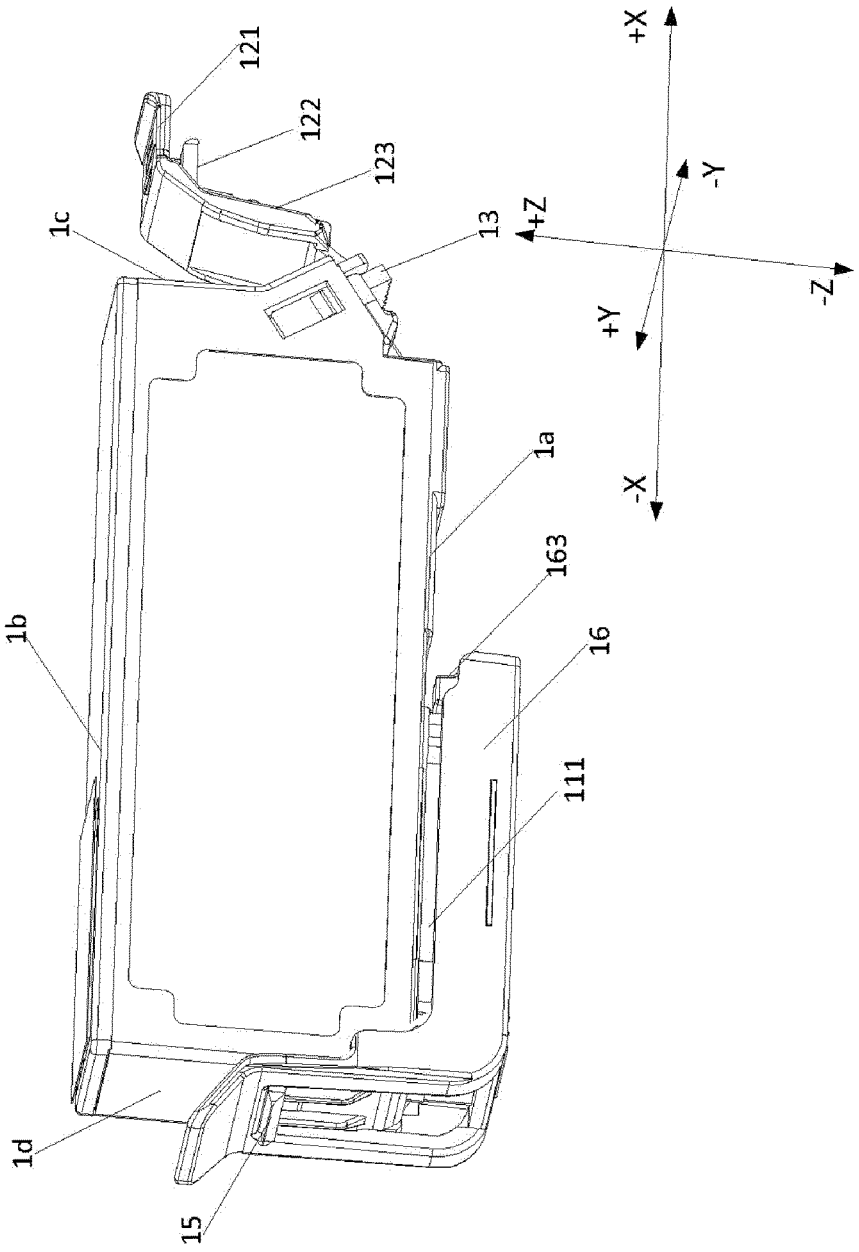

FIG. 5

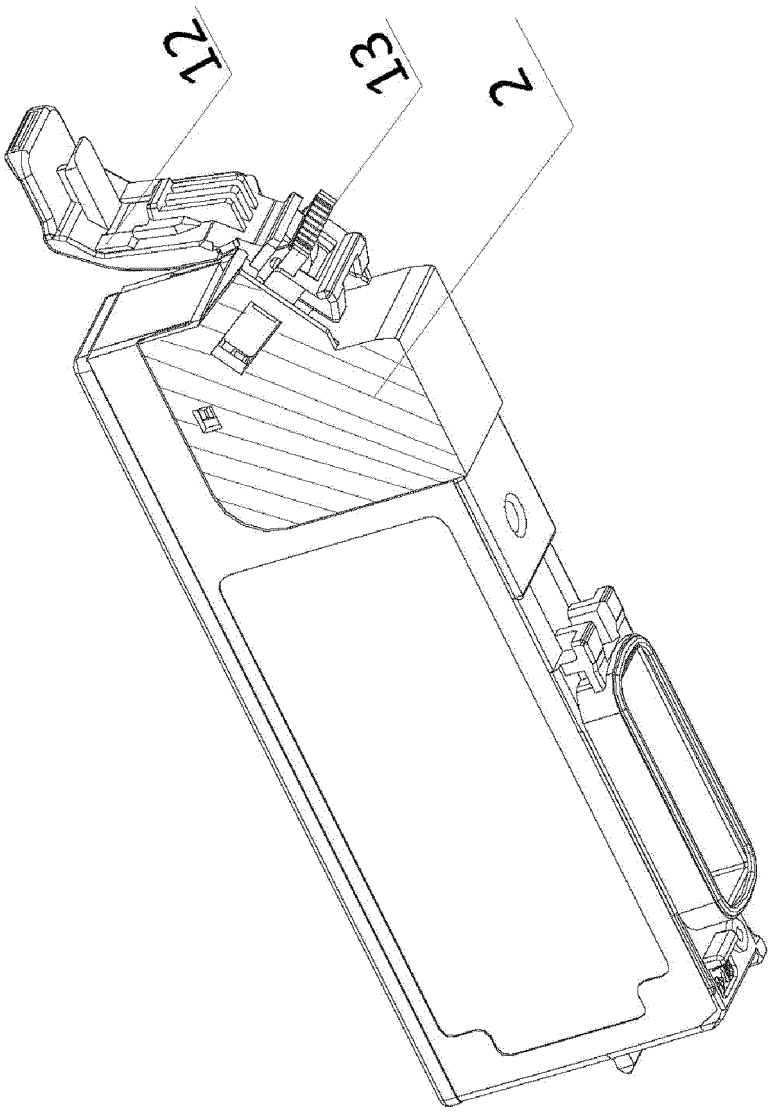

FIG. 6

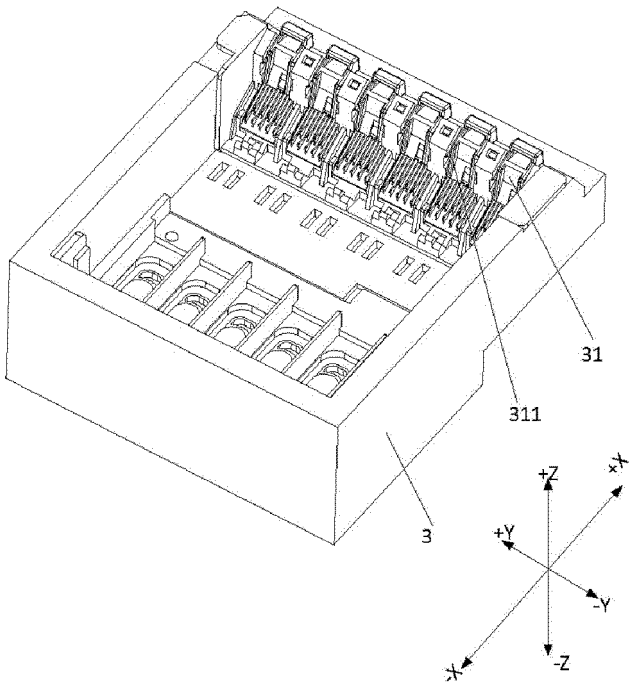

FIG. 7

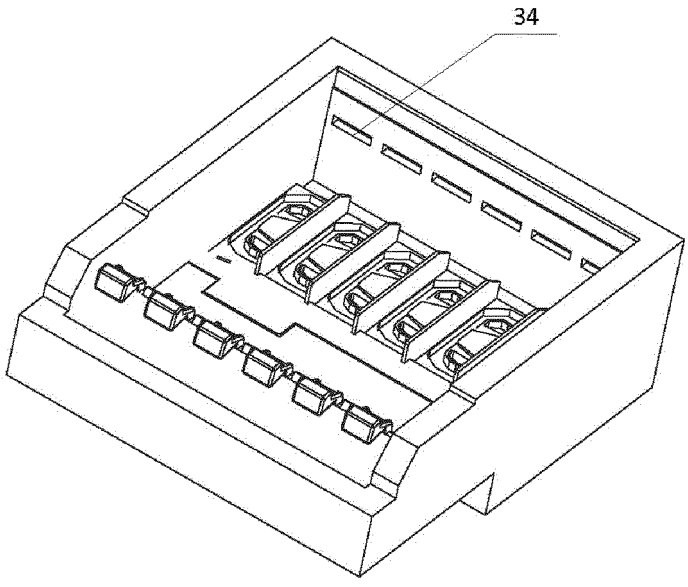

FIG. 8

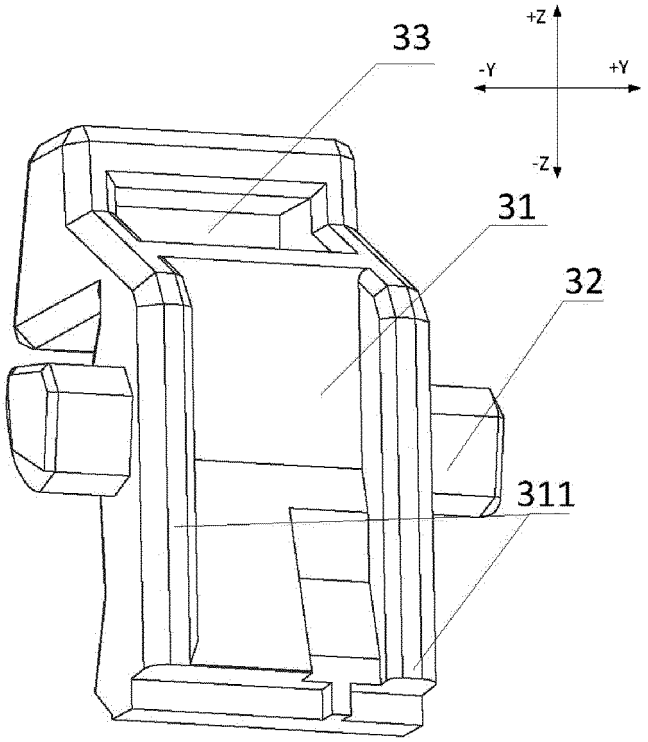

FIG. 9

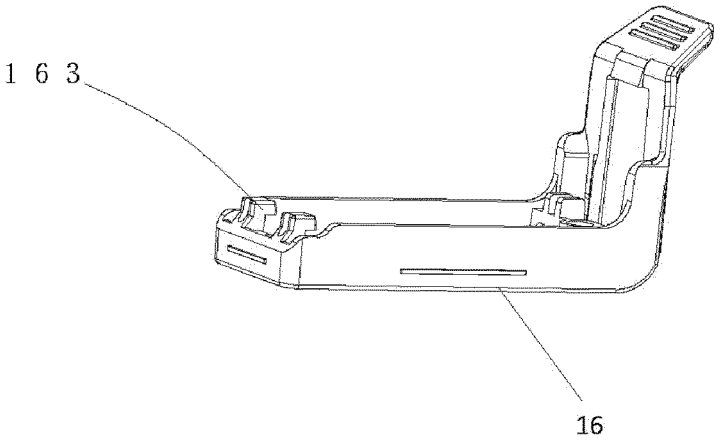

FIG. 10

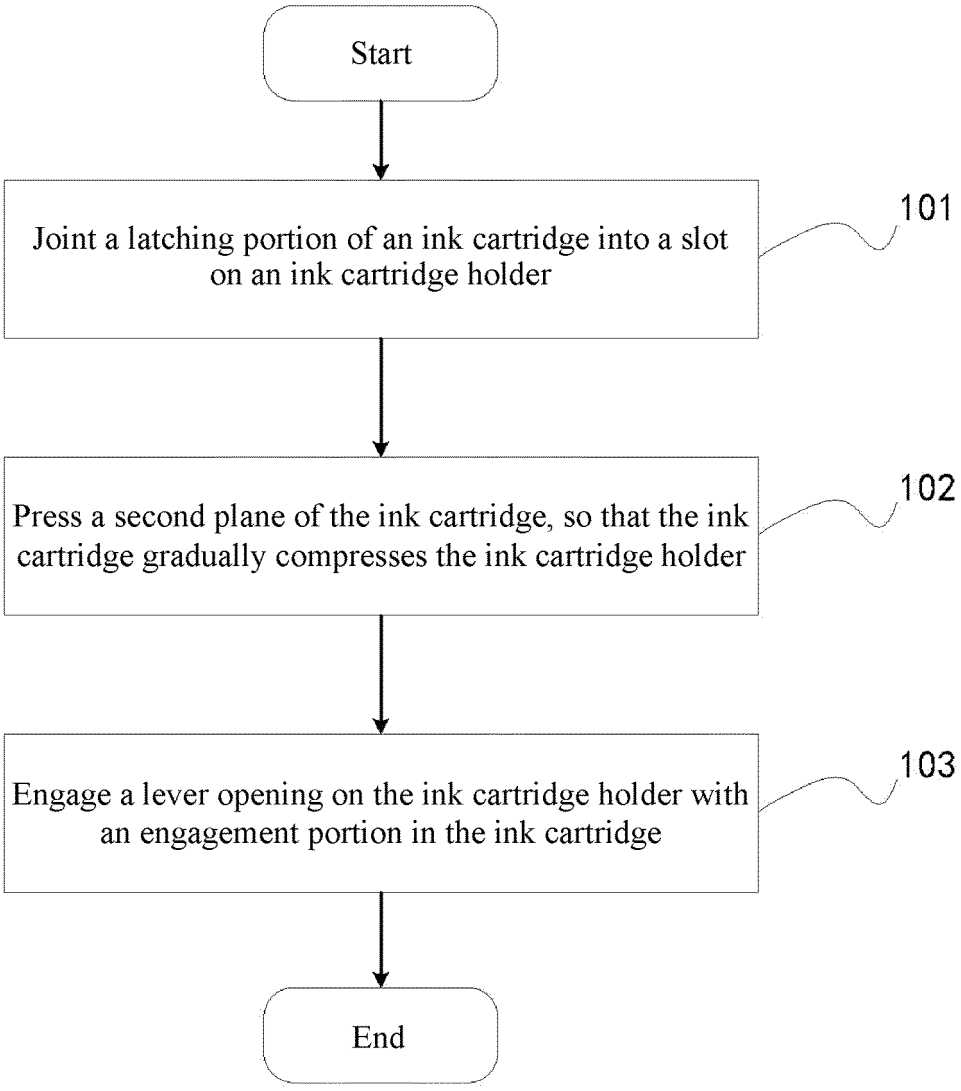
Start
Joint a latching portion of an ink cartridge into a slot on an ink cartridge holder
101
Press a second plane of the ink cartridge, so that the ink cartridge gradually compresses the ink cartridge holder
102
Engage a lever opening on the ink cartridge holder with an engagement portion in the ink cartridge
103
End

FIG. 11

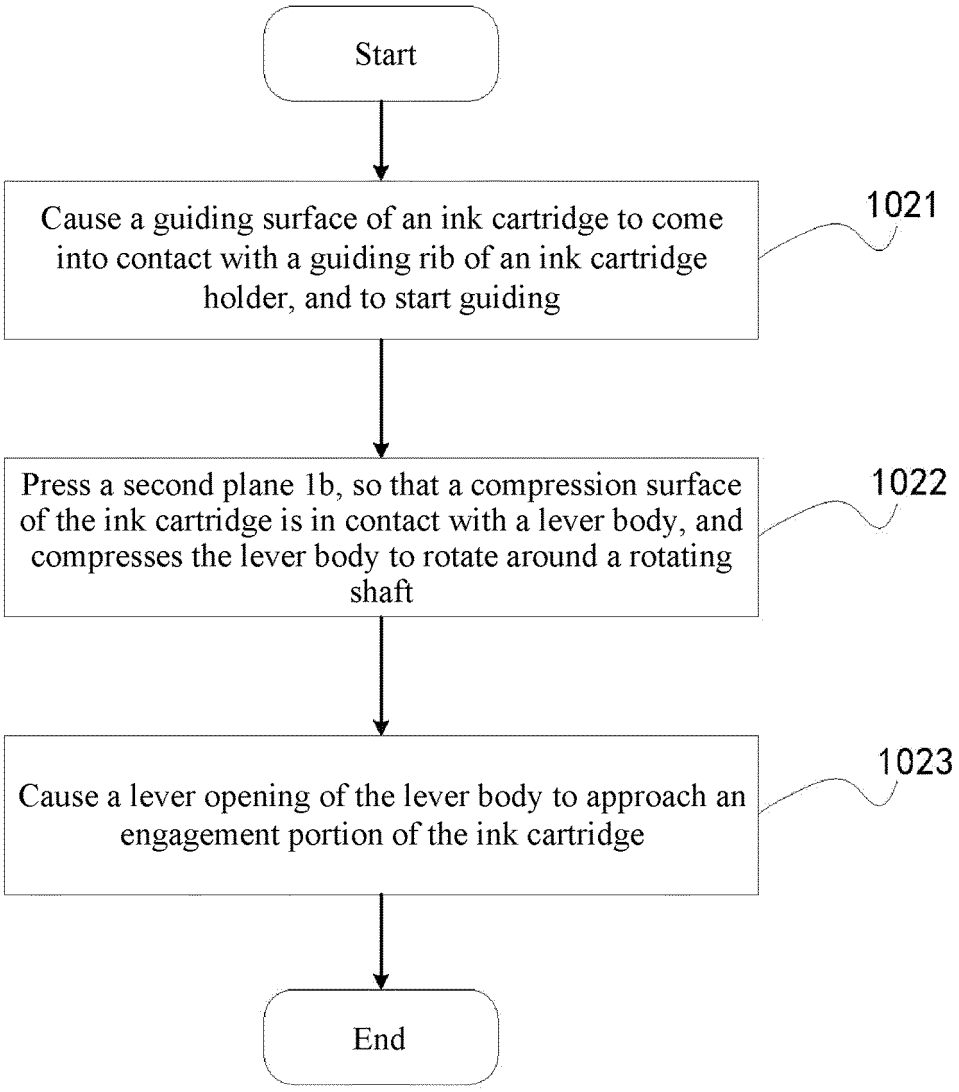
Start
Cause a guiding surface of an ink cartridge to come into contact with a guiding rib of an ink cartridge holder, and to start guiding
1021
Press a second plane 1b, so that a compression surface of the ink cartridge is in contact with a lever body, and compresses the lever body to rotate around a rotating shaft
1022
Cause a lever opening of the lever body to approach an engagement portion of the ink cartridge
1023
End

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/095774

A. CLASSIFICATION OF SUBJECT MATTER

B41J 2/175 (2006.01) i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B41J

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)

CNPAT, EPODOC, WPI, CNKI: NINESTAR, jia jingzheng, qiu yongqun, ma haoming, zhu yijing, printer, printing machine, printing device, joint, install, ink w cartridge, handle, handlebar, handgrip, distance, interval, spacing, install, hold, lever, leverage

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 1294053 A (LEXMARK INTERNATIONAL INC.) 09 May 2001 (09.05.2001) description, page 4, the sixth paragraph, page 5, the second paragraph and the fifth paragraph and figures	17, 19
A	CN 203864179 U (NINESTAR MANAGEMENT CO., LTD.) 08 October 2014 (08.10.2014) description, paragraphs [0032]-[0033], [0037] and figures 1-5	1-19
PX	CN 204955732 U (NINESTAR MANAGEMENT CO., LTD.) 13 January 2016 (13.01.2016) the whole document	1-16
A	CN 101890841 A (NINESTAR MANAGEMENT CO., LTD.) 24 November 2010 (24.11.2010) the whole document	1-19

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 October 2016	24 October 2016
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer YUAN, Renyuan Telephone No. (86-10) 01062413033

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/095774

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2015047382 A1 (HEWLETT-PACKARD DEVELOPMENT COMPANY, L. P.) 02 April 2015 (02.04.2015) the whole document	1-19
A	US 2002140778 A1 (BROTHER KOGYO KABUSHIKI KAISHA) 03 October 2002 (03.10.2002) the whole document	1-19
A	DE 202008018375 U1 (ARTECH G. M. B. H. DESIGN & PRODUCTION IN PLASTIC) 04 June 2013 (04.06.2013) the whole document	1-19

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/095774

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CN 204955732 U	13 February 2016	None	
CN 101890841 A	24 November 2010	None	
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		JP 3783585 B2	07 June 2006
		JP 2003053999 A	26 February 2003
DE 202008018375 U1	04 June 2013	None	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201510060960 **[0003]**