TONER REPLENISHING DEVICE OF IMAGE FORMING MACHINE AND TONER CARTRIDGE FOR USE THEREIN

Field of the Invention

The present invention relates to a toner replenishing device for replenishing a developing device, which is mounted in an image forming machine, such as an electrostatic copier or an electrostatic printer, with a toner; and a toner cartridge for use therein.

Description of the Prior Art

This type of toner replenishing device generally comprises a toner cartridge accommodating a toner, and a toner cartridge bearer disposed in a machine body and having a toner cartridge mounting portion for detachably mounting the toner cartridge thereon. The toner cartridge comprises a container body having a toner discharge opening and accommodating a toner, a sealing member for strippably closing the toner discharge opening, and a take-up shaft for taking up the sealing member while peeling it off. The toner cartridge bearer, on the other hand, is disposed in a machine body and has a toner cartridge mounting portion for detachably mounting the toner cartridge thereon. The toner cartridge is inserted into the toner cartridge mounting portion from a predetermined inserting direction, and set at a predetermined position.

With the toner cartridge being set on the toner cartridge mounting portion of the toner cartridge bearer as described above, the take-up shaft is rotated to take up the sealing member while peeling it off. As a result, the toner discharge opening is unclosed to cause the toner in the toner cartridge to fall into a hopper of the toner

cartridge bearer. To drive the take-up shaft rotationally, a driven gear is mounted on the take-up shaft, and this driven gear is engaged with a driving gear disposed in the toner cartridge bearer.

The driven gear and the driving gear are mounted, respectively, on the toner cartridge and the toner cartridge bearer, i.e., different members separated from each other. Thus, when a driving force is transmitted between the two gears, the toner cartridge may be displaced from the setting position. Consequently, the state of engagement between both gears is released, so that the sealing member cannot be peeled off. Furthermore, when the diameters of the driven gear and the driving gear are decreased to make the entire apparatus compact, the engagement of the teeth becomes less frequent. Unless assembly precision is increased, a failure in power transmission may occur during rotational driving, thereby causing the disadvantage that the sealing member cannot be peeled off.

Summary of the Invention

An object of the present invention is to provide a toner replenishing device of an image forming machine capable of reliably performing the rotational driving of a take-up shaft which takes up, while peeling off, a sealing member for strippably closing a toner discharge opening formed in a toner cartridge; and a toner cartridge for use in the toner replenishing device.

To attain the object, the invention provides a toner replenishing device of an image forming machine, which comprises

a toner cartridge having a container body accommodating a toner, the container body having a toner discharge opening in a lower surface thereof, a

sealing member strippably mounted on the lower surface of the container body, for closing the toner discharge opening, and a take-up shaft for taking up the sealing member while peeling it off, and

a toner cartridge bearer disposed in a machine body and having a toner cartridge mounting portion for detachably mounting the toner cartridge thereon, and a driving shaft for rotationally driving the take-up shaft, wherein

with the toner cartridge being mounted on the toner cartridge mounting portion of the toner cartridge bearer, the take-up shaft and the driving shaft are positioned opposite each other on the same axis;

the end, opposed to the driving shaft, of the take-up shaft is provided with a fitting convex or fitting concave non-circular in cross section, while the end, opposed to the take-up shaft, of the driving shaft is provided with a fitting concave or fitting convex non-circular in cross section to be fitted over or fitted into the fitting convex or fitting concave provided on or in the take-up shaft;

the toner cartridge bearer is provided with driving shaft moving means for moving the driving shaft in the axial direction between a removing position and a fitting position, and when the driving shaft is located at the fitting position by the driving shaft moving means, the fitting concave or fitting convex provided in or on the driving shaft is fitted over or fitted into the fitting convex or fitting concave provided on or in the take-up shaft.

The invention also provides a toner cartridge for use in a toner replenishing device of an image forming machine,

the toner cartridge having a container body

accommodating a toner, the container body having a toner discharge opening in a lower surface thereof, a sealing member strippably mounted on the lower surface of the container body, for closing the toner discharge opening, and a take-up shaft for taking up the sealing member while peeling it off, and

the toner cartridge being detachably mounted on a toner cartridge mounting portion of a toner cartridge bearer disposed in a machine body, wherein

the take-up shaft is provided with a fitting convex or fitting concave non-circular in cross section to be fitted into or fitted over a fitting concave or fitting convex non-circular in cross section provided in or on a driving shaft disposed in the toner cartridge bearer.

The invention further provides a toner cartridge for use in a toner replenishing device of an image forming machine,

the toner cartridge having a container body accommodating a toner, the container body having a toner discharge opening in a lower surface thereof, a sealing member strippably mounted on the lower surface of the container body, for closing the toner discharge opening, and a take-up shaft for taking up the sealing member while peeling it off, and

the toner cartridge being detachably mounted on a toner cartridge mounting portion of a toner cartridge bearer disposed in a machine body, wherein

the take-up shaft has a drivingly connecting member mounted thereon, the drivingly connecting member having a fitting convex or fitting concave non-circular in cross section to be fitted into or fitted over a fitting concave or fitting

convex non-circular in cross section provided in or on a driving shaft disposed in the toner cartridge bearer.

Other characteristics of the invention will become clear from the following description.

Brief Description of the Drawings

Fig. 1 is a schematic structural sectional view showing an embodiment of an image forming machine equipped with a toner replenishing device constructed in accordance with the present invention;

Fig. 2 is a perspective view of the image forming machine of Fig. 1;

Fig. 3 is a perspective view showing in a disassembled manner a toner cartridge and a toner cartridge bearer constituting the toner replenishing device to be mounted on the image forming machine of Fig. 1;

Fig. 4 is a side view, partly broken away, showing the toner cartridge illustrated in Fig. 3;

Fig. 5 is a perspective view showing, in a disassembled manner, a take-up shaft to be mounted on the toner cartridge illustrated in Fig. 3, and a drivingly connecting member to be mounted on the take-up shaft;

Fig. 6 is a perspective view showing the state of the toner cartridge illustrated in Fig. 3 with a shutter member open;

Fig. 7 is a front view of rotationally driving means for rotationally driving the take-up shaft mounted on the toner cartridge illustrated in Fig. 3;

Fig. 8 is a sectional view showing the relation between the take-up shaft and a driving shaft constituting the rotationally driving means illustrated in Fig. 7, with the driving shaft being

located at a removing position;

Fig. 9 is a sectional view showing the relation between the take-up shaft and the driving shaft constituting the rotationally driving means illustrated in Fig. 7, with the driving shaft being located at a fitting position; and

Fig. 10 is a perspective view of driving shaft moving means for moving the driving shaft, which constitutes the rotationally driving means illustrated in Fig. 7, between the removing position and the fitting position.

Detailed Description of the Preferred Embodiments

The present invention will now be described in detail with reference to the accompanying drawings illustrating preferred embodiments of a toner replenishing device of an image forming machine and a toner cartridge for use therein that are constructed in accordance with the present invention.

Figs. 1 and 2 show an electrostatic copier as an image forming machine equipped with a toner replenishing device constructed in accordance with the invention. The illustrated electrostatic copier has a machine body housing 2 in the form of a rectangular parallelopiped. On the top of this machine body housing 2, there are disposed a stationary transparent plate 4 on which a document to be copied is placed, and an openable/closable document pressing plate 5 for covering the stationary transparent plate 4 and the document placed thereon. In a nearly central part of the machine body housing 2, a photoconductor drum 6 is rotatably disposed as shown in Fig. 1. This photoconductor drum 6 is rotationally driven by driving means (not shown) in a direction shown by an arrow 60. Around the photoconductor drum 6, a charging corona discharger

8, a developing device 10, a transfer corona discharger 12, a peeling corona discharger 14, a cleaning unit 16, and a static eliminating lamp 18 are disposed in this order when viewed in the direction of rotation indicated by the arrow 60. The illustrated electrostatic copier has an optical system comprising an illuminating lamp 20, a first mirror 22, a second mirror 24, a third mirror 26, a lens 28, and a fourth mirror 30 disposed above the photoconductor drum 6. This optical system illuminates a document placed on the stationary transparent plate 4 by the illuminating lamp 20, and focuses an image of reflected light therefrom onto the outer peripheral surface of the photoconductor drum 6 via the first mirror 22, second mirror 24, third mirror 26, lens 28, and fourth mirror 30. The illustrated electrostatic copier has a transfer sheet feeder 32 for feeding a transfer sheet to a transfer area between the transfer corona discharger 12 and the photoconductor drum 6. The transfer sheet feeder 32 has transfer sheet cassettes 34a, 34b for accommodating transfer sheets, transfer sheet dispatch rollers 36a, 36b, separating roller pairs 38a, 38b, a guide path 40, carrying roller pairs 42 and 44, and a register roller pair 46. The respective roller pairs of the so constituted transfer sheet feeder 32 are rotationally driven by driving means (not shown). On the transfer sheet delivery side of the transfer area, a transfer sheet conveying belt mechanism 48, a fixing roller pair 52 constituting a fixing device 50, and a discharge roller pair 54 are disposed. The conveying belt mechanism and the rollers are rotationally driven by driving means (not shown). On the front surface of the machine body housing 2 having these members

disposed therein, a front cover 2a is mounted in an openable and closable manner with its lower edge as a fulcrum, as shown in Fig. 2.

In the electrostatic copier constructed as above, the charging corona discharger 8 charges a photosensitive material on the photoconductor drum 6 to a specific polarity substantially uniformly while the photoconductor drum 6 is being rotationally driven in the direction of the arrow 60. Then, the document placed on the stationary transparent plate 4 is illuminated by the illuminating lamp 20. Its reflected light image is scan projected by exposure onto the photoconductor drum 6 via the first mirror 22, second mirror 24, third mirror 26, lens 28, and fourth mirror 30 to form an electrostatic latent image on the photoconductor drum 6. Then, the electrostatic latent image on the photoconductor drum 6 is developed to a toner image by the developing device 10. On the other hand, transfer sheets accommodated in the transfer sheet cassette 34a or 34b of the transfer sheet feeder 32 are dispatched by the transfer sheet dispatch roller 36a or 36b to the guide path 40, stopped transiently at the register roller pair 46, and carried to the transfer area in synchronism with the toner image formed on the photoconductor drum 6. The transfer sheet carried to the transfer area passes between the photoconductor drum 6 having the toner image formed thereon and the transfer corona discharger 12 to have the toner image transferred thereto. The transfer sheet with the transferred toner image is peeled from the photoconductor drum 6 by the action of the peeling corona discharger 14, and carried by the transfer sheet conveying belt mechanism 48 to the fixing device 50. There, the transfer sheet has the toner

image thermally fixed, and is discharged onto a discharge tray 56 by the discharge roller pair 54. The photoconductor drum 6 finishing a transfer step in the above manner is cleared of the toner, adhering to its outer peripheral surface, by the cleaning unit 16. Further, the photoconductor drum 6 has its photosensitive surface illuminated with static eliminating light by the static eliminating lamp 18, whereby the static electricity is removed.

The illustrated electrostatic copier has a toner replenishing device 100 for replenishing the developing device 10 with a toner. This toner replenishing device 100 is disposed forward of and above the developing device 10, and comprises a toner cartridge 200 containing the toner, and a toner cartridge bearer 300 for detachably mounting the toner cartridge 200 thereon. On the toner cartridge bearer 300, a folding guide tray 310 is mounted for guiding the mounting and removal of the toner cartridge 200.

The guide tray 310, as shown in Fig. 2, is movable between a guiding position at which the guide tray 310 has been reclined to a horizontal state forward of the developing device 10, and a folding position at which the guide tray 310 has been turned upwards from the guiding position to a state nearly normal to the guiding position. The guide tray 310 will be described in detail later on.

In replacing the toner cartridge 200, as shown in Fig. 2, the opening/closing cover 2a constituting part of the front surface of the machine body housing 2 is tilted forward to a horizontal state to open it. With the guide tray 310 being located at the guiding position, the toner cartridge 200 that has been mounted on the toner cartridge

bearer 300 is pulled out forward. Then, a fresh toner cartridge 200 is mounted on the toner cartridge bearer 300 via the guide tray 310. When the fresh toner cartridge 200 has been mounted on the toner cartridge bearer 300, the guide tray 310 is turned upwardly from the illustrated guiding position to the folding position which is nearly normal to the guiding position. Then, the opening/closing cover 2a is closed by turning it upwards until it rests on the same plane as the front surface of the machine body housing 2. Even if the guide tray 310 remains in a horizontal state, the guiding position, when closing the opening/closing cover 2a, the opening/closing cover 2a being closed touches the guide tray 310. Thus, the opening/closing cover 2a can turn the guide tray 310 to the folding position.

Next, the toner cartridge 200 constituting the toner replenishing device 100 will be described with reference to Figs. 3 to 6.

The toner cartridge 200 has a container body 201 accommodating a toner, and a flange 203 forming the lower surface of the container body 201 and having a toner discharge opening 202. On the lower surface of the flange 203, a sealing member 210 comprising a resin film which closes the toner discharge opening 202 is mounted strippably. This sealing member 210, as shown in Fig. 4, is bonded to one side toward the other side of the flange 203 by heat sealing or by means of an adhesive, then folded back, and fastened at its front end to a take-up shaft 220 to be described later on.

The take-up shaft 220 is rotatably disposed in a front-to-back end wall 231 constituting a sealing member accommodating portion 230 provided on one side of the container body 201 as shown in Fig.

4. This take-up shaft 220 is formed from synthetic resin such as polyacetal highly slidable relative to a bearing, and a socket portion 221 is integrally formed at one end thereof. In the socket portion 221, a fitting hole 221a semicircular in cross section is formed, and an engaging claw 221b is provided. Into the fitting hole 221a formed in the socket portion 221 of the so constructed take-up shaft 220, a drivingly connecting member 240 is fitted for transmitting a rotational driving force. This drivingly connecting member 240 comprises a mounting portion 241 to be fitted into the fitting hole 221a, and a fitting convex 242, and is integrally molded from, for example, ABS resin with high strength. The mounting portion 241 constituting the drivingly connecting member 240 has a semicircular cross section, and has an undercut groove 241a formed on its outer periphery. With the mounting portion 241 being fitted into the fitting hole 221a of the socket portion 221, the engaging claw 221b is engaged with the undercut groove 241a. The fitting convex 242 constituting the drivingly connecting member 240 is triangular in cross section in the illustrated embodiment. This fitting convex 242 may be polygonal other than triangular in cross section, and may be provided with any non-circular cross sectional shape, for example, by splining or serrating its outer periphery. Also, the fitting hole 221a formed in the socket portion 221 and the mounting portion 241 constituting the drivingly connecting member 240 need to be non-circular in cross section. The drivingly connecting member 240 provided with the fitting convex 242 is constituted as a part separate from the take-up shaft 220, and is adapted to be fitted into and mounted on the socket

portion 221 provided in the take-up shaft 220. Thus, the drivingly connecting member having the fitting convex 242 with a different cross sectional shape is set according to the type of a toner accommodated in the toner cartridge, whereby the toner cartridge set, for instance, according to the destination of shipment in harmony with the climatic conditions can be easily identified.

On the flange 203 forming the lower surface of the container body 201 that constitutes the toner cartridge 200, a shutter member 250 is slidably mounted. The shutter member 250, as shown in Fig. 6, comprises a first portion 251 and a second portion 252, and is integrally molded from a suitable plastic material. On the first portion 251, L-shaped projections 251a, 251a heading in opposite directions to each other are integrally molded in the opposite edge parts thereof. Between this pair of L-shaped projections 251a, 251a and the upper surface of the first portion 251, the corresponding edge part of the flange 203 is fitted to serve as a guide for the sliding of the shutter member 250 relative to the flange 203. With the shutter member 250 being located at an open position shown in Fig. 6, the L-shaped projections 251a, 251a are engaged with stoppers 203a, 203a provided in a pull-out side end part of the flange 203.

The second portion 252 constituting the shutter member 250 is connected to the first portion 251 via a thin-walled portion 253, and thus can be folded about the thin-walled portion 253. In the second portion 252, L-shaped projections 252a, 252a heading in opposite directions to each other are integrally molded on its opposite edge parts. Between this pair of L-shaped projections 252a, 252a

and the upper surface of the second portion 252, the corresponding edge part of the flange 203 is fitted to serve as a guide for the sliding of the shutter member 250 relative to the flange 203. In a forward side end part of the second portion 252 constituting the shutter member 250, engaging holes 252b, 252b are formed.

Next, the toner cartridge bearer 300 will be described with reference to Figs. 3 and 7 to 10.

The toner cartridge bearer 300 has a toner cartridge mounting portion 320, and a hopper portion 330 provided in the center of the toner cartridge mounting portion 320. Forward of the toner cartridge mounting portion 320, the guide tray 310 is mounted. The guide tray 310 has a turning shaft 311 at one end thereof, and is turnably mounted at the front end of the toner cartridge mounting portion 320 by the turning shaft 311. The guide tray 310 is adapted to be movable between the guiding position, i.e., the horizontal state shown in Fig. 3, and the folding position at which the guide tray 310 has been turned upwards from the guiding position to a state nearly normal to the guiding position. With the guide tray 310 being located at the guiding position, the horizontal state shown in Fig. 3, the guide tray 310 is adapted to contact a stopper 325 provided on the toner cartridge mounting portion 320. On opposite side areas of the guide tray 310, guide grooves 312, 312 are provided for guiding the shutter member 250 mounted on the flange 203 forming the lower surface of the container body 201 of the toner cartridge 200. On a forward side end part of the guide tray 310, engaging members 313, 313 are disposed for engaging the engaging holes 252b, 252b provided in the second portion 252 constituting the shutter member 250.

These engaging members 313, 313 are urged by the spring force of springs (not shown) so as to protrude upward from the upper surface of the shutter member 250.

On opposite side areas of the toner cartridge mounting portion 320, guide grooves 321, 321 are provided for guiding the flange 203 that forms the lower surface of the container body 201 of the toner cartridge 200. On the rear side, and the left side when viewed from the forward side, of the toner cartridge mounting portion 320, side walls 322 and 323, respectively, are erected. In a right side end part, when viewed from the forward side, of the side wall 322, a positioning concave 322a is provided to be fitted with the other end part of the take-up shaft 220 mounted on the container body 201 constituting the toner cartridge 200. On the side walls 322 and 323, rotationally driving means 340 is disposed for rotationally driving the take-up shaft 220. The rotationally driving means 340, as shown in Fig. 7, is composed of an electric motor 341 as a driving source, a driving screw gear 343 mounted on a rotationally driving shaft 342 of the electric motor 341, a driven screw gear 344 meshing perpendicularly with the driving screw gear 343, an idle gear 345 comprising a spur gear which is constructed integrally with the driven screw gear 344, a spur gear 346 meshing with the idle gear 345, and a driving shaft 348 having a flange 347 provided on the side surface of the spur gear 346. In the core of this driving shaft 348, as shown in Fig. 8, a pin inserting hole 348a is formed. Also, at the end, opposed to the take-up shaft 220, of the driving shaft 348, a fitting concave 349 is formed for fitting over the fitting convex 242 of the drivingly

connecting member 240 mounted on the take-up shaft 220. In the illustrated embodiment, this fitting concave 349 is triangular in cross section in correspondence with the cross sectional shape of the fitting convex 242. The so constituted driving shaft 348 is pierced with a support pin 350 attached to the side wall 323, and is supported thereby so as to be movable axially between a removing position shown in Fig. 8 and a fitting position shown in Fig. 9. Between a flange 347 provided at the left end of the driving shaft 348 in the drawings and the side wall 323, a coil spring 351 is disposed to urge the driving shaft 348 always toward the right in the drawings.

The illustrated toner cartridge bearer 300 includes driving shaft moving means 360 for moving the driving shaft 348 leftward in Figs. 8 and 9 against the spring force of the coil spring 351. The driving shaft moving means 360 has a moving member 361 as illustrated in Fig. 10. The moving member 361 has a notch 361a in its one end part to assume a bifurcated shape. In the other end part of the moving member 361, a slot 361 elongated in the up-and-down direction is provided. At the end of the notch 361a in the one end part of the so constituted moving member 361, a cam plate 362 is attached by means of machine screws 363, 363. This cam plate 362 is also provided with a notch 362a at one end part thereof to assume a bifurcated shape. In the bifurcated part, inclined surfaces 362b, 362b are provided, and these inclined surfaces 362b, 362b are adapted to engage the flange 347 provided on the driving shaft 348. The so constituted moving member 361 is supported by a guide support member 324 (see Fig. 3) provided on the toner cartridge mounting

portion 320 so as to be movable in the directions indicated by arrows X and Y in Fig. 10. The guide support member 324 has an arcuate guide hole 324a formed for guiding a moving pin (to be described later on).

The driving shaft moving means 360 in the illustrated embodiment has a moving mechanism 364 for reciprocating the moving member 361 in the directions of the arrows X and Y in Fig. 10 in association with the movement of the guide tray 310. This moving mechanism 364 is composed of a moving gear 365 formed integrally with the turning shaft 311 of the guide tray 310, a driven gear 367 meshing with the moving gear 365, a moving lever 368 provided integrally with the driven gear 367, and a moving pin 369 provided integrally with the moving lever 368. The moving pin 369 is fitted into the slot 361b provided in the other end part of the moving member 361, and the guide hole 324a formed in the guide support member 324. The state shown in Fig. 10 is a state in which the guide tray 310 is located at the guiding position in a horizontal state, with the moving pin 369 being positioned at the lower end of the slot 361b. In this state, the moving member 361 is moved in the direction of the arrow X in Figs. 8 and 10, and the inclined surfaces 362b, 362b of the cam plate 362 are engaged with the flange 347. As a result, the driving shaft 348, as shown in Fig. 8, is located at the removing position at which it has been moved leftward in the drawing against the spring force of the coil spring 351. On the other hand, the guide tray 310 is turned upwards from the state shown in Figs. 8 and 10 to the folding position, nearly normal to that state, indicated by a two-dot chain line in Fig. 10. During this action, the moving gear 365

provided on the turning shaft 311 of the guide tray 310 is turned in a direction indicated by a two-dot chain arrow in Fig. 10. The driven gear 367 meshing with the moving gear 365 is turned in a direction indicated by a two-dot chain arrow in Fig. 10. Thus, the moving lever 368 provided integrally with the driven gear 367 is also turned, whereby the moving pin 369 provided integrally with the moving lever 368 is also turned along the guide hole 324a formed in the guide support member 324. As a result, the moving member 361 having the slot 361b fitted with the moving pin 369 is moved in the direction of the arrow Y in Figs. 9 and 10 (the shifted member 361 is indicated by a two-dot chain line in Fig. 10), whereupon the engagement of the inclined surfaces 362b, 362b of the cam plate 362 with the flange 347 is released. Upon this disengagement of the cam plate 362 and the flange 347, the driving shaft 348, as shown in Fig. 9, is moved rightward in the drawing by the spring force of the coil spring 351. The fitting concave 349 provided at the front end thereof is brought to the fitting position at which the fitting concave 349 fits over the fitting convex 242 of the take-up shaft 220 mounted on the toner cartridge 200 and located at a predetermined position.

On the illustrated toner cartridge bearer 300, toner carrying means 370 is disposed for carrying a toner, which has been fed to the hopper portion 330 of the toner cartridge bearer 300, to the developing device 10. The toner carrying means 370 may be a well-known screw conveyor type one, which is actuated by an electric motor (not shown).

The toner replenishing device 100 in the illustrated embodiment is constituted as above. The

action of mounting the toner cartridge 200 on the toner cartridge bearer 300 will be described below.

In mounting the toner cartridge 200 on the toner cartridge bearer 300, the opening/closing cover 2a constituting part of the front surface of the machine body housing 2 is tilted forward to a horizontal state to open it, as shown in Fig. 2, and the guide tray 310 is located at the guiding position, a horizontal state, as shown in Fig. 3. After the guide tray 310 is located at the guiding position, the shutter member 250 of a fresh toner cartridge 200 is inserted from the forward side into the guide grooves 312, 312 provided on the opposite side areas of the guide tray 310. The shutter member 250 is slid and pushed in together with the container body 201 of the toner cartridge 200. When the shutter member 250 has been positioned on the guide tray 310, the engaging holes 252b, 252b provided in the second portion 252 constituting the shutter member 250 engage the engaging members 313, 313 disposed on the guide tray 310, so that the movement of the shutter member 250 is restrained. When the container body 201 of the toner cartridge 200 is further pushed in with the movement of the shutter member 250 under restraint, the flange 203 is inserted into the guide grooves 321, 321 formed on the opposite side areas of the toner cartridge mounting portion 320. With the flange 203 being guided during insertion, the container body 201 is moved, and brought to the predetermined position of the toner cartridge mounting portion 320. At this time, the other end area of the take-up shaft 220 mounted on the container body 201 is fitted into the positioning concave 322a provided on the side wall 322 of the toner cartridge mounting portion 320.

Thus, the container body 201 is positioned at the predetermined position.

When the container body 201 of the toner cartridge 200 has been mounted at the predetermined position of the toner cartridge mounting portion 320 in the foregoing manner, the take-up shaft 220 mounted on the container body 201 is positioned on the same axis as that of the driving shaft 348 as shown in Fig. 8. In this state, the guide tray 310 rests at the guiding position, i.e., in a horizontal state. Thus, the moving member 361 is moved in the direction of the arrow X in Fig. 8 as stated previously. The driving shaft 348 provided with the flange 347 engaging the cam plate 362 is located at the removing position at which the driving shaft 348 has been moved leftward in Fig. 8 against the spring force of the coil spring 351 as shown in Fig. 8. Hence, the fitting concave 349 provided in the front end area of the driving shaft 348 is not fitted over the fitting convex 242 of the take-up shaft 220 mounted on the toner cartridge 200.

When the toner cartridge 200 has been mounted at the predetermined position of the toner cartridge mounting portion 320, the guide tray 310 is turned upward about the turning shaft 311. At this time, the second portion 252 constituting the shutter member 250 positioned on the guide tray 310 is also folded upward about the thin-walled portion 253. As a result, the guide tray 310 and the second portion 252 constituting the shutter member 250 are turned from the horizontal state to the folding position nearly normal to the horizontal state.

By the turning of the guide tray 310 from the guiding position to the folding position, the moving pin 369 provided integrally with the moving

lever 368 is turned along the guide hole 324a formed in the guide support member 324 via the moving gear 365 provided on the turning shaft 311 of the guide tray 310, the driven gear 367 meshing with the moving gear 365, and the moving lever 368 provided integrally with the driven gear 367. Thus, the moving member 361 whose slot 361b the moving pin 369 has been fitted into is moved in the direction of the arrow Y in Figs. 9 and 10. As a result, the inclined surfaces 362b, 362b of the cam plate 362 mounted on the moving member 361 are disengaged from the flange 347. The driving shaft 348 is brought to the fitting position at which it has been moved rightward in Fig. 9 by the spring force of the coil spring 351 as shown in Fig. 9. Hence, the fitting concave 349 provided in the front end area of the driving shaft 348 is fitted over the fitting convex 242 of the take-up shaft 220, which has been mounted on the toner cartridge 200 and located at the predetermined position, whereby the driving shaft 348 and the take-up shaft 220 are drivingly connected together. By such movement of the guide tray 310 from the guiding position to the folding position, i.e., the mounting action for the toner cartridge 200, the driving shaft 348 and the take-up shaft 220 can be drivingly connected together reliably. After the guide tray 310 is turned from the guiding position to the folding position, the opening/closing cover 2a constituting part of the front surface of the machine body housing 2 is turned upwards to close it. The electric motor 341 constituting the rotationally driving means 340 is driven, with the driving shaft 348 and the take-up shaft 220 being drivingly connected together in the above manner. The resulting driving force is transmitted to the

rotationally driving shaft 342, driving screw gear 343, driven screw gear 344, idle gear 345, and spur gear 346, and the driving shaft 348 is rotated via the spur gear 346. Hence, the take-up shaft 220 drivingly connected to the driving shaft 348 is rotated. Upon rotation of the take-up shaft 220, the sealing member 210 is peeled off and taken up to unclose the toner discharge opening 202. Thus, the toner accommodated in the container body 201 of the toner cartridge 200 falls into the hopper portion 330 provided in the toner cartridge bearer 300.

An explanation will be offered for the action of taking the toner cartridge 200 from the toner cartridge bearer 300 if the toner contained in the container body 201 of the toner cartridge 200 is used up.

In withdrawing the toner cartridge 200 from the toner cartridge bearer 300, the opening/closing cover 2a constituting part of the front surface of the machine body housing 2 is tilted forward to a horizontal state to open it, as shown in Fig. 2, and the guide tray 310 is turned from the folding position to the guiding position shown in Fig. 3. By this turning, the moving pin 369 provided integrally with the moving lever 368 is turned along the guide hole 324a formed in the guide support member 324 via the moving gear 365 provided on the turning shaft 311 of the guide tray 310, the driven gear 367 meshing with the moving gear 365, and the moving lever 368 provided integrally with the driven gear 367. Thus, the moving member 361 whose slot 361b the moving pin 369 has been fitted into is moved in the direction of the arrow X in Figs. 8 and 10. As a result, the inclined surfaces 362b, 362b of the cam plate 362 are engaged with the flange 347. Upon this engagement,

the driving shaft 348 is moved leftward in Fig. 8 against the spring force of the coil spring 351 as shown in Fig. 8, and thereby brought to the removing position. Hence, the fitting concave 349 provided in the front end area of the driving shaft 348 is disengaged from the fitting convex 242 of the take-up shaft 220 mounted on the toner cartridge 200, whereby the driving connection between the driving shaft 348 and the take-up shaft 220 is released. By such turning of the guide tray 310 from the folding position to the guiding position, the second portion 252 constituting the shutter member 250 is also turned about the thin-walled portion 253, and returned to the horizontal state shown in Fig. 6.

Then, the container body 201 of the toner cartridge 200 mounted at the predetermined position of the toner cartridge mounting portion 320 is pulled forward. As a result, the flange 203 constituting the lower surface of the container body 201 is moved forward, while being guided by the guide grooves 321, 321 formed in the opposite side areas of the toner cartridge mounting portion 320, until it is positioned on the shutter member 250 located on the guide tray 310. When the container body 201 of the toner cartridge 200 is further pulled forward, the shutter member 250 can be removed from the guide tray 310 together with the container body 201 of the toner cartridge 200.

While the present invention has been described based on the illustrated embodiments, it is to be understood that the invention is not restricted to these embodiments, but various changes and modifications may be made within the scope of the invention. In the illustrated embodiments, for instance, the fitting convex 242 is provided on the

take-up shaft 220 mounted on the toner cartridge 200, while the fitting concave 349 is provided in the driving shaft 348 disposed in the toner cartridge bearer 300. However, a fitting concave may be provided in the take-up shaft 220, while a fitting convex may be provided on the driving shaft 348.

The toner replenishing device of an image forming machine and a toner cartridge for use therein that comply with the present invention are constituted as described above. Thus, they exhibit the following actions and effects:

According to the invention, the take-up shaft for taking up the sealing member, which strippably closes the toner discharge opening formed in the toner cartridge, is provided with the fitting convex or fitting concave non-circular in cross section. This fitting convex or fitting concave is fitted into or fitted over the fitting concave or fitting convex non-circular in cross section that is provided in the driving shaft disposed in the toner cartridge bearer. Unlike a conventional gear transmission mechanism, therefore, the invention is free from a failure in power transmission occurring during rotational driving, and can reliably drive the take-up shaft rotationally.

According to the invention, moreover, the toner cartridge bearer has the guide tray mounted thereon which is movable between the guiding position at which it guides the toner cartridge to the toner cartridge mounting portion of the toner cartridge bearer, and the folding position to which the guide tray is turned upwards from the guiding position to a state nearly normal to the guiding position. In association with the guide tray, the driving shaft is moved between the removing position and the fitting

position. Thus, the driving connection of the driving shaft and the take-up shaft and the release of the driving connection can be achieved by the mounting and removing actions for the toner cartridge.

According to the invention, furthermore, the take-up shaft has the drivingly connecting member mounted thereon which has the fitting convex or fitting concave non-circular in cross section to be fitted into or fitted over the fitting concave or fitting convex non-circular in cross section provided in or on the driving shaft disposed in the toner cartridge bearer. Thus, the drivingly connecting member having the fitting convex or fitting concave with a different cross sectional shape is set according to the type of the toner accommodated in the toner cartridge, whereby the toner cartridge set, for instance, according to the destination of shipment in harmony with the climatic conditions can be easily identified.

What we claim is:

1. A toner replenishing device of an image forming machine, which comprises

a toner cartridge having a container body accommodating a toner, said container body having a toner discharge opening in a lower surface thereof, a sealing member strippably mounted on the lower surface of the container body, for closing the toner discharge opening, and a take-up shaft for taking up the sealing member while peeling it off, and

a toner cartridge bearer disposed in a machine body and having a toner cartridge mounting portion for detachably mounting the toner cartridge thereon, and a driving shaft for rotationally driving the take-up shaft, wherein

with the toner cartridge being mounted on the toner cartridge mounting portion of the toner cartridge bearer, the take-up shaft and the driving shaft are positioned opposite each other on the same axis;

the end, opposed to the driving shaft, of the take-up shaft is provided with a fitting convex or fitting concave non-circular in cross section, while the end, opposed to the take-up shaft, of the driving shaft is provided with a fitting concave or fitting convex non-circular in cross section to be fitted over or fitted into the fitting convex or fitting concave provided on or in the take-up shaft;

said toner cartridge bearer is provided with driving shaft moving means for moving the driving shaft in the axial direction between a removing position and a fitting position, and when the driving shaft is located at the fitting position by the driving shaft moving means, the fitting concave or fitting convex provided in or on the

driving shaft is fitted over or fitted into the fitting convex or fitting concave provided on or in the take-up shaft.

2. The toner replenishing device of an image forming machine as claimed in claim 1, wherein said toner cartridge bearer has a guide tray mounted thereon, said guide tray being movable between a guiding position at which it guides the toner cartridge to the toner cartridge mounting portion of the toner cartridge bearer, and a folding position at which the guide tray has been turned upwards from the guiding position to a state nearly normal to the guiding position, and said driving shaft moving means is adapted to be moved in association with the guide tray.

3. A toner cartridge for use in a toner replenishing device of an image forming machine,

said toner cartridge having a container body accommodating a toner, said container body having a toner discharge opening in a lower surface thereof, a sealing member strippably mounted on the lower surface of the container body, for closing the toner discharge opening, and a take-up shaft for taking up the sealing member while peeling it off, and

said toner cartridge being detachably mounted on a toner cartridge mounting portion of a toner cartridge bearer disposed in a machine body, wherein

said take-up shaft is provided with a fitting convex or fitting concave non-circular in cross section to be fitted into or fitted over a fitting concave or fitting convex non-circular in cross section provided in or on a driving shaft disposed in said toner cartridge bearer.

4. A toner cartridge for use in a toner replenishing device of an image forming machine,

said toner cartridge having a container body accommodating a toner, said container body having a toner discharge opening in a lower surface thereof, a sealing member strippably mounted on the lower surface of said container body, for closing the toner discharge opening, and a take-up shaft for taking up said sealing member while peeling it off, and

said toner cartridge being detachably mounted on a toner cartridge mounting portion of a toner cartridge bearer disposed in a machine body, wherein

said take-up shaft has a drivingly connecting member mounted thereon, said drivingly connecting member having a fitting convex or fitting concave non-circular in cross section to be fitted into or fitted over a fitting concave or fitting convex non-circular in cross section provided in or on a driving shaft disposed in the toner cartridge bearer.

5. The toner cartridge for use in a toner replenishing device of an image forming machine as claimed in claim 4, wherein a socket portion having a fitting hole non-circular in cross section is provided at the end of said take-up shaft, and a mounting portion non-circular in cross section to be fitted into said fitting hole is provided in said drivingly connecting member.