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(54) TONER CARTRIDGE

(57) Disclosed is a toner cartridge (200) mounted on an image forming device (180) in a detachable manner, comprising a case provided with a toner chamber (204) for storing toner, a toner inlet (188) and a toner outlet (252) aligned and matched with the toner inlet, and a switch member (250) located between the toner outlet (252) and the toner inlet (188) for controlling position switching between a closed position and an opened position of between the toner outlet (252) and the toner inlet (188). A switch member mounting portion (270) is provided at a location corresponding to the toner outlet (252) on an outer surface of the case, and the switch member (250) comprises a main body centrally provided with a central opening, the main body can slide in a plane where the switch member mounting portion (270) is located, and in a direction of mounting the toner cartridge (200), the switch member (250) first keeps stationary relative to the toner outlet (252) and the toner inlet (188) and then the toner outlet (252) gradually communicates with the toner inlet (188). The present utility model solves the technical problem of producing a contamination at a location not corresponding to the toner outlet (252) in the image forming device when the toner cartridge is opened by rotation of the switch member, as existed in the prior art.

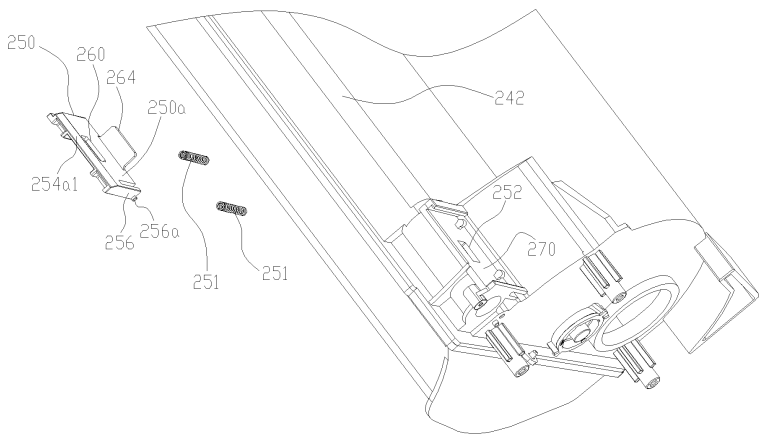

FIG. 7

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Description

Technical field

[0001] The present utility model relates to a toner cartridge

Background

[0002] An image forming device utilizes toner for creating images on a printing paper. The toner is accommodated in a toner cartridge detachable from the image forming device. A toner cartridge whose toner is depleted is replaced by a new one.

[0003] Referring to FIG. 1, an image forming device 180 and a toner cartridge 100 are mounted in a laser printer in a detachable manner. Generally, the image forming device 180 is mounted before mounting the toner cartridge 100, and the toner cartridge 100 may be mounted to the image forming device in a detachable manner. When the toner cartridge is mounted to the image forming device, the toner outlet 152 of the toner cartridge is aligned and matched with the toner inlet 188 of the image forming device. The toner may flow out from the toner outlet 152 into the toner inlet 188. In FIG. 1, the arrow direction indicates the mounting direction of the toner cartridge 100 to the image forming device 180 (i.e. the direction "x").

[0004] Referring to FIGs. 2A and 2B, the toner outlet 152 of the toner cartridge 100 is provided with a switch member 170 for opening or closing the toner outlet 152. The switch member 170 is connected to the toner cartridge 100 by a rotation shaft 402 around which the switch member 170 may be rotated. The rotation shaft 402 is provided with a torsion spring (not shown) which has one free end abutting against the switch member 170 and another free end abutting against a front wall 114 of the toner cartridge 100, so that the switch member 170 is in a closed position in normal state (FIG. 2A). The front end of the switch member 170 is provided with a force bearing portion 406. The force bearing portion 406 bends downwards as a whole, and is in contact with the edge 189 of the toner inlet 188 of the image forming device 180, so as to enable opening of the switch member 170. When the toner cartridge 100 is inserted into the image forming device 180 and before the force bearing portion 406 of the switch member 170 is in contact with the edge 189, the switch member 170 is in a closed position, as shown in FIG. 2A. When the force bearing portion 406 of the switch member 170 is in contact with the edge 189, the switch member 170 overcomes the torsional force exerted on the rotation shaft 402 by the torsion spring to rotate downwards, and then the switch member 170 is in an opened position. As shown in FIG. 2B, the toner outlet 152 is communicated with the toner inlet 188 of the image forming device, allowing the toner to enter from the toner cartridge 100 into the image forming device 180 to participate in the development process of an image.

[0005] In the process of rotating the switch member 170 to open the toner outlet 152 of the toner cartridge, since the switch member will form a certain angle with the toner outlet during rotation of the switch member, if leakage of toner occurs, the toner will slide from the toner outlet 152, along the tilted switch member, to a location not corresponding to the toner outlet in the image forming device, and contaminate this location. Moreover, In the process of opening the toner outlet 152 of the toner cartridge by the switch member 170, the toner outlet 152 will be opened before aligned with the toner inlet 188 of the image forming device, which makes the toner leak from the toner outlet 152 into the image forming device and contaminate the image forming device, leading to printing defects on one hand and waste of the toner on the other hand.

Summary

[0006] The present utility model provides a toner cartridge to solve the technical problem of producing a contamination at a location not corresponding to the toner outlet in the image forming device when a toner cartridge is opened by rotation of a switch member and thereby causing a printing defect, as existed in the prior art.

[0007] In order to solve the technical problem above, the present utility model provides a technical solution as described below.

[0008] A toner cartridge mounted to an image forming device in a detachable manner comprises a case provided with a toner chamber for storing toner, a toner outlet aligned and matched with a toner inlet of the image forming device, and a switch assembly located between the toner outlet and the toner inlet for controlling outflow of the toner from the toner outlet by opening or closing the toner outlet, the toner cartridge is characterized in that the switch assembly is switched between a toner outlet close position and a toner outlet open position in a sliding manner.

[0009] The switch assembly comprises a switch member and an elastic element that is provided between the switch member and the case.

[0010] The switch member comprises a main body slidably connected with an outer surface of the case at the toner outlet.

[0011] A switch member mounting portion is provided at a location corresponding to the toner outlet on the outer surface of the case, the switch member mounting portion is in a horizontal plane that is in the periphery of the toner outlet and matched with an inner surface of the switch member, and the main body of the switch member may slide in the horizontal plane, and in a mounting direction of the toner cartridge, the switch member first keeps stationary relative to the toner outlet and the toner inlet, and then the toner outlet gradually communicates with the toner inlet.

[0012] A force bearing portion is formed by extending outwards from an end of the main body of the switch

member, at which the main body abuts against the image forming device on which the main body is mounted, and the force bearing portion forms an angle with a plane where the main body of the switch member is located.

[0013] The main body of the switch member is slidably connected to a surface of the switch member mounting portion by a guide rail.

[0014] The main body of the switch member is rotatably connected to the surface of the switch member mounting portion by a fixing piece, the main body of the switch member can rotate around the fixing piece in a plane where the switch member mounting portion is located, and the elastic element is mounted to the fixing piece, with one end of the elastic element abutting against the case, and the other end abutting against the main body of the switch member.

[0015] The switch member has a side for closing when opening the main body of the switch member, the side is spaced apart from the nearest side of the toner outlet by a distance L when the main body of the switch member is in a closed position in the absence of an external force.

[0016] The main body of the switch member is further provided with a central opening.

[0017] The central opening is spaced apart from the nearest side of the toner outlet by a distance L when the main body of the switch member is in a closed position in the absence of an external force.

[0018] The main body of the switch member is provided with an elastic arm on one side thereof, the elastic arm has a protrusion rising from an outer side of an end thereof, and is spaced apart from the main body; the main body of the switch member is provided with a guide rail on another side opposite to the elastic arm, the switch member mounting portion is provided with a first side wall and a second side wall, wherein an end of the first side wall is provided with an extension portion extending towards the second side wall, and a guide groove matched with the guide rail is formed between the extension portion and the switch member mounting portion, and the second side wall is provided with a guide slot matched with the protrusion.

[0019] The main body of the switch member is provided, at a side close to the outer surface of the case, with a slot, one end of which is open and the other end is a blind end, the outer surface of the case is provided with a block portion at a location corresponding to a lateral opening of the slot, the elastic element is located within the slot, and has one end abutting against the blind end of the slot and the other end abutting against the block portion.

[0020] The number of each of the elastic element, the slot and the block portion is two, distributing on both sides of the central opening.

[0021] The main body of the switch member is provided with a guide groove, and the switch member mounting portion is provided with a guide post matched with the guide groove, wherein the guide groove and the guide post are located along the direction in which the elastic element applies an elastic force to the switch member.

[0022] According to the technical solution described above, the switch member slides in the plane where the switch member mounting portion is located, in a toner cartridge mounting direction, the switch member first keeps stationary relative to the toner outlet and the toner inlet, and then the toner outlet is gradually communicated with the toner inlet, that is, the toner outlet can be opened by a translational move of the switch member, toner leaked out during the opening process will only fall to a location corresponding to the toner outlet in the image forming device, and thus prevent the toner from sliding from toner outlet, alone the tilted switch member, to a location not corresponding to the toner outlet in the image forming device and contaminating this location. Hence, the technical problem of producing a contamination at a location not corresponding to the toner outlet in the image forming device when the toner cartridge is opened by rotation of the switch member and thereby causing a printing defect, as existed in the prior art, is solved. Moreover, since when the main body of the switch member is in a closed position in the absence of an external force, the central opening, or the main body, is spaced apart from the nearest side of the toner outlet by a distance L. Therefore, the toner outlet will not start to be opened until the toner cartridge slides for a distance L after being mounted into and in contact with the image forming device, thereby delaying the opening of the toner outlet, and significantly reducing leakage of the toner.

Brief description of drawings

[0023]

FIG. 1 is a perspective view of an existing image forming device and a toner cartridge;

FIGs. 2A-2B are perspective views of a switch member of a toner outlet of an existing toner cartridge in an opened state and a closed state;

FIG. 3 is a front perspective view of a toner cartridge employed in Embodiment 1;

FIG. 4 is a back perspective view of a toner cartridge employed in Embodiment 1;

FIG. 5 is an exploded perspective view of a toner cartridge employed in Embodiment 1;

FIG. 6 is a perspective view of a switch member of a toner cartridge employed in Embodiment 1, as seen after an end cap of the toner cartridge is removed;

FIG. 7 is an exploded perspective view of a switch member, a pressure spring and a toner cartridge in Embodiment 1;

FIG. 8 is a perspective view at a toner outlet of a toner cartridge employed in Embodiment 1;

FIG. 9 is a perspective view of a switch member of a toner cartridge employed in Embodiment 1;

FIG. 10 is a partial sectional view of a switch member starting to be in contact with a toner inlet of an image forming device after a toner cartridge employed in Embodiment 1 is mounted into a printer, where the switch member is in a closed position;

FIG. 11 is a partial sectional view of a switch member opening a toner outlet after a toner cartridge employed in Embodiment 1 is mounted into a printer;

FIG. 12 is a front view of an end cap on an end of a toner cartridge employed in Embodiment 1;

FIG. 13 is a perspective view of a switch member employed in Embodiment 1 with a force bearing portion being in the front;

FIGs. 14 and 15 are sectional views of a switch member employed in Embodiment 1 being in a closed and an opened position, respectively, when the main body of the switch member includes no central opening.

FIG. 16 is a perspective view of a switch member employed in Embodiment 1 being connected with a toner cartridge by a tension spring; and

FIG.17 is a perspective view of mounting a switch member employed in Embodiment 2.

Description of embodiments

Embodiment 1

[0024] To facilitate description, direction "x" is defined as the front of the toner cartridge, "y" as the top, and "z" as the right, wherein, the direction "x" is also the mounting direction of toner cartridge towards the image forming device.

[0025] Referring to FIGs. 3-5, a toner cartridge 200 includes a case that is provided with a toner chamber 204 for storing toner (FIG. 5). The case includes a top cap 206 and a main body 208, which are welded together to define an enclosed toner chamber 204. The main body 208 includes a first side wall 210 and a second side wall 212, and a front wall 214 and a back wall 216 that are connected to the first side wall 210 and the second side wall 212. A first end cap 218 and a second end cap 220 are mounted to the first side wall 210 and the second side wall 212 by a auger or other fastening means. The second end cap 220 is further provided with a toner cartridge limiting groove 221 that is concaved from the front wall 214 towards the back wall 216. The top cap 206 or the main body 208 of the toner cartridge 200 may be further provided with a handle 222 so as to facilitate detaching or mounting the toner cartridge 200 from or to the image forming device.

[0026] Referring to FIGs. 3, 4 and 12, both the first end cap 218 and the second end cap 220 are provided with a wing-shaped guide rail 211 for mounting the toner cartridge. When the toner cartridge 200 is being mounted to a printer, the wing-shaped guide rail 211 of the toner cartridge 220 slides along a guide rail groove (not shown) on the inside wall of the printer, so that the toner cartridge can be mounted to a specified position in the printer. The wing-shaped guide rail 211 includes a plurality of protrusions 211 a, 211b, 211c and 211 d, an external contour line surrounding the protrusions (shown by dotted line in FIG. 12) runs on the toner cartridge 220 from the front wall 214 towards the back wall 216, and forms a front portion (the protrusion 211 a located) and a back portion (the protrusions 211 b, 211 c and 211 d located), where the front portion is narrower than the back portion so as to facilitate guiding of the toner cartridge 200. The protrusions 211 a, 211 c and 211 d have a semi-circular cross section, the protrusion 211b has a circular cross section, and tangent lines of bottom circles of the protrusions 211 a, 211 b and 211 d keep in the same horizontal line. The guide rail for mounting the toner cartridge, consisting of a plurality of parts (i.e. the protrusions 211 a, 211 b, 211 c and 211 d), saves material on one hand and solves the problem of end cap deformation caused by shrinkage due to the injection molding on the other hand. The number and shape of the protrusions of the wing-shaped guide rail 211 of the toner cartridge are not limited to those described in the present disclosure.

[0027] Referring to FIG.5, a gear set is mounted between the first end cap 218 and the first side wall 210. The main gear 230 is engaged with a drive system of a laser printer to transfer driving force. In the front of the toner cartridge 200, part of the main gear 230 is exposed between the first end cap 218 and the first side wall 210 (FIG. 3). A stirring element 234 is mounted in the toner chamber 204 in a rotatable manner, with both ends of its rotation shaft 236 passing through the first side wall 210 and the second side wall 212 via matching shaft holes of the first side wall 210 and the second side wall 212. A drive gear 237, which is connected to a first end of the rotation shaft 236, is engaged with the main gear 230 to transfer driving force.

[0028] Referring to FIG.5, a toner delivery auger 240 includes a first end 240a, a second end 240b and augers 240c. The front wall 214 is provided with a passage 242 along direction "z" between the first side wall 210 and the second side wall 212. The passage 242 and a rotation shaft of the toner delivery auger 240 are arranged above the rotation shaft 236 of the stirring element. The passage 242 may be integrally injection molded with the front wall 214, forming a part of the front wall 214. The first end 240a of the toner delivery auger 240 extends through the

first side wall 210. A drive gear 244 is mounted on the first end 240a of the toner delivery auger 240, and is engaged with the main gear 230 directly or by one or more intermediate gears. The passage 242 includes an open section 242a and a closed section 242b. The open section 242a of the passage 242 is open to the toner chamber 204, and runs along the first side wall 210 towards the second end 240b of the toner delivery auger 240 (the left of the toner cartridge). The closed section 242b of the passage 242 extends from the second side wall 212 (the right of the toner cartridge) to enclose the second end 240b of the toner delivery auger. When the stirring element 234 rotates, a stirring blade 238 mounted on the stirring element 234 conveys the toner in the toner chamber 204 to the open section 242a of the passage 242, where the toner delivery auger 240 is driven by the drive gear 244 to rotate and transfers the toner in the passage 242 to the closed section 242b of the passage 242. A toner outlet 252 is arranged at the bottom of the closed section 242b of the passage 242 (see FIG. 7, 8, 10 or 11), and is oriented downwards so that the toner can flow out of the toner outlet 252 by gravity. A switch member 250 is arranged at the toner outlet on the front wall 214 of the toner cartridge (FIG. 6) and can open or close the toner outlet 252 to control the outflow of the toner from the toner cartridge 200. The closed section 242b of the passage 242 may be further provided with a ventilating window 242b1, so that air external to the toner cartridge may pass through the toner outlet 252 and the ventilating window 242b1 into the toner chamber 204 of the toner cartridge, so as to release internal pressure of the toner chamber 204.

[0029] Referring to FIGs.6, 7 and 9, the switch member 250 is mounted on the toner cartridge 200 in a detachable manner. Under the action of a pressure spring 251, the switch member 250 slides between an open position and a close position (FIGs. 10-11). The switch member includes a main body 254, and the main body 254 has an elastic arm 256 on one side thereof. The elastic arm 256 has a protrusion 256a rising from an outer side of an end thereof, and is spaced apart from the main body 254. The elastic arm 256 may be bent towards the inside of the main body 254 and be restored to an original position. The main body 254 is provided with a guide rail 258 on another side opposite to the elastic arm 256. The guide rail 258 is formed by concaving the outer surface 254a of the main body 254 of the switch member 250 towards the inner surface 254b. The main body 254 is centrally provided with a central opening 260. One or more slots 262 for accommodating pressure springs 251 are arranged between the central opening 260 and the guide rail 258/elastic arm 256, and a pressure spring 251 may be inserted through an end opening 262a of the slot 262, where one end of the pressure spring 251 abuts against a blind end 262b of the slot 262 and the other end protrudes freely out of the end opening 262a. The slot 262 further includes a lateral opening 262c that is located on the inner surface 254b of the main body 254 of the switch member 250. The lateral opening 262c has a width smaller than the outer diameter of the pressure spring 251, so as to prevent the pressure spring 251 from falling from the inner surface 254b of the main body 254. With the pressure spring 251 embedded within the switch member 250, a compact structure is created, thereby saving space. This disclosure utilizes a pair of slots 262 symmetrically arranged on both sides of the central opening 260, ensuring the switch member 250 having an even force distribution during movement. From an end face, on which the end openings 262a of the slots 262 are located, of the main body 254 of the switch member 250, a force bearing portion 264 extends downwards, and a lateral surface of the force bearing portion 264 forms an angle α with the outer surface 254a of the main body 254 of the switch member 250, where $0° < \alpha < 180°$ (FIG. 6). In the present solution, α is 90°, that is, the force bearing portion 264 extends in a direction perpendicular to the outer surface 254a of the main body 254 of the switch member 250. As shown in FIG. 13, the force bearing portion 264 of the switch member 250 may also be arranged on a front end of the switch member 250, i.e. an end face of the main body 254 of the switch member 250 opposite to the end face on which the end openings 262a of the slots 262 are located, and may extend from the outer surface 254a towards the inner surface 254b of the main body 254 of the switch member 250. When the main body 254 is in a closed position in the absence of an external force, the central opening 260 is spaced apart from the closest side of the toner outlet 252 by a distance L (FIG. 10), so that the opening of the toner outlet 252 will not start until the toner cartridge slides for a distance L after being mounted into and in contact with the image forming device. This will delay the opening of the toner outlet 252, significantly reducing leakage of the toner. A groove 268 for accommodating a seal member 266 is further provided at the central location where the central opening 260 is arranged (FIGs. 10-11). The groove 268 is formed by concaving the inner surface 254b towards the outer surface 254a of the main body 254 of the switch member 250. The seal member 266 is provided with a seal member opening 300 corresponding to the central opening 260 / toner outlet 252 of the switch member 250 (FIGs. 10-11), and may be bonded on a surface of the groove 268 formed on the inner surface 254b of the main body (which is the arrangement adopted in the present disclosure), or on the switch member mounting portion 270. The front end of the outer surface 254a of the main body 254 may further be provided with a guide face 254a1 which forms an obtuse angle with the outer surface 254a and an acute angle with the inner surface 254b.

[0030] Referring to FIGs.7-8, at the bottom of the closed section 242b of the passage 242 is a switch member mounting portion 270, which lies in a horizontal plane stretching from the front wall 214 towards the back wall 216 of the toner cartridge 200. The switch member mounting portion 270 is matched with the inner surface 254b of the switch member 254. Along the longitudinal

extension direction of the toner cartridge 200 (the direction "z"), a switch member mounting portion first side wall 272 and a switch member mounting portion second side wall 274 are respectively arranged on both ends of the switch member mounting portion 270, and perpendicular to the switch member mounting portion 270. Both the switch member mounting portion first side wall 272 and the switch member mounting portion second side wall 274 extend from the front wall 214 towards the back wall 216 of the toner cartridge 200 (in the direction "x"). An end portion of the switch member mounting portion first side wall 272 is provided with an extension portion 272a extending towards the switch member mounting portion second side wall 274, and a guide groove 276 for the switch member 270 is formed between the extension portion 272a and the switch member mounting portion. The guide rail 258 of the switch member 254 is allowed to slide along the guide groove 276. The extension portion 272a locks the guide rail 258 of the switch member 254, achieving up-and-down positioning (the direction "y") of the switch member 254 on the switch member mounting portion 270. A guide slot 274a is provided in the switch member mounting portion second side wall 274 at a side close to the front wall 214 of the toner cartridge 200, which allows the protrusion 256a on the elastic arm 256 of the switch member 250 to be snapped into the guide slot 274a, achieving front-and-back positioning (the direction "x") of the switch member 254 on the switch member mounting portion 270. The guide slot 274a has a length equal to the distance that the switch member 250 can move along the switch member mounting portion 270. The toner outlet 252 is an internal opening formed by hollowing from the switch member mounting portion 270 to the closed section 242b of the passage 242. A pair of block portions 278 is provided on the switch member mounting portion 270 at a side close to the front wall 214 of the toner cartridge 200, and abut against ends of the pressure springs 251 at a side that the end openings 262a of the slots 262 for accommodating pressure springs are located. Each block portion 278 has a sectional dimension smaller than that of each slot 262 for accommodating corresponding pressure spring 251, ensuring that the block portion 278 can slide within the slot 262 for the pressure spring 251. The pair of block portions 278 is located on both sides of the toner outlet 252, and is close to the front wall 214 of the toner cartridge 200.

[0031] In combination with FIGs. 6-9, a mounting process of the switch member will be specifically described. Firstly, make the inner surface 254b of the switch member 250 facing upward, insert the pressure spring 251 into the slot 262 through the end opening 262a of the slot 262 and make one end of the pressure spring 251 abut against the blind end 262b of the slot 262 and the other end protrude out of the end opening 262a of the slot 262. Then, flip over the switch member 250 mounted with the pressure springs 251, so that the inner surface 254b of the switch member 250 faces the switch member mounting portion 270. Press the elastic arm 256 of the switch member 250 and make the elastic arm 256 bend towards to the inside of the switch member 250, so that the guide rail 258 can enter into the guide groove 276. At this time, the protrusion 256a on the elastic arm 256 is abutting against a lateral side of the switch member mounting portion second side wall 274. Lastly, push the switch member 250 so that the guide rail 258 slides along the guide groove 276 and the protrusion 256a on the elastic arm 256 slides along the lateral side of the switch member mounting portion second side wall 274, until the protrusion 256a on the elastic arm 256 is snapped into the guide slot 274a. At this time, pressure on the elastic arm 256 is released and the elastic arm 256 is restored to its free state. An end of the pressure spring 251 protruding out of the end opening 262a of the slot 262 abuts against the block portion 278, and the pressure spring 251 is compressed within the slot 262. When the switch member 250 is in a closed position, the front end of the switch member 250 protrudes from the switch member mounting portion 270 under the action of the pressure spring 251. At this time, the central opening 260 of the switch member 250 and the toner outlet 252 of the toner cartridge are staggered, and thereby the toner is blocked. In mounting direction of a toner cartridge (i.e. the direction "x"), the central opening 260 of the switch member 250 is in the downstream of the toner outlet 252 of the toner cartridge. When the switch member 250 is in an open position, the switch member 250 is retracted under applied force, and the central opening 260 of the switch member 250 communicates with the toner outlet 252 of the toner cartridge, allowing the toner outlet 252 to be opened, and the toner to flow out from the toner outlet 252 and the central opening 260.

[0032] Referring to FIGs.10-11, processes of opening and closing the toner outlet 252 by the switch member 250 will be specifically described. According to the present disclosure, the seal member 266 is bonded to, and moves together with, the switch member 250. For simplicity, the description for the status of the seal member 266 will be omitted in the following as it will move in the same manner as the switch member 250. Before the toner cartridge 200 is mounted into a printer, the switch member 250 is in a closed position, that is, the central opening 260 of the switch member 250 and the toner outlet 252 of the toner cartridge are staggered. When toner cartridge is inserted into the image forming device along the direction of the arrow shown in figure 10, the central opening 260 of the switch member 250 is in the downstream of the toner outlet 252 of the toner cartridge. As the toner cartridge 200 is inserted, the outer surface 254a of the switch member 250 is guided by the guide face 254a1 of the switch member 250 to come in contact with the upper surface of the toner inlet 188 (FIG. 1) of the image forming device 180. Since the central opening 260 of the switch member 250 is in the downstream of the toner cartridge 200 along the mounting direction of the toner cartridge 200, the central opening 260 is firstly aligned with the toner inlet 188 of the image forming de-

vice 180 (FIG. 1), and meanwhile, the force bearing portion 264 of the switch member 250 abuts against an edge 189 of the toner inlet 188 of the image forming device 180 (FIG. 1) (if the force bearing portion 264 of the switch member 250 is arranged on the front end of the switch member, the force bearing portion 264 will abut against a corresponding part of the image forming device 180 at a position opposite to the edge 189 of the toner inlet 188 of the image forming device 180), so that the switch member 250 keeps stationary relative to the toner inlet 188 of the image forming device 180 (FIG. 1). At this time, the toner outlet 252 of the toner cartridge 200 remains in a closed position, as shown in FIG. 9. When the toner cartridge 200 is further inserted into the printer, the toner outlet 252 of the toner cartridge approaches the central opening 260 of the switch member 250 and the toner inlet 188 of the image forming device 180 (FIG. 1), the guide rail 258 of the switch member 254 slides in the guide groove 276, the protrusion 256a on the elastic arm 256 of the switch member 250 slides in the guide slot 274a, and the block portions 278 slide in the slots 262 for the pressure springs 251, compressing the pressure springs 251. When the toner cartridge 200 reaches its limiting position, i.e. the limiting groove 221 on the second end cap 220 of the toner cartridge 200 abuts against the limiting protrusion 187 on the image forming device, the toner cartridge 200 is stationary relative to the image forming device 180, the toner outlet 252 of the toner cartridge is aligned with the central opening 260 of the switch member 250 and the toner inlet 188 of the image forming device 180 (FIG. 1), and the switch member 250 opens the toner outlet 252 of the toner cartridge, so that the toner may be supplied from the toner cartridge 200 into the image forming device 180.

[0033] Since the central opening 260 of the switch member 250 is in the downstream of the toner outlet 252 of the toner cartridge, achieving a mechanism for opening the toner outlet of the toner cartridge in stages where the central opening 260 of the switch member 250 is first aligned with the toner inlet 188 of the image forming device 180 and then aligned with the toner outlet 252 of the toner cartridge, the central opening 260 and the toner inlet 188 of the image forming device 180, an issue of toner leakage during the process of opening the toner outlet of the toner cartridge can be effectively improved. Even in the case of toner leakage, since the switch member includes a main body centrally provided with a central opening and slidably connected with an outer surface of the case at the toner outlet, and a pressure spring is provided between the main body and the case, that is, the toner outlet can be opened by a translational move of the switch member, toner leaked out during the opening process will only fall to a location corresponding to the toner outlet in the image forming device, and thus prevent the toner from sliding from toner outlet, along the tilted switch member, to a location not corresponding to the toner outlet in the image forming device and contaminating this location, which solves the technical problem of producing a contamination at a location not corresponding to the toner outlet in the image forming device when the toner cartridge is opened by rotation of the switch member and thereby causing a printing defect, as existed in the prior art.

[0034] Referring to FIG.6, a first support portion 217a, a second support portion 217b and a third support portion 217c that extend from the front wall 214 to the back wall 216 (in the direction "x") are provided at the bottom 217 of the front wall 214 of the main body of the toner cartridge 200. The first support portion 217a and second support portion 217b are located on two sides of the bottom 217 of the front wall 214 and close to the first side wall 210 and the second side wall 212 of the main body 208. The third support portion 217c is located at the middle of the bottom 217 of the front wall 214. In the mounting direction of the toner cartridge 200 into the printer (i.e. direction "x"), the third support portion 217c is located in the downstream of, and forms a triangle with, the first support portion 217a and second support portion 217b, allowing the toner cartridge 200 to "stand" in the image forming device more stable.

[0035] Of course, the main body 254 may not include the central opening 260. Referring to FIGs.14-15, the toner outlet 252 may be opened or closed by sliding of the main body 254 thereon. The main body 254 has a side 254c for closing when opening the main body 254, and in the absence of an external force, the side 254c extends beyond and thus closes the toner outlet. When the main body 254 slides under an external force to a position where the side 254c reaches the toner outlet 252, the toner outlet starts to be opened. When the main body 254 is in a closed position in the absence of an external force, the side 254c for closing is still spaced apart from the closest side of the toner outlet 252 by a distance L, so that the toner outlet 252 will not start to be opened until the toner cartridge slides for a distance L after being mounted into and in contact with the image forming device. This will delay the opening of the toner outlet 252, significantly reducing leakage of the toner.

[0036] In this embodiment, the pressure spring may also be replaced with a tension spring. As shown in FIG. 16, a pair of tension springs 351 is provided on both sides of the switch member 250, with one end of the tension spring 351 being connected with the switch member 250 and the other end with the case of the toner cartridge.

Embodiment 2

[0037] FIG. 17 is a schematic diagram illustrating a switch member and a corresponding switch member mounting portion on the toner cartridge according to Embodiment 2. Unless specifically stated otherwise, other parts of the toner cartridge have identical structures as in Embodiment 1.

[0038] The switch member 450 includes a main body 455 that is connected to the switch member mounting portion 470 by a connection member 460. The main body

455 may rotate freely around the connection member 460 in a plane in which the switch member mounting portion 470 is located. A torsion spring 480 is mounted to the connection member 460, with one end abutting against a block portion 451 on the main body of the switch member 455 and then other end abutting against the case of the toner cartridge. The main body 455 is provided with a guide groove 452, and the switch member mounting portion 470 is provided with a guide post 472 matched with the guide groove 452, where the guide groove 452 and the guide post 472 are positioned along the direction in which the torsion spring 480 applies an elastic force to the main body 455. The main body 455 is further provided with a force bearing portion 454 and a central opening 453.

[0039] When the switch member 450 is in a position where the toner outlet 471 is in a closed state, the torsion spring 480 applies a force to the switch member 450 by the block portion 451, the force driving the central opening 453 away from the toner outlet 471, so that the central opening 453 and the toner outlet 471 keep staggered, thereby enabling the switch member 450 to cover the toner outlet. At this time, the toner is enclosed within the toner cartridge. The guide post 472 abuts against a blind end of the guide groove 452, playing a role of limiting the switch member 450. During the process of the toner cartridge being mounted into a laser printer, the force bearing portion 454 of the switch member 450 abuts against the edge 189 of the image forming device, so that the switch member 450 initially keep stationary relative to the toner inlet 188, and the central opening 453 of the switch member 450 is initially aligned with the toner inlet 188 of the image forming device 180. When the toner cartridge is inserted further, the toner outlet 471 slides towards the central opening 453 and the toner inlet 188, and the three openings (i.e. the toner outlet 471, the central opening 453 and the toner inlet 188) are made to be aligned. At this time, the toner may flow into the toner inlet 188 through the toner outlet 471 and the central opening 453.

[0040] In this embodiment, the central opening of the switch member may also be removed, which accordingly reduces the area occupied by the main body of the switch member. When the switch member is used to close the toner outlet, both edges of the switch member are located at both sides of the toner outlet respectively; and when the toner outlet is in a opened position, the both edges of the switch member are located at the same side of the toner outlet.

[0041] In this embodiment, the torsion spring may also be replaced with a tension spring. In this case, one end of the tension spring is connected with the switch member, and the other end with the main body of the toner cartridge.

[0042] In the present utility model, it is assumed that the blocking rate of the switch member is presumed to be "1" when the toner outlet is completely blocked by the switch member, and the blocking rate is "0" when the toner outlet is not covered by the switch member at all; the throughput of the toner is "1" when the toner outlet is perfectly aligned with the toner inlet, and the throughput is "0" when the toner outlet is not aligned with the toner inlet at all. During the process of the toner cartridge being mounted to then image forming device, the blocking rate of the switch member on the toner outlet and the throughput rate of the toner between the toner outlet and the toner inlet will change as follows:

[0043] In first stage, before the switch member is in contact with the image forming device, the toner outlet is completely blocked by the switch member. At this time, the blocking rate of the switch member on the toner outlet is "1 ", and the throughput between the toner outlet and the toner inlet is "0".

[0044] In second stage, before the switch member is in contact with the image forming device, but the toner cartridge is not yet fully mounted in place, the blocking rate of the switch member on the toner outlet will change from "1" to "0", while the throughput between the toner outlet and the toner inlet will change from "0" to "1".

[0045] In third stage, the toner cartridge is fully mounted in place, and at this time, the blocking rate of the switch member on the toner outlet becomes "0", and the throughput between the toner outlet and the toner inlet becomes "1".

[0046] During the process of the toner cartridge being detached from the image forming device, the blocking rate of the switch member on the toner outlet and the throughput between the toner outlet and the toner inlet will change contrarily to those in the above stages, and thus will not be repeated herein.

[0047] During the process of the toner outlet approaching the toner inlet, the switch member firstly keeps stationary relative to the toner outlet and the toner inlet, and then the toner outlet slides or rotates relative to the switch member until the toner outlet communicates with the toner inlet, which dramatically alleviates the technical problem of toner leakage when the switch member for the toner outlet of the toner cartridge is being opened.

Claims

1. A toner cartridge mounted on an image forming device in a detachable manner, comprising a case provided with a toner chamber for storing toner, a toner outlet aligned and matched with a toner inlet of the image forming device, and a switch assembly located between the toner outlet and the toner inlet for controlling outflow of the toner from the toner outlet, the toner cartridge being, **characterized in that** the switch assembly is switched between a toner outlet close position and a toner outlet open position in a sliding manner.

2. The toner cartridge according to claim 1, wherein the switch assembly comprises a switch member and

an elastic element that is provided between the switch member and the case.

3. The toner cartridge according to claim 2, wherein the switch member comprises a main body slidably connected with an outer surface of the case at the toner outlet.

4. The toner cartridge according to claim 3, wherein a switch member mounting portion is provided at a location corresponding to the toner outlet on the outer surface of the case, where the switch member mounting portion is in a horizontal plane that is in the periphery of the toner outlet and matched with an inner surface of the switch member, the main body of the switch member can slide in the horizontal plane where the switch member mounting portion is located, and in a mounting direction of the toner cartridge, the switch member first keeps stationary relative to the toner outlet and the toner inlet, and then the toner outlet gradually communicates with the toner inlet.

5. The toner cartridge according to claim 4, wherein a force bearing portion is formed by extending outwards from an end of the main body of the switch member, at which the main body abuts against the image forming device on which the main body is mounted, and the force bearing portion forms an angle with a plane where the main body of the switch member is located.

6. The toner cartridge according to claim 5, wherein the main body of the switch member is slidably connected to a surface of the switch member mounting portion by a guide rail.

7. The toner cartridge according to claim 5, wherein the main body of the switch member is rotatably connected to a surface of the switch member mounting portion by a fixing piece, wherein the main body of the switch member can rotate around the fixing piece in the plane where the switch member mounting portion is located, and the elastic element is mounted to the fixing piece, with one end of the elastic element abutting against the case, and the other end abutting against the main body of the switch member.

8. The toner cartridge according to claim 6 or 7, wherein the switch member has a side for closing when opening the main body of the switch member, wherein the side is spaced apart from the nearest side of the toner outlet by a distance L when the main body of the switch member is in a closed position in the absence of an external force.

9. The toner cartridge according to any one of claims 2-7, wherein the main body of the switch member is further provided with a central opening.

10. The toner cartridge according to claim 9, wherein the central opening is spaced apart from the nearest side of the toner outlet by a distance L when the main body of the switch member is in a closed position in the absence of an external force.

11. The toner cartridge according to claim 6, wherein, the main body of the switch member is provided with an elastic arm on one side, the elastic arm has a protrusion rising from an outer side of an end thereof, and is spaced apart from the main body; the main body of the switch member is provided with a guide rail on another side opposite to the elastic arm, the switch member mounting portion is provided with a first side wall and a second side wall, wherein an end of the first side wall is provided with an extension portion extending towards the second side wall, and a guide groove matched with the guide rail is formed between the extension portion and the switch member mounting portion, and the second side wall is provided with a guide slot matched with the protrusion.

12. The toner cartridge according to claim 11, wherein the main body of the switch member is provided, at a side close to the outer surface of the case, with a slot, one end of which is open and the other end is a blind end, the outer surface of the case is provided with a block portion at a location corresponding to a lateral opening of the slot, the elastic element is located within the slot, and has one end abutting against the blind end of the slot and the other end abutting against the block portion.

13. The toner cartridge according to claim 12, wherein the number of each of the elastic element, the slot and the block portion each is two, distributing on both sides of the central opening.

14. The toner cartridge according to claim 7, wherein the main body of the switch member is provided with a guide groove, and the switch member mounting portion is provided with a guide post matched with the guide groove, wherein the guide groove and the guide post are located along the direction in which the elastic element applies an elastic force to the switch member.

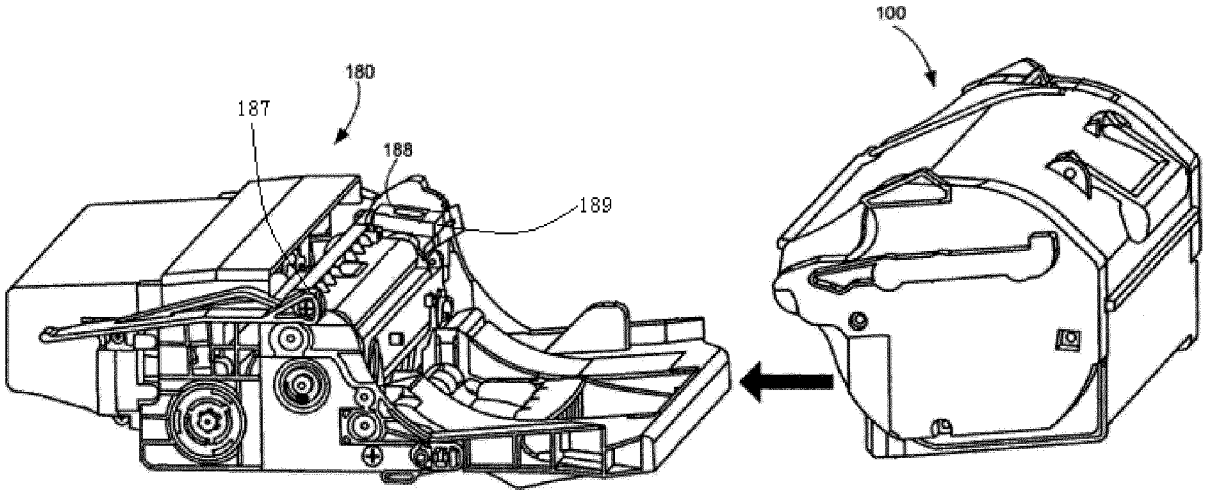

FIG. 1

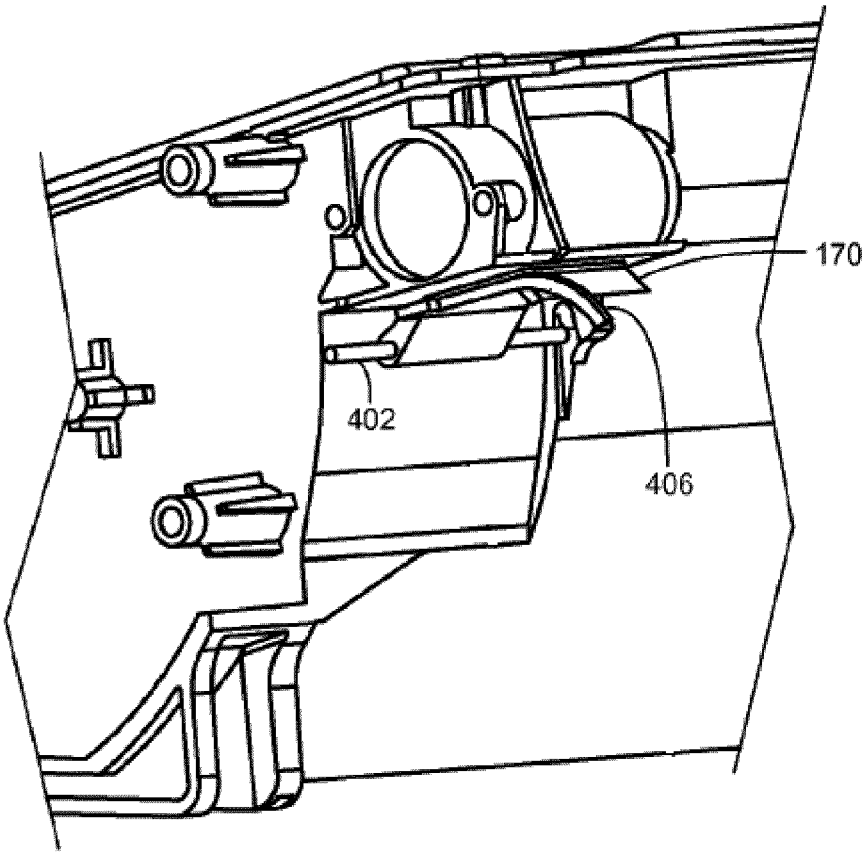

FIG. 2A

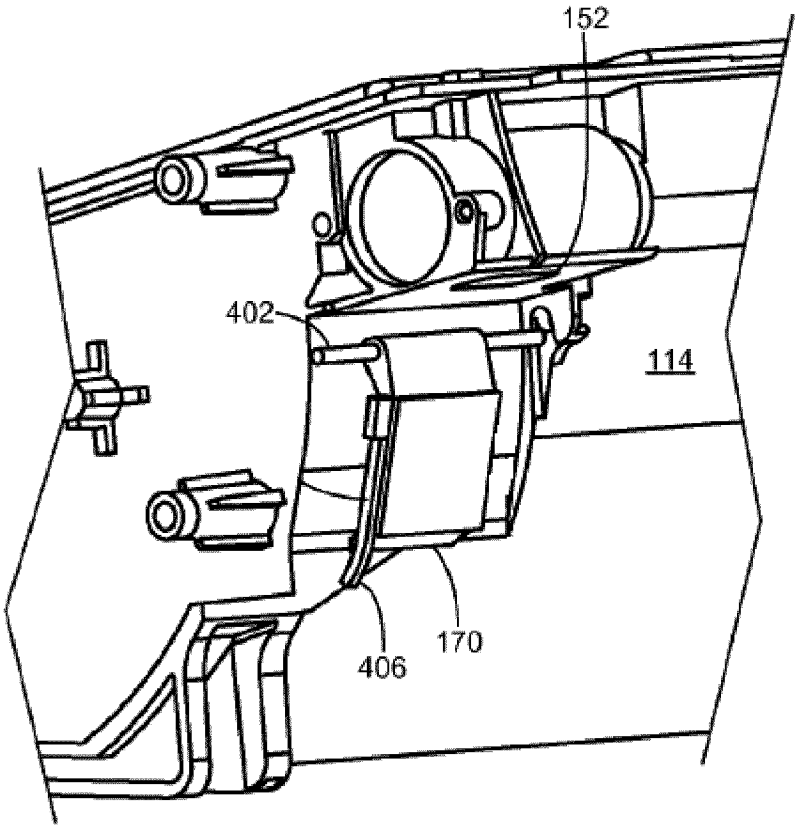
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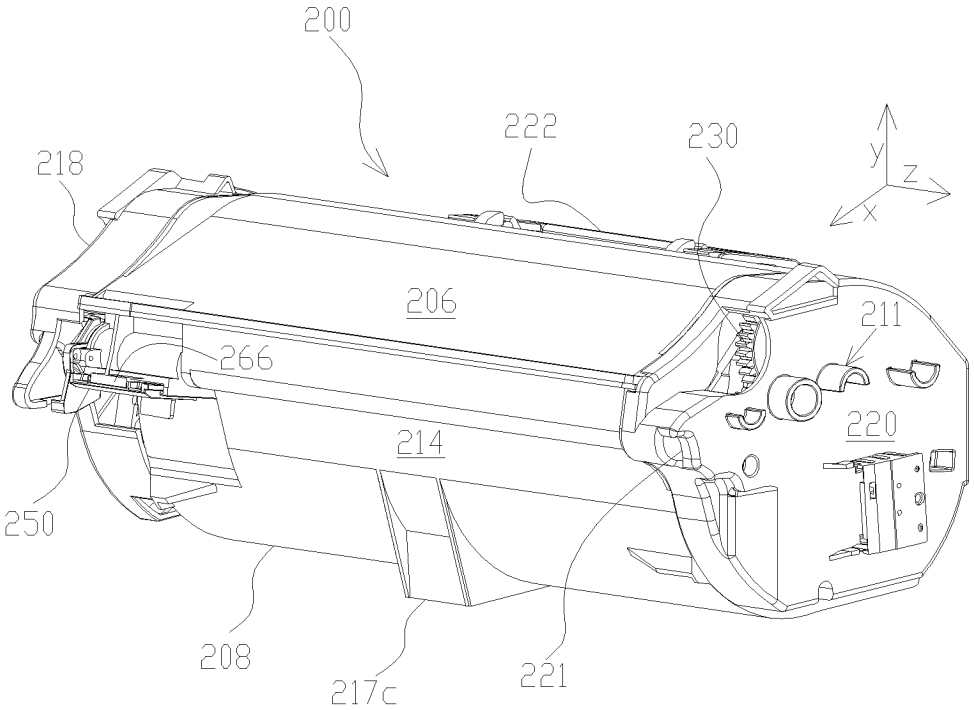
FIG. 2B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218
y
z
x
206
211
266
220
214
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208
217c
221

FIG. 3

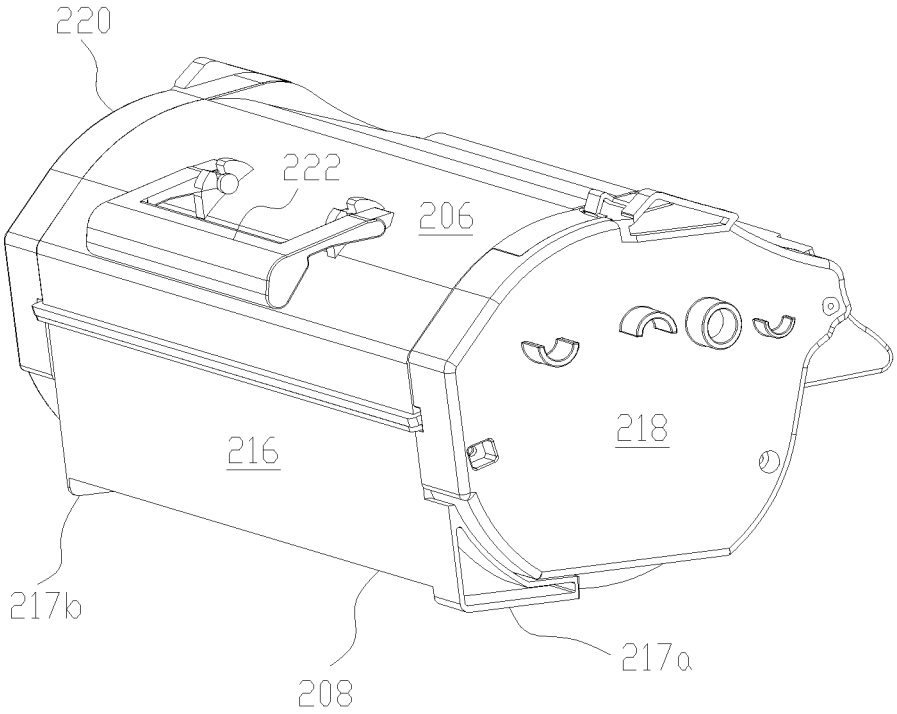
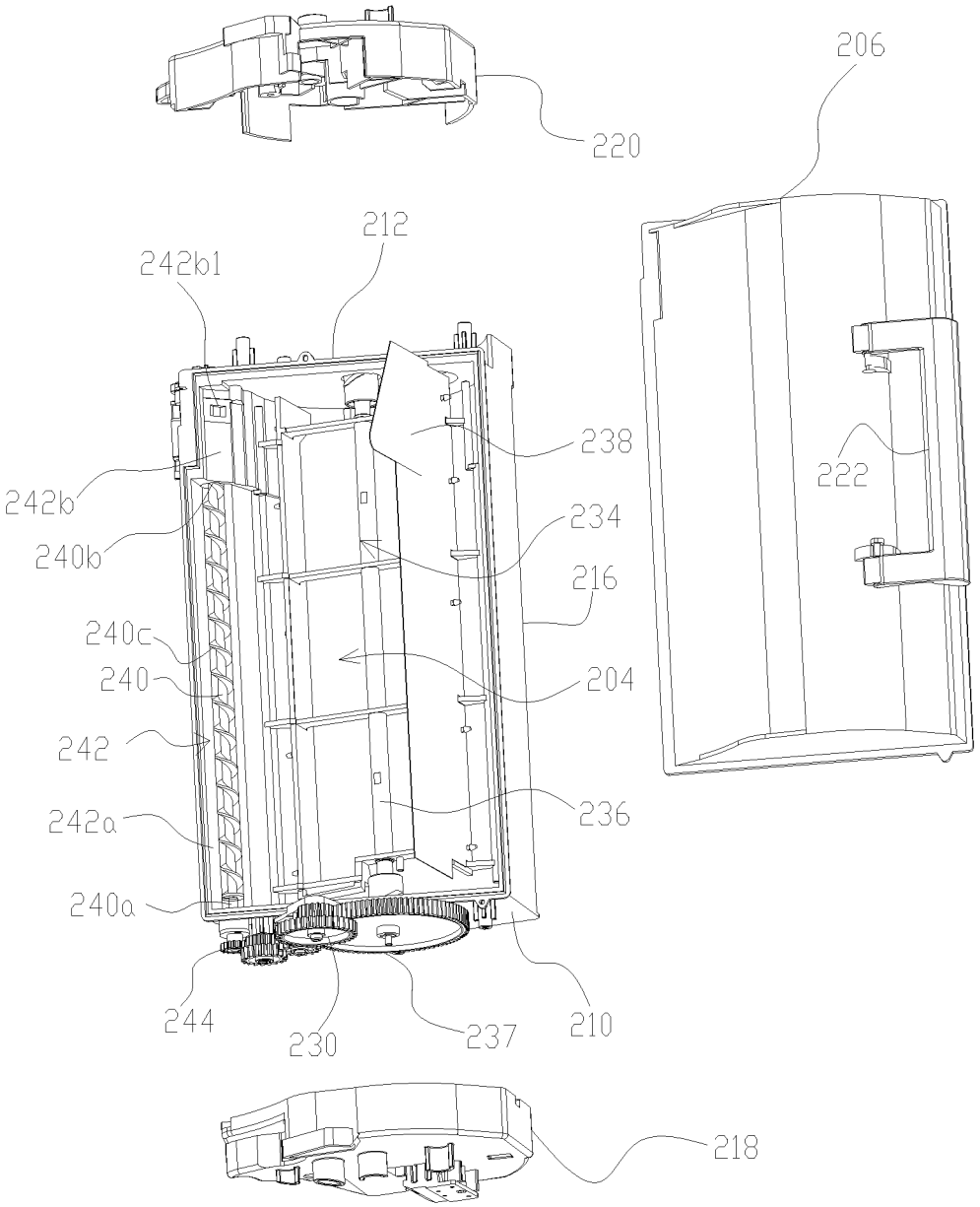


FIG. 4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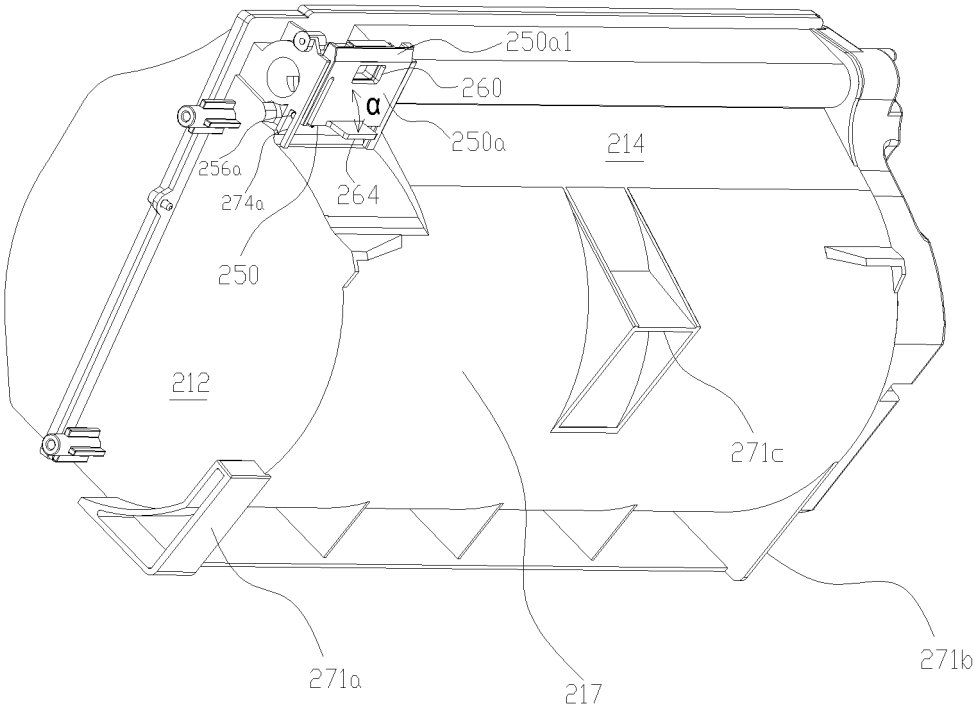
237
210
218

FIG. 5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264
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212
271c
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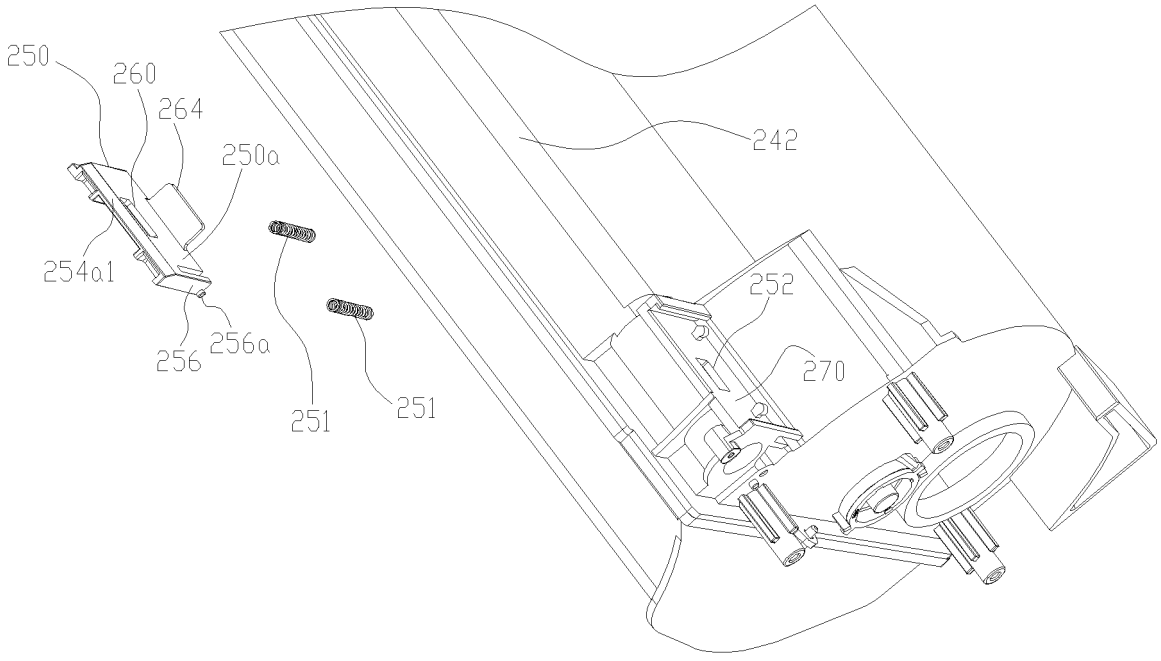
217
271b

FIG. 6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254a1
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256a
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251
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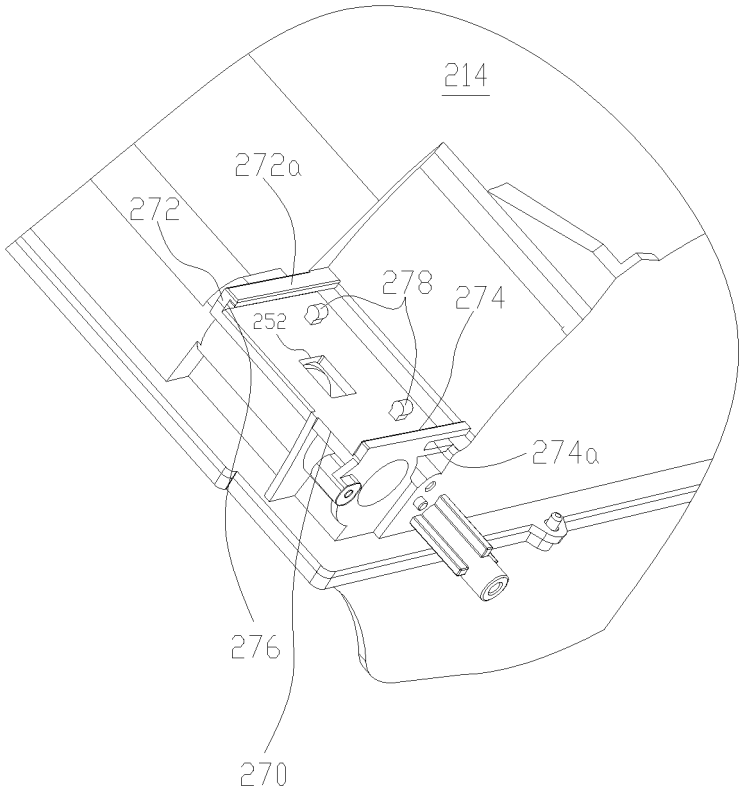
270

FIG. 7


214
272a
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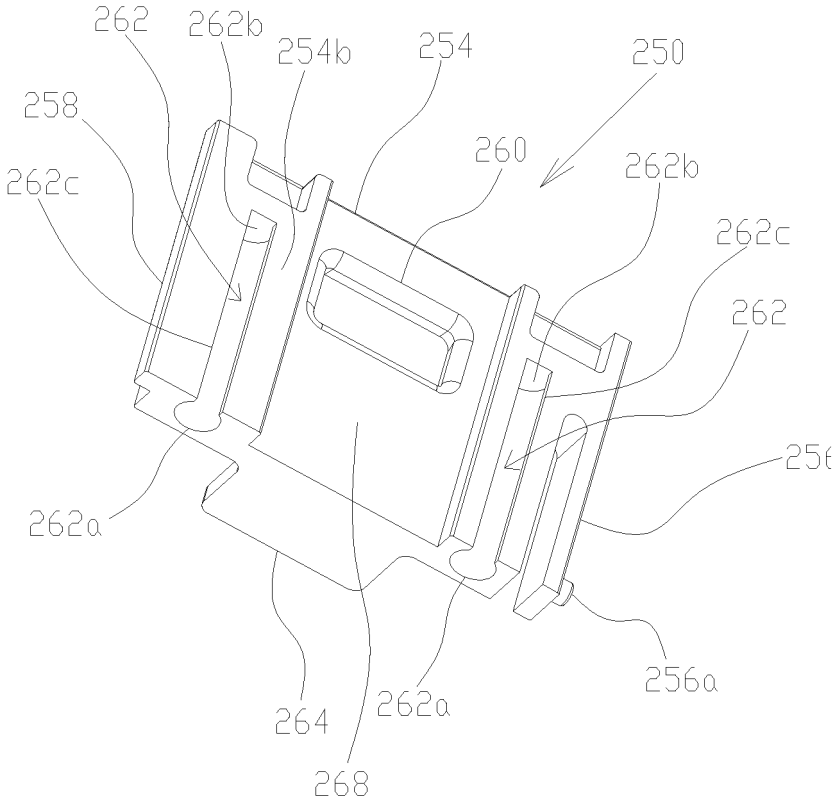
252
274a
276
270

FIG. 8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262b
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262b
262c
262c
262
262a
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262a
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FIG. 9

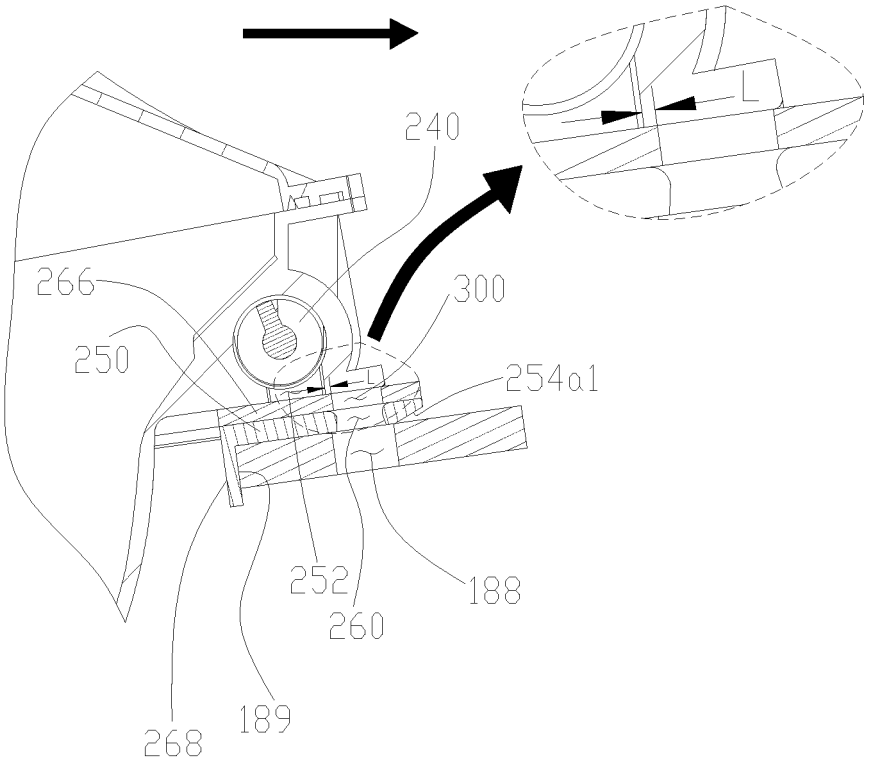
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FIG. 10

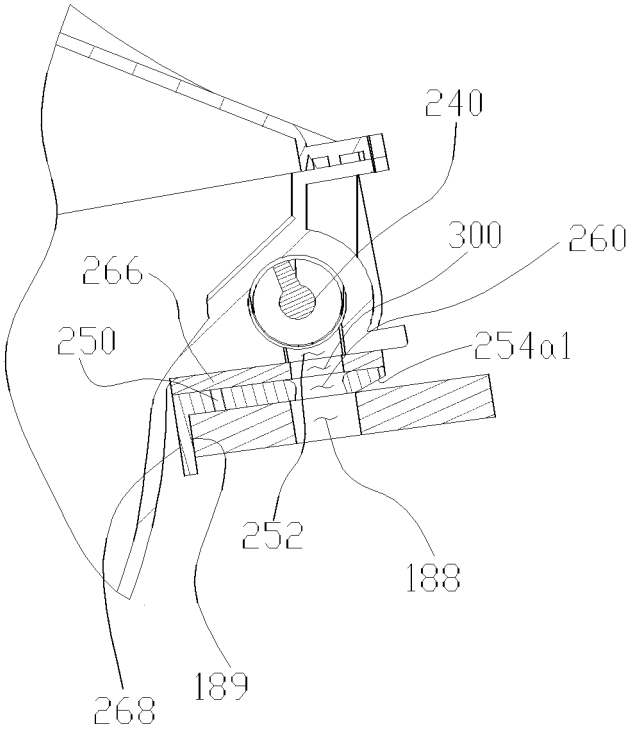
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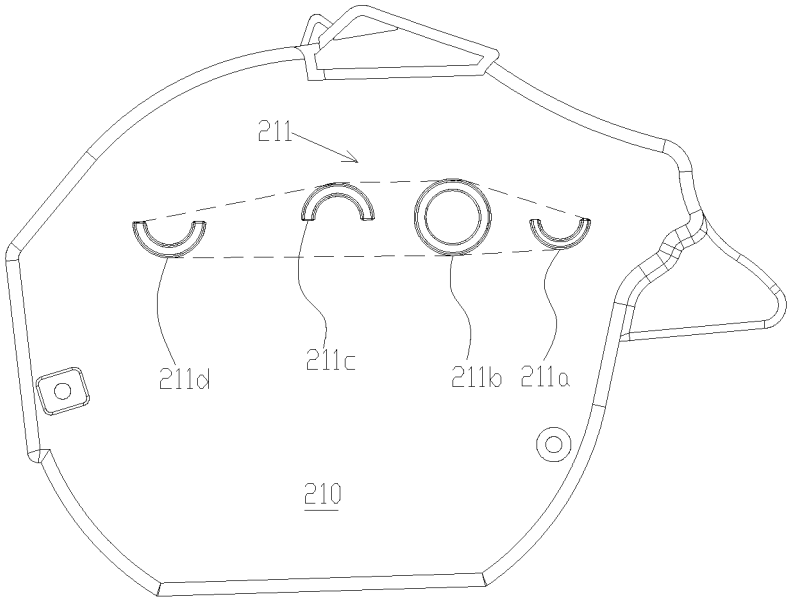
FIG. 11


211
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211b
211a
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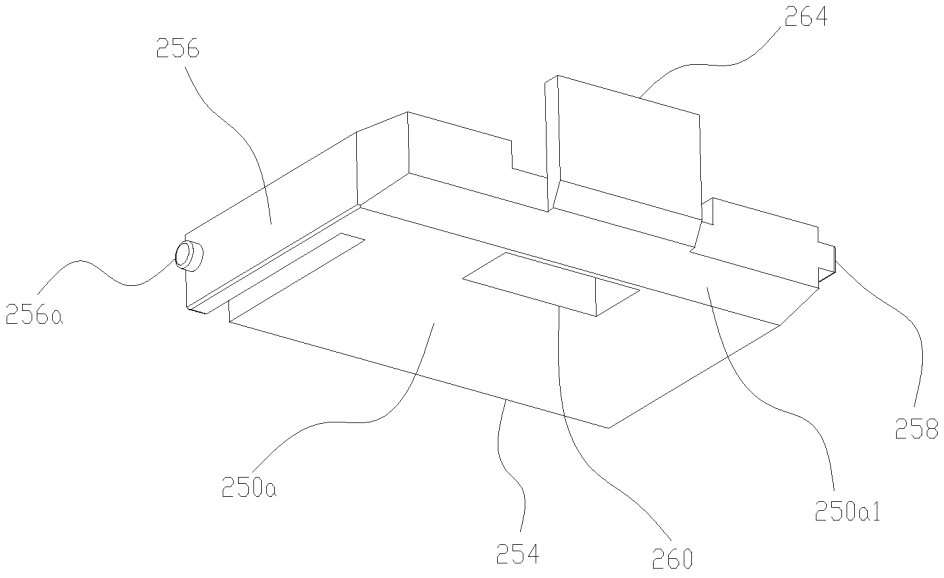
FIG. 12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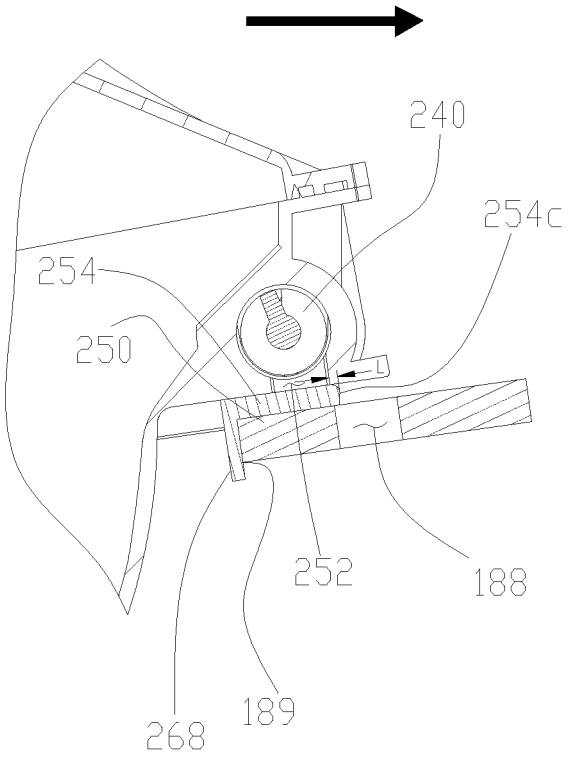
250a1
254
260

FIG. 13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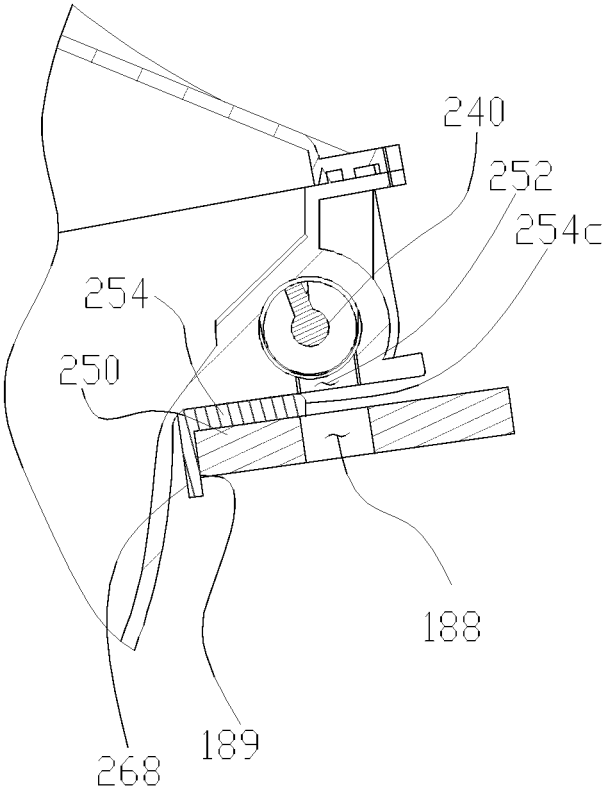
252
188
268
189

FIG. 14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250
188
189
268

FIG. 15

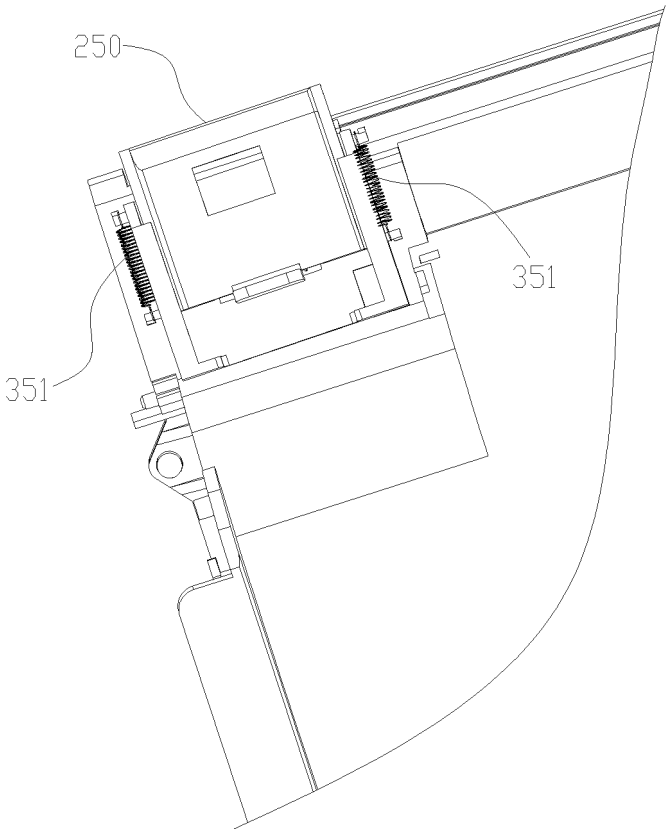

FIG. 16

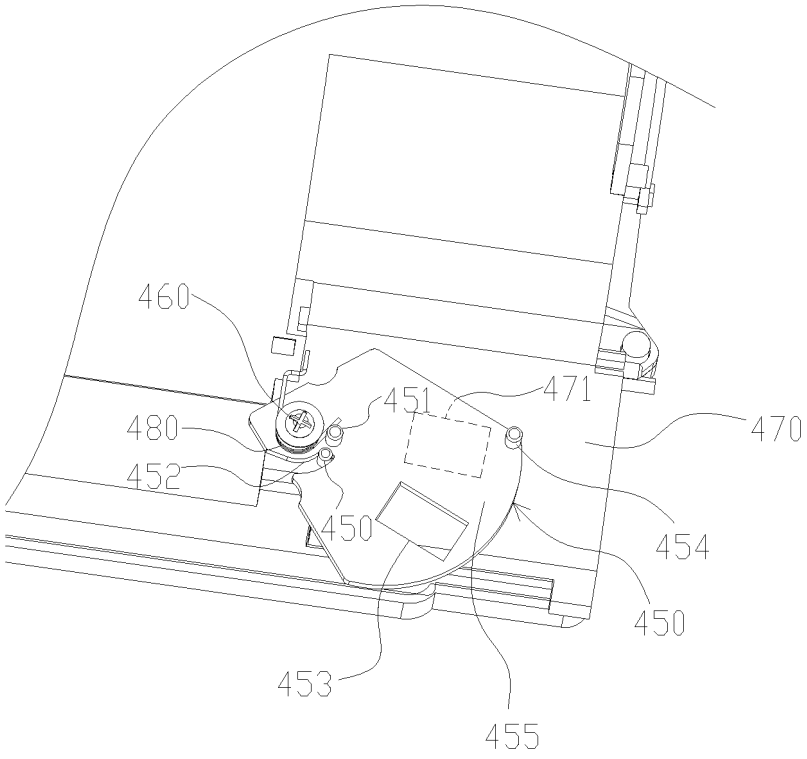

FIG. 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/081802

A. CLASSIFICATION OF SUBJECT MATTER

G03G 15/08 (2006.01) i; G03G 15/06 (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)

G03G 15/-

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)

EPODOC, WPI, CNPAT, CNKI: carbon powder, toner, elastic, powder, shell, cas+, inlet, outlet, switch, shutter, spring

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 203673229 U (ZHUHAI SEINE TECHNOLOGY CO., LTD), 25 June 2014 (25.06.2014), claims 1-10, and figures 1-15	1-14
X	CN 1152138 A (RICOH CO., LTD.), 18 June 1997 (18.06.1997), description, page 15, paragraph 7 to page 21, paragraph 2, and figures 1-16	1-3
Y	CN 1152138 A (RICOH CO., LTD.), 18 June 1997 (18.06.1997), description, page 15, paragraph 7 to page 21, paragraph 2, and figures 1-16	9, 10
Y	CN 102467019 A (FUJI XEROX CO., LTD.), 23 May 2012 (23.05.2012), description, page 9, paragraph 6 to page 14, paragraph 4, and figures 1-18	9, 10
A	US 5678121 A (XEROX CORP.), 14 October 1997 (14.10.1997), the whole document	1-14
A	US 5153649 A (GOLD STAR CO., LTD.), 06 October 1992 (06.10.1992), the whole document	1-14
A	CN 201215610 Y (PRINT-RITE TECHNOLOGY DEVELOPMENT CO., LTD. OF ZHUHAI), 01 April 2009 (01.04.2009), the whole document	1-14

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

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

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

"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
08 August 2014 (08.08.2014)	**29 September 2014 (29.09.2014)**
Name and mailing address of the ISA/CN: 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 **SUN, Zhongqin** Telephone No.: (86-10) **61648165**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/081802

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 201262686 Y (PRINT-RITE TECHNOLOGY DEVELOPMENT CO., LTD. OF ZHUHAI), 24 June 2009 (24.06.2009), the whole document	1-14

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/081802

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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		DE 19606097 A1	22 August 1996
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CN 201215610 Y	01 April 2009	None	
CN 201262686 Y	24 June 2009	None	

Form PCT/ISA/210 (patent family annex) (July 2009)