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(54) Ink cartridge assembled from body and channel-module

(57) An ink cartridge (200) is provided with a body (210), a channel module (220) attached to the body (210), a plurality of first engaging parts (230a to 230d), and a plurality of second engaging parts (240a to 240d). The first engaging parts are arranged on one of the body (210) and the channel module (220), while the second engaging parts corresponding to the first engaging parts are arranged on the other of the body (210) and the channel module (220). The relative position of the body (210) and the channel module (220) on a two-dimension plane is substantially fixed by the engagement of the first engaging parts (230a to 230d) and the second engaging parts (240a to 240d).

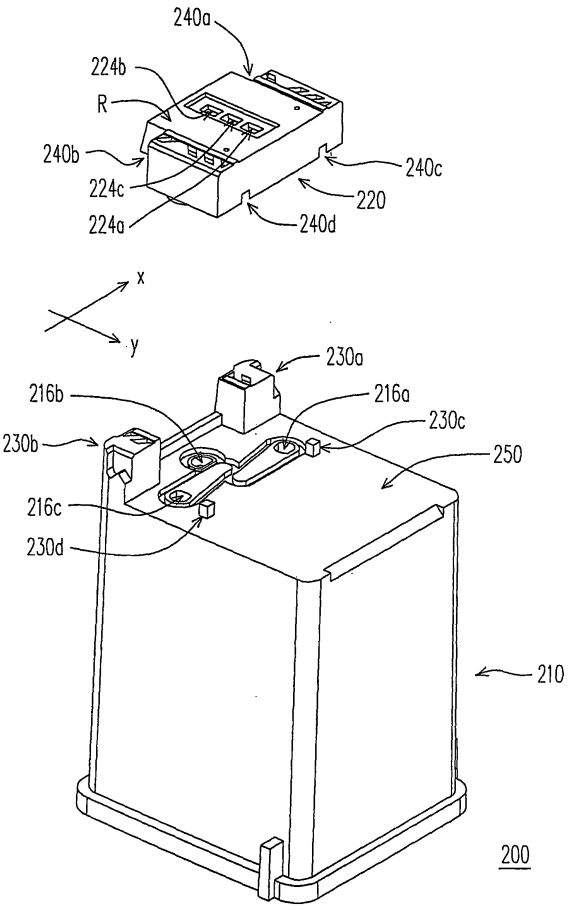

FIG. 2A

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an ink cartridge. More particularly, the present invention relates to an ink cartridge having flow channels fabricated separately by means of module and then assembled to the body.

Description of Related Art

[0002] Inkjet printing technique has been widely used in office equipment having the function of printing graphics. Inkjet printing technique mainly uses a high pressure produced by a printhead (inkjet chip) to push ink instantly. Ink drops are then jetted from the printhead onto a surface of a document so as to form ink dots which form graphics or texts on the surface of the document.

[0003] In order to supply ink to the printhead, the ink cartridge has an ink chamber for storing ink and a flow channel for guiding the ink in the ink chamber to the printhead. As for a single ink cartridge supplying multiple colors of ink, the ink of each color has an independent ink chamber and an independent flow channel.

[0004] One of the several methods of fabricating cartridges in the conventional arts is to integrate ink chambers and flow channels as a whole by molding, and then sealing one side of the flow channels with a cover plate. However, the mold design of the ink cartridge in such method will be more difficult, resulting in the increase of the fabricating cost of the ink cartridge. The method is disclosed in, for example, US Patent No. 5,497,178 and US Patent No. 6,811,250.

[0005] Therefore, the Taiwan Patent No. I259806 entitled "Ink Cartridge" has disclosed a technique of fabricating the ink chambers and the flow channels of the ink cartridge separately and then assembling them, which facilitates reducing the fabricating cost of the ink cartridge.

[0006] FIG. 1A is a perspective exploded view of a conventional ink cartridge obtained from one perspective view angle. FIG 1B is a perspective exploded view of the conventional ink cartridge of FIG. 1A obtained from another view angle. Referring to FIGs. 1A and 1B, the ink cartridge 100 includes a body 110 and a channel module 120. The body 110 has three ink chambers 112a, 112b, and 112c and three ink delivery ports 116a, 116b, and 116c. The ink delivery ports 116a, 116b, and 116c are located at the bottom of the body 110, and the ink chambers 112a, 112b, and 112c respectively fluidly communicate with the ink delivery ports 116a, 116b, and 116c, so that the ink in the ink chambers 112a, 112b, and 112c is supplied to the channel module 120.

[0007] The channel module 120 has three flow channels 122a, 122b, and 122c. The ink chambers 112a, 112b, and 112c respectively fluidly communicate to the flow channels 122a, 122b, and 122c by the ink delivery ports 116a, 116b, and 116c on the bottom. The flow channels 122a, 122b, and 122c further respectively have three ink supply ports 124a, 124b, and 124c in a chip bonding area R, such that the ink is output to the printhead (inkjet chip) on the chip bonding area R.

[0008] The channel module 120 is attached to the bottom of the body 110 by means of ultrasonic welding, laser welding, or adhesive coating. No matter before or after the attaching, in order to locate the channel module 120 onto the bottom of the body 110, two blocks 118a and 118b of the body 110 are respectively engaged with two indentations 128a and 128b of the channel module 120, such that the channel module 120 is located at the bottom of the body 110.

[0009] However, by using the blocks 118a and 118b and the indentations 128a and 128b to locate the body 110 and the channel module 120, only one side (adjacent to the left side of FIG. 1B, or referred to as the front end of the channel module 120) of the channel module 120 can be located, and the other side of the channel module 120 (adjacent to the right side of FIG. 1B, or referred to as the back end of the channel module 120) can move or swing. Therefore, whether the location is accurate after assembling has to be inspected by a measurement tool with at least a two-dimensional level. If the swing is serious, the attachment between the channel module 120 and the body 110 is poor. Therefore, in order to prevent the swing of the channel module 120, one method is to fit the blocks 118a and 118b with the indentations 128a and 128b by means of an interference fit.

[0010] However, when the blocks 118a and 118b and the indentations 128a and 128b are fitted by means of such interference, stress will be concentrated on a junction between the blocks 118a and 118b and the indentations 128a and 128b. If an ultrasonic welding method is used to attach the channel module 120 to the body 110, the ultrasonic energy will be concentrated at the position where stress is concentrated, so the yield of attachment between the channel module 120 and the body 110 is reduced.

SUMMARY OF THE INVENTION

[0011] The present invention is directed to an ink cartridge for enhancing the production yield.

[0012] The present invention is also directed to an ink cartridge for enhancing the flexibility in arrangement of the ink chambers.

[0013] The present invention is also directed to an ink cartridge for conveniently locating the channel module of the ink cartridge to the body of the ink cartridge.

[0014] The objectives and advantages of the present invention can be further understood from the technical features disclosed by the present invention.

[0015] As embodied and broadly described herein, an ink cartridge including a body, a channel module, first

engaging parts, and second engaging parts is provided. The body has ink chambers. The channel module is attached to the body. The first engaging parts are arranged on one of the body and the channel module. The second engaging parts corresponding to the first engaging parts are arranged on the other of the body and the channel module. The relative position of the body and the channel module on a two-dimension plane is substantially fixed by the engagement of the first engaging parts and the second engaging parts.

[0016] As embodied and broadly described herein, an ink cartridge including a body and a channel module is provided. The body has ink chambers and ink delivery ports. The ink delivery ports are located at a bottom of the body, and the ink chambers respectively fluidly communicate with the ink delivery ports. The channel module has a base attached to the bottom of the body and an uplift portion protruding from the base, and has a chip bonding area located on the uplift portion, ink supply ports located on the chip bonding area, and flow channels respectively fluidly communicating the ink delivery ports with the ink supply ports. The base has a base surface, and the uplift portion has a side surface connecting the base surface and the chip bonding area. The angle between the side surface and the base surface is between 90 degrees and 135 degrees.

[0017] According to the present invention, the relative position of the body and the channel module on a two-dimension plane is fixed by means of engagement, so as to ensure the relative location when and after the channel module is attached to the body. Moreover, in the present invention, the horizontal section of some flow channels extends from the chip bonding area to an area outside the chip bonding area, so as to enhance the flexibility in arrangement of the ink chambers.

[0018] In order to obtain the aforementioned and other objectives, features and advantages of the present invention, comprehensible embodiments accompanied with figures are described in detail below.

[0019] It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0021] FIG 1A is a perspective exploded view of a conventional ink cartridge obtained from one view angle.

[0022] FIG 1B is a perspective exploded view of the ink cartridge of FIG 1A obtained from another view angle.

[0023] FIG. 2A is a perspective exploded view an ink cartridge according to a first embodiment of the present invention obtained from one view angle.

[0024] FIG 2B is a perspective exploded view of the ink cartridge of FIG 2A obtained from another view angle.

[0025] FIG 3A is a perspective exploded view of an ink cartridge according to a second embodiment of the present invention obtained from one view angle.

[0026] FIG 3B is a perspective exploded view of the ink cartridge of FIG 3A obtained from another view angle.

[0027] FIG 4A is a perspective exploded view of an ink cartridge according to a third embodiment of the present invention obtained from one view angle.

[0028] FIG 4B is a perspective exploded view of the ink cartridge of FIG 4A obtained from another view angle.

[0029] FIG 5A is a schematic view of a profile of the channel module in FIG 4A.

[0030] FIG 5B is a schematic view of a profile of a channel module according to a fourth embodiment of the present invention.

[0031] FIG 5C is a schematic view of a profile of a channel module according to a fifth embodiment of the present invention.

[0032] FIG 6 is a perspective exploded view of an ink cartridge according to a sixth embodiment of the present invention.

[0033] FIG 7 is a perspective exploded view of an ink cartridge according to a seventh embodiment of the present invention.

[0034] FIG 8 is a perspective exploded view of an ink cartridge according to an eighth embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0035] The following embodiments are illustrated with reference to the accompanied drawings, so as to illustrate the specific embodiments for implementing the present invention. The direction terms mentioned in the present invention such as "up", "down", "front", "back", "left" and "right" only refer to the directions in the accompanied drawings. Therefore, the direction terms are used for illustrating and not for limiting the present invention.

[0036] FIG 2A is a perspective exploded view of an ink cartridge according to a first embodiment of the present invention obtained from one view angle. FIG 2B is a perspective exploded view of the ink cartridge of FIG. 2A obtained from another view angle. Referring to FIGs. 2A and 2B, the ink cartridge 200 includes a body 210, a channel module 220, engaging parts 230a to 230d, and engaging parts 240a to 240d. In one embodiment, the body 210 is a hollow container constituted by a bottom 250 and four sidewalls substantially vertical to the bottom 250.

[0037] The body 210 has three ink chambers 212a to 212c and three ink delivery ports 216a to 216c. The ink delivery ports 216a to 216c are respectively located at a bottom 250 of the body 210, and the ink chambers 212a to 212c respectively fluidly communicate with the ink delivery ports 216a to 216c.

[0038] The channel module 220 has a chip bonding area R, three flow channels 222a to 222c, and three ink supply ports 224a to 224c. The ink supply ports 224a to 224c are located in the chip bonding area R, and the flow channels 222a to 222c respectively fluidly communicate ink delivery ports 216a to 216c with the ink supply ports 224a to 224c.

[0039] The engaging parts 230a to 230d are arranged on the body 210, for example, in the form of the four blocks or protrusions (the blocks and protrusions referred to as blocks in the present invention), and the engaging parts 240a to 240d are arranged on the channel module 220, for example, in the form of the four indentations or grooves or notches (the indentations or grooves or notches referred to as "indentations" in the present invention) as shown in FIG 2A. The relative position of the body 210 and the channel module 220 on a two-dimension plane on the surface of the bottom 250 is substantially fixed by the engagement of the engaging parts 230a to 230d and the engaging parts 240a to 240d. The two-dimension plane is a plane extended along the x-axis and γ-axis in FIGs. 2A and 2B. It should be noted that the term "fixed" in the description of "the relative position of the body and the channel module on a two-dimension plane on the surface of the bottom is substantially fixed" or the like in the embodiments of the present invention includes the meaning of locating the relative position between the channel module and the body.

[0040] Compared with the blocks 118a and 118b of the conventional ink cartridge 100 and the corresponding indentations 128a and 128b which can only restrict the channel module 120 from moving along the positive x-axis, negative x-axis, and negative y-axis relatively to the body 110, the engaging parts 230a to 230d and the engaging parts 240a to 240d of the first embodiment can restrict the channel module 220 from moving along the positive x-axis, negative x-axis, positive y-axis, and negative y-axis relatively to the body 210, and can also restrict the channel module 220 from rotating about the z-axis (orthogonal to the x-axis and y-axis) relatively to the body 210. In other words, not only a deviation of the channel module 220in x-axis and y-axis directions but also the rotation deviation about the z-axis (orthogonal to the x-axis and y-axis) can be prevented, when the channel module 220 is assembled on the body 210, by the engagement or cooperation of the engaging parts 230a to 230d and the engaging parts 240a to 240d.

[0041] Since the engaging parts 230a to 230d and the engaging parts 240a to 240d are used for locating the relative position between the channel module 220 and the body 210, the accuracy of orientation of the channel module 220 with respect to the body 210 can be improved. Therefore, when the channel module 220 is attached to the body 210, for example, by means of ultrasonic welding, the welding quality and yield can be enhanced because of the engagement of the engaging parts 230a to 230d and the engaging parts 240a to 240d. However, the method of fixing the channel module 220 onto the body 210 in the present embodiment is not limited to ultrasonic welding, other methods such as laser welding, or bonding by adhesive can also be used to fix the channel module 220 onto the body 210. The arrangement of engaging parts in the present invention can assist to locate the channel module 220 onto the body 210. Moreover, by respectively measuring the distance between the engaging parts 230a to 230d and the distance between the engaging parts 240a to 240d, an inspector or manufacturer can easily inspect whether the channel module 220 or body 210 is manufactured within an allowable tolerance before fixing the channel module 220 onto the body 210, thereby ensuring that the channel module 220 can be correctly fitted and located on the body 210.

[0042] The engaging parts 230a to 230d are blocks, and the engaging parts 240a to 240d are indentations. However, in the embodiments which are not shown, one or all of the engaging parts 230a to 230d is/are indentation(s), and the corresponding one or all of the engaging parts 240a to 240d is/are block(s). Moreover, in one embodiment, when the engaging parts 230a to 230b are blocks and are arranged at two corners on one side of the surface of the bottom 250 (as shown for example in FIG. 2A), the engaging parts 230a to 230b can be used as positioning blocks for positioning or locating the ink cartridge 200 when the ink cartridge 200 is mounted in a printer.

[0043] The ink cartridge having three ink chambers is taken as an example. However, it is known that it is not intended to limit the number of the ink chambers of the ink cartridge of the present invention, and persons skilled in the art can determine the number of the ink chambers, for example, two ink chambers or more than four ink chambers according to the spirit of the present invention.

[0044] FIG 3A is a perspective exploded view of an ink cartridge according to a second embodiment of the present invention obtained from one view angle. FIG 3B is a perspective exploded view of the ink cartridge of FIG 3A obtained from another view angle. Referring to FIGs. 3A and 3B, the ink cartridge 300 includes a body 310 and a channel module 320.

[0045] The body 310 has three ink chambers 312a to 312c and three ink delivery ports 316a to 316c. The ink delivery ports 316a to 316c are located at a bottom 350 of the body 310, and the ink chambers 312a to 312c respectively fluidly communicate with the ink delivery ports 316a to 316c.

[0046] The channel module 320 is attached to the bottom 350 of the body 310. The channel module 320 has a chip bonding area R, three flow channels 322a to 322c, and three ink supply ports 324a to 324c. The ink supply ports 324a to 324c are located in the chip bonding area R, and the flow channels 322a to 322c respectively fluidly communicate ink delivery ports 316a to 316c with the ink supply ports 324a to 324c.

[0047] The channel module 320 has a base 320a attached to the body 310, an uplift portion 320b protruding

from the base 320a. The chip bonding area R is formed on the uplift portion 320b. The base 320a has a base surface B. The uplift portion 320b has a side surface S connecting the base surface B and the chip bonding area R, and the angle A between the side surface S and the base surface B is between 90 degrees and 135 degrees.

[0048] A section of the flow channel 322a substantially parallel to the abovementioned two-dimension plane extends from the chip bonding area R to an area outside the chip bonding area R. Moreover, the ink supply ports 324a to 324c are arranged in sequence. In one embodiment, the extending direction of the section of the flow channel 322a is substantially parallel to the arrangement direction of the ink supply ports 324a to 324c in the y-axis direction shown in FIGs. 3A and 3B. In another embodiment, the angle between the extending direction of the section of the flow channel 322a and the arrangement direction of the ink supply ports 324a to 324c is greater than 0 degree (i.e. the extending direction of the section of the flow channel 322a is not substantially parallel to the arrangement direction of the ink supply ports 324a to 324c). In other words, the extending direction of the section of the flow channel 322a may be designed similar to that of a section of the flow channel 322b substantially parallel to the abovementioned two-dimension plane.

[0049] In one embodiment, the ink chambers 312a to 312c are arranged in sequence, and the extending direction of the section of the flow channel 322a is substantially parallel to the arrangement direction (y-axis direction) of the ink chambers 312a to 312c. In other embodiments, the extending direction of the section of the flow channel 322a is not required to be substantially parallel to the arrangement direction of the ink chambers 312a to 312c. In other words, the extending direction of the section of the flow channel 322a can be designed similar to that of a section of the flow channel 322b substantially parallel to the abovementioned two-dimension plane. Moreover, the ink chambers 312a to 312c are arranged in sequence, and the ink supply ports 324a to 324c are arranged in sequence, and the arrangement direction of the ink chambers 312a to 312c is substantially parallel to the arrangement direction of the ink supply ports 324a to 324c (y-axis direction).

[0050] The ink chambers 312a to 312c can be arranged along different directions by horizontally extending one, some, or all of the flow channels. Therefore, compared with the ink chambers 212a to 212c in FIGs. 2A and 2B, the ink chambers 312a to 312c in FIGs. 3A and 3B can accommodate a sponge with a larger width (in the y-axis direction), such that the ink is supplied normally. It is known to persons skilled in the art that it is allowed to extend one or more flow channels instead of one flow channel as required.

[0051] FIG 4A is a perspective exploded view of an ink cartridge according to a third embodiment of the present invention obtained from one view angle. FIG 4B is a perspective exploded view of the ink cartridge of the present invention in FIG 4A obtained from another view angle. The third embodiment is a combination of the first and second embodiments. The ink cartridge 400 includes a body 410, a channel module 420, engaging parts 430a to 430d, and engaging parts 440a to 440d.

[0052] The body 410 has three ink chambers 412a to 412c and three ink delivery ports 416a to 416c. The ink delivery ports 416a to 416c are respectively located at a bottom 450 of the body 410, and the ink chambers 412a to 412c respectively fluidly communicate with the ink delivery ports 416a to 416c.

[0053] The channel module 420 includes a chip bonding area R, three flow channels 422a to 422c, and three ink supply ports 424a to 424c. The ink supply ports 424a to 424c are located in the chip bonding area R, and the flow channels 422a to 422c respectively fluidly communicate ink delivery ports 416a to 416c with the ink supply ports 424a to 424c.

[0054] The channel module 420 further has a base 420a attached to the body 410 and an uplift portion 420b protruding from the base 420a. The chip bonding area R is formed on the uplift portion 420b. The base 420a has a base surface B. The uplift portion 420b has a side surface S connecting the base surface B and the chip bonding area R, and the angle A between the side surface S and the base surface B is between 90 degrees and 135 degrees.

[0055] The engaging parts 430a to 430d may be arranged on the body 410 in the form of four blocks as shown in FIG 4A, and the engaging parts 440a to 440d may be arranged on the channel module 420 in the form of four indentations as shown in FIG 4A. The relative position of the body 410 and the channel module 420 on a two-dimension plane is substantially fixed by the engagement of the engaging parts 430a to 430d and the engaging parts 440a to 440d. The two-dimension plane is a plane extended along the x-axis and y-axis in FIGs. 2A and 2B. By the engagement of the engaging parts 430a to 430d and the engaging parts 440a to 440d, the movement of the channel module 420 along the positive x-axis, negative x-axis, positive x-axis, and negative y-axis relatively to the body 410 can be restricted, and the rotation of the channel module 420 about the z-axis (orthogonal to the x-axis and y-axis) relatively to the body 410 can also be restricted. In other words, not only a deviation of the channel module 420 in x-axis and y-axis directions but also the rotation deviation about the z-axis (orthogonal to the x-axis and y-axis) can be prevented, when the channel module 420 is assembled onto the body 410 by the engagement or cooperation of engaging parts 430a to 430d and the engaging parts 440a to 440d.

[0056] In one embodiment, the engaging parts 430a to 430d are respectively arranged at the four corners on the surface of the bottom 450, as shown in FIG. 4A. The engaging parts 430a to 430d when arranged at two corners on the bottom 450 can provide protection for the channel module 420 fixed on the bottom 450, such that the damage to the channel module 420 or separation of the channel module 420 from the body 410, caused by

the collision of the channel module 420 when the ink cartridge 400 falls onto the floor, can be avoided.

[0057] Since the engaging part 430a to 430d and the engaging parts 440a to 440d are used for locating the relative position between the channel module 420 and the body 410, the accuracy of orientation of the channel module 420 with respect to the body 410 can be improved. Therefore, when the channel module 420 is attached to the body 410, for example, by means of ultrasonic welding, the welding quality and yield can be enhanced. However, the engaging method of fixing the channel module 420 onto the body 410 in the present embodiment is not limited to ultrasonic welding, other methods such as laser welding, or bonding by adhesive can also be used to fix the channel module 420 onto the body 410. The arrangement of engaging parts in the present invention can assist to locate the channel module 420 onto the body 410.

[0058] The engaging parts 430a to 430d are blocks, and the engaging parts 440a to 440d are indentations. However, in the embodiments which are not shown, one or all of the engaging parts 430a to 430d is/are indentation(s), and the corresponding one or all of the engaging parts 440a to 440d is/are block(s). Moreover, in one embodiment, when the engaging parts 430a to 430d are blocks and arranged at two corners on one side of the surface of the bottom 450 (as shown for example in FIG. 4A), the engaging parts 430a and 430b can be used as positioning blocks for positioning or locating the ink cartridge 400 when the ink cartridge 400 is mounted in a printer.

[0059] The section of the flow channel 422a substantially parallel to the abovementioned two-dimension plane extends from the chip bonding area R to an area outside the chip bonding area R. Moreover, the ink supply ports 424a to 424c are arranged in sequence, and the extending direction of the section of the flow channel 422a is substantially parallel to the arrangement direction of the ink supply ports 424a to 424c, i.e., in y-axis direction in FIGS. 4A and 4B.

[0060] The ink chambers 412a to 412c are arranged in sequence, and the extending direction of the section of the flow channel 422a is substantially parallel to the arrangement direction of the ink chambers 412a to 412c (y-axis direction). Moreover, the ink supply ports 424a to 424c are arranged in sequence, and the arrangement direction of the ink chambers 412a to 412c is substantially parallel to the arrangement direction of the ink supply ports 424a to 424c (y-axis direction). In other embodiments, the extending direction of the section of the flow channel 422a is not substantially parallel to the arrangement direction of the ink chambers 412a to 412c. In other words, the extending direction of the section of the flow channel 422a is designed similar to that of a section of the flow channel 422b substantially parallel to the abovementioned two-dimension plane.

[0061] The ink chambers 412a to 412c can be arranged along different directions by horizontally extending one, some, or all of the flow channels. Therefore, compared with the ink chambers 212a to 212c in FIGs. 2A and 2B, the ink chambers 412a to 412c can accommodate a sponge with a larger width (in the y-axis direction), such that the ink can be supplied normally. It is known to persons skilled in the art that it is allowed to extend one or more flow channels instead of one flow channel as required.

[0062] FIG 5A is a schematic view of the profile of the channel module in FIG. 4A. The channel module 420 has two opposite first side edges 421 a and two opposite second side edges 421b, and the four engaging parts 440a to 440d are respectively located at two ends of each of the two first side edges 421a. When the engaging parts 440a to 440d are indentations, the engaging parts (not shown) corresponding to the engaging parts 440a to 440d are blocks, and vice versa.

[0063] FIG 5B is a schematic view of the profile of the channel module according to a fourth embodiment of the present invention. The channel module 520 has two opposite first side edges 521a, two opposite second side edges 521b. Two engaging parts 540a to 540b respectively located at an end of each of the two first side edges 521a, another two engaging parts 540c to 540d respectively located at the center of each of the two first side edges 521a. When the engaging parts 540a to 540d are indentations, the engaging parts on the body (not shown) corresponding to the engaging parts 540a to 540d are blocks, and vice versa. It should be noted that the engaging parts 540c and 540d are not required to be located in the center of each of the two side edges 521a respectively, but can also be located between the center and the ends of each of the two first side edges 521 a.

[0064] FIG 5C is a schematic view of the profile of the channel module according to a fifth embodiment of the present invention. The channel module 620 has two opposite first side edges 621a, two opposite second side edges 621b. Two engaging parts 640a to 640b respectively located at an end of each of the two first side edges 621a, and another engaging part 640c located at the center of the second side edge 621b away from the abovementioned ends of the two first side edges having two engaging parts 640a to 640b respectively located at the corners. When the engaging parts 640a to 640c are indentations, the engaging parts on the body (not shown) corresponding to the engaging parts 640a to 640c are blocks, and vice versa.

[0065] It can be known from the embodiments in FIGs. 5A to 5C that in the scope of the present invention, the number of the above engaging parts on the channel module and the body are determined according to the design requirement, and are respectively located at the corresponding position of the body and the channel module, so as to fix the relative position of the body and the channel module on the two-dimension plane. Moreover, the location of the engaging part on the channel module is not limited to any one side edge of the channel module, and can also be formed on the lower surface of the chan-

nel module attached to the bottom of the body.

[0066] FIG 6 is a perspective exploded view of an ink cartridge according to a sixth embodiment of the present invention. Referring to FIG 6, in the sixth embodiment, engaging parts 730a to 730d are at four corners of the external surface of the bottom 750 of the body 710 of the ink cartridge 700, and are engaged with the engaging parts 740a to 740d at four corners of the channel module 720. Compared with the ink cartridge 400 in the third embodiment of FIG 4A, the engaging parts 730c and 730d of the ink cartridge 700 are indentations instead, and the engaging parts 740c and 740d thereof are blocks instead.

[0067] FIG 7 is a perspective exploded view of an ink cartridge according to a seventh embodiment of the present invention. Referring to FIG 7, compared with the ink cartridge 700 in the sixth embodiment of FIG 6, an engaging part 830 is on the external surface of the bottom 850 of the body 810 of the ink cartridge 800 in the seventh embodiment and partially surrounds the side edges of the channel module 820, such that the relative position of the body 810 and the channel module 820 on a two-dimension plane (XY plane) is substantially fixed by the engagement of the engaging part 830 and the channel module 820.

[0068] FIG 8 is a perspective exploded view of an ink cartridge according to an eighth embodiment of the present invention. Referring to FIG 8, compared with the ink cartridge 700 in the seventh embodiment of FIG 6, an engaging part 930 is arranged on the external surface of the bottom 950 of the body 910 of the ink cartridge 900 in the eighth embodiment and fully surrounds the side edges of the channel module 920, such that the relative position of the body 910 and the channel module 920 on a two-dimension plane (XY plane) is substantially fixed by the engagement of the engaging part 930 and the channel module 920.

[0069] In view of the above, the ink cartridge of the present invention uses the engagement to ensure the accuracy and liability of the location between the body and the channel module. On the other hand, in the present invention, the horizontal section of some flow channels extend from the chip bonding area to an area outside the chip bonding area, thereby improving the flexibility in arrangement of the ink chambers.

[0070] The foregoing description of the preferred embodiment of the present invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form or to exemplary embodiments disclosed. Accordingly, the foregoing description should be regarded as illustrative rather than restrictive. Obviously, many modifications and variations will be apparent to practitioners skilled in this art. The embodiments are chosen and described in order to best explain the principles of the invention and its best mode practical application, thereby to enable persons skilled in the art to understand the invention for various embodiments and with various modifications as are suited to the particular use or implementation contemplated. It is intended that the scope of the invention be defined by the claims appended hereto and their equivalents in which all terms are meant in their broadest reasonable sense unless otherwise indicated. It should be appreciated that variations may be made in the embodiments described by persons skilled in the art without departing from the scope of the present invention as defined by the following claims. Moreover, the abstract and the title are used to facilitate searching the patent document, but not used for limiting the claimed scope of the present invention.

Claims

1. An ink cartridge, comprising:

   a body, having a plurality of ink chambers;
   a channel module, attached to the body;
   a plurality of first engaging parts, arranged on one of the body and the channel module; and
   a plurality of second engaging parts, corresponding to the first engaging parts and arranged on the other of the body and the channel module, wherein the relative position of the body and the channel module on a two-dimension plane is substantially fixed by the engagement of the first engaging parts and the second engaging parts.

2. An ink cartridge as claimed in claim 1, wherein one of the first engaging parts and the corresponding one of the second engaging parts are a block and an indentation.

3. An ink cartridge as claimed in claim 1 or claim 2, wherein a bottom of the body has a plurality of ink delivery ports respectively fluidly communicating with the ink chambers, the channel module has a chip bonding area, a plurality of ink supply ports, and a plurality of flow channels, and the ink supply ports are located in the chip bonding area, and the flow channels respectively fluidly communicate the ink delivery ports with the ink supply ports.

4. An ink cartridge as claimed in claim 3, wherein a section of at least one flow channel of the flow channels which is substantially parallel to the two-dimension plane extends from the chip bonding area to an area outside the chip bonding area.

5. An ink cartridge as claimed in claim 4, wherein the ink supply ports are arranged in sequence, and the extending direction of the section is substantially parallel to the arrangement direction of the ink supply ports.

6. An ink cartridge as claimed in claim 4, wherein the ink chambers are arranged in sequence, and the extending direction of the section is substantially parallel to the arrangement direction of the ink chambers.

7. An ink cartridge as claimed in claim 3, wherein the ink chambers are arranged in sequence, the ink supply ports are arranged in sequence, and the arrangement direction of the ink chambers is substantially parallel to the arrangement direction of the ink supply ports.

8. An ink cartridge as claimed in any preceding claim, wherein the channel module has a base attached to the body, an uplift portion protruding from the base, and a chip bonding area located on the uplift portion; the base has a base surface, the uplift portion protrudes from the base surface and has a side surface connecting the base surface and the chip bonding area, and the angle between the side surface and the base surface is between 90 degrees and 135 degrees.

9. An ink cartridge, comprising:

a body, having a plurality of ink chambers;
a channel module, attached to the body, and having two opposite first side edges and two opposite second side edges.
a plurality of first engaging parts, arranged on the channel module, and respectively located at two ends of each of the first side edges, or respectively located at an end and the position away from the end of each of the first side edges, or respectively located at an end of each of the first side edges and at the second side edge away from the end of the first side edge; and
a plurality of second engaging parts, corresponding to the first engaging parts and arranged on the body, wherein the relative position of the body and the channel module on a two-dimension plane is substantially fixed by the engagement of the first engaging parts and the second engaging parts.

10. An ink cartridge as claimed in claim 9, wherein one of the first engaging parts and the corresponding one of the second engaging parts are a block and an indentation.

11. An ink cartridge as claimed in claim 9 or claim 10, wherein a bottom of the body has a plurality of ink delivery ports respectively fluidly communicate with the ink chambers; the channel module has a chip bonding area, a plurality of ink supply ports, and a plurality of flow channels; and the ink supply ports are located in the chip bonding area, and the flow channels respectively fluidly communicate the ink delivery ports with the ink supply ports.

12. An ink cartridge as claimed in claim 11, wherein a section of at least one of the flow channels substantially parallel to the two-dimension plane extends from the chip bonding area to an area outside the chip bonding area.

13. An ink cartridge as claimed in claim 12, wherein the ink supply ports are arranged in sequence, and the extending direction of the section is substantially parallel to the arrangement direction of the ink supply ports.

14. An ink cartridge as claimed in claim 12, wherein the ink chambers are arranged in sequence, and the extending direction of the section is substantially parallel to the arrangement direction of the ink chambers.

15. An ink cartridge as claimed in claim 11, wherein the ink chambers are arranged in sequence, the ink supply ports are arranged in sequence, and the arrangement direction of the ink chambers is substantially parallel to the arrangement direction of the ink supply ports.

16. An ink cartridge as claimed in claim 9, wherein the channel module has a base attached to the body, an uplift portion protruding from the base, and a chip bonding area located on the uplift portion; the base has a base surface, the uplift portion protrudes from the base surface and has a side surface connecting the base surface and the chip bonding area, and the angle between the side surface and the base surface is between 90 degrees and 135. degrees.

17. An ink cartridge, comprising:

a body, having a plurality of ink chambers, a plurality of ink delivery ports, and a plurality of blocks, wherein the ink delivery ports are located at a bottom of the body, and the ink chambers are respectively fluidly communicate with the ink delivery ports; and
a channel module, having a base attached to the bottom of the body and an uplift portion protruding from the base, and having a chip bonding area located on the uplift portion, a plurality of ink supply ports located on the chip bonding area, and a plurality of flow channels respectively communicating the ink delivery ports with the ink supply ports, wherein the base has a base surface, and the uplift portion has a side surface connecting the base surface and the chip bonding area, and the angle between the side surface and the base surface is between 90 degrees and

135 degrees.

18. An ink cartridge as claimed in claim 17, wherein a section of at least one of the flow channels extends from the chip bonding area to an area outside the chip bonding area.

19. An ink cartridge as claimed in claim 18, wherein the ink supply ports are arranged in sequence, and the extending direction of the section is substantially parallel to the arrangement direction of the ink supply ports.

20. An ink cartridge as claimed in claim 18, wherein the ink chambers are arranged in sequence, and the extending direction of the section is substantially parallel to the arrangement direction of the ink chambers.

21. An ink cartridge as claimed in claim 17, wherein the ink chambers are arranged in sequence, the ink supply ports are arranged in sequence, and the arrangement direction of the ink chambers is substantially parallel to the arrangement direction of the ink supply ports.

22. An ink cartridge as claimed in claim 17, wherein the channel module has two opposite side edges and a plurality of indentations respectively located at least one end of each of the two opposite side edges, and the blocks are formed at a external surface of the bottom of the body and are respectively corresponding to the indentations.

23. An ink cartridge as claimed in claim 22, wherein the body has four sidewalls, at least two of the blocks are respectively arranged at the two corners of the external surface of the bottom of the body and adjacent to the same one of the sidewalls, for locating the ink cartridge in a printer.

24. An ink cartridge, comprising:

a body, having four sidewalls, a plurality of ink chambers, and a plurality of ink delivery ports, wherein the ink delivery ports are located at a bottom of the body, and the ink chambers respectively fluidly communicate with the ink delivery ports;
a channel module, attached to an external surface of the bottom of the body, and having a chip bonding area, a plurality of ink supply ports, and a plurality of flow channels, wherein the ink supply ports are located in the chip bonding area, and the flow channels respectively fluidly communicate the ink delivery ports with the ink supply ports;
at least three first engaging parts, wherein at least two of the blocks are respectively arranged at the two corners of the external surface of the bottom of the body and adjacent to the same one of the sidewalls; and
a plurality of second engaging parts, arranged on the channel module corresponding to the first engaging parts respectively, wherein the relative position of the body and the channel module on a two-dimension plane is substantially fixed by the engagement of the first engaging parts and the second engaging parts.

25. An ink cartridge as claimed in claim 24, wherein at least one of the first engaging parts not adjacent to the same sidewall is arranged on the external surface of the bottom of the body and is adjacent to another one of the sidewalls.

26. An ink cartridge as claimed in claim 24, wherein the channel module has a base attached to the external surface of the body, and an uplift portion protrudes from the base, wherein the chip bonding area is located on the uplift portion, the base has a base surface, the uplift portion protrudes from the base surface and has a side surface connecting the base surface and the chip bonding area, and the angle between the side surface and the base surface is between 90 degrees and 135 degrees.

27. An ink cartridge, comprising:

a body, having a plurality of ink chambers and a plurality of ink delivery ports, wherein the ink delivery ports are located at a bottom of the body, and the ink chambers respectively fluidly communicate with the ink delivery ports;
a channel module, attached to an external surface of the bottom of the body, and having a chip bonding area, a plurality of ink supply ports, and a plurality of flow channels, wherein the ink supply ports are located in the chip bonding area, and the flow channels respectively fluidly communicate the ink delivery ports with the ink supply ports; and
an engaging part, arranged on the external surface of the bottom of the body, wherein the engaging part at least partially surrounds side edges of the channel module, the relative position of the body and the channel module on a two-dimension plane is substantially fixed by the engagement of the engaging parts and the channel module.

28. An ink cartridge as claimed in claim 27, wherein the engaging part fully surrounds the side edges of the channel module.

29. An ink cartridge as claimed in claim 27, wherein the

channel module has a base attached to the external surface of the body, an uplift portion protruding from the base, wherein the chip bonding area is located on the uplift portion, the base has a base surface, the uplift portion protrudes from the base surface and has a side surface connecting the base surface and the chip bonding area, and the angle between the side surface and the base surface is between 90 degrees and 135 degrees.

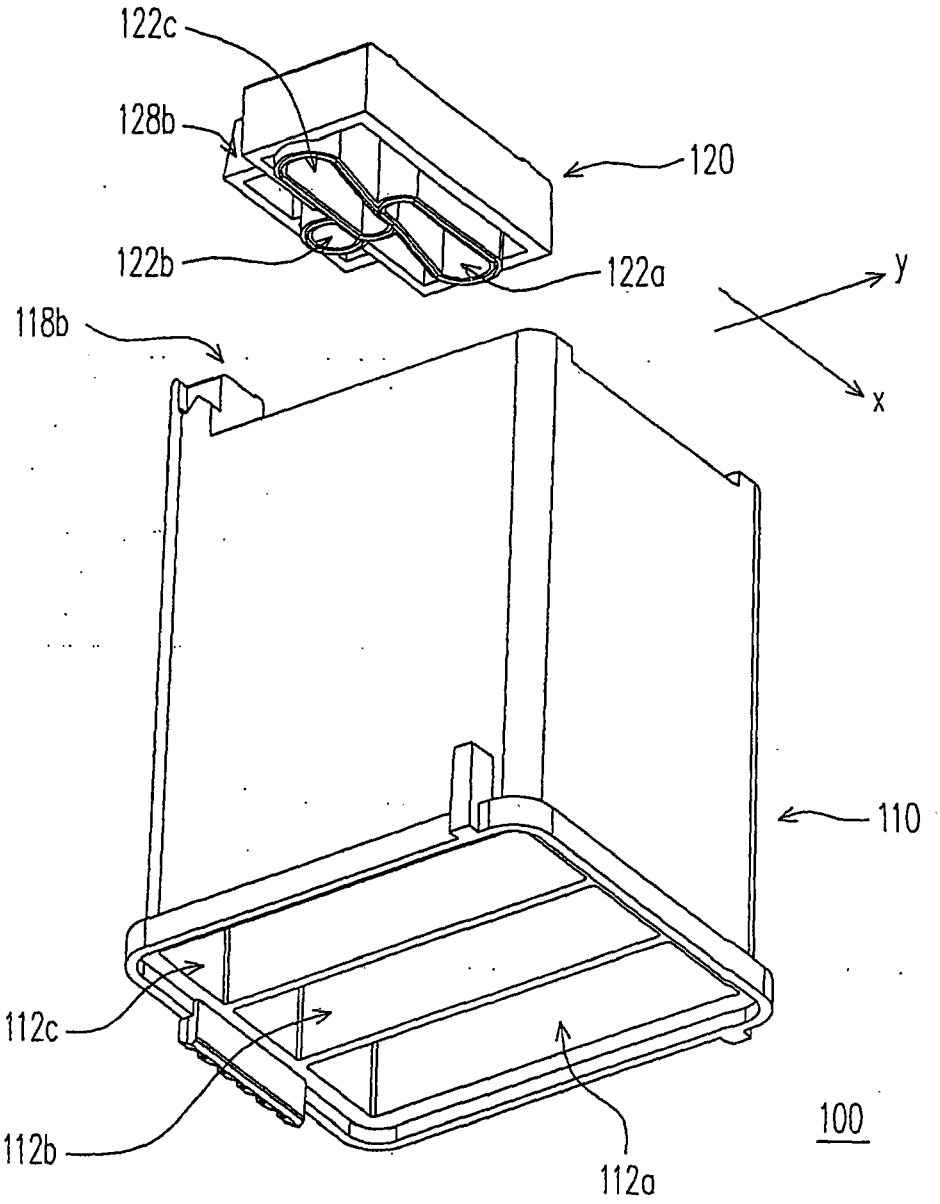

FIG. 1A (PRIOR ART)

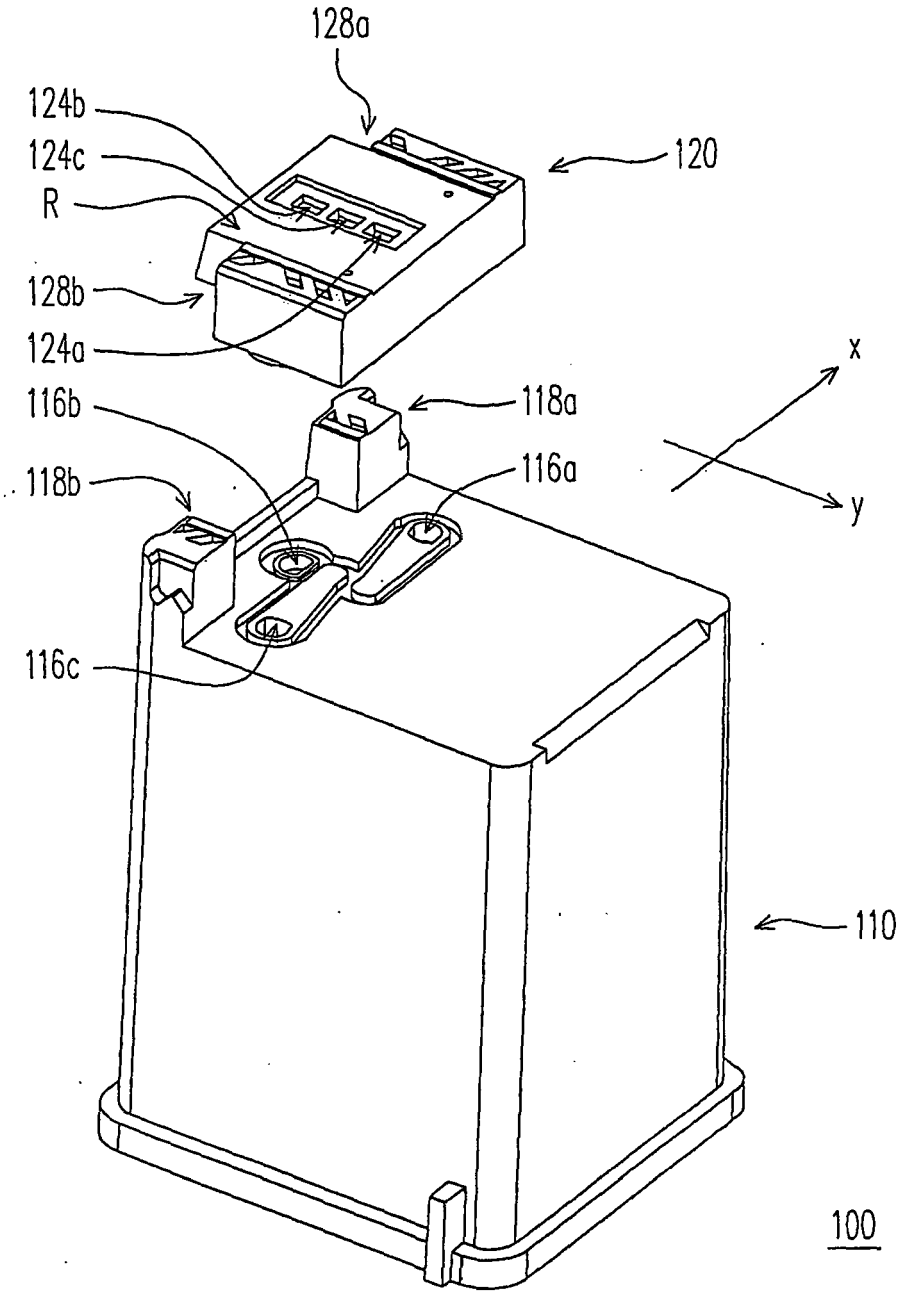

FIG. 1B (PRIOR ART)

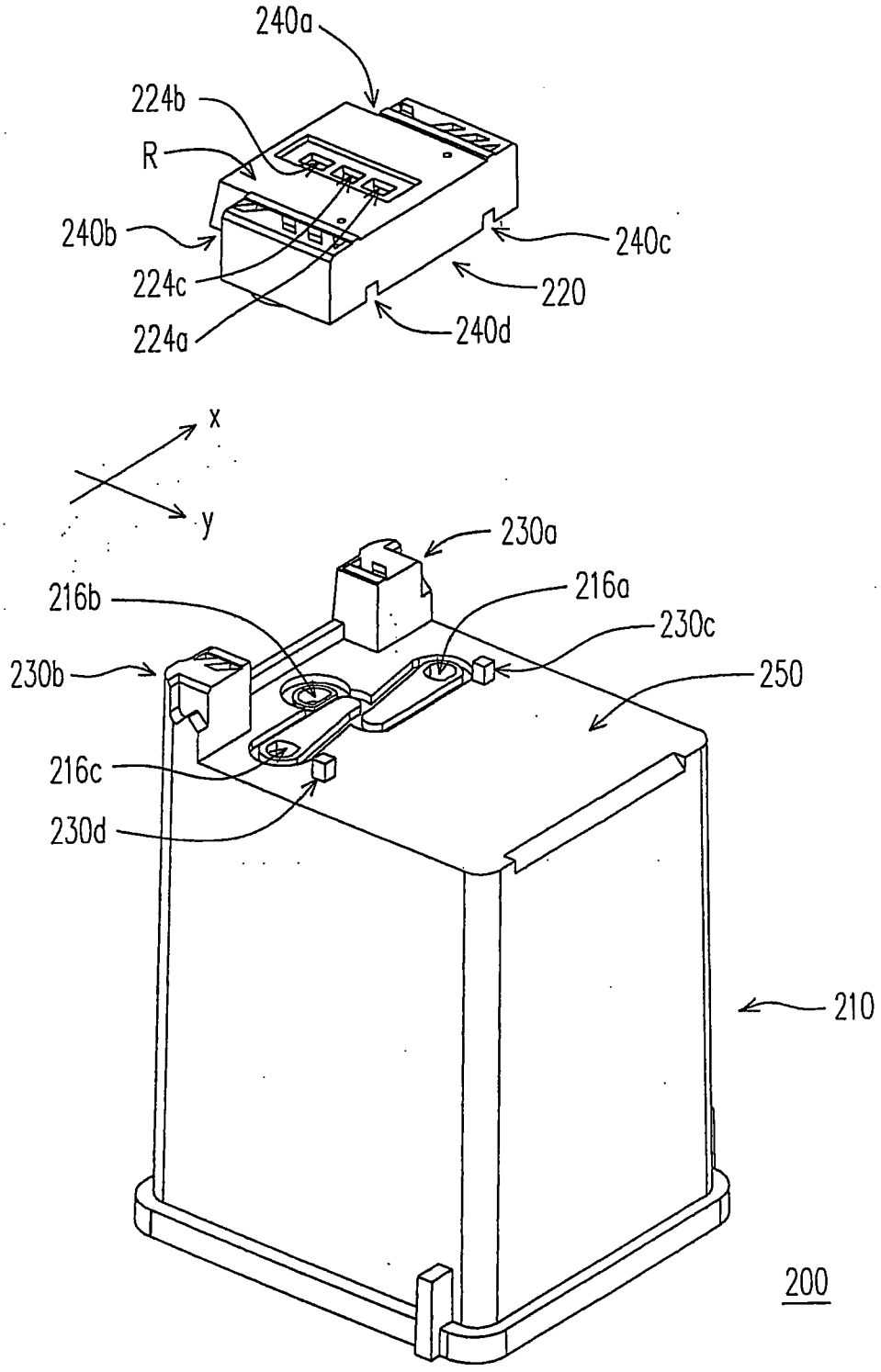
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FIG. 2A

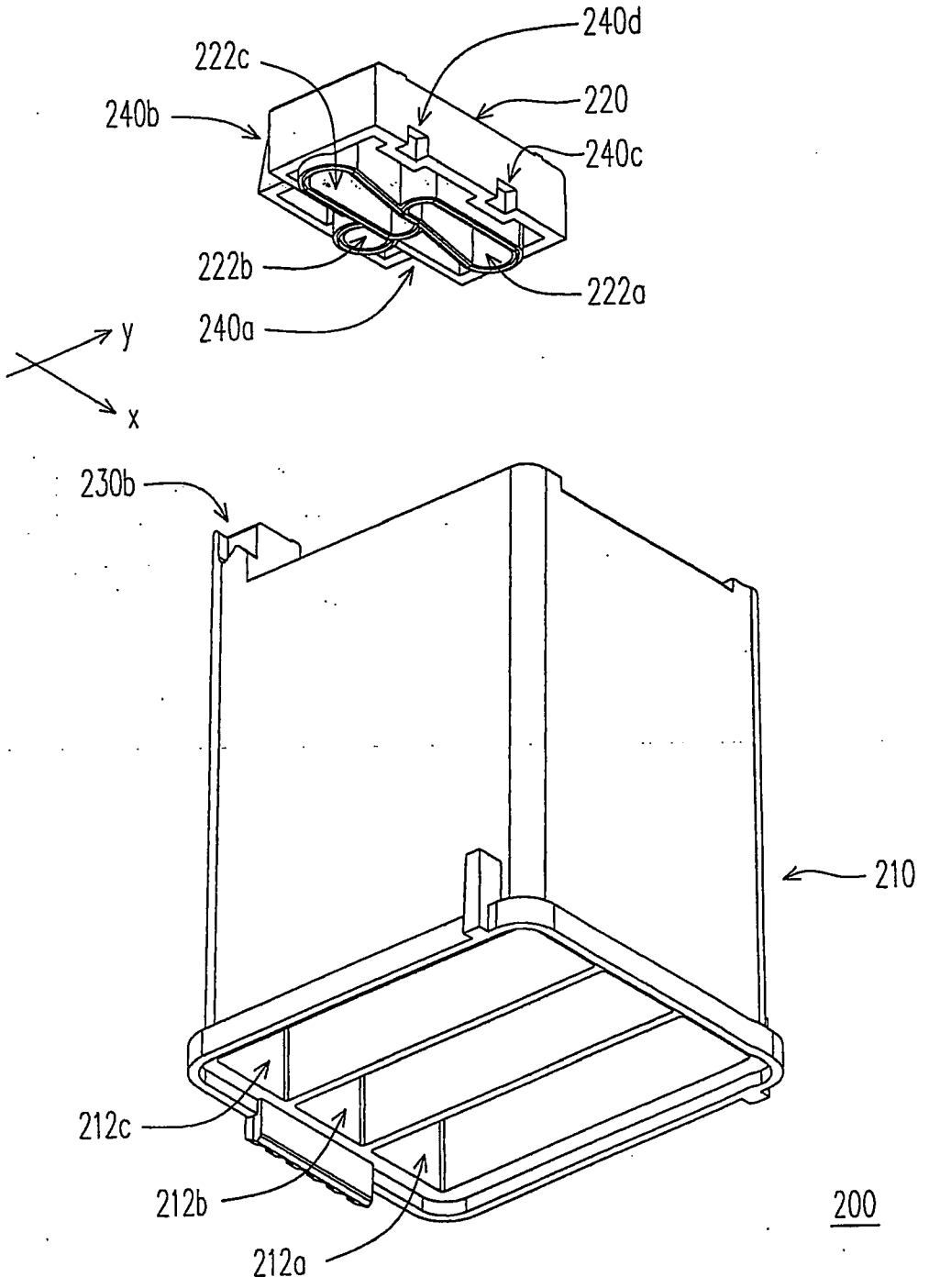
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FIG. 2B

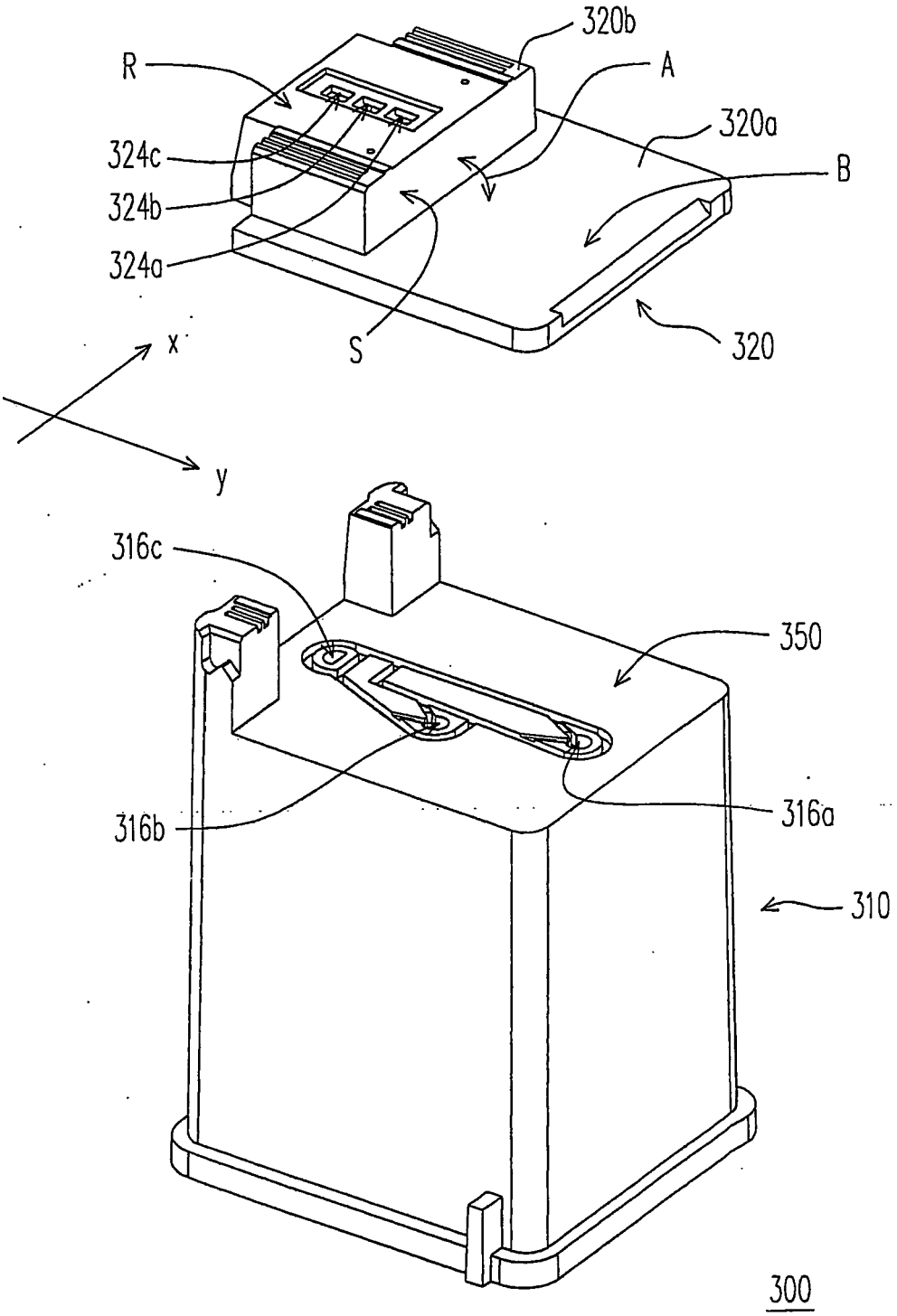
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FIG. 3A

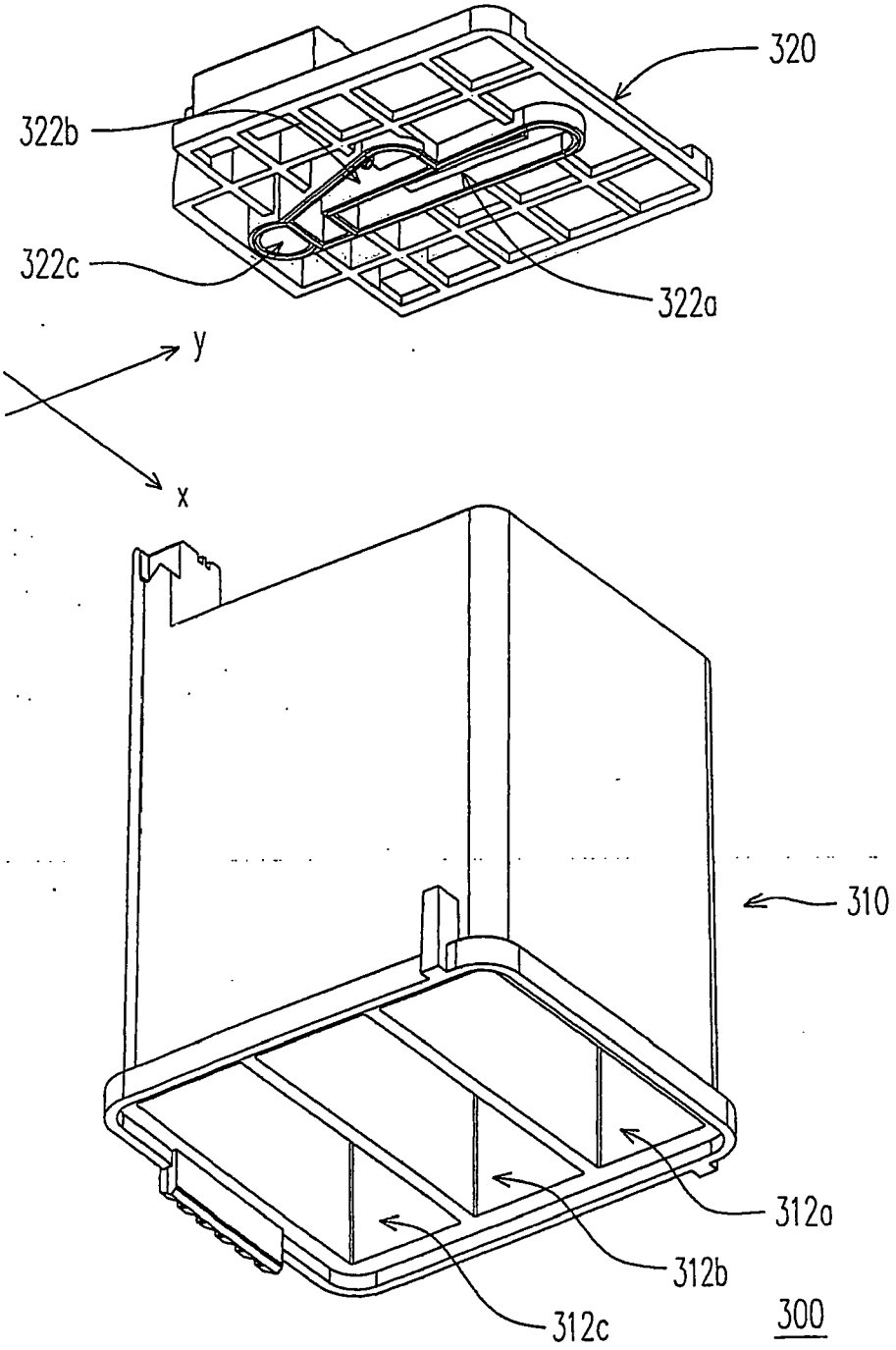

FIG. 3B

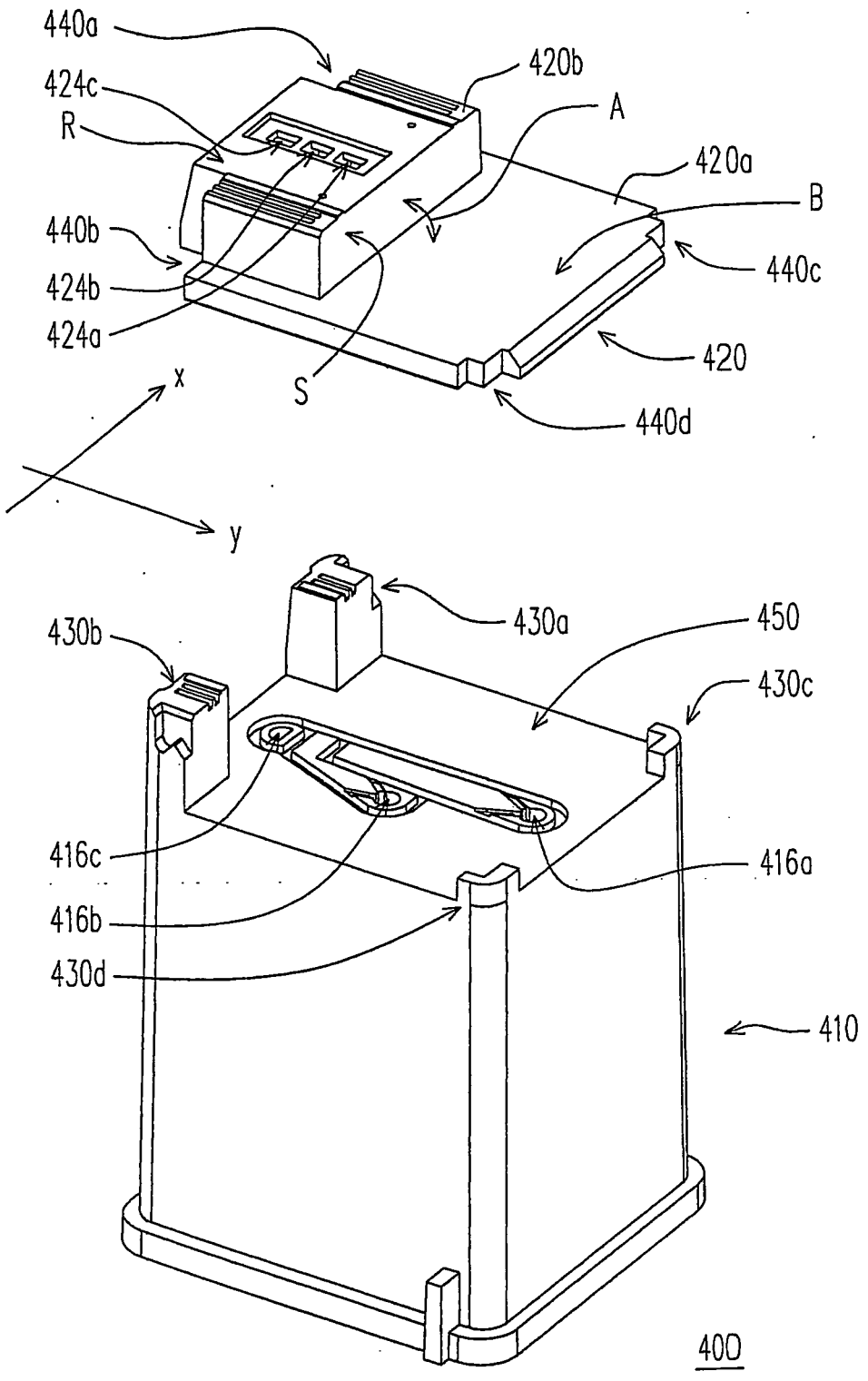
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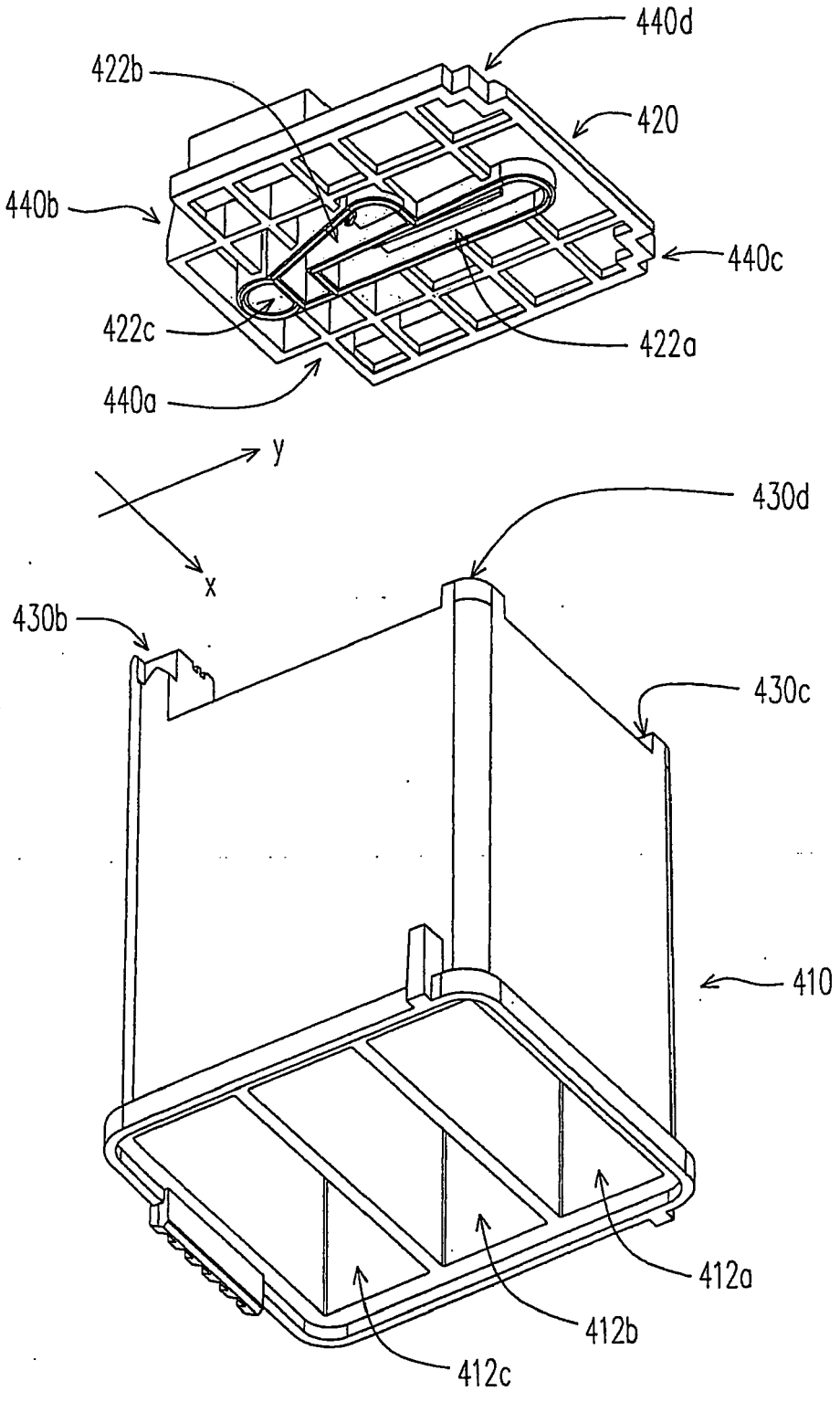
FIG. 4A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412c
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FIG. 4B

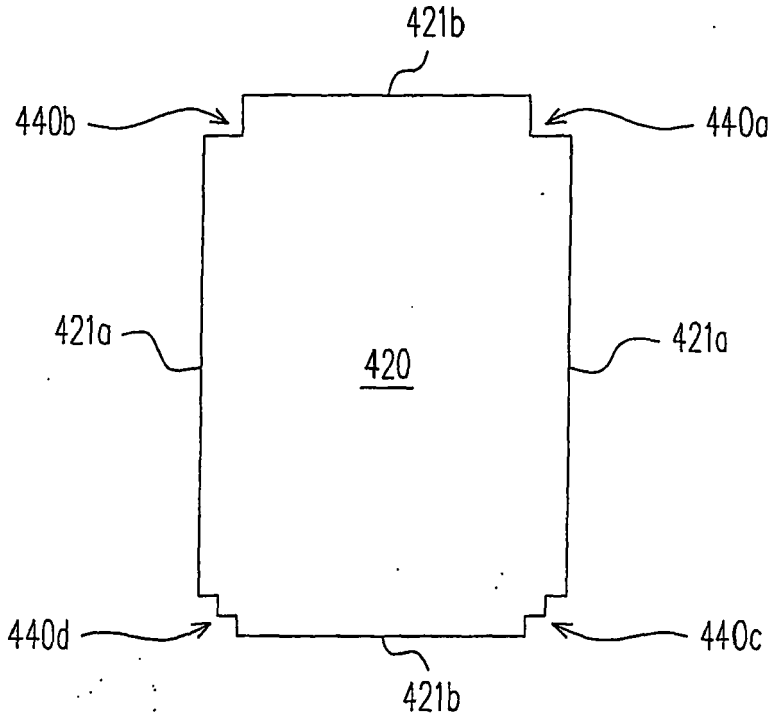
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FIG. 5A

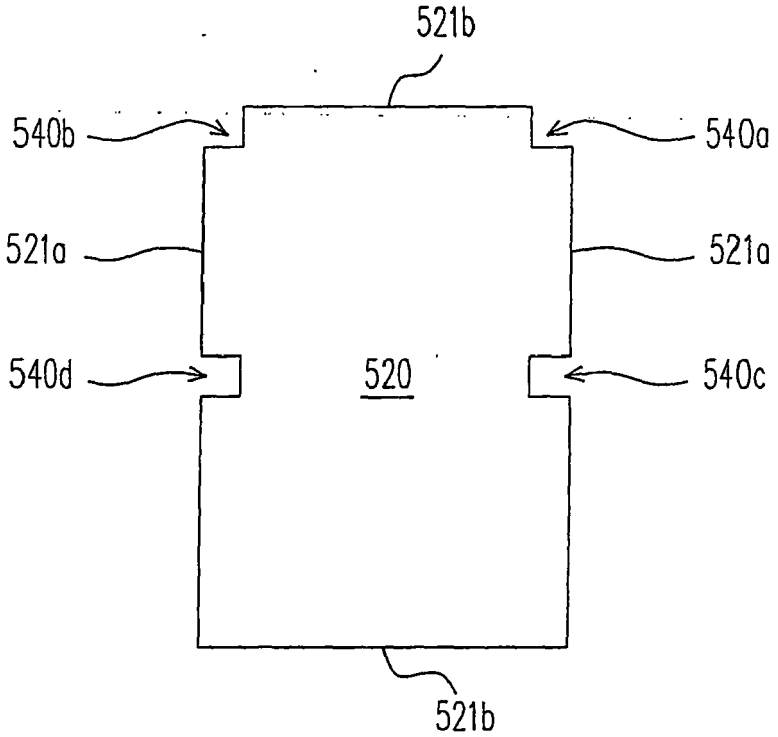
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FIG. 5B

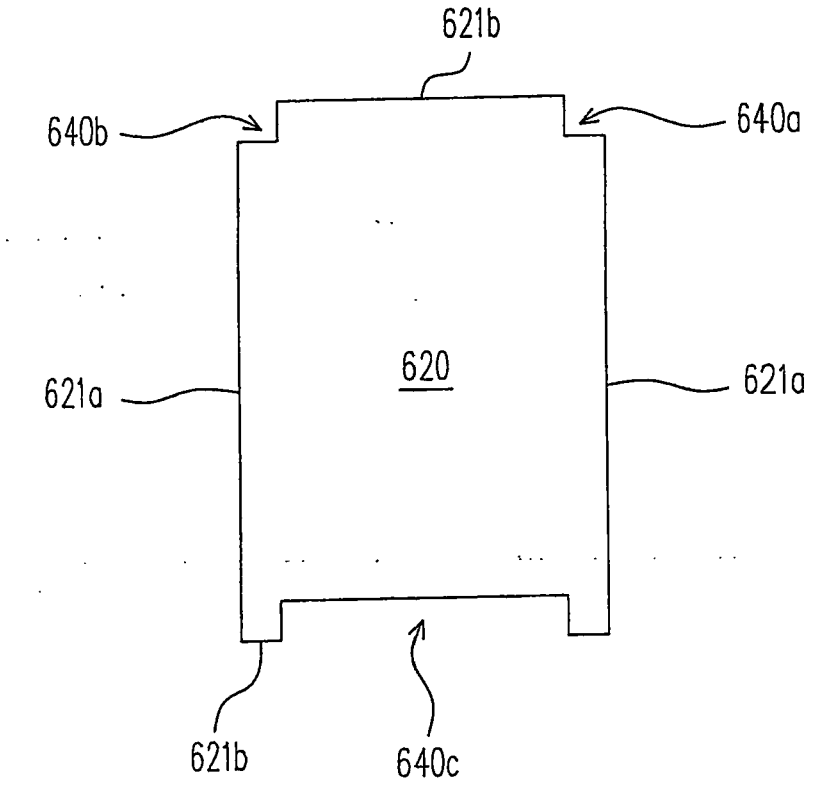

FIG. 5C

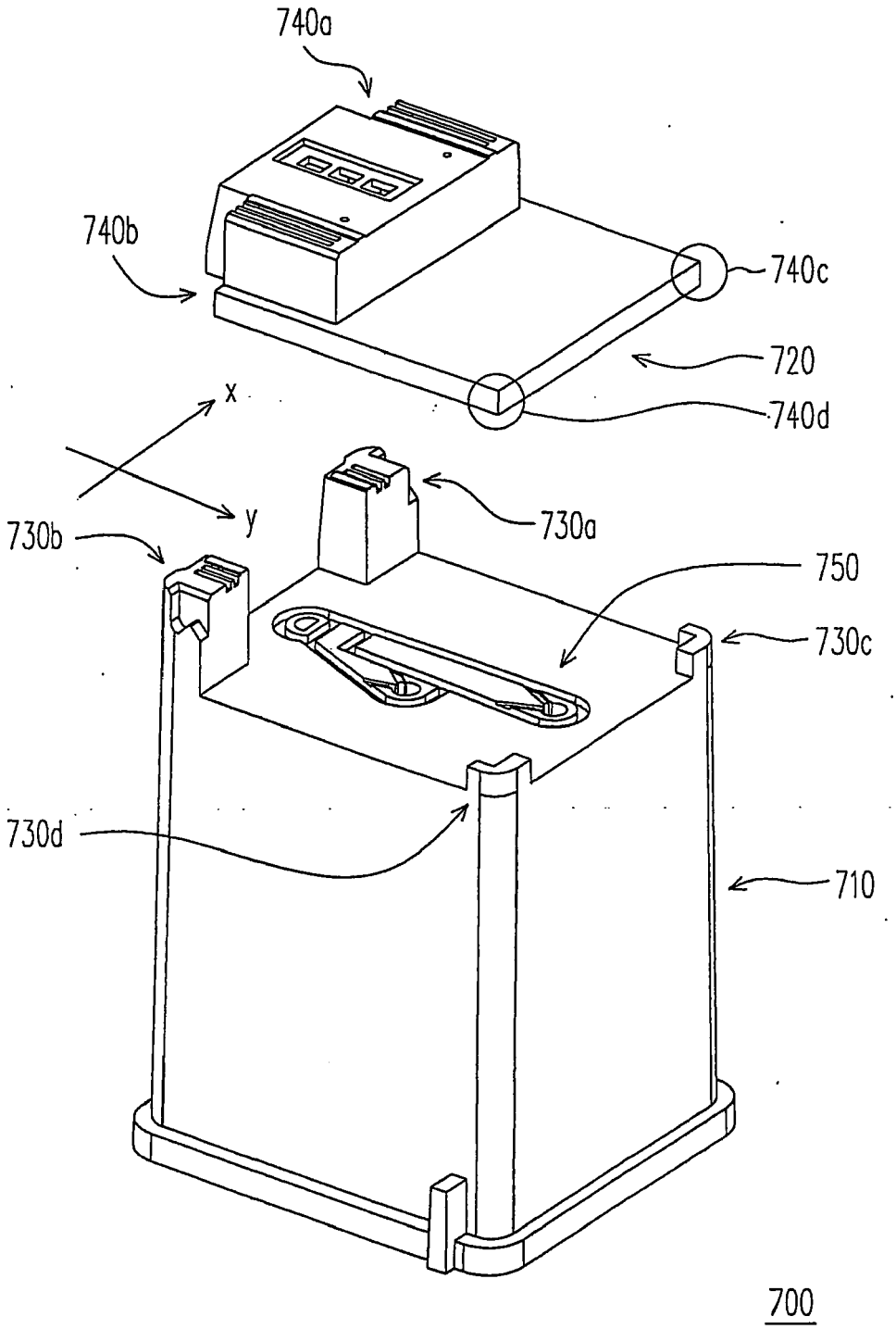

FIG. 6

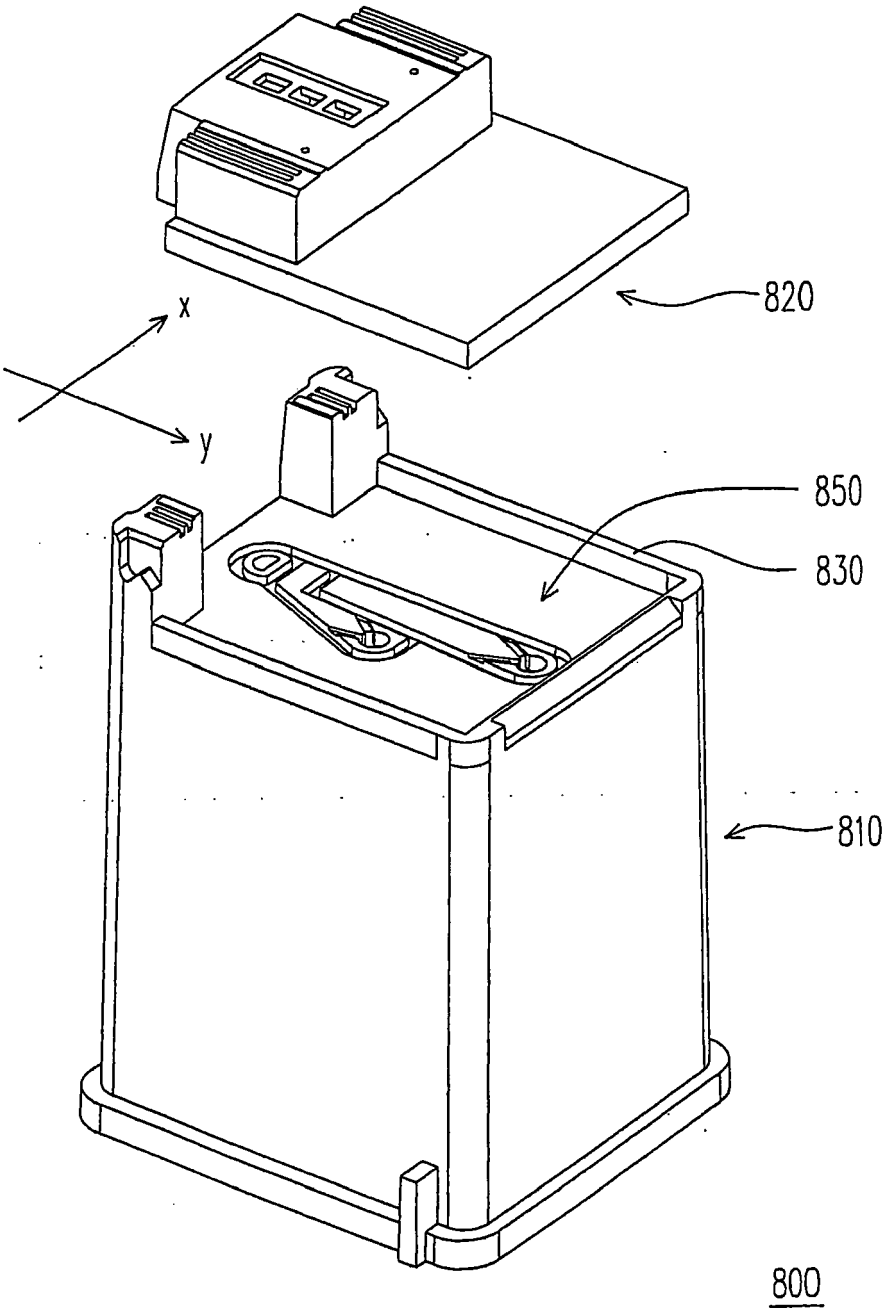

FIG. 7

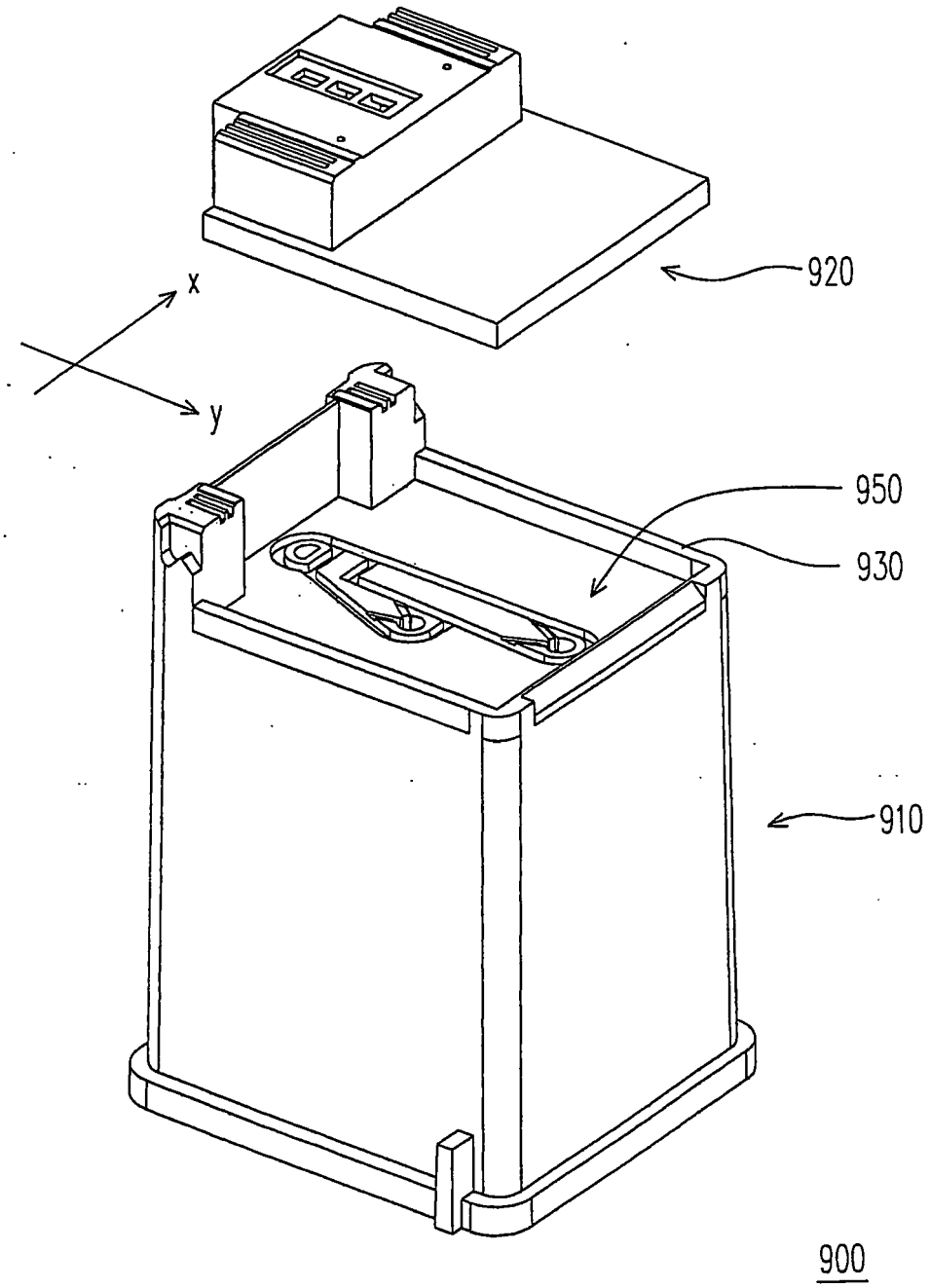

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 25 1863

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 August 2007	Van Oorschot, Hans

CATEGORY OF CITED DOCUMENTS

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