DESCRIPTION

[TITLE OF THE INVENTION]

DEVELOPER ACCOMMODATING CONTAINER, DEVELOPER ACCOMMODATING UNIT, PROCESS CARTRIDGE, ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS

[TECHNICAL FIELD]

The present invention relates to an image forming apparatus, and a developer accommodating container, a developer accommodating unit, a developing device and a cartridge which are to be used in the image forming apparatus.

Here, the image forming apparatus forms an image on a recording material (medium) by using, e.g., an electrophotographic image forming process and may include, e.g., an electrophotographic copying machine, an electrophotographic printer (such as an LED printer or a laser beam printer), an electrophotographic facsimile machine, and the like.

Further, the cartridge refers to a cartridge including at least a developing means and the developing device which are integrally constituted to be made detachably mountable to an image forming apparatus main assembly and a cartridge including the developing device and at least a photosensitive member

unit including a photosensitive member which are integrally constituted to be made detachably mountable to the image forming apparatus main assembly.

Further, the developer accommodating container and the developer accommodating unit are accommodated in the image forming apparatus or the cartridge. The developer accommodating container and the developer accommodating unit are at least provided with a flexible container for accommodating the developer.

[BACKGROUND ART]

In a conventional electrophotographic image forming apparatus using the electrophotographic image forming process, a process cartridge type in which an electrophotographic photosensitive member and process means actable on the photosensitive member are integrally assembled into a cartridge and this cartridge is detachably mountable to a main assembly of the electrophotographic image forming apparatus is employed.

In such a process cartridge, as shown in Figure 48, an opening provided to a developer accommodating frame 31 for accommodating the developer (toner, carrier, etc.) is sealed with a sealing member. Further, a type in which a bonding portion 33 of a toner seal 32 which is the sealing member is pulled and peeled during use, thus unsealing the opening to

enable supply of the developer has been widely employed (Japanese Laid-Open Patent Application (JP-A) Hei 4-66980).

Further, against a problem such that the developer is scattered in the process cartridge in a developer filling step during manufacturing of the process cartridge, a constitution in which a deformable inner container is used has been devised (JP-A Hei 4-66980).

[DISCLOSURE OF THE INVENTION]

However, as in JP-A Hei 4-66980, it is difficult to provide an elastic member inside the inner container in manufacturing, and there is the case where it takes a cost.

Therefore, an object of the present invention is, in a constitution different from the conventional constitution, to propose a developer accommodating unit using a flexible container and being excellent in an unsealing property.

In order to accomplish the above object, one of constitutions of the inventions according to the present invention is as follows:

A developer accommodating unit for accommodating a developer for image formation, wherein the developer accommodating unit comprises: a developer accommodating container including a flexible

container provided with an opening for permitting discharge of the accommodated developer and including a sealing member for sealing the opening and for exposing the opening by being moved; an unsealing member, mounted on the sealing member, for moving the sealing member; and a frame which accommodates the developer accommodating container and the unsealing member and which includes a fixing portion for fixing the flexible container.

According to the present invention, in the developer accommodating unit using the flexible container for accommodating the developer, an unsealing characteristic of the sealing member for sealing the flexible container opening can be improved.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Figure 1 is a principal sectional view of a process cartridge in an embodiment of the present invention.

Figure 2 is a principal sectional view of an image forming apparatus in the embodiment of the present invention.

Figure 3 is a perspective view from a cross section of a developer accommodating container including an unsealing member in the embodiment of the present invention.

Figure 4 is a sectional view of a developer

accommodating unit before unsealing in the embodiment of the present invention.

Figure 5 is a sectional view of the developer accommodating unit immediately before the unsealing in the embodiment of the present invention.

Figure 6 is a sectional view of the developer accommodating unit during unsealing in the embodiment of the present invention.

Figure 7 includes sectional views for illustrating a process of unsealing a discharging portion in the embodiment of the present invention.

Figure 8 includes sectional views for illustrating the process of unsealing the discharging portion in the embodiment of the present invention.

Figure 9 is a sectional view of the developer accommodating unit after the unsealing in the embodiment of the present invention.

Figure 10 is an illustration of the developer accommodating container before unsealing in the embodiment of the present invention.

Figure 11 is an illustration of the developer accommodating container during unsealing in the embodiment of the present invention.

Figure 12 is a sectional view for illustrating the discharging portion in the embodiment of the present invention.

Figure 13 includes illustrates of a

hard-to-unseal developer accommodating container in which is not the embodiment of the present invention.

Figure 14 includes sectional views of the hard-to-unseal developer accommodating container which is not the embodiment of the present invention.

Figure 15 is a sectional view of a hard-to-unseal developer accommodating unit which is not the embodiment of the present invention.

Figure 16 is a sectional view of the developer accommodating unit in the embodiment of the present invention.

Figure 17 is a sectional view of the developer accommodating unit in the embodiment of the present invention.

Figure 18 is a sectional view of a developer accommodating container in Second Embodiment of the present invention.

Figure 19 is a sectional view of a developer accommodating unit in Second Embodiment of the present invention.

Figure 20 is an illustration of the developer accommodating container in the embodiment of the present invention.

Figure 21 includes illustrations of the developer accommodating container in the embodiment of the present invention.

Figure 22 includes illustrations of the

developer accommodating container in the embodiment of the present invention.

Figure 23 includes illustrations of a developer accommodating container which is not the embodiment of the present invention.

Figure 24 includes illustrations of the developer accommodating container in the embodiment of the present invention.

Figure 25 includes illustrations of the developer accommodating unit in the embodiment of the present invention.

Figure 26 includes illustrations of the developer accommodating unit in the embodiment of the present invention.

Figure 27 includes illustrations of a fixing portion of the developer accommodating container in the embodiment of the present invention.

Figure 28 includes illustrations of openings of the developer accommodating container in the embodiment of the present invention.

Figure 29 includes sectional views of the developer accommodating container in the embodiment of the present invention.

Figure 30 includes illustrations of developer accommodating containers in embodiments of the present invention.

Figure 31 includes illustrations of the

developer accommodating container including an unsealing member.

Figure 32 includes illustrations of the developer accommodating unit in the embodiment of the present invention.

Figure 33 includes illustrations of the developer accommodating unit in the embodiment of the present invention.

Figure 34 is an illustration of the developer accommodating unit in the embodiment of the present invention.

Figure 35 is a sectional view of a developer accommodating unit in an embodiment of Embodiment 3 of the present invention.

Figure 36 is a sectional view of the developer accommodating unit in the embodiment of Embodiment 3 of the present invention.

Figure 37 is a sectional view of a developer accommodating unit in an embodiment of Embodiment 4 of the present invention.

Figure 38 is a sectional view of the developer accommodating unit in the embodiment of Embodiment 4 of the present invention.

Figure 39 includes schematic illustrations of an opening in an embodiment of Embodiment 5 of the present invention.

Figure 40 includes schematic illustrations of

the opening in the embodiment of Embodiment 5 of the present invention.

Figure 41 is a sectional view of the developer accommodating unit in an embodiment of Embodiment 6 of the present invention.

Figure 42 is a schematic illustration of openings in the embodiment of Embodiment 6 of the present invention.

Figure 43 is a schematic illustration of the openings in the embodiment of the Embodiment 6 of the present invention.

Figure 44 is a schematic illustration of the openings in the embodiment of Embodiment 6 of the present invention.

Figure 45 is a schematic illustration in the embodiment of the present invention.

Figure 46 includes schematic illustrations of drive transmission to an unsealing member in the embodiment of the present invention.

Figure 47 includes sectional views of the developer accommodating unit in the embodiment of Embodiment 6 of the present invention.

Figure 48 is a view for illustrating a conventional example.

[BEST MODE FOR CARRYING OUT THE INVENTION]

In the following description, a developer accommodating container refers to at least a

flexibility container and a sealing member for sealing an opening, provided to the flexible container, for permitting discharge of a developer. The developer accommodating container before the developer is accommodated therein is referred to as a developer accommodating container 37 for accommodating the developer. The developer accommodating container which accommodates the developer and which is provided with an unsealing member for unsealing the sealing member is referred to as a developer accommodating container 30 including the unsealing member. The developer accommodating container which accommodates the developer and which is not provided with the sealing member is referred to as a developer accommodating container 26 accommodating the developer.

Incidentally, for simplification, these developer accommodating containers will be described as the developer accommodating container 37, the developer accommodating container 30 and the developer accommodating container 26 by using different reference numerals.

A developer accommodating unit includes at least the developer accommodating container and a frame for accommodating the developer accommodating container.

<Embodiment 1>

Figure 1 illustrates a principal sectional

view of a process cartridge including the developer accommodating unit to which the present invention is applicable, and Figure 2 illustrates a principal sectional view of an image forming apparatus to which the present invention is applicable.

<Summary of structure of process cartridge>

The process cartridge includes an image bearing member and process means actable on the image bearing member. Here, as the process means, there are, e.g., a charging means for electrically charging a surface of the image bearing member, a developing device for forming an image on the image bearing member, and a cleaning means for removing a developer (containing toner, carrier, etc.) remaining on the image bearing member surface.

The process cartridge A in this embodiment includes, as shown in Figure 1, includes a photosensitive (member) drum 11 as the image bearing member and includes, at a periphery of the photosensitive drum 11, a charging roller 12 as the charging means and a cleaner unit 24 including a cleaning blade 14, having elasticity, as the cleaning means. Further, the process cartridge A includes a developing device 38 including a first frame 17 and a second frame 18. The process cartridge A integrally includes the cleaner unit 24 and the developing device 38, and is constituted so as to be detachably

mountable to an image forming apparatus main assembly B as shown in Figure 2. The developing device 38 includes a developing roller 13 as the developing means, a developing blade 15, a developer supplying roller 23, and a developer accommodating container 26, for accommodating the developer, in which the developer is accommodated. The developing roller 13 and the developing blade are supported by the first frame 17.

<Summary of structure of image forming apparatus>

The process cartridge A is mounted in the image forming apparatus main assembly B as shown in Figure 2 and is used for image formation. In the image formation, a sheet S is fed by a feeding roller 7 from a sheet cassette 6 mounted at a lower portion of the apparatus, and in synchronism with this sheet feeding, the photosensitive drum 11 is selectively exposed to light by an exposure device 8 to form a latent image. The developer is supplied to the developing roller 13 (developer carrying member) by the sponge-like developer supplying roller 23 and is carried in a thin layer on the surface of the developing roller 13. By applying a developing bias to the developing roller 13, the developer is supplied depending on the latent image and thus the latent image is developed into a developer image. This (developer) image is transferred onto the fed sheet S by bias voltage application to a

transfer roller 9. The sheet S is conveyed to a fixing device 10 to be subjected to image fixing, and the sheet S is discharged by a sheet discharging roller 1 to a sheet discharge portion 3 at an upper portion of the apparatus.

<Summary of structure of developer accommodating unit>

Next, a structure of a developer accommodating unit 25 will be described with reference to Figures 3, Figure 4, (a) of Figure 7 and Figure 20. Here, Figure 3 is a perspective view of the developer accommodating container 30 from cross section, Figure 4 is a sectional view of the developing device 38, Figure 7 is a detailed sectional view in the neighborhood of the discharging portion 35 for permitting discharge of the developer from a developer bag 16 as a flexible container, and Figure 20 is a sectional view of the developer accommodating container 26 from cross section. Incidentally, the sectional views are a plane passing through an unsealing member 20, openings 35a and fixing portions 16d and 16e. Further, the sectional views are a plane perpendicular to a rotational axis of the unsealing member 20.

(Developer accommodating unit)

The developer accommodating unit 25 is, as shown in Figure 4, constituted from the developer accommodating container 30, the developing roller 13, the developing blade 15, and the first frame 17 and

the second frame 18 which support these members. A combination of the first frame and the second frame is a frame which accommodates the developer accommodating container 30.

Incidentally, in this embodiment, the developer accommodating unit 25 is the same as the developing device 38. This is because the developer accommodating unit 25 includes the developing roller 13 and the developing blade 15. However, the developing roller 13 and the developing blade 15 may also be supported by a frame separately from the developer accommodating unit 25 and thus may be separated from the developer accommodating unit 25. In this case, the developing device 38 is constituted by the developer accommodating unit 25, the developing roller 13 and the developing blade 15 (not shown).

(Developer accommodating container including unsealing member)

The developer accommodating container 30 including the unsealing member is constituted by an unsealing member 20 and the developer accommodating container 26 as shown in Figure 3 and Figure 4.

The unsealing member 20 includes an engaging portion 20b to be engaged with a sealing member 19, and by engaging a portion-to-be-engaged 19b of the developer accommodating container 26 with the engaging portion 20b, the developer accommodating container 30

including the unsealing member is constituted.

(Developer accommodating container in which developer is accommodated)

As shown in (c) of Figure 30, the developer accommodating container 26 is constituted from the developer, a developer bag 16 and the sealing member 19. Here, the developer is powder.

The developer bag 16 of the developer accommodating container 26 is sealed with the sealing member 19 at the plurality of openings 35a for permitting the discharge of the developer and includes a bonding portion 39a which seals a filling opening (injection port) for permitting filling (entrance) of the developer. Thus, the respective openings 35a and the filling opening 39 of the developer accommodating container 26 in which the developer is accommodated are sealed and therefore the accommodated developer is not leaked out to the outside, so that the developer accommodating container 26 can be treated as a single unit. Further, the sealing member 19 includes holes as the portions-to-be-engaged 19b to be engaged with the unsealing member 20, thus being engageable with the unsealing member 20.

(Developer accommodating container for accommodating developer)

As shown in (a) of Figure 30, the developer accommodating container 37 for accommodating the

developer is constituted from the developer bag 16 and the sealing member 19 for sealing the plurality of openings 35a for permitting the discharge of the developer and for exposing the openings 35a by being moved. Here, the developer bag 16 of the developer accommodating container 37 for accommodating the developer includes the filling opening 39 for permitting the filling of the developer and the openings 35a for permitting the discharge of the developer.

Here, in the developer accommodating container 37 for accommodating the developer, the developer is not filled as yet, and the developer accommodating container 37 is in a state in which the filling opening 39 for permitting the filling of the developer is open.

(Filling and developer accommodating container)

Here, a relation between the developer accommodating container 37 for accommodating the developer and the developer accommodating container 26 in which the developer is accommodated will be described.

First, as shown in (a) of Figure 30, the developer accommodating container 37 for accommodating the developer is not filled with the developer and is provided with the filling opening 39 for permitting the filling of the developer.

Next, as shown in (b) of Figure 30, the developer is filled from the filling opening 39, for permitting the filling of the developer, of the developer accommodating container 37 for accommodating the developer. Further, by flexibility of the developer bag 16, the filling opening 39 for permitting the filling of the developer is deformable correspondingly to a filling device and thus the filling of the developer is facilitated without causing scattering of the developer. At the time of the filling, a known auger type filling device is used but another method having a similar function may also be used.

Then, as shown in (c) of Figure 30, the filling opening 39 for permitting the filling of the developer is bonded and sealed. The bonding of the bonding portion 39a of the opening for permitting the filling of the developer is made by ultrasonic bonding in this embodiment but may also be made by other bonding methods using heat, a laser and the like.

Then, when the bonding of the bonding portion 39a of the opening for permitting the filling is completed, the developer is filled, so that the developer accommodating container 26 in which the developer is accommodated is provided.

Incidentally, a position and a size of the filling opening 39 for permitting the filling may

appropriately by disposed correspondingly to shapes and the like of the filling device of the developer and the process cartridge A.

(Effect of incorporating developer bag in developing device)

By forming the developer-accommodated developer accommodating container 26 in a bag shape, the developer can be treated as a unit. For that reason, a developer filling step can be separated from a main assembling step (manufacturing line) of the process cartridge A. By this, the developer is prevented from being scattered in the main assembling step (manufacturing line) of the process cartridge A, so that maintenance such as cleaning of the manufacturing line can be reduced. By the prevention of the scattering of the developer during the assembling step, it is possible to omit a cleaning step of the process cartridge A to be performed after the filling of the developer.

Further, also in the filling step of the developer bag 16, the developer bag 16 has flexibility, and the filling opening 39 for permitting the filling is also soft and therefore can be easily sealed with less scattering.

Further, the developer accommodating container 26 in which the developer is accommodated has flexibility and therefore can be assembled while

following a shape of the frame.

Further, in the filling step, the developer accommodating container 37 has flexibility and therefore deforms its cross section to increase its volume in which the developer can be filled, so that a filling amount can be increased during the filling.

Further, the developer accommodating container 37 before the developer filling has flexibility and thus can be made small (thin), so that a storing space during storage before the filling can be made small compared with the frame which is a resinous structure.

<Structure of developer bag>

As shown in Figure 3 and Figure 4, the developer bag 16 accommodates the developer therein and has a bag-like shape which is deformable, and is provided with the plurality of openings 35a at the discharging portion 35, for permitting the discharge of the accommodated developer.

Further, the developer bag 16 includes developer bag fixing portions (portions-to-be-fixed) 16d and 16e fixed to the first frame 17 and the second frame 18.

(Material and air permeability of developer bag)

Figure 29 includes sectional views for illustrating the developer accommodating container 26. As shown in (a) of Figure 29, the developer bag 16 is constituted by bonding a sheet 16u which includes the

discharging portion 35 and does not have air permeability and a sheet 16s which has the air permeability and which is an air permeable portion to each other.

Here, a degree of the air permeability of the air permeable portion 16s may appropriately be selected so that the developer is prevented from leaking out of the developer bag 16 based on a balance with a size of the developer (particle size of powder) to be accommodated.

As a material for the air permeable portion 16s, a nonwoven fabric or the like formed of polyethylene terephthalate (PET), polyethylene (PE), polypropylene (PP) or the like in a thickness of 0.03 - 0.15 mm is preferred. Further, even when the material for the air permeable portion 16s is not the nonwoven fabric, a material having minute holes which are smaller than the powder such as the developer may also be used.

Further, with respect to arrangement of the air permeable portion, in this embodiment, as shown in Figure 3 and Figure 29, the air permeable portion 16s is disposed over the entire region of the developer bag 16 with respect to a longitudinal direction in the second frame 18 side. Incidentally, as shown in (b) of Figure 29, the air permeable portion 16s may also constitute the entire developer bag 16.

Incidentally, as the material for the developer bag 16 other than the air permeable portion 16s, a material having flexibility so as to improve efficiency during the discharge of the developer described later may preferably be used. Further, the material for the air permeable portion 16s may also have flexibility.

(Effect of developer bag having air permeability)

Thus, the reason why the air permeability is imparted to the developer bag 16 is that the developer bag 16 can meet states during manufacturing, during transportation until a user uses the cartridge A, and during storage. First, the reason for the state during the manufacturing is that the developer bag 16 is made deformable and reducible in order to facilitate assembling of the developer bag 16 with the frames 17 and 18. In the case where the developer bag 16 is not provided with the air permeability portion, the size thereof cannot be changed from that in a state in which the developer bag 16 is filled with the developer (state in which the bag is closed) and therefore the developer bag 16 is not readily deformed. For that reason, it takes time to assembling and steps are complicated. Therefore, when the air permeability is imparted to at least a part of the developer bag 16, the size of the developer bag 16 can be changed from that in the state in which the developer bag 16 is

filled with the developer and then is closed, thus facilitating the assembling.

Next, the reason for the states during the transportation and during the storage is that the developer bag 16 can meet a change in different air pressure during the transportation and during the storage of the process cartridge A. The difference in air pressure between the inside and outside of the developer bag 16 is generated in the case where the developer bag 16 is in a lower air-pressure environment during the transportation or the like than during the manufacturing or in the case where the developer bag 16 is stored at a higher temperature than during the manufacturing. For that reason, by expansion of the developer bag 16, there is a fear that parts contacting the developer bag 16 are deformed or broken. There is a need, for that purpose, to control the air pressure and the temperature during the transportation and during the storage, so that facilitates and a cost are needed. However, problems caused due to the difference in air pressure between the inside and outside of the developer bag 16 can be solved by partly imparting the air permeability to the developer bag 16.

Further, in the case where the nonwoven fabric is provided with the discharging portion 35 and a bonding portion 22 at a periphery of the discharging

portion 35, there is a fear that fibers of the nonwoven fabric fall out with peeling of the sealing member 19 during unsealing and then enter the developer to adversely affect the image. For that reason, by providing the discharging portion 35 to the sheet 16u different from the sheet 16s having the air permeability, the above-described falling-out of the fibers from the nonwoven fabric is prevented.

Further, a filling density can be increased by filling the developer while effecting deaeration from the air permeable portion 16s.

(Structure of discharging portion of developer bag)

As shown in Figure 3 and Figure 10, the developer bag 16 includes the developer discharging portion 35 consisting of the plurality of openings 35a for permitting the discharge of the inside developer and the connecting portion 35b defining the plurality of openings 35a. Further, the discharging portion 35 is continuously surrounded at its periphery by the bonding portion 22 to be unsealably bonded, so that the developer accommodated in the developer bag 16 is sealed with the sealing member 19.

(Structure of bonding portion of developer bag)

The bonding portion 22 has a rectangular shape surrounded by two lines extending in a long direction (direction F) and two lines extending in a short direction (direction E), and therefore the bonding

portion 22 enables the sealing of the discharging portion 35.

Here, of the two lines of the bonding portion 22 welded with respect to the long direction (direction F), a bonding portion which is first unsealed is referred to as a first bonding portion 22a and a bonding portion which is unsealed later is referred to as a second bonding portion 22b. In this embodiment, in the case where the bonding portion 22 is viewed along the surface of the sealing member 19, the bonding portion in a side closer to a fold(ed)-back portion 19d (or portion-to-be-engaged 19b) described later is the first bonding portion 22a. Further, the bonding portion opposing the first bonding portion 22a via the opening is the second bonding portion 22b. Further, a bonding portion with respect to a widthwise direction is a widthwise (short) bonding portion 22c.

In this embodiment, an unsealing direction is the direction E. The unsealing direction is defined as follows. In the case where the unsealing is effected by moving the sealing member 19, of the first bonding portion 22a and the second bonding portion 22b opposing to each other via the opening 35a, the first bonding portion 22a is first unsealed (peeled). Thus, a direction directed from the first bonding portion 22a to be first unsealed toward the second bonding

portion 22b is the unsealing direction E.

Incidentally, when the sealing member 19 is unsealed (peeled) from the developer bag 16 in the E direction, when viewed microscopically, the peeling progresses also in the arrow F direction in some cases due to the deformation of the developer bag 16 by an unsealing force also in the first bonding portion 22a and the second bonding portion 22b. However, the unsealing direction in this embodiment does not refer to such a microscopic unsealing direction.

(Arrangement of openings of developer bag)

Next, arrangement of the openings 35a will be described with reference to Figure 10, Figure 11 and Figure 30. The movement direction of the sealing member 19 (the direction of the sealing member 19 pulled by the unsealing member 20) for sealing the openings 35a and for exposing the openings 35a by being moved is D. By the movement of the sealing member 19, the exposure of the openings 35a progresses in the unsealing direction E. In the following, the movement direction of the sealing member 19 is D.

The plurality of openings 35a and the plurality of connecting portions 35b are disposed at different positions in the direction F perpendicular to the unsealing direction E. Further, the sealing member 19 is configured to be wound up by rotating the unsealing member 20 but the above-described direction

F is the same direction as an axis (axial line) of the rotation shaft of the unsealing member 20.

Here, the reason why the rotational axis direction of the developing roller 13 and the arranged direction F of the plurality of openings 35a are made equal is that the developer is easily supplied, during the discharge thereof, to the developing roller 13 over the entire longitudinal direction without being localized.

Here, the plurality of openings 35a are disposed at the different positions in the direction of F and therefore the discharging portion 35 is long in the direction F and is short in the direction E. That is, with respect to the direction F, a distance from an end to another end of the plurality of openings 35a is longer than that with respect to the direction E.

Thus, the discharging portion 35 where the plurality of openings 35a are disposed at the different positions in the direction F perpendicular to the unsealing direction E is long in the direction F and is short in the direction E, and therefore the distance required for the unsealing can be made shorter than that required for the unsealing in the long direction F and therefore a time required for the unsealing can also be made short.

Further, a constitution in which the sealing

member 19 for covering the discharging portion 35 is wound up by the unsealing member 20 is employed. The rotational axis direction of the unsealing member 20 and the direction F substantially perpendicular to the unsealing direction E are made equal, so that winding distance and time of the sealing member 19 can be shortened.

(Shape and direction of openings of developer bag)

Each of the plurality of openings 35a in Embodiment 1 has a circular shape. When a discharging property is taken into consideration, an area of the openings 35a may preferably be large. Further, the connecting portions 35b defining the openings 35a may preferably be large (thick) in order to enhance the strength of the developer bag 16. Therefore, the area of the openings 35a and the area of the connecting portions 35b are required to achieve a balance in view of a material and a thickness of the discharging portion 35 and a force relationship with peeling strength during the unsealing described later and may be appropriately selected. Further, the shape of the openings 35a may also be, in addition to the circular shape, a polygonal shape such as a rectangular shape, an elongated circular shape as shown in Figure 18 in Embodiment 2 described later, and the like shape.

Incidentally, the arrangement of the openings 35a may only be required to be disposed at the

different positions with respect to the direction F perpendicular to the unsealing direction E, and even when the openings 35a overlap with each other as shown in (c) of Figure 28, or do not overlap with each other as shown in (d) of Figure 28, there is an effect of the connecting portions 35b described later.

Further, the direction of the openings 35a may preferably be such that the developer accommodated in the developer bag 16 is easily discharged in an attitude during image formation. For that reason, in the attitude during image formation, the openings 35a are disposed so as to be open downward with respect to the gravitational direction. Here, the downward opening of the openings 35a with respect to the gravitational direction refers to that the direction of the openings 35a has a downward component with respect to the gravitational direction.

(Fixing between developer bag and frame)

As shown in Figure 3 and Figure 4, the developer bag 16 is fixed inside the first frame 17 and the second frame 18 by the two fixing portions 16d and 16e.

(First fixing portion)

First, as a first fixing portion, the first fixing portion 16d of the developer bag 16 where a force is received when the sealing member 19 is unsealed from the developer bag 16 as described later

is provided. The first fixing portion 16d is provided at a plurality of positions in parallel to the direction F in which the plurality of openings 35a are arranged. Incidentally, other than the arrangement at the plurality of positions, the first fixing portion 16d may also be a single fixing portion elongated in parallel to the direction F (not shown).

Further, the position of the first fixing portion 16d is provided in the neighborhood of the openings 35a.

Further, the first fixing portion 16d of the developer bag 16 is fixed to a first fixing portion 18a of the frame.

The first fixing portion 16d is a fixing portion necessary for the time of unsealing the developer bag 16, and its action and arrangement will be described later in the description of the unsealing.

(Second fixing portion)

Further, as a second fixing portion, the second fixing portion 16e for preventing movement of the developer bag 16 downward or toward the developing roller 13 and the developer supplying roller 23 is provided.

The second fixing portion 16e is provided for the following two reasons. A first reason is that the second fixing portion 16e is prevented from moving downward in the attitude during the image formation.

For that reason, the second fixing portion 16e may preferably be disposed at an upper position in the attitude during the image formation.

Further, a second reason is that the developer bag 16 is prevented from disturbing the image in contact with the developing roller 13 and the developer supplying roller 23 during the image formation. For that reason, the second fixing portion 16e of the developer bag 16 may preferably be provided at a position remote from the developing roller 13 and the developer supplying roller 23. In this embodiment, the second fixing portion 16e of the developer bag 16 is disposed at an upper position remote from the developing roller 13 as shown in Figure 1.

Further, the second fixing portion 16e of the developer bag 16 is fixed to a second fixing portion 18b of the frame.

(Fixing method between developer bag and frame)

(Fixing method of first fixing portion)

As a fixing method of the first fixing portion 16d of the developer bag 16, fixing by ultrasonic clamping (caulking) such that a boss of the second frame 18 is passed through the hole of the developer bag 16 to be deformed is used. As shown in (a) of Figure 27, before fixing, the first fixing portion 18a of the second frame 18 has a cylindrical boss shape, and the first fixing portion 16d of the developer bag

16 has a hole which is open. An assembling step is shown below.

First, a projected-shaped portion of the first fixing portion 18a of the second frame 18 is passed through the hole of the first fixing portion 16d of the developer bag 16 ((b) of Figure 27).

Then, an end of the first fixing portion 18a of the second frame 18 is fused by an ultrasonic clamping tool 34 ((c) of Figure 27).

Then, the end of the first fixing portion 18a of the second frame 18 is deformed so that it is larger than the hole of the first fixing portion 16d, so that the developer bag 16 is fixed to the second frame 18 ((d) of Figure 27).

(Fixing method of second fixing portion)

As shown in Figure 24, a fixing method of the second fixing portion 16e of the developer bag 16 uses clamping by the two frames 17 and 18. Holes are made in the developer bag 16 to constitute the first fixing portion 16e of the developer bag 16, and projections are provided to the second frame 18 to constitute the second fixing portion 18b of the frame.

Then, an assembling step is shown below. The projections of the fixing portion 18b of the second frame 18 are passed through the first fixing portion 16d of the developer bag 16, and then fixing by clamping such that the second fixing portion (holes)

16e of the developer bag is prevented from being disengaged (dropped) from the projections by the first frame 17 is made.

(Other fixing means)

As fixing means, other than the above-described ultrasonic clamping, it is also possible to use fixing means other than those using ultrasonic wave. For example, heat clamping using heat, (heat) welding or ultrasonic welding for directly welding the developer bag 16 to the first frame 17 and the second frame 18, bonding using a solvent or an adhesive, insertion of the developer bag 16 between the frames, the heat clamping, the ultrasonic clamping, a screw, or hooking using of holes and projections (such as bosses), and the like means may also be used. Further, the developer bag 16 may also be fixed via a separate member provided between the first or second frame 17 or 18 and the developer bag depending on appropriate design based on relationships in space, arrangement or the like between the developer bag 16 and the first or second frame 17 or 18 (not shown).

<Structure of sealing member>

As shown in Figures 3 and 4, the sealing member 19 covers the discharging opening 35 of the developer bag 16 before use of the process cartridge A to seal the developer in the developer bag 16. The sealing member 19 is moved, so that the openings 35a

are exposed. The structure of the sealing member 19 has a sheet-like shape including a sealing portion 19a for covering the discharging portion 35 of the developer bag 16, a portion-to-be-engaged 19b to be fixed with the unsealing member 20 described later, and a sealing member connecting portion 19c which connects the sealing portion 19a and the portion-to-be-engaged 19b. The sheet is formed of a laminate material having a sealant layer which exhibits an easy-unsealing property described later, and a base material is polyethylene terephthalate (PET), polyethylene, polypropylene or the like, and a thickness may appropriately be selected from a range of 0.03 - 0.15 mm.

(Sealing portion of sealing member)

The sealing portion 19a refers to a region where the sealing member 19 seals the plurality of openings 35a and connecting portions 35b of the developer bag 16. By the sealing portion 19a, the developer is prevented from being leaked from the inside of the developer bag 16 until before use of the process cartridge A.

(Engaging portion of sealing member)

The sealing member 19 has a free end portion in one end side thereof with respect to the unsealing direction E, and at the free end portion, the portion-to-be-engaged 19b to be engaged with the

unsealing member for moving the sealing member is provided. With the portion-to-be-engaged 19b, the unsealing member for moving the sealing member so as to expose the openings is engaged. The unsealing member may also be configured to automatically perform the unsealing by receiving drive (driving force) from the image forming apparatus main assembly B. Or, the unsealing member may also be configured to perform the unsealing by being held and moved by the user. In this embodiment, the unsealing member 20 is a rotation shaft provided in the frame, and the sealing member 19 engaged with the unsealing member 20 is pulled, so that the developer accommodating container 26 accommodating the developer is unsealed.

(Sealing member connecting portion of sealing member)

A portion for connecting the bonding portion 22 and the sealing member engaging portion 19b is the sealing member connecting portion 19c. The sealing member connecting portion 19c is a portion for transmitting a force so as to pull off the bonding portion 22 by receiving the force from the unsealing member 20.

(Folding-back of sealing member connecting portion)

Here, referring to Figure 12, a plane formed between the first bonding portion 22a and the second bonding portion 22b at the movement of the unsealing is taken as N1. A plane which is perpendicular to the

plane N1 and which passes through the first bonding portion 22a is taken as N2. Here, the unsealing member 20 is disposed in the second bonding portion 22b side than the plane N2 passing through the first bonding portion 22a. In other words, the sealing member 19 includes, when it is seen along the surface of the sheet-like sealing member 19, a fold(ed)-back portion 19d where the sealing member 19 is folded back at the portion (connecting portion 19c) between the connecting portion 22 and the portion-to-be-engaged 19b engaged with the unsealing member 20. The fold-back portion 19d may be provided with or not provided with a fold (crease). Here, a folding angle Q of the sealing member 19 may preferably be 90 degrees or less. The folding angle Q is a narrow angle Q between a surface of the bonding portion 22 of the developer bag 16 and a surface along the direction D in which the sealing member 19 is pulled.

(Fixing of sealing member)

Further, fixing between the sealing member 19 and the unsealing member 20 is, in this embodiment, made by the ultrasonic clamping similarly as in the first fixing portion 16d. Other than the ultrasonic clamping, the fixing may also be made by the (heat) welding, the ultrasonic welding, the bonding, the insertion between the frames, the hooking by a hole and a projection, or the like similarly as the fixing

means for the first fixing portion 16d and the second fixing portion 16e.

(Portion having easy-unsealing property of sealing member)

Next, a method of providing a peeling force of the bonding portion 22 with a desired value will be described. In this embodiment, in order to provide the peeling force with the desired value (herein a minimal force within a range in which the toner sealing property can be maintained), two methods are principally employed.

In a first method, a laminate material having a sealant layer for enabling easy unsealing of the sealing member 19 is applied. Further, the first method is a method in which the easy unsealing is enabled at the bonding portion by applying, as the material for the developer bag 16, a sheet material (of, e.g., polyethylene or polypropylene) which is weldable with the sealant layer and which has flexibility. By changing a combination of formulation of the sealant layer with the material to be bonded, the peeling force can be adjusted correspondingly to a desired condition. In this embodiment, a material having a peeling strength of about 3N/15 mm measured by testing methods for hermetically sealed flexible packages of JIS-Z0238 is used.

A second method is a method in which as shown

in Figure 4 and Figure 7, the discharging portion 35 of the developer bag 16 is placed in a state in which the sealing member 19 is folded back with respect to an unsealing advancing direction (arrow E in the figures). For example, in the state of Figure 4, the unsealing member 20 is rotated (an arrow C in the figure), so that the sealing member 19 is pulled in a pulling direction (arrow D in the figure) by the unsealing member 20. By doing so, the developer bag 16 and the sealing member 19 provide an inclined peeling positional relationship, as shown in Figure 12, in which the narrow angle Q between the surface of the bonding portion 22 of the developer bag 16 and the surface along the pulling direction D of the sealing member 19 is 90 degrees or less. It has been conventionally known that the peeling force necessary to pull off the both surfaces can be reduced by effecting the inclined peeling. Accordingly, as described above, the sealing member 19 is placed in the folded-back state with respect to the unsealing advancing direction (arrow E in the figure), so that the sealing member 19 at the bonding portion 22 and the developer bag 16 are placed in the inclined peeling positional relationship, and the peeling force can be adjusted so as to be reduced.

<Structure of unsealing member>

The unsealing member 20 is used for the

purpose of peeling the sealing member 19 from the developer bag 16 by applying a force to the sealing member 19 to move the sealing member 19. The unsealing member 20 includes a supporting portion (not shown) which has a shaft shape and which is rotatably supported by the second frame 18 at its ends, and includes an engaging portion 20b for fixing the portion-to-be-engaged 19b of the sealing member 19. In this embodiment, the unseal member 20 has a rectangular shaft shape, and the portion-to-be-engaged 19b of the sealing member 19 is engaged with the engaging portion 20b at one surface of the rectangular shaft.

(Combined use as unsealing member, urging member and stirring member)

Further, the urging member 21 for externally acting on the developer bag 16 to discharge the developer accommodated in the developer bag 16, and the unsealing member 20 may be separate members, respectively, but in this embodiment, the same part performs functions of the unsealing member 20 and the urging member 21.

Further, a function of stirring the developer discharged from the developer bag 16 and a function of the unsealing member 20 may be performed by separate members, respectively, but in this embodiment, the unsealing member 20 also perform the stirring function

as the same part.

(Effect of combined use as unsealing member, urging member and stirring member)

Thus, by using the same part (member) as the unsealing member 20, the urging member 21 and the stirring member, the number of parts is reduced, so that it becomes possible to realize cost reduction and space saving.

<Summary of unsealing of developer accommodating bag>

The unsealing of the developer accommodating bag 16 will be described with reference to Figure 7 and Figure 8.

The developing device 38 includes a power application point portion 20a where the unsealing member 20 applies the force for pulling the sealing member 19 in order to effect the unsealing, and includes the fixing portion 18a of the frame for fixing the developer bag 16 to be pulled.

The power application point portion 20a is a portion, closest to the bonding portion 22, of a portion where the sealing member 19 and the unsealing member 20 contact at the moment of the unsealing. In (b) of Figure 7, a corner portion 20c of the unsealing member is the power application point portion 20a. The fixing portion 18a of the second frame 18 includes a fixing portion 18c for suppressing movement of the developer bag 16 caused by the force during the

unsealing. Further, from the bonding portion 22, in this embodiment, the first fixing portion 18a of the frame and the first bonding portion 16d of the developer bag are bonded by the ultrasonic clamping, and as shown in (b) and (c) of Figure 7 and (a) of Figure 8, a portion, near the bonding portion 22, of the ultrasonic clamping portion of the first fixing portion 18a constitutes the fixing portion 18c.

Next, drive transmission of the unsealing member 20 will be described by using Figure 50. Figure 50 includes schematic illustrations showing the drive transmission to the unsealing member 20. Incidentally, in Figure 50, the sealing member 19 and the developer bag 16 and the like are omitted. First, the unsealing member 20 is rotatably supported at its ends by the first frame 17. Further, a gear 54 is connected to the unsealing member 20 at one-side end portion. Further, gears (52, 53) are disposed in the cartridge A. Further, the gear 52 includes a coupling portion 52a for receiving the drive (driving force) from the image forming apparatus B. The image forming apparatus B is provided with a driving means 51, and the driving means 51 includes, at its end, a coupling 51a for transmitting the drive to the cartridge A.

With respect to an arrow direction shown in (a) of Figure 50, the cartridge A is mounted to the inside of the image forming apparatus B. Next, the

driving means 51 is moved in an arrow direction shown in (b) of Figure 50, so that the coupling portion 51a of the driving means 51 and the coupling 52a of the gear 52 are engaged with each other. Then, as shown in (c) of Figure 50, the drive is transmitted from the driving means 51 of the image forming apparatus B to the gear 52, the gear 53 and the gear 54, so that the unsealing member 20 is rotated. Incidentally, the drive transmission from the image forming apparatus B to the cartridge B is not limited to the coupling by projection and recess, but may also be use of a means, such as engagement by gears or the like, capable of the drive transmission.

Then, as shown in Figure 4, the unsealing member 20 is rotated in the arrow C direction by transmission of the driving force thereto.

Then, a state immediately before the sealing member 19 is pulled by further rotation of the unsealing member 20 to start the unsealing of the first bonding portion 22a is shown in Figure 5 and (b) of Figure 7. With the rotation, the sealing member 19 fixed to the unsealing member 20 by the portion-to-be-engaged 19b is pulled in the arrow D direction by the corner portion 20c (power application point portion 20a) of the rectangular unsealing member 20.

When the sealing member 19 is pulled, the

developer bag 16 is pulled via the bonding portion 22. Then, a force is applied to the first fixing portion 16d of the developer bag 16, so that the developer bag 16 is pulled from the fixing portion 18c toward the power application point portion 20b by the fixing portion 18c. Then, in a cross section perpendicular to the rotation shaft of the unsealing member 20, the first bonding portion 22a is moved so as to approach a line connecting the power application point portion 20a and the fixing portion 18c. At this time, with respect to the arrow D direction, from a side close to the rotation shaft of the unsealing member 20, the portions are disposed in the order of the openings 35a, the first bonding portion 22a, the fold-back portion 19d and the fixing portion 18c ((b) of Figure 7). Further, the unsealing member 19 is folded back between the first bonding portion 22a and the portion-to-be-engaged 19b and therefore the force is applied to the portion of the first bonding portion 22a so as to be inclination-peeled in the arrow D direction. Then, the peeling of the first bonding portion 22a is effected to start the unsealing of the discharging portion 35.

Further, together with the corner portion 20c, also the power application point portion 20a is moved in the arrow C direction, and when the sealing member 19 contacts a corner portion 20d, the power

application point portion 20a is moved from the corner portion 20c to the corner portion 20d. Here, (b) of Figure 7 shows a state in which the power application point portion 20a is the corner portion (c), and (c) of Figure 7 shows a state in which the unsealing member 20 in further rotated and the power application point portion is moved to the corner portion 20d.

As shown in Figure 6 and (c) of Figure 7, together with advance of the unsealing with further rotation of the unsealing member 20, also the fold-back portion 19d advanced in the arrow E direction. Then, the unsealing further advances, so that the openings 35a are exposed. A state in which the peeling of the second bonding portion 22b is to be started after the openings 35a are exposed is shown in (a) of Figure 8. Also at this time, similarly as the peeling of the first bonding portion 22a, the sealing member 19 is pulled toward the power application point portion 20a, and the developer bag 16 stands firm toward a direction of the fixing portion 18c (arrow H). Then, in a cross section perpendicular to the rotation shaft of the unsealing member 20, the second bonding portion 20b is moved so as to approach a line connecting the power application point portion 20a and the fixing portion 18c. Then, the force is applied to the portion of the bonding portion 22b in the arrow D direction, so that the second bonding portion 22b is

peeled. Then, the second bonding portion 22b is peeled to complete the unsealing ((b) of Figure 8 and Figure 9). Then, the developer inside the developer bag 16 passes through the openings 35a of the discharging portion 35, and is disposed in an arrow I direction.

Thus, the sealing member 19 is wound up around the unsealing member 20 by the rotation of the unsealing member 20, so that the bonding portion 22 is unsealed. The sealing member 19 is wound up by the rotation and therefore a space required to move the unsealing member 20 may only be required to be a rotation space, and compared with the case where the sealing member 19 is moved by movement other than the rotation, it is possible to realize space saving.

Further, the openings 35a may also be exposed by rotating the unsealing member 20 by the user to wind up the sealing member 19. However, it is preferable that the unsealing member 20 is rotated by the drive from the image forming apparatus B to wind up the sealing member 19 since the operation does not trouble the user.

By providing the sealing member 19 with the fold-back portion 19d, the bonding portion 22 can be inclination-peeled without effecting shearing peeling and can be unsealed with reliability.

Further, the portion-to-be-engaged (19b), to be engaged with the unsealing member 20, for unsealing

the sealing member 19 in an end side of the sealing member 19 with respect to a direction substantially perpendicular to the direction F in which the plurality of openings 35a are arranged is provided, so that the sealing member 19 can be engaged and unsealed with reliability.

Further, by providing the frame with the fixing portion 18c, the developer bag 16 is supported during the unsealing, so that even a soft and deformable developer bag 16 becomes unsealable with reliability.

Further, with respect to the discharge of the developer during the unsealing, as described above, the bonding portion 22 is moved on the line connecting the power application point portion 20a and the fixing portion 18c (in the order of (a) of Figure 7, (b) of Figure 7, (c) of Figure 7 and (a) of Figure 8). By this motion, the developer at the periphery of the openings 35a is moved, so that agglomeration of the developer can be broken.

Further, as shown in Figure 34, the unsealing member 20 is unsealable even when the unsealing member 20 is rotated in a rotational direction of an arrow C2. Thus, the rotational direction of the unsealing member 20 is selectable from even the C direction shown in Figures 4 to 9 and the C2 direction of Figure 34, and may appropriately selected depending on design.

(Arrangement relation of fixing portion associated with unsealing)

As shown in Figure 4, in order to peel off the first bonding portion 22b with reliability, the following arrangement relation is required between the first bonding portion 22b and the fixing portion 18c. During the unsealing, with respect to the fixing portion 18c, the unsealing member 20 pulls the sealing member 19 in the arrow D direction. At this time, with respect to the movement direction D of the sealing member 19 by the unsealing member 20, the fixing portion 18c is provided in an upstream side of the openings 35a. For that reason, a force is applied to the fixing portion 18c in the arrow H direction. Therefore, when the unsealing force is applied, the sealing member 19 is pulled in the arrow H direction and the arrow D direction between the fixing portion 18c and the unsealing member 20 to apply a force to the first bonding portion 20a, thus advancing the unsealing in the arrow E direction. Thus, if the fixing portion 18c is not provided upstream with respect to the movement direction D of the sealing member 19, the entire developer bag 16 is pulled in the direction in which the unsealing member 20 is pulled, so that the force cannot be applied to the first bonding portion 22a and the unsealing cannot be effected.

In this way, the fixing portion 18c is provided upstream with respect to the movement direction D of the sealing member 19, so that reliable unsealing becomes possible.

(Distance relation of fixing portion associated with unsealing)

As shown in Figure 22 and Figure 23, in order to peel off the first bonding portion 22b with reliability, the following length relationship is required between the first bonding portion 22a and the fixing portion 18c. First, a point of the first bonding portion 22a finally peeled off when a flat surface which passes the unsealing member 20, the openings 35a and the fixing portion 18c and which is perpendicular to the rotation shaft of the unsealing member 20 is viewed, is a first point 22d. The first point 22d is an end portion point of the first bonding portion 22a close to the openings. Further, a distance from the fixing portion 18c to the first point 22d along the developer bag 16 is M1. Further, a distance measured, from the first fixing portion 18d to the first point 22d, along the developer accommodating bag 16 with respect to the direction including the openings 35a is M2. Incidentally, the openings 35a are a space in which the material for the developer bag 16 is not present but a width of the openings 35a is also included in the distance.

At this time, M1 < M2 is satisfied to permit the peeling-off of the first bonding portion. Here, the above relationship of M1 < M2 will be described specifically.

(Case of M1 < M2)

First, in the case where M1 < M2 is satisfied, as shown in Figure 22, a force (arrow D) for pulling the sealing member 19 to the first bonding portion 22a by the unsealing member 20 and a retaining force (arrow H) of the fixing portion are applied to the first bonding portion 22a, so that the first bonding portion 22a can be inclination-peeled. By effecting the inclination peeling, the peeling force can be set at a low level. Here, (a) of Figure 22 shows before the unsealing, and (b) of Figure 22 shows immediately before the first bonding portion 22a is unsealed.

(Case of M1> M2)

On the other hand, in the case of M1 > M2, as shown in Figure 23, the pulling force by the unsealing member 20 is not applied to the first bonding portion 22a but is applied to the second bonding portion 22b. In this case, the force is not applied to the first bonding portion 22a and therefore the first bonding portion 22a is not peeled. In this case, the force (arrow D) from the unsealing member 20 and the retaining force (arrow H) of the fixing portion 18c are applied to the second bonding portion 22b. In this

state, to the second bonding portion 22b, the force (arrow D) for pulling the sealing member 19 by the unsealing member 20 and the retaining force (arrow H) of the fixing portion 18c (in the arrow H direction) are applied, and at the portion of the second bonding portion 22b, the peeling relationship is a shearing peeling relationship and therefore it is difficult to unseal the second bonding portion 22b. This is because the shearing peeling requires a large force compared with the inclination peeling.

Here, (a) of Figure 23 is a view before the unsealing, and (b) of Figure 23 is a view when the force (arrow D) for pulling the sealing member 19 by the unsealing member 20 is applied to the bonding portion (the second bonding portion in this case) by the rotation of the unsealing member 20. Further, to the second bonding portion 22b, the force is applied but is applied based on the shearing peeling relation, and therefore compared with the case of the inclination peeling, a very large force is required, so that it becomes difficult to reduce the peeling force.

(Distance in case where projection (rib) is present)

Incidentally, here, definition of a manner of measuring the above-described distances M1 and M2 will be described. The distances M1 and M2 are important when the sealing member 19 is pulled during the

unsealing. In the case where there is no projection rib 16t at an intermediate position of paths of M1 and M2, the distances developed as shown in Figure 22 and Figure 23 may only be required to be measured. Further, as shown in Figure 24, in the case where there is the projection 16t formed, by bonding in manufacturing, at the intermediate position of the paths of M1 and M2, even when the sealing member 19 is pulled during the unsealing, the projection 16t is not elongated (peeled off) and therefore the portion of the projection 16t is not included in the distances M1 and M2. That is, the portion, such as the projection 16t, which does not affect transmission of the force is not included in the distances M1 and M2.

As described above, based on the relationship of M1 < M2, the first bonding portion 22a is unsealed earlier than the second bonding portion 22b. By the earlier unsealing of the first bonding portion 22a than the second bonding portion 22b, the fold-back portion 19d of the sealing member 19 can be provided at the first bonding portion 22a. By this fold-back portion 19d, the peeling is not the shearing peeling but is the inclination peeling. By this, with reliability, the sealing member 19 can be peeled off from the developer bag 16, so that it is possible to provide an unsealable developing device 38.

(Case of plurality of fixing portions)

Here, a relation between a plurality of fixing portions and the unsealing will be described by using Figure 31. Immediately, before the unsealing member 20 is rotated from a state of (a) of Figure 31 to unseal the first bonding portion 22a is (b) of Figure 31. In this embodiment, the first fixing portion 18a and the second fixing portion 18b are provided. Here, the force during the unsealing is applied to the first fixing portion 18a disposed at a place close to the first bonding portion 22a which is first unsealed while sandwiching the openings 35a between the portions 22a and 22b. For that reason, the second fixing portion 18b is not required to be taken into consideration of the measuring manners of the distances M1 and M2 described above. Thus, in the case where there are the plurality of fixing portions, the fixing portion disposed at the place close to the first bonding portion 22a which is first unsealed while sandwiching the openings 35a, between the portions 22a and 22b, to which the force during the unsealing is to be applied may be used as a basis (of the unsealing).

(Positional relation of second bonding portion)

An arrangement in which the second bonding portion 22b can be more satisfactorily unsealed without being wound up around the unsealing member 20 will be described by using Figure 12 shows a state

immediately before the first bonding portion 22a is unsealed. First, an end portion of the first bonding portion 22a in a side remote from the openings 35a is a second point 22e. An end portion of the second bonding portion 22b in a side remote from the openings 35a is a third point 22f. Here, a distance from the second point 22e to the third point 22f is L1. Further, a distance from the second point 22e to the power application point portion 20a is L2. At this time, a relationship between the distance L1 and the perpendicular to L2 needs a relationship of L1 < L2.

The reason thereof is that in the case where L1 is distance L2, the second bonding portion 22b reaches the power application point portion 22a before the peeling of the second bonding portion 22b is ended, and the second bonding portion 22b is wound about the unsealing member 20. The force cannot be applied so as to peel off the sealing member 19 from the second bonding portion 22b. For that reason, it becomes difficult to unseal the sealing member 19 from the developer bag 16.

As described above, the relationship between the distance L1 and the distance L2 is made L1 < L2, the sealing member 19 is satisfactorily unsealable without being wound about the unsealing member 20.

(Function of connecting portions defining openings)

A summary of the connecting portions 35b,

defining the openings, which perform a large function in the unsealing operation of the developer bag 16 will be described.

Figure 11 is a view of the discharging portion 35 when the peeling of the portion, at the first bonding portion 22a, to be first unsealed is ended to expose the openings 35a, and is a state in which the peeling at the second bonding portion 22b is not ended. As described above, the discharging portion 35 includes the plurality of openings 35a disposed at different positions with respect to the perpendicular direction F to the unsealing direction E in which the exposure of the openings 35a advances. For that reason, also the plurality of connecting portions 35b defining the plurality of openings 35a are disposed at a plurality of positions with respect to the F direction. By this, the plurality of connecting portions 35b bridge the first bonding portion 22a and the second bonding portion 22b with respect to the direction E in which the unsealing of the openings 35a advances. For that reason, at the time of the state of Figure 8 in which the unsealing of the first bonding portion 22a is ended, the force when the second bonding portion 22b is unsealed can be received by the first fixing portion 16d via the connecting portions 35b, so that the force for peeling off the sealing member 19 from the developer bag 16 can be transferred. That is, the

forces are applied to the second bonding portion 22b in the directions of the arrow D and the arrow E, so that also at the second bonding portion 22b, the sealing member 19 is peelable.

A similar effect can be obtained also in cases other than the case where the openings 35a are arranged in the direction perpendicular to the unsealing direction F as shown in (b) of Figure 28 as described above. Even when the openings 35a are not completely arranged in the direction perpendicular to the unsealing direction E as shown in (c) of Figure 28, the connecting portions 35b can transmit the force, for peeling off the sealing member 19 from the developer bag 16, as shown by an arrow P. Further, even when the openings 35 overlap with each other with respect to the unsealing direction E as shown in (d) of Figure 28, the connecting portions 35b can transmit the force, for obliquely peeling the sealing member 19 from the developer bag 16, as shown by an arrow P. That is, the plurality of openings 35a may only be required to be disposed at different positions with respect to the direction F perpendicular to the unsealing direction E.

Further, as shown in (b) of Figure 28, a portion including the connecting portions 35b at a periphery of the openings 35a may also be used as the bonding portion 22. Also in this case, by the presence

of the connecting portions 35b, the force can be transmitted to the end of the peeling at the bonding portion 22, so that the unsealing is effected with reliability.

Further, as for a relationship between the rotation shaft of the unsealing member 20 and the openings 35a, it can be said that the openings 35a are disposed at the different positions with respect to the direction R of the rotation shaft of the unsealing member 20. By doing so, the connecting portions 35b for bridging the first and second bonding portions 22a and 22b with respect to the perpendicular direction (arrow E) to the rotation shaft of the unsealing member 20. The openings 35a may only be required to be located at the different positions in the rotational axis direction R of the unsealing member. Even when the openings 35a overlap with each other with respect to the rotational axis direction R as shown in (b) of Figure 28 and do not overlap with each other completely with respect to the rotational axis direction R as shown in (c) of Figure 28, the force can be transmitted as shown by the arrow P and there is the effect of the connecting portions 35b.

Thus, by the presence of the connecting portions 35b for bridging the first and second bonding portions 22a and 22b at the discharging portion 35, the developer accommodating container 26 accommodating

the developer and the developer accommodating container 30 including the unsealing member 20 can transmit the unsealing force of the unseal member 20 until the second bonding portion 22b is unsealed, so that the unsealing can be effected with reliability.

Further, a relationship between the openings 35a and the portion-to-be-engaged 19b of the sealing member will be described (Figure 3). The portion-to-be-engaged 19b is provided in an end side of the sealing member 19 with respect to the direction substantially perpendicular to the direction in which the plurality of openings are arranged.

A relationship between the openings 35a and the unsealing member 20 will be described (Figure 3). The unsealing member 20 is provided in an end side of the sealing member 19 with respect to the direction substantially perpendicular to the direction in which the plurality of openings are arranged.

Also in such a constitution, it is possible to obtain the effect of transmitting the unsealing force of the unsealing member 20 by the connecting portions 35b until the second bonding portion 22b is unsealed. (Example in which connecting portions are separate members)

Further, as shown in Figure 21, the connecting portions 35b defining the openings 35a may also be separate members (connecting members 16f). In this

case, a constitution in which a single long opening 16a in the direction F perpendicular to the unsealing direction E is provided and the connecting members 16f as the separate member connecting both sides of the opening 16a along the unsealing direction E are provided on the single long opening 16a is employed. At this time, the connecting members 16f are bonded in each of the first bonding portion 22a side and the second bonding portion 22b side of the long single opening 16a by adhesive bonding, welding or the like.

Incidentally, also in the case where the developer bag 16 is provided with the connecting members 16f, the sealing member 19 is folded back between the bonding portion 22 and the portion-to-be-engaged 19b as described above and is wound around the unsealing member 20, so that the developer bag 16 is unsealable. By employing such a constitution, the connecting portions 35b defining the openings in the case where the plurality of openings 35a are provided, and the connecting members 16f perform the same function. That is, the long single opening 16a is the same as the case where there are the plurality of openings 35a by providing the connecting members 16f.

Therefore, when the sealing member 19 is peeled at the second bonding portion 22b after the unsealing at the first bonding portion 22a is ended,

the force (arrow D) during the unsealing at the second bonding portion 22b by the unsealing member 20 can be received by the first fixing portion 16d via the connecting members 16f with respect to the arrow H direction. Therefore, the force for peeling the sealing member 19 from the developer bag 16 can be transmitted. That is, the forces are applied to the second bonding portion 22b in the arrow D direction and the arrow H direction, so that the unsealing is enabled also the second bonding portion 22b.

In this way, the long single opening 16a forms the plurality of openings 35a by the connecting members 16f, so that it also becomes possible to strengthen only the connecting members 16f.

(Problem of unsealing property in case of no connecting portion)

Here, an example in which the present invention is not applied and it is difficult to unseal the developer bag 16 will be described. This is, as shown in Figures 13 and 14, the case where there are no connecting portions 35b and it becomes difficult to effect the unsealing. Figure 13 is an example in which there are no connecting portions 35b and there is a single opening 16a, in which (a) of Figure 13 is a view showing a state before the peeling at the second bonding portion 22b, and (b) of Figure 13 and Figure 15 are views showing a state when the sealing member

19 is peeled at the second bonding portion. Further, Figure 8 includes enlarged sectional views at a periphery of the opening 35a in states before and after the sealing member 19 is peeled at the second bonding portion 22b in this embodiment, and Figure 14 includes sectional views at the periphery of the opening 35a in the case where there are no connecting portions 35b and thus it becomes difficult to effect the unsealing.

In this case, a state in which the unsealing advances to the second bonding portion 22b is (a) of Figure 14, and from this state, the sealing member 19 is pulled and moved in the arrow D direction by further rotation of the unsealing member 20. Then, since there are no connecting portions 35b, the force from the first fixing portion 16d cannot be transmitted to the second bonding portion 22b side at the central portion of the opening 16a. For that reason, as shown in (b) of Figure 14 and (b) of Figure 13, a binding force from the fixing portion 18a of the frame to the second bonding portion 22b is eliminated, so that the opening 16a gradually opens largely in the arrow D direction. Further, the second bonding portion 22b is pulled by the sealing member 19, so that the opening 16a is deformed as shown in (c) of Figure 14. In this case, a force acting on the second bonding portion 22b fails to provide the inclination peeling

positional relationship as shown in Figure 8 and causes the shearing peeling (approximately 0-degree peeling) by the deformation of the opening 35a as shown in (c) of Figure 14, so that a large force is required for the peeling. Moreover, the supporting force of the first fixing force 16d cannot be transmitted to the second bonding portion 22b and therefore the second bonding portion 22b is pulled by the unsealing member 20 without causing the peeling of the sealing member 19 therefrom. For that reason, the opening 16a in the neighborhood of a longitudinal central portion of the second bonding portion 22b further opens largely, so that the second bonding portion 22b is wound about the unsealing member 20.

Incidentally, if a member for accommodating the developer is a rigid member such as a structure, there is no such a deformation, so that the sealing can be made as in the conventional example. However, in the case of a constitution in which the developer is accommodated in a deformable soft bag-like member and an opening which is deformed during unsealing is unsealed, as described above, when there are no connecting portions 35b, it becomes difficult to effect the unsealing.

As described above, the sealing member 19 (= toner seal) is made unsealable by transmitting the driving force to the unsealing member 20 of the image

forming apparatus B, and there is no need for the user to peel off the toner seal, so that the developing device 38 and the process cartridge A can be more simply replaced and used. Further, the sealing member 19 after the unsealing is fixed to the unsealing member 20, so that the unsealing can be effected without removing a waste material from the process cartridge A.

<With respect to summary of urging member and developer discharge)

(Urging member)

As shown in Figure 16, the urging member 21 is provided with a shaft portion 21a and an urging sheet 21b fixed to the shaft portion 21a and is provided rotatably inside the first frame 17 and the second frame 18.

First, the shaft portion 21a performs a function by the same part as the unsealing member 20 (21a = 20). Therefore, as described above, the driving force is transmitted to the shaft portion 21a by the unshown driving means of the main assembly of the image forming apparatus B, so that the urging member 21 (= 20) is rotated in the arrow C direction.

Next, the urging sheet 21b is fixed on a surface of a rectangular shaft portion 21a in cross section and is rotated together with the shaft portion 21a. Incidentally, the urging sheet 21b is a flexible

sheet formed of a material such as PET, PPS (polyphenylene sulfide) or polycarbonate, in a thickness of about 0.05 - 0.1 mm, and an end thereof projects to the outside of a circumscribed circle of the shaft portion 21a. Here, in this embodiment, on different surfaces of the shaft portion 21a, the sealing member 19 and the urging sheet 21a are fixed but may also be fixed on the same surface of the shaft portion 21a.

Further, as shown in Figure 16 and Figure 17, the urging sheet 21b also performs the function of stirring the developer and feeding the developer toward the developing roller 13 and the developer supplying roller 23.

<Summary of developer discharge from developer bag>

(Summary of discharge from before unsealing to during unseal)

First, with respect to the discharge of the developer from before the unsealing to the time of start of the unsealing, as shown in Figure 7 and Figure 8 described above, the sealing member 19 is pulled toward the power application point portion 20a (arrow D), and the developer bag 16 is supported by the fixing portion 18c. For that reason, during unsealing, three places consisting of the power application point portion 20a, the fixing portion 18c of the frame and the place of the bonding portion 22

where the sealing member 19 is peeled are moved in a direction in which these three places are aligned in a rectilinear line in a cross section perpendicular to the rotation shaft of the unsealing member 20. Thus, the position of the openings 35a is changed between the time before the unsealing member 20 applies the force to the sealing member 19 to perform the unsealing operation and the time when the unsealing operation is started to unseal the bonding at the first bonding portion 22a, so that stagnation of the developer in the neighborhood of the openings 35a can be prevented and a discharging property is good.

(Summary of discharge after unsealing: during urging)

Further, after the unsealing, when the sealing member 19 is unsealed from the above-described developer bag 16 as shown in (b) of Figure 8, the openings 35a are disposed to open toward below the developer bag 16 and therefore the developer in the neighborhood of the openings 35a is discharged by the action of gravitation and vibration or the like of the developer bag 16 during the unsealing.

After the unsealing, when the unsealing member 20 is further rotated, also the urging sheet 21b fixed to the unsealing member 20, for urging the developer bag 16 is rotated, so that the urging sheet 21b is wound about the unsealing member 20 by the developer bag 16 as shown in Figure 9. Here, as shown in Figure

16, the urging sheet 21b has elasticity and therefore is likely to be restored to an original shape, thus urging the developer bag 16 in an arrow J direction. At this time, the developer bag 16 is urged by the urging sheet 21b and is pressed against the second frame 18 via the toner, so that the entire developer bag 16 is deformed. Further, the developer bag 16 is urged by the urging sheet 21b to be decreased in its inside volume. Thus, by the decrease in volume of and the change in entire shape of the developer bag 16, the developer inside the developer bag 16 is stirred, and thereby, the developer is readily discharged from the openings 35a. Further, at this time, the developer bag 16 is closed except for the openings 35a and there is no escape route except for the openings 35a, and therefore the discharging property from the openings 35a is high. By the discharging action as described above, the developer is readily discharged in the arrow I direction.

Incidentally, at this time, if the developer bag 16 is contacted to and pressed against the second frame 18 at least at a part thereof, the developer bag 16 is deformable.

Further, by aligning the rotational axis direction of the developing roller 13 and the arrangement direction F of the plurality of openings 35a, the developer can be easily supplied over the

entire longitudinal direction of the developing roller 13 during the discharge without being localized.

Further, when the developing device 38 is mounted in the image forming apparatus B, by providing the openings 35a so as to open toward the direction of gravitation, the developer discharging property can be improved.

Further, the urging member 21 provided inside the frames (17, 18) urges the developer bag 16 so as to be pressed against the second frame 18, by which the developer discharging property can be improved.

Further, also the urging member 21 uses a flexible sheet which includes a base material such as polyethylene terephthalate (PET), polyethylene or polypropylene and which is 0.03 - 0.15 mm in thickness, and therefore takes part in the discharging action by a mechanism similar to that of the above-described urging sheet 21b.

(Summary of discharge: developer bag shape restoration)

Then, as shown in Figure 17, the unsealing member 20 is further rotated, so that the urging sheet 21b is separated from the developer bag 16. At this time, the developer bag 16 has flexibility and therefore is likely to be restored to the state before the urging by the weight of the developer (arrow K). Then, also the urging sheet 21b is rotated and urges

the developer bag 16 toward the second frame 18 as shown in Figure 16, so that the developer bag 16 is deformed to move the developer at a position other than the neighborhood of the openings 35a, and the developer is discharged from the openings 35a.

(Summary of discharge: repetition of unsealing/restoration)

In the case where the developer immediately after the unsealing is present in the developer bag 16 in a large amount, an entering amount of the urging sheet 21b to the unsealing member 20 is repetitively changed, so that the developer bag 16 is deformed so as to be pressed against the second frame 18. Contraction of the developer bag 16 by the urging with the urging member 21 and restoration of the developer bag 16 by the weight of the developer inside the developer bag 16 and by the flexibility of the developer bag 16 are repeated. Further, by the above-described action, the developer bag 16 itself is moved and therefore the developer bag 16 is vibrated, so that the developer inside the developer bag 16 is discharged from the openings 35a also by this vibration. Further, the urging member 21 is rotated and therefore is capable of repetitively urging the developer bag 16.

(Example in which developer bag is applied to frame)

Incidentally, a portion 27 where the developer

bag 16 is urged against the second frame 18 is as shown in Figure 25, even in the case where a bonding portion 28 such as an adhesive or a double-side tape is provided and bonds the developer bag 16 to the second frame 18, the urging sheet 21b can urge the developer bag 16 to discharge the developer.

(Case where amount of developer becomes small)

The case where the amount of the developer inside the developer bag 16 becomes small by effecting image formation will be described by using Figure 32. Incidentally, for simplification, the urging member 21 will be principally described, but also with respect to the sealing member 19, a similar phenomenon occurs. Immediately after the unsealing, as shown in (a) of Figure 32, the shape of the developer bag 16 follows the shape of the urging member 21 so that the developer bag 16 always contacts the urging member 21 by the weight of the accommodated developer, and a size (inside volume) is periodically changed. However, when the accommodated developer becomes small, as shown in (b) of Figure 32, the weight of the developer becomes light, so that the developer bag 16 does not follow the urging member 21 and repeats periodical separation from and contact with the urging member 21. The developer bag 16 and the urging member 21 periodically contact each other, and therefore the developer can be discharged by the vibration of the

developer bag 16.

Depending on a position relationship between the developer bag 16 and the urging member 21, there is the case where the developer bag 16 and the urging member 21 always do not contact each other at the time when the developer becomes small. That is, the discharge of the developer by the periodical contact is not effected, and therefore there is a possibility that the developer which is not discharged remains in the developer bag 16. At this time, as shown in (c) of Figure 32, a constitution in which the urging sheet 21b is fixed to the urging member 21 and has a length enough to always bring the urging sheet 21b in contact with the developer bag 16 may preferably be employed. By doing so, the urging sheet 21b is contacted to the developer bag 16 in a flexed (bent) state, and therefore even in the case where the developer becomes small and the developer bag 16 is deformed, a state in which the developer bag 16 and the urging member 21 do not contact each other is not created, so that the discharging effect can be maintained. That is, when the flexible sheet is used as the urging member 21, depending on the state of the developer bag, it is possible to change a distance from the center of the rotation shaft of the urging member to an application (action) point where the developer bag 16 is urged. Specifically, when the toner is sufficiently contained

in the developer bag 16, the urging sheet 21b urges the developer bag 16 in the flexed state, but as the toner in the developer bag 16 becomes small, the urging sheet 21b is contacted to the developer bag 16 in a state in which the flexure thereof is more eliminated.

Further, with respect to the rotational axis direction of the urging member 21, even in the case where localization is caused in the developer in the developer bag 16 and contact non-uniformity between the developer bag 16 and the urging sheet 21b is generated, if the above-described constitution in which the urging sheet 21b is fixed to the urging member 21 is employed, it is possible to maintain the discharging effect similarly as described above.

(Combined use as urging sheet and sealing member)

Incidentally, a single part may also be used as the urging sheet 21b and the sealing member 19 to have functions of these members. That is, after the unsealing, the bonding portion 22 is separated from the developer bag 16 and therefore an end of the sealing member 19 in the bonding portion 22 side is a free end. For this reason, the sealing member 19 can have the function of the urging sheet 21b. Thus, the unsealing member 20 can have the function of the shaft portion 21a of the urging member 21, and the sealing member 19 can have the function of the urging sheet

21b.

By doing so, it is possible to reduce the number of parts and thus cost reduction can be realized.

As described above, the developer inside the developer bag 16 can be satisfactorily discharged without providing another discharging part such as a developer discharging roller at the openings 35a as a developer discharging port, so that agglomeration and bridge of the developer in the neighborhood of the openings 35a can be prevented. By this, even in the case where the developer in the developer bag 16 is agglomerated by tapping during transportation, storage or the like, the agglomerated developer is broken by such movement of the entire developer bag 16 and the periphery of the openings 35a, so that it is possible to prevent a state in which it becomes difficult to discharge the developer.

(Example in which urging member is single part)

Further, the urging member 21 is not separate parts consisting of the shaft portion 21a and the urging sheet 21b, but even when the urging member 21 is a single part as shown in (a) of Figure 26 and is provided with a projection (projected portion) 21c functioning as the urging sheet 21b, the developer can be similarly discharged. In the case where the urging member 21 is constituted by only the shaft portion 21a,

when the urging member 21 is viewed in its cross section perpendicular to its rotation center, the developer bag 16 can be pressed against a frame 29 to be deformed even in the case where the cross section of the shaft portion 21a has a polygonal shape ((b) of Figure 26) or has a cam shape ((c) of Figure 26). This is because when the urging member 21 is disposed so as to contact at least the developer bag 16, a distance from the rotation center to the outer end of the urging member 21 is changed and therefore the entering amount of the urging member 21 to the developer bag 16 is also changed. That is, so long as the shaft portion is not a shaft having a circular cross section including the rotational axis as its center, the developer bag 16 can be deformed by the rotation of the urging member 21. As shown in Figure 26, a distance 21c from the center of the urging member 21 to a remote outer end of the urging member 21 and a close distance 21d to an outer end are different from each other and therefore the entering amount of the urging member 21 to the developer bag 16 is also changed.

Further, (b) of Figure 33 is a sectional view of an urging member 21 having a cross-shape in cross section, and (a) of Figure 33 is a cross-sectional illustration of the developer accommodating unit 25 including the cross-shaped urging member 21. As shown

in Figure 33, in the case where four projections (projected portions) 21e having the same distance from the center of the urging member 21 to the outer end are provided, outer configurations (21c) of the four projections 21e are equal to each other. However, the urging member 21 includes a portion, other than the projections 21e, having an outer end (distance 21d) close to the center and therefore the entering amount to the developer bag 16 can be changed. That is, the urging member 21 can be made a rotatable member including portions different in distance from the rotation center of the urging member 21 to the outer end of the urging member in the cross section perpendicular to the rotation center of the urging member 21.

Thus, the developer bag 16 is urged by the urging member 21 (arrow J) to be pressed against the frame 29, thus being deformed to decrease its inside volume, so that the inside developer is pushed out to be discharged from the openings 35a (arrow I).

Further, in an attitude during the image formation, the shaft portion 21a (= 20) of the urging member 21 is positioned under the developer bag 16 with respect to the direction of gravitation, and contacts the developer bag 16. Further, the cross-sectional shape of the shaft portion 21a (= 20) of the urging member 21 is rectangular and is not

circular, and therefore by the rotation of the shaft portion 21a (= 20), the entering amount of the shaft portion 21a (= 20) to the developer bag 16 is periodically changed as described above. Also by the change in entering amount of the shaft portion 21a (= 20) to the developer bag 16, the developer bag 16 can be changed in volume and can be vibrated, so that the developer discharging property can be improved.

Further, if the constitution in which the urging sheet 21b is fixed to the urging member 21 is employed, the urging sheet 21b is contacted to the developer bag 16 is the flexed state, and therefore even in the case where the developer bag 16 is deformed, a state in which the developer bag 16 and the urging member 21 do not contact each other is not created. For that reason, it is possible to maintain the discharging effect. Further, even when the constitution in which the urging sheet 21b having the flexibility is provided is not employed, the discharging effect can be maintained similarly as described above also by making the projection 21c to have a thin sheet-like shape so as to have flexibility and a length enough to contact the developer bag 16.

<Summary of urging member and developer circulation in developer bag>

As described above, as the functional effect of the above-described urging member 21, the toner

discharge has been described, but next a developer circulating function, in the developer bag, which is another functional effect of the above-described urging member 21 will be described by using Figure 17.

As shown in Figure 17, the rotation of the unsealing member 20 advances, so that the urging sheet 21b separates from the developer bag 16. At this time, the developer bag 16 has the flexibility and therefore will be restored, by the weight of the accommodated developer, to the state before being urged (arrow K). Further, also the urging sheet 21b is rotated to urge, as shown in Figure 16, the developer bag 16 toward the second frame 18 thereby to deform the developer bag 16, so that also the developer at a position other than the neighborhood of the openings 35a is moved, and by this motion of the developer, the developer circulating function (action) in the developer bag 16 is generated. That is, the deformation function of the developer bag 16 moves the developer in the developer bag 16, thus generating the developer circulating function in the developer bag 16. Further, a deformation amplitude of the developer bag and the developer circulating function are in a proportional relationship.

<Embodiment 2>

(Vacuum molding>

As Embodiment 2, in place of the developer bag

16 in Embodiment 1, a developer accommodating member 34 is used.

The developer accommodating member 34 is formed by shaping a sheet-like material by vacuum molding, air-pressure molding or press molding, and is used. The developer accommodating container 30 including the unsealing member includes, similarly as in Embodiment 1, the developer accommodating member 34, the sealing member 19, the unsealing member 20, the first frame 17 and the second frame 18. Incidentally, the unsealing member 20 is a member having the function of the urging member 21 and the developer stirring function similarly as in Embodiment 1.

(Structure of developer bag)

As shown in Figure 18 and (c) of Figure 29, the developer accommodating member 34 is constituted by a molded portion 34a which is a flexible container formed by the vacuum molding, the air-pressure molding or the press molding, and (constituted by) a sheet-like air permeable portion 34b. Here, bonding between the molded portion 34a and the air permeable portion 34b is made by (heat) welding, laser welding, an adhesive, an adhesive tape or the like. The reason why an air permeability is imparted to the developer accommodating member 34 is the same as that in Embodiment 1 and is that the developer accommodating member 34 meets states during manufacturing, during

transportation and during storage.

As the material for the molded portion 34a, ABS, PMMA, PC, PP, PE, HIPS, PET, PVC and the like and composite multi-layer materials of these materials are preferred. Further, the thickness of the molded portion 34a may preferably be about 0.1 - 1 mm in the sheet shape before the molding. The material and thickness of the molded portion 34a may only be required to be appropriately selected depending on cost, product specification, manufacturing condition, and the like.

The molded portion 34a is bonded to the air permeable portion 34b at an outer peripheral portion 34c of the molded portion 34a. The developer accommodating member 34 accommodates the developer therein. Further, at a part of the outer peripheral portion 34c, fixing portions 16d (portions-to-be-fixed) of the developer accommodating member 34 are provided. The shape of the molded portion 34a follows the inside (shape) of the frames 17 and 18 (Figure 19).

Further, the developer accommodating container 26 in which the developer is accommodated is constituted by the developer accommodating member 34 and the sealing member 19 for unsealably covering the discharging portion 35 of the developer accommodating member 34 to seal the toner inside the developer

accommodating member 34.

The developer accommodating container 30 including the unsealing member is constituted by the unsealing member 20 for unsealing the sealing member 19 from the developer accommodating member 34 and the developer accommodating container 26 in which the developer is accommodated.

The developing device 38 is constituted by the developer accommodating container 30 including the unsealing member, the developing roller 13 as the developing means, the developing blade 15, and the first frame 17 and the second frame 18 which support these members.

Here, the discharging portion 35 is provided at the molded portion 34a, and also a constitution of this discharging portion 35 is the same as that in Embodiment 1, and a plurality of openings 35a and connecting portions 35b for defining the plurality of openings 35a are provided with respect to the direction F substantially perpendicular to the unsealing direction E in which the unsealing of the developer accommodating member 34 advances. That is, the plurality of openings 35a are disposed at different positions with respect to the direction F perpendicular to the unsealing direction E. Further, the plurality of openings 35a are disposed at different positions with respect to the direction of

the rotation shaft of the unsealing member 20. Further, the portion-to-be-engaged 19b is provided in an end side of the sealing member 19 with respect to the direction substantially perpendicular to the direction in which the plurality of openings 35a are arranged. Further, the unsealing member 20 is provided in the end side of the sealing member 19 with respect to the direction substantially perpendicular to the direction in which the plurality of openings 35a are arranged. The fixing portion includes a fixing portion 16d, necessary for the unsealing, corresponding to the first fixing portion 16d in Embodiment 1. The shape of the developer accommodating member 34 itself is intended to be maintained by the molded portion 34a and the developer accommodating member 34 has the shape following the frame, and therefore the developer accommodating member 34 is supported by the frame as a whole, so that the developer accommodating member 34 is not readily moved toward the developer supplying roller 23 and the developing roller 13.

Next, as a means for fixing the fixing portion, it is possible to cite the (heat) welding, the ultrasonic welding, the adhesive bonding, the insertion between the frames, the heat clamping, the ultrasonic clamping, the hooking using the hole and the projection, and the like.

Incidentally, the constitutions of the sealing

member 19 and the unsealing member 20 are the same as those in Embodiment 1.

<Summary of unsealing of developer accommodating bag>

Next, the unsealing of the developer accommodating bag will be described. Here, the fixing portion and the position thereof are the substantially same as those in Embodiment 1, and also the force relationship is the same as that in Embodiment 1. Therefore, also the unsealing step is the same as that in Embodiment 1 (Figure 7 and Figure 8).

In Embodiment 2, the openings 35a are disposed at the molded portion 34a, but also the molded portion 34a is flexible similarly as in Embodiment 1, so that the force relationship is the same as that in Embodiment 1. Therefore, also in Embodiment 2, the plurality of connecting portions 35b bridge the first bonding portion 22a and the second bonding portion 22b with respect to the direction E in which the unsealing advances. For that reason, when the unsealing at the first bonding portion 22a is ended and the unsealing at the second bonding portion 22b is effected, a force for peeling the sealing member 19 from the developer accommodating member 34 can be transmitted. For that reason, the unsealing also at the bonding portion 22b becomes possible.

Also the developer discharging port after the unsealing is the same as that in Embodiment 1. When

the sealing member 19 is unsealed from the above-described developer accommodating member 34, first, the openings 35a are disposed at the lower portion of the developer accommodating member 34, and therefore the position of the openings 35a during the unsealing is moved at the same time when the gravitation acts on the openings 35a, so that the developer is discharged. Further, by the vibration or the like of the developer accommodating member 34, the developer in the neighborhood of the openings 35a is discharged. Here, the unsealing member 20 also functions as the urging member 21. Further, the urging member 21 has a rectangular shape in the cross section perpendicular to the rotational axis direction of the urging member 21, and the discharge of the developer is accelerated by the rotation of the urging member 21 as described in Embodiment 1 (Figure 19).

Here, the urging member 21 contacts a surface which is the same surface as the surface where the openings 35a of the developer accommodating member 34 are provided. Incidentally, the developer accommodating member 34 is constituted by a plurality of surfaces including the surface where the openings 35a of the developer accommodating member 34 are provided and another surface connected to the surface via a bent portion 34d.

By employing the constitution as described

above, in addition to the effect in Embodiment 1, the following effects are achieved.

(Effect of vacuum molding)

By forming a part of the developer accommodating member 34 through the vacuum molding, the following effects are obtained.

As a first effect, the developer accommodating member 34 can be shaped so as to follow the inside (shape) of the frame. For that reason, in the bag form as described in Embodiment 1, it is difficult to insert the bag until corner portions of the frame, so that a gap (space) is formed between the developer accommodating member 34 and the first frame 17, and the space is not an effective developer accommodating space.

As a second effect, the developer accommodating member 34 can be shaped so as to follow (the shape of) the frame and therefore can be easily assembled with the frame. This is because there is no need to push the developer accommodating member into the frame during the assembling so that its shape follows the shape of the frame.

As a third effect, the developer accommodating member 34 is not readily moved toward the developer supplying roller 23 and the developing roller 13. This is because the developer accommodating member 34 is supported by the frame as a whole since the shape of

the developer accommodating member 34 itself is maintained as described above by the vacuum molding and has the shape which follows (the shape of) the frame. For that reason, the second fixing portion for preventing the movement of the developer bag toward the developer supplying roller 23 and the developing roller 13 as described in Embodiment 1 can be omitted.

Further, as shown in Figure 19, an effect of pushing the surface 34f which is the same surface as the surface where the openings 35a are provided is as follows. The developer accommodating member 34 is constituted by the plurality of surfaces by the vacuum molding. Therefore, the bent portion 34d is present between the plurality of surfaces. The surface of the developer accommodating member 34 is defined as a portion surrounded by bent portions. Here, a difference in effect between the case where the surface 34f including the openings 35a is urged and the case where a surface 34e which does not include the openings 35a is urged will be described. The surface 34e is a surface which sandwiches the bent portion 34d between itself and the surface 34f including the opening 35a. A force received by the surface 34e urged by the urging member 21 is transmitted via the bent portion 34d. The force is largely attenuated before it reaches the surface including the openings 35a. For that reason, also a

force for moving the openings 35a becomes small compared with the case where the surface 34f including the openings 35a is urged directly. For that reason, the function (action) of discharging the developer by moving the openings 35a becomes small. Therefore, when the urging member 21 urges the surface 34f including the openings 35a, the urging member 21 can efficiently improve the discharging property of the inside developer and can prevent stagnation of the developer. Thus, by the rotation of the urging member 21 of which function is performed by the unsealing member 20, the developer accommodating member 34 is urged so as to be pressed against the second frame 18, so that the developer accommodating member 34 is deformed to change the position of the openings 35, and the inside developer is discharged. Further, there are the plurality of openings 35a and therefore the developer is readily discharged more than the case of a single opening. Further, the openings 35a are disposed downward with respect to the direction of gravitation in the attitude during the image formation and therefore the developer is easily discharged.

<Embodiment 3>

(Example in which unsealing member, urging member and stirring member are separate members)

By using Figures 35 and 36, an example in the case where an urging member 21, an unsealing member 20

and a stirring member 41 are separate members, respectively is shown. Figure 35 is a schematic sectional view before unsealing, and Figure 36 is a schematic sectional view after the unsealing. Here, each of the urging member 21, the unsealing member 20 and the stirring member 41 is rotatably supported by the first frame 17, and is rotated by receiving drive (driving force) from the main assembly of the image forming apparatus B. In an unsealing step, the unsealing member 20 is rotated in an arrow C direction, so that the sealing member 19 is wound up to expose the openings 35a. Further, with the rotation of the urging member 21, the urging member 21 urges the developer accommodating member 34 to deform the developer accommodating member 34, so that the discharge of the toner from the inside of the developer accommodating member 34 is urged. Further, by the rotation of the stirring member 41, the toner discharged from the developer accommodating member 34 can be stirred. Thus, the urging member 21, the unsealing member 20 and the stirring member 41 are the separate members, and therefore as desired, it is possible to set a rotational direction, a rotation speed, a rotation time and the like of each of the members.

<Embodiment 4>

(Example in which unsealing operation is operation

other than rotation)

By using Figure 37 and Figure 38, an example in the case where the unsealing member 20 is not rotated but is moved in a direction apart from the fixing portion 18a thereby to expose the openings 35a is shown. Here, the unsealing member 20 is slidably supported at its end portions by the first frame 17. Further, the unsealing member 20 is capable of being moved by an operation of the main assembly of the image forming apparatus B or by a user's operation. Here, the unsealing member 20 moves in an arrow C2 direction. With this movement of the unsealing member 20, the sealing member 19 is pulled in the arrow D direction to peel welded portions 22a and 22b to expose the openings 35a. Incidentally, the sliding direction C2 is not limited to a rectilinear line but may also be another shape such as an arcuate shape if the unsealing member 20 is movable in the direction apart from the fixing portion 19a.

Further, the unsealing member 20 may also function as the urging member 21 during the discharge or as the toner stirring member after the discharge, by being repeatedly reciprocated also after the unsealing (Figure 45).

Thus, the operation of the unsealing member 20 can be constituted, other than the rotation, so as to cause the sealing member 19 to be movable, and

therefore as desired, a constitution in which the unsealing member 20 is operated can appropriately be selected.

<Embodiment 5>

(Example in which opening is formed by half-cut)

As shown in Figure 39, an example in which the opening 35a is formed by being half-cut will be described. Figure 39 includes illustrations showing, in cross section, a step of forming the opening 35a. A state in which the opening 35a is processed in the order of (a), (b) and (c) of Figure 39. Further, a view seen from above in Figure 45 is Figure 40.

First, the developer bag 16 which is the flexible container and the urging member 21 are bonded to each other so as to have the easy-to-unseal property as described above, so that a two-layer structure is formed ((a) of Figure 39).

Next, the layer of the developer bag 16 is cut into a hole shape providing the opening 35a by a jig such as a cutter ((b) of Figure 39, (a) of Figure 40). By this, the structure constituted by the two layers of the developer bag 16 and the sealing member 19 was in a state in which the layer of the developer bag 16 is cut (half-cut).

Next, a state during unsealing is shown by using (d), (e) and (f) of Figure 39 and Figure 40. Of the two layers of the half-cut developer bag 16 and

the sealing member 19, the sealing member 19 is pulled in an arrow D direction by the unsealing member 20 ((d) of Figure 39). With the pulling of the unsealing member 20 in the arrow D direction, the opening 35a starts to expose ((e) of Figure 39, (b) of Figure 40). At this time, a portion 16w in the cut portion of the developer bag 16 is separated from the developer bag 16 together with the sealing member 19. Then, the sealing member 19 is further moved to be separated from the developer bag 16, so that the opening 35a is exposed. By using such half-cut to provide the opening 35a, there is no need to dispose, as waste, an end piece of the portion of the opening 35a in a manufacturing step. Further, it becomes possible to omit control such that the end piece of the opening 35a is prevented from being included in the process cartridge A during manufacturing.

<Embodiment 6>

Next, by using Figure 19, Figure 41, Figure 42, Figure 43 and Figure 44, a constitution and action for activating a developer circulating function (action) in the developer bag 16 will be described. Figure 41 is a sectional view perpendicular to a rotation center axis of the urging member 21 of the developing device 38.

As described in Embodiment 1, the fact that the developer circulation in the developer bag 16 is

generated by the deformation of the developer bag 16 was described above. Here, in the case where the molded product 34 described in Embodiment 2 is used, the shape of the developer bag 16 is capable of taking a shape similar to that of the frame 17, whereby as shown in Figure 19, a region where the developer bag 16 and the frame 17 hermetically contact each other is increased. By this increase, there is the case where a deformable region of the developer bag 16 by the urging member 21 is limited and as a result, also the developer circulation in the developer bag 16 is limited. Accordingly, in the case where the developer circulating function in the developer bag 16 is further required, as shown in Figure 41, a gap α is provided between a side (surface) 34e, continuous with a side (surface) 34f including openings of the developer bag 16 via a bent portion 34d, and the frame 17. This gap α may be set depending on an amount in which the developer bag 16 is amplified. Here, when the above-described gap α is set at a value not less than an amplitude of the developer bag 16 by the urging member 21, the above-described developer circulating function is proportional to the amplitude of the developer bag 16 and therefore the developer circulating function is performed to the maximum. However, in this case, correspondingly to a volume generated by the gap α, an accommodating amount of the

developer is limited. Next, in the case where the above-described gap α is set so as to be less than the amplitude of the developer bag 16, the developer circulating function becomes limited one. In this case, compared with the case where the gap α which is not less than the amplitude of the above-described developer bag 16 is provided, it becomes possible to direct the developer accommodating amount in an increasing direction correspondingly to a decrease in gap α. Accordingly, the value of the above-described gap α may be appropriately set depending on a required developer circulating function in the developer bag 16 and an amount of the accommodated developer. Further, as shown in Figure 41, a constitution in which the above-described gap α is made small toward between the side (surface) 34f including the openings and a side (surface) 34h opposing the side including the openings may also be employed. That is, the gap α is constituted so as to become larger as the gap α approaches the side 34f including the openings. Such a constitution can be made a constitution capable of achieving a balance between the developer circulation in the developer bag 16 and the developer accommodating amount, more than a constitution in which the gap α is provided in the entire region of the side 34e continuous with the side 34f including the openings via the bent portion 34d. Incidentally,

the bent portion 34d may appropriately selected from those including one constituted by chamfering ((b) of Figure 46), one constituted by a plurality of sides (surfaces) ((d) of Figure 46) and those having curvature ranging from a value close to 0 ((a) of Figure 46) to a large value ((c) of Figure 46).

As described above, the constitution of the gap α in the cross section perpendicular to the rotation center axis of the urging member 21 has been described, but next, by using Figure 42, Figure 43 and Figure 44, a constitution of a gap β in the cross section with respect to a direction parallel to the rotation center axis of the urging member 21 will be described. Figure 42 is a perspective view of a developer accommodating container 30. Figure 43 is a VV cross section shown in Figure 41. Figure 44 is a perspective view obtained by cutting only the frame 17 shown in Figure 41 along V-V line.

As shown in Figure 42, the side 34e continuous with the side 34f including the openings via the bent portion 34d and sides (surfaces) 34g are 3 sides provided in both sides with respect to the rotation center axis direction of the urging member 21 and at a surface opposing the air permeable portion 34b.

Here, as shown in Figure 43, a gap is provided each of between a side 34g with respect to a longitudinal direction of the rotation center axis of

the urging member 21 and the frame 17 and between another side 34g with respect to the longitudinal direction of the rotation center axis of the urging member 21 and the frame 17. A gap setting manner is similar to that in the above-described cross section perpendicular to the rotation center axis of the urging member.

Further, the developer circulating function is similar to the function (action) described in Embodiment 1.

[INDUSTRIAL APPLICABILITY]

As described in the foregoing, there are provided a developer accommodating container, a developer accommodating unit, a process cartridge and an electrophotographic image forming apparatus which are capable of further activating circulation of the developer in the developer bag 16.

CLAIMS

1. A developer accommodating unit for accommodating a developer for image formation, wherein said developer accommodating unit comprises:

a developer accommodating container including a flexible container provided with an opening for permitting discharge of the accommodated developer and including a sealing member for sealing the opening and for exposing the opening by being moved;

an unsealing member, mounted on said sealing member, for moving said sealing member; and

a frame which accommodates said developer accommodating container and said unsealing member and which includes a fixing portion for fixing the flexible container.

2. A developer accommodating unit according to Claim 1, wherein an end of said sealing member is bonded to a periphery of the opening at a bonding portion, and

wherein when the bonding portion is started to be peeled, a narrow angle of said sealing member between a side where said sealing member is bonded to the bonding portion and a side along a movement direction is 90 degrees or less.

3. A developer accommodating unit according to Claim 1 or 2, wherein the flexible container is provided with a portion-to-be-fixed to be fixed to the fixing portion of said frame.

4. A developer accommodating unit according to Claim 1 or 2, wherein the flexible container includes a portion-to-be-fixed, and

wherein the portion-to-be-fixed is to be fixed to said frame via a connecting member to be fixed to the fixing portion of said frame.

5. A developer accommodating unit according to Claims 1 - 4, wherein the fixing portion is provided along a direction substantially perpendicular to a movement direction of said sealing member.

6. A developer accommodating unit according to Claims 1 - 5, wherein said sealing member is wound up by said unsealing member so as to be peeled from a side near the fixing portion.

7. A developer accommodating unit for accommodating a developer for image formation, wherein said developer accommodating unit comprises:

a developer accommodating container including a flexible container provided with an opening for

permitting discharge of the accommodated developer and including a sealing member for sealing the opening by being bonded to said flexible container at a bonding portions and for exposing the opening by being moved;

a frame for accommodating said developer accommodating container and said sealing member; and which includes a fixing portion for fixing the flexible container,

an unsealing member, provided rotatably on said frame, for unsealing the opening by peeling said sealing member from said developer accommodating container by winding said sealing member around a rotation shaft, wherein said unsealing member includes, in the case where said unsealing member is seen along a surface of said sealing member, a folded-back portion between the bonding portion and a portion where said unsealing member is mounted,

wherein said frame is provided with a fixing portion for suppressing movement of the flexible container when said unsealing member is moved, and

wherein when a flat plane which passes through said unsealing member, the opening and the fixing portion and which is perpendicular to the rotation shaft of said unsealing member is seen,

of the bonding portions which opposes to each other via the opening, in the case where the bonding portions are seen along the surface of said sealing

member, the bonding portion in a side near the folded-back portion is a first bonding portion,

wherein of the first bonding portion, a point at an end portion in a side near the opening is a first point,

wherein a distance measured from the fixing portion to the first point along the flexible container with respect to a direction which does not include the opening is M1,

wherein a distance measured from the fixing portion to the first point along the flexible container with respect to a direction including the opening is M2, and

wherein M1 < M2 is satisfied.

8. A developer accommodating unit according to Claim 7, wherein the bonding portion opposing the first bonding portion via the opening is a second bonding portion,

wherein of the first bonding portion, a point at an end portion in a side remote from the opening is a second point,

wherein of the second bonding portion, a point at an end portion in a side remote from the opening is a third point,

wherein when bonding at the first bonding portion is unsealed by said unsealing member, a

portion where said unsealing member applies a force to said sealing member is a force application point portion,

wherein a distance between the second point and the third point is L1,

wherein a distance between the second point and the force application point portion is L2, and

wherein L1 < L2 is satisfied.

9. A developer accommodating unit according to Claim 7 or 8, wherein the flexible container is fixed to said frame so that a position of said developer accommodating container is changed between a time before and unsealing member moves said sealing member to perform an unsealing operation and a time when the unsealing operation is started to unseal the bonding at the first bonding portion.

10. A developer accommodating container for accommodating a developer, wherein said developer accommodating container comprises:

a flexible container provided with an opening for permitting discharge of the developer; and

a sealing member capable of sealing the opening by being bonded to said flexible container at bonding portions and capable of exposing the opening by being moved,

wherein said sealing member is provided, in an end side, with a portion-to-be-engaged to be engaged with an unsealing member for unsealing, said sealing member by moving said sealing member,

wherein said flexible container is provided with a portion-to-be-fixed to be fixed to a frame for accommodating said developer accommodating container to suppress movement of said flexible container at a time of an unsealing operation of said unsealing member, and

wherein when a flat plane which passes through the portion-to-be-engaged, the opening and the portion-to-be-fixed and which is perpendicular to a flat surface of said sealing member is seen,

of the bonding portions which opposes to each other via the opening, in the case where the bonding portions are seen along the surface of said sealing member, the bonding portion in a side near the portion-to-be-engaged is a first bonding portion,

wherein of the first bonding portion, a point at an end portion in a side near the opening is a first point,

wherein a distance measured from the fixing portion to the first point along the developer accommodating container with respect to a direction which does not include the opening is M1,

wherein a sum of a distance measured from the

fixing portion to the first point along the developer accommodating container with respect to a direction including the opening, and the opening is M2, and

wherein M1 < M2 is satisfied.

11. A developer accommodating unit according to any of Claims 1 - 9, further comprising a developer carrying member for carrying the developer for developing a latent image.

12. A process cartridge detachably mountable to an image forming apparatus main assembly, which is a process cartridge in which a developer accommodating unit according to any of Claims 1 to 9 and 11 and an electrophotographic photosensitive member are integral with each other, or is a process cartridge in which a developer accommodating unit according to Claim 10 and the electrophotographic photosensitive member are integral with each other.

13. An electrophotographic image forming apparatus comprising a process cartridge according to Claim 12.