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(54) Toner Supplying Apparatus and Method of Supplying Toner

Vorrichtung und Verfahren zum Zuführen von Toner

Appareil et procédé de fourniture de toner

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Description

[0001] The present general inventive concept relates to an image forming apparatus. More particularly, the present general inventive concept relates to a toner supplying apparatus to supply an image forming apparatus with toner.

[0002] Generally, some types of image forming apparatuses are supplied with toner for development by a separate toner supplying apparatus holding a predetermined amount of toner. When the separate toner supplying apparatus holding the predetermined amount of the toner is mounted to a predetermined position of the image forming apparatus, the toner is supplied to the image forming apparatus.

[0003] FIG. 1 is a view illustrating a conventional toner supplying apparatus used in an image forming apparatus.

[0004] Referring to FIG. 1, the toner supplying apparatus 1 includes a toner tank 10 and a supplying part 11. The supplying part 11 is formed in a substantially hollow cylindrical shape and projects inside the toner tank 10. A toner outlet 13 for discharging toner is provided at an outer surface of the supplying part 11. A toner-conveying device (not illustrated) that conveys toner in the toner tank 10 into the supplying part 11 is provided at a side of the supplying part 11. Also, a rotation shaft 15 is rotatably disposed at a center of the toner tank 10, and a toner agitating film 17 is fixed to the rotation shaft 15 to agitate the toner. At this time, the toner agitating film 17 has a width corresponding to an inner length L1 of the toner tank 10, exclusive of a width of the supplying part 11. Also, a driving gear 19 is disposed at an end of the rotation shaft 15 so that when the toner supplying apparatus 1 is mounted to the image forming apparatus (not illustrated), the rotation shaft 15 can be supplied with a rotation force by the image forming apparatus.

[0005] Therefore, when the toner supplying apparatus 1 is mounted to the image forming apparatus (not illustrated), the driving gear 19 rotates the rotation shaft 15 so that the toner agitating film 17 fixed to the rotation shaft 15 rotates. When the toner agitating film 17 rotates, the toner in the toner tank 10 is agitated to move downward to the toner-conveying device (not illustrated). Then, the toner-conveying device conveys the toner into the supplying part 11, so that the toner is discharged outside of the toner tank 10 through the toner outlet 13. A toner inlet 21 is provided under the toner outlet 13and is in fluid communication with a developing unit 23 of the image forming apparatus. Therefore, the toner discharged through the toner outlet 13 falls into the toner inlet 21, is transported to the developing unit 23 of the image forming apparatus, and develops images.

[0006] However, the conventional toner supplying apparatus 1 with the above-described structure has a lot of toner left in the toner tank 10 when the toner of the toner supplying apparatus 1 is determined to have "run out" of toner, even though the toner agitating film 17 rotates to agitate the toner. This problem (i.e., a lot of toner left in the toner tank 10 when the toner of the toner supplying apparatus 1 is determined to have "run out" of toner) is caused by the structure of the toner supplying apparatus 1. In other words, because the toner supplying apparatus 1 has the supplying part 11 projecting inside the toner tank 10, the toner agitating film 17 cannot agitate the whole (entire) inner space of the toner tank 10, and as a result, some of the toner is left in the toner tank 10. In other words, the toner agitating film 17 agitates the toner in the inner space of the toner tank 10 except for a location on a surface of the supplying part 11 projecting inside the toner tank 10, so that the toner near the supplying part 11 cannot be moved to the outside thereof and instead remains inside the toner tank 10. If a lot of the toner remains in the toner tank 10, a toner using efficiency of the toner supplying apparatus 1 is decreased. As a result, a printing cost is increased. Also, discarding the toner remaining in the toner supplying apparatus 1 may cause environmental pollution.

[0007] JP-A-2006/017892 discloses a toner vessel having a paddle to dislodge toner for use.

[0008] US-B-6,418,290 discloses a rotatable agitating sheet for agitating a developer in a container.

[0009] The invention provides a toner supplying apparatus to minimize an amount of toner remaining in a toner tank thereof when the toner tank should to be replaced.

[0010] Additional aspects and advantages of the present general inventive concept will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the general inventive concept.

[0011] According to the present invention there is provided an apparatus and method as set forth in the appended claims. Preferred features of the invention will be apparent from the dependent claims, and the description which follows.

[0012] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

FIG. 1 is a sectional view illustrating a conventional toner supplying apparatus;

FIG. 2 is a perspective view illustrating a toner supplying apparatus, according to an embodiment of the present general inventive concept;

FIG. 3 is a plan view illustrating a toner agitating film of the toner supplying apparatus of FIG. 2, according to an embodiment of the present general inventive concept;

FIG. 4 is a sectional view illustrating an operation of a toner agitating film of the toner supplying apparatus of FIG. 2, according to an embodiment of the present general inventive concept;

FIG. 5 is a plan view illustrating another toner agitating film of the toner supplying apparatus of FIG. 2, according to another embodiment of the present general inventive concept.

[0013] Reference will now be made in detail to the embodiments of the present general inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present general inventive concept by referring to the figures.

[0014] Referring to FIG. 2, a toner supplying apparatus 100 according to an embodiment of the present general inventive concept includes a toner tank 101, a supplying part 103, a toner-conveying member 105, and a toner-agitating member 110.

[0015] The toner tank 101 may store a predetermined amount of toner and may be formed in a substantially hollow cylindrical shape, as illustrated in FIG. 2. In FIG. 2, the toner tank 101 is illustrated as having an open back end so that an inside of the toner tank 101 can be illustrated. However, the actual toner tank 101 of the toner supplying apparatus 100 according to the present embodiment has a closed back end.

[0016] The supplying part 103 may be disposed at a bottom of the inside of the toner tank 101 and may discharge toner from the inside of the toner tank 101 to an outside of the toner tank 101. For example, the supplying part 103 may project from the bottom of the toner tank 101 to the inside of the toner tank 101 in a pillar shape with a semi-circular section. The supplying part 103 may include a toner outlet (not illustrated) to discharge the toner in an outer surface thereof.

[0017] The toner-conveying member 105 may be disposed at a side of the supplying part 103 at the bottom of the inside of the toner tank 101. The toner-conveying member 105 may be formed in, for example, a coil spring shape. An end of the toner-conveying member 105 may reach an inside the supplying part 103 so that when the toner-conveying member 105 rotates, the toner in the toner tank 101 is conveyed to the inside of the supplying part 103. The toner conveyed by the toner-conveying member 105 may be discharged to the outside through the toner outlet.

[0018] The toner-agitating member 110 may be rotatably disposed inside the toner tank 101 and forces the toner in the toner tank 101 to move in a downward direction (i.e., towards the bottom of the toner tank 101). For example, when the toner-agitating member 110 rotates at a middle of the toner tank 101, the toner in the toner tank 101 is agitated to prevent the toner from solidifying (i.e., from becoming solid). As a result, the toner moves down to the bottom of the toner tank 101 by its own weight.

[0019] The toner-agitating member 110 may include a rotation shaft 112 and a toner agitating film 120. The rotation shaft 112 may be rotatably disposed at a center of the toner tank 101 and may have a driving gear (not illustrated) coaxially coupled with an end of the rotation shaft 112 projecting from a side of the toner tank 101. Therefore, the rotation of the driving gear causes the rotation shaft 112 to rotate. Also, the rotation shaft 112 may have a wing plate 114 to help fix the toner agitating film 120 to the rotation shaft 112. The wing plate 114 may be formed to be substantially symmetric with respect to the rotation shaft 112.

[0020] Referring to FIG. 3, the toner agitating film 120 may have a width W corresponding to the inner length of the toner tank 101. Furthermore, the toner agitating film 120 may be elastically-deformable. For example, the toner agitating film 120 may bend along a projection projecting inside the toner tank 101, such as the supplying part 103, when the toner agitating film contacts the projection. Also, the toner agitating film 120 may have a length L from a center axis C of the rotation shaft 112 to ends 121a and 122a of the toner agitating film 120, and the length L may correspond to an inner radius of the toner tank 101. For example, the toner agitating film 120 may be formed so that the ends 121a and 122a of the toner agitating film 120 touch an inner surface 101a (see FIG. 4) of the toner tank 101. Alternatively, the toner agitating film 120 may be formed to have a narrow gap between the ends 121a and 122a of the toner agitating film 120 and the inner surface 101a of the toner tank 101.

[0021] As illustrated in FIGS. 2 and 3, the toner agitating film 120 may have a first agitating part 121 and a second agitating part 122. The first and second agitating parts 121 and 122 may include a separation gap g separating the ends 121a and 122a from each other by a predetermined distance, as illustrated in FIG. 3. In other words, the first and second agitating parts 121 and 122 are formed so that the end 121a of the first agitating part 121 and the end 122a of the second agitating part 122 are separated from each other in a rotational direction of the toner agitating film 120 by the separation gap g. As illustrated in FIG. 3, the above-described toner agitating film 120 may have the first and second agitating parts 121 and 122 formed in one piece (i.e., formed from a single piece of film). In other words, the although ends 121a and 122a of the first and second agitating parts 121 and 122, respectively, may be separated from each other, opposite ends 123 and 124 of the first and second agitating parts 121 and 122, respectively, may be in contact with (e.g., connected to) each other.

[0022] The first agitating part 121 may have a width W1 corresponding to the width of the supplying part 103, and the second agitating part 122 may have a width W2. corresponding to the inner length of the toner tank 101 exclusive of the

width of the supplying part 103. Therefore, when the first agitating part 121 moves up along a top surface 103a of the supplying part 103 by the rotation of the rotation shaft 112, the second agitating part 122 can move along the inner surface 101a of the toner tank 101 unimpeded by the movement of the first agitating part 121 with respect to the supplying part 103. In other words, the toner agitating film 120 may rotate integrally with the rotation shaft 112 with the first agitating part's end 121a and the second agitating part's end 122a separated from each other by a predetermined distance d when the first agitating part 121 moves along the surface 103a of the supplying part 103, as illustrated in FIG. 4.

[0023] Furthermore, the toner agitating film 120 may have at least one , such as one or both of openings 121b and 122b. For example, the first agitating part 121 and the second agitating part 122 may each have at least one opening, such as the openings 121b and 122b, respectively. The openings 121b and 122b may help the toner agitating film 120 to agitate the toner, and/or may decrease the rotation force that rotates the toner agitating film 120. In this embodiment, the first agitating part 121 has one opening 121b, and the second agitating part 122 has two openings 122b. However, the present general inventive concept is not limited to this arrangement of openings.

[0024] FIG. 5 is a view illustrating a toner agitating film 130 as another example of a toner agitating film of the toner supplying apparatus 100 of FIG. 2, according to another embodiment of the present general inventive concept. The toner agitating film 130 according to this embodiment has a first agitating part 131 and a second agitating part 132 that are separately formed (i.e., formed by separate pieces of film), and fixed to the rotation shaft 112, in contrast to the above-described toner agitating film 120 of FIG. 3, which has the first and second agitating parts 121 and 122 formed in one piece (i.e., formed by a single piece of film). Thus, opposite ends 133 and 134 of the first and second agitating parts 131 and 132, respectively, may be separated from each other by a second predetermined separation gap a. The separation gap g and the second separation gap a may be the same size, or may be different sizes. Except for being formed by separate pieces of film, the remaining structure and operation of the toner agitating film 130 of the present embodiment can be substantially the same as the structure and operation of the toner agitating film 120 of the previous embodiment, so that detailed descriptions thereof are omitted.

[0025] In the above description, the toner agitating film 120 (or 130) has the structure corresponding to the toner tank 101 having only one projection (e.g., the part projecting 103) projecting inside the toner tank 101; however, this should not be considered as limiting the present general inventive concept. For example, when the toner tank 101 has two or more projections projecting inside the toner tank 101, the toner agitating film 120 (or 130) may include a number of agitating parts corresponding to the number of the two or more projections in the width direction thereof. Therefore, the toner agitating film 120 (or 130) can agitate the toner located almost anywhere in the toner tank 101.

[0026] Hereinafter, an operation of the toner supplying apparatus 100 of FIG, 2, according to an embodiment of the present general inventive concept, will be explained with reference to FIGS. 2 to 4.

[0027] When the toner supplying apparatus 100 is mounted to an image forming apparatus (not illustrated), a driving gear (not illustrated) of the toner supplying apparatus 100 receives a rotation force from the image forming apparatus and rotates. The rotation of the driving gear causes the rotation shaft 112 to rotate so that the toner agitating film 120 fixed to the wing plate 114 of the rotation shaft 112 (or the toner agitating film 120 fixed to the rotation shaft 112 in another way, such as directly thereto, in the absence of the wing plate 114) rotates integrally with the rotation shaft 112.

[0028] When the toner agitating film 120 rotates inside the toner tank 101, the first agitating part 121 of the toner agitating film 120 touches the top surface 103a of the supplying part 103 at a predetermined location. The rotation shaft 112 continues to rotate while the first agitating part 121 is in contact with the top surface 103a of the supplying part 103 at the predetermined location, and the first agitating part 121 is bent in a reverse direction of the rotational direction of the rotation shaft 112 (i.e., the first agitating part 121 is bent in a reverse direction of the direction of arrow B in FIG. 4) and slides on the top surface 103a of the supplying part 103 as illustrated in FIG. 4. At this time, the second agitating part 122 remains substantially straight (e.g., is not bent in the reverse direction to the extent that the first agitating part 121 is bent) when it rotates integrally with the rotation shaft 112. In other words, the toner agitating film 120 may rotate with the end 121a of the first agitating part 121 and the end 122a of the second agitating part 122 being apart from each other in the rotational direction thereof by the predetermined distance d, as illustrated in FIG. 4.

[0029] Therefore, the first agitating part 121 can agitate the toner that is piled up near the supplying part 103, e.g., on the top surface 103a of the supplying part 103, to fall to the bottom of the toner tank 101 where the toner-conveying member 105 is disposed. In other words, the first agitating part 121 agitates the toner disposed on the top surface 103a of the supplying part 103 to fall to the toner-conveying member 105. After the first agitating part 121 leaves the top surface 103a of the supplying part 103 due to the continued rotation of the rotation shaft 112, the toner agitating film 120 rotates with the end 121a of the first agitating part 121 and the end 122a of the second agitating part 122 being substantially in a straight line. That is, after the first agitating part 121 bends in the reverse direction opposite to the rotation direction of the toner agitating film 120 to contact the top surface 103a, the first agitating part 121 returns to an original position (i.e., a position before the bending thereof), which allows the ends 121a and 122a to substantially align with each other, thus substantially eliminating the distance d between the first and second agitating parts 121 and 122.

[0030] When the toner agitating member 110 rotates, the first and second agitating parts 121 and 122 agitate toner in almost the entire inner space of the toner tank 101 to move the toner to the bottom of the toner tank 101. At this time,

the toner-conveying member 105 receives a rotation force from a driving source (not illustrated) and rotates to convey the toner at the bottom of the toner tank 101 in a direction A into the supplying part 103, as illustrated in FIG. 2. The toner conveyed into the supplying part 103 is discharged outside of the toner tank 101 through a toner outlet (not illustrated). The discharged toner may be supplied to a developing unit of the image forming apparatus to develop images.

[0031] Toner using efficiencies were measured for four toners having different colors using a conventional toner supplying apparatus including a toner tank, and using a toner supplying apparatus according to an embodiment of the present general inventive concept, including a toner tank and a toner-agitating member having two agitating parts formed using a single piece of film. The results are summarized in Table 1. Here, the "toner using efficiency" refers to a percentage of toner stored in the toner tank that is used to print images before the toner supply apparatus should be replaced. Thus, a higher toner using efficiency indicates a lower amount of toner remaining in the toner supply apparatus upon replacement thereof. Accordingly, a higher toner using efficiency is desired.

TABLE 1

Toner color	Conventional toner supplying apparatus (%)	Toner supplying apparatus according to the present embodiment (%)	Difference (%)
Yellow	84.75	94.25	9.5
Magenta	83.75	94.25	10.5
Cyan	84.25	94.75	10.5
Black	88.15	96.78	8.63

[0032] The results summarized in Table 1 demonstrate that the toner using efficiency of the toner supplying apparatus according to the present embodiment is higher than the toner using efficiency of the conventional toner supplying apparatus. Therefore, the amount of toner remaining in the toner supplying apparatus according to the present embodiment is less than the amount of toner remaining in the conventional toner supplying apparatus. For example, the toner using efficiency of the toner supplying apparatus according to the present embodiment may be about 8% to about 11% higher than the corresponding toner using efficiency of the conventional supplying apparatus.

[0033] With a toner supplying apparatus according to embodiments of the present general inventive concept, because toner on projections projecting inside a toner tank of the toner supplying apparatus can be agitated, almost all of the toner in the toner tank can be used. Therefore, when the toner supplying apparatus is replaced, an amount of toner remaining in the toner tank is minimized.

[0034] Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention, as defined in the appended claims.

Claims

1. A toner supplying apparatus, comprising:

a storage unit (101) to store toner and having a supplying part (103) projecting towards an interior of the storage unit (101) to discharge toner from the storage unit (101); and
an agitating unit to agitate the toner in the storage unit (101), the agitating unit comprising an agitating film (120) having a first agitating part (121) and a second agitating part (122),

wherein the first agitating part (121) is configured to contact an inner surface (101a) of the storage unit (101) and a surface (103a) of the supplying part (103) and the second agitating part is configured to contact the inner surface (101a) of the storage unit (101);
characterised in that:

a) the first and second agitating parts (121, 122) extend side by side radially away from a rotation shaft (112) of the agitating unit to respective ends (121a, 122a) whereby the ends (121a, 122a) of the first and second agitating parts (121, 122) are separated from each other in a width direction parallel to the rotation shaft (112) by a predetermined separation gap (g); and
b) during relative rotation of the agitation film (120) and the storage unit (101), the first agitating part (121) is configured to bend to slide on the surface (103a) of the supplying part (103), such that the first and second

agitating parts (121,122) are spaced apart from each other in a direction of rotation.

2. The toner supplying apparatus of claim 1, wherein the first and second agitating parts (121,122) are formed from separate pieces of film.

3. The toner supplying apparatus of claim 1 or claim 2, wherein the agitating unit further comprises a rotation shaft (112) to rotate the first and second agitating parts (121,122) in a rotation direction.

4. The toner supplying apparatus of claim 3, wherein the supplying part (103) is disposed on a bottom surface of the storage unit (101) below the rotation shaft (112).

5. The toner supplying apparatus of claim 3 or claim 4, wherein the storage unit (101) has a substantially-cylindrical shape, and the rotation shaft (112) is disposed at a center of the storage unit (101).

6. The toner supplying apparatus of any one of claims 3 to 5, wherein:

each of the first and second agitating parts (121,122) includes a first end connected to the rotation shaft (112) and a second end opposite to the first end; and
the second ends of the first and second agitating parts (121,122) are separated from each other in a width direction parallel to an inner length of the storage unit (101) by a predetermined separation gap.

7. The toner supplying apparatus of claim 6, wherein the first ends of the first and second agitating parts (121,122) are in contact with each other.

8. The toner supplying apparatus of claim 6, wherein the first ends of the first and second agitating parts (121,122) are separated from each other in the width direction by a second predetermined separation gap.

9. The toner supplying apparatus of claim 8, wherein sizes of the predetermined separation gap and the second predetermined separation gap are different from each other.

10. The toner supplying apparatus of claim 6, wherein lengths of the first and second agitating parts (121,122) extending from the rotation shaft (112) to the second ends of the first and second agitating parts (121,122) are substantially the same.

11. The toner supplying apparatus of claim 6, wherein the first agitating part (121) has a width corresponding to a width of the supplying part (103), and the second agitating part (122) has a width corresponding to the inner length of the storage unit (101) exclusive of the width of the projection (103).

12. The toner supplying apparatus of claim 6, wherein the first and second agitating parts (121,122) have first and second widths, respectively, extending in a direction parallel to the inner length of the storage unit (101), and the second width is wider than the first width.

13. The toner supplying apparatus of any one of claims 1 to 12, wherein the first and second agitating parts (121,122) are elastically-deformable independently of each other.

14. The toner supplying apparatus of any one of claims 1 to 13, wherein at least one of the first and second agitating parts (121,122) comprises an opening (121b/122b) to permit a passage of the toner therethrough.

15. The toner supplying apparatus of any one of claims 1 to 14, wherein the first agitating part (121) comprises at least one first opening (121b) to permit a passage of the toner therethrough, and the second agitating part (122) comprises a plurality of second openings (122b) to permit a passage of the toner therethrough.

16. The toner supplying apparatus of any one of claims 1 to 15, wherein the projection (103) is a supplying unit to supply toner from the interior of the storage unit (101) to an exterior of the storage unit (101).

17. The toner supplying apparatus of claim 16, further comprising a conveying unit to convey the toner to the supplying unit.

18. The toner supplying apparatus of any one of claims 1 to 17, wherein the agitating unit has a width corresponding to an inner length of the storage unit (101).

19. The toner supplying apparatus of any one of claims 1 to 18, wherein:

the supplying part (103) comprises a plurality of projections; and
the first agitating part (121) comprises a plurality of first agitating parts corresponding to the plurality of projections.

20. A method of agitating toner in a toner tank (101) having a supplying part (103) extending therein, the method comprising:

agitating toner on an inner surface of the storage unit (101) and a surface (103a) of the projection (103) by contacting an end of a first agitating part (121) with the inner surface of the storage unit (101) and with the surface (103a) of the supplying part (103); and
agitating toner on an inner surface of the toner tank (101) by contacting an end of a second agitating part (122) with the inner surface of the toner tank (101),

characterised in that:

a) the first and second agitating parts (121, 122) extend side by side radially away from a rotation shaft (112) of the agitating unit to respective ends (121a, 122a) whereby the ends (121a, 122a) of the first and second agitating parts (121, 122) are separated from each other in a width direction parallel to the rotation shaft (112) by a predetermined separation gap (g); and
b) the agitating of the toner on the surface of the supplying part (103) comprises causing relative rotation of the agitating film (120) and the storage unit (101), wherein the first agitating part (121) bends to slide on the surface (103a) of the supplying part (103), such that the first and second agitating parts (121,122) are separated in a direction perpendicular to the inner length of the toner tank (101) by a predetermined distance.

21. The method of claim 20, further comprising substantially aligning the ends of the first and second agitating parts (121, 122) in the direction perpendicular to the inner length of the toner tank (101) after the first agitating part (121) contacts the surface of the supplying part (103).

Patentansprüche

1. Tonerzuführungsvorrichtung, umfassend:

eine Aufbewahrungseinheit (101) zur Aufbewahrung von Toner und mit einem Zuführungsteil (103), das in Richtung des Innenraums der Aufbewahrungseinheit (101) vorsteht, zur Ableitung von Toner aus der Aufbewahrungseinheit (101); und
eine Bewegungseinheit zum Bewegen des Toners in der Aufbewahrungseinheit (101), wobei die Bewegungseinheit einen Bewegungsfilm (120) mit einem ersten Bewegungsteil (121) und einem zweiten Bewegungsteil (122) umfasst,
wobei das erste Bewegungsteil (121) dazu konfiguriert ist, mit einer Innenfläche (101a) der Aufbewahrungseinheit (101) und einer Fläche (103a) des Zuführungsteils (103) in Kontakt zu treten, und das zweite Bewegungsteil dazu konfiguriert ist, mit der Innenfläche (101a) der Aufbewahrungseinheit (101) in Kontakt zu treten;

dadurch gekennzeichnet, dass:

a) sich das erste und zweite Bewegungsteil (121, 122) Seite an Seite radial von einer Drehwelle (112) der Bewegungseinheit weg zu jeweiligen Enden (121a, 122a) hin erstrecken, wodurch die Enden (121a, 122a) des ersten und zweiten Bewegungsteils (121, 122) voneinander in einer Breitenrichtung parallel zur Drehwelle (112) durch einen vorbestimmten Trennungsspalt (g) getrennt sind; und
b) während einer Relativdrehung des Bewegungsfilms (120) und der Aufbewahrungseinheit (101), das erste Bewegungsteil (121) dazu konfiguriert ist, sich zu biegen, um an der Fläche (103a) des Zuführungsteils (103) derart entlang zu gleiten, dass das erste und zweite Bewegungsteil (121, 12 2) in einer Drehungsrichtung voneinander beabstandet sind.

2. Tonerzuführungsvorrichtung nach Anspruch 1, wobei das erste und zweite Bewegungsteil (121, 122) aus separaten Filmstücken gebildet sind.

3. Tonerzuführungsvorrichtung nach Anspruch 1 oder Anspruch 2, wobei die Bewegungseinheit ferner eine Drehwelle (112) zum Drehen des ersten und zweiten Bewegungsteils (121, 122) in eine Drehungsrichtung umfasst.

4. Tonerzuführungsvorrichtung nach Anspruch 3, wobei sich das Zuführungsteil (103) auf einer Bodenfläche der Aufbewahrungseinheit (101) unter der Drehwelle (112) befindet.

5. Tonerzuführungsvorrichtung nach Anspruch 3 oder Anspruch 4, wobei die Aufbewahrungseinheit (101) eine im Wesentlichen zylindrische Form aufweist und sich die Drehwelle (1 1 2) in einem Mittelpunkt der Aufbewahrungseinheit (101) befindet.

6. Tonerzuführungsvorrichtung nach einem der Ansprüche 3 bis 5, wobei:

das erste und das zweite Bewegungsteil (121, 122) jeweils ein erstes, mit der Drehwelle (112) verbundenes Ende und eine zweites, dem ersten Ende gegenüberliegendes Ende enthält; und
die zweiten Enden des ersten und zweiten Bewegungsteils (121 , 122) voneinander in einer Breitenrichtung parallel zu einer Innenlänge der Aufbewahrungseinheit (101) um einen vorbestimmten Trennungsspalt getrennt sind.

7. Tonerzuführungsvorrichtung nach Anspruch 6, wobei die ersten Enden des ersten und zweiten Bewegungsteils (121, 122) miteinander in Kontakt stehen.

8. Tonerzuführungsvorrichtung nach Anspruch 6, wobei die ersten Enden des ersten und zweiten Bewegungsteils (121, 122) voneinander in einer Breitenrichtung um einen zweiten vorbestimmten Trennungsspalt getrennt sind.

9. Tonerzuführungsvorrichtung nach Anspruch 8, wobei sich die Größen des vorbestimmten Trennungsspalts und des zweiten vorbestimmten Trennungsspalts voneinander unterscheiden.

10. Tonerzuführungsvorrichtung nach Anspruch 6, wobei sich die Längen des ersten und zweiten Bewegungsteils (121, 122), die sich von der Drehwelle (112) zu den zweiten Enden des ersten und zweiten Bewegungsteils (121, 122) erstrecken, im Wesentlichen gleichen.

11. Tonerzuführungsvorrichtung nach Anspruch 6, wobei das erste Bewegungsteil (121) eine der Breite des Zuführungsteils (103) entsprechende Breite aufweist und das zweite Bewegungsteil (122) eine der Innenlänge der Aufbewahrungseinheit (101) minus die Breite des Vorsprungs (103) entsprechende Breite aufweist.

12. Tonerzuführungsvorrichtung nach Anspruch 6, wobei das erste und zweite Bewegungsteil (121, 122) eine erste bzw. zweite Breite haben, die sich in einer Richtung parallel zur Innenlänge der Aufbewahrungseinheit (101) erstrecken, und die zweite Breite breiter als die erste Breite ist.

13. Tonerzuführungsvorrichtung nach einem der Ansprüche 1 bis 12, wobei das erste und zweite Bewegungsteil (121, 122) unabhängig voneinander elastisch verformbar sind.

14. Tonerzuführungsvorrichtung nach einem der Ansprüche 1 bis 13, wobei das erste und/oder zweite Bewegungsteil (121, 122) eine Öffnung (121b/122b) zu einem Durchlassen des Toners umfasst.

15. Tonerzuführungsvorrichtung nach einem der Ansprüche 1 bis 14, wobei das erste Bewegungsteil (121) mindestens eine erste Öffnung (121b) zu einem Durchlassen de s Toners umfasst, und das zweite Bewegungsteil (122) mehrere zweite Öffnungen (122b) zu einem Durchlassen des Toners umfasst.

16. Tonerzuführungsvorrichtung nach einem der Ansprüche 1 bis 15, wobei der Vorsprung (103) eine Zuführungseinheit ist, die Toner aus dem Innenraum der Aufbewahrungseinheit (101) heraus nach außen zuführt.

17. Tonerzuführungsvorrichtung nach Anspruch 16, ferner eine Fördereinheit zum Fördern des Toners zu der Zuführungseinheit umfassend.

18. Tonerzuführungsvorrichtung nach einem der Ansprüche 1 bis 17, wobei die Bewegungseinheit eine der Innenlänge der Aufbewahrungseinheit (101) entsprechende Breite aufweist.

19. Tonerzuführungsvorrichtung nach einem der Ansprüche 1 bis 18, wobei:

das Zuführungsteil (103) mehrere Vorsprünge umfasst; und
das erste Bewegungsteil (121) eine der Mehrzahl Vorsprünge entsprechende Mehrzahl erster Bewegungsteile umfasst.

20. Verfahren zur Bewegung von Toner in einem Tonerbehälter (101) mit einem sich darin erstreckenden Zuführungsteil (103), wobei das Verfahren Folgendes umfasst:

Bewegen von Toner an einer Innenfläche der Aufbewahrungseinheit (101) und einer Fläche (103a) des Vorsprungs (103) durch Inkontakttreten eines Endes eines ersten Bewegungsteils (121) mit der Innenfläche der Aufbewahrungseinheit (101) und mit der Fläche (103a) des Zuführungsteils (103); und
Bewegen von Toner an einer Innenfläche des Tonerbehälters (101) durch Inkontakttreten eines Endes eines zweiten Bewegungsteils (122) mit der Innenfläche des Tonerbehälters (101),

dadurch gekennzeichnet, dass

a) sich das erste und zweite Bewegungsteil (121, 122) Seite an Seite radial von einer Drehwelle (112) der Bewegungseinheit weg zu jeweiligen Enden (121a, 122a) hin erstrecken, wodurch die Enden (121a, 122a) des ersten und zweiten Bewegungsteils (121, 122) voneinander in einer Breitenrichtung parallel zur Drehwelle (112) durch einen vorbestimmten Trennungsspalt (g) getrennt sind; und
b) das Bewegen des Toners an der Fläche des Zuführungsteils (1 0 3) das Verursachen einer Relativdrehung des Bewegungsfilms (120) und der Aufbewahrungseinheit (101) umfasst, wobei sich das erste Bewegungsteil (121) biegt, um an der Fläche (103a) des Zuführungsteils (103) derart entlang zu gleiten, dass das erste und zweite Bewegungsteil (121, 122) in einer Richtung senkrecht zur Innenlänge des Tonerbehälters (101) um einen vorbestimmten Abstand getrennt sind.

21. Verfahren nach Anspruch 20, ferner umfassend im Wesentlichen Ausrichten der Enden des ersten und zweiten Bewegungsteils (121, 122) in der Richtung senkrecht zur Innenlänge des Tonerbehälters (101), nachdem das erste Bewegungsteil (121) mit der Fläche des Zuführungsteils (103) in Kontakt tritt.

Revendications

1. Appareil de fourniture de toner, comprenant:

une unité de stockage (101) pour stocker du toner et comprenant une partie de fourniture (103) qui fait saillie en direction de l'intérieur de l'unité de stockage (101) pour décharger du toner hors de l'unité de stockage (101); et une unité d'agitation pour agiter le toner dans l'unité de stockage (101), l'unité d'agitation comprenant un film d'agitation (120) qui présente une première partie d'agitation (121) et une deuxième partie d'agitation (122),

dans lequel la première partie d'agitation (121) est configurée de manière à mettre en contact une surface intérieure (101a) de l'unité de stockage (101) et une surface (103a) de la partie de fourniture (103), et la deuxième partie d'agitation est configurée pour entrer en contact avec la surface intérieure (101a) de l'unité de stockage (101);
caractérisé en ce que:

a) les première et deuxième parties d'agitation (121, 122) s'étendent côte à côte en s'écartant radialement d'un axe de rotation (112) de l'unité d'agitation jusqu'à des extrémités respectives (121a, 122a), où les extrémités (121a, 122a) des première et deuxième parties d'agitation (121, 122) sont séparées l'une de l'autre dans un sens de la largeur parallèle à l'axe de rotation (112) par un espace de séparation prédéterminé (g); et
b) pendant la rotation relative du film d'agitation (120) et de l'unité de stockage (101), la première partie d'agitation (121) est configurée pour se plier afin de glisser sur la surface (103a) de la partie de fourniture (103), de telle sorte que les première et deuxième parties d'agitation (121, 122) soient espacées l'une de l'autre dans un sens de rotation.

2. Appareil de fourniture de toner selon la revendication 1, dans lequel les première et deuxième parties d'agitation (121, 122) sont formées à partir de pièces de film séparées.

3. Appareil de fourniture de toner selon la revendication 1 ou la revendication 2, dans lequel l'unité d'agitation comprend en outre un axe de rotation (112) pour faire tourner les première et deuxième parties d'agitation (121, 122) dans un sens de rotation.

4. Appareil de fourniture de toner selon la revendication 3, dans lequel la partie de fourniture (103) est disposée sur une surface inférieure de l'unité de stockage (101) en dessous de l'axe de rotation (112).

5. Appareil de fourniture de toner selon la revendication 3 ou la revendication 4, dans lequel l'unité de stockage (101) présente une forme essentiellement cylindrique, et l'axe de rotation (112) est disposé à un centre de l'unité de stockage (101).

6. Appareil de fourniture de toner selon l'une quelconque des revendications 3 à 5, dans lequel:

chacune de s première et deuxième parties d'agitation (121, 122) comprend une première extrémité qui est connectée à l'axe de rotation (112), et une deuxième extrémité opposée à la première extrémité; et
les deuxièmes extrémités des première et deuxième parties d'agitation (121, 122) sont séparées l'une de l'autre dans un sens de la largeur parallèle à une longueur intérieure de l'unité de stockage (101) par un espace de séparation prédéterminé.

7. Appareil de fourniture de toner selon la revendication 6, dans lequel les premières extrémités des première et deuxième parties d'agitation (121, 122) sont en contact l'une avec l'autre.

8. Appareil de fourniture de toner selon la revendication 6, dans lequel les premières extrémités des première et deuxième parties d'agitation (121, 122) sont séparées l'une de l'autre dans le sens de la largeur par un deuxième espace de séparation prédéterminé.

9. Appareil de fourniture de toner selon la revendication 8, dans lequel les tailles de l'espace de séparation prédéterminé et du deuxième espace de séparation prédéterminé sont différentes l'une de l'autre.

10. Appareil de fourniture de toner selon la revendication 6, dans lequel les longueurs des première e t deuxième parties d'agitation (121, 122) qui s'étendent à partir de l'axe de rotation (112) jusqu'aux deuxièmes extrémités des première et deuxième parties d'agitation (121, 122) son t sensiblement identiques.

11. Appareil de fourniture de toner selon la revendication 6, dans lequel la première partie d'agitation (121) présente une largeur qui correspond à une largeur de la partie de fourniture (103), et la deuxième partie d'agitation (122) présente une largeur qui correspond à la longueur intérieure de l'unité de stockage (101) à l'exclusion de la largeur de la saillie (103).

12. Appareil de fourniture de toner selon la revendication 6, dans lequel les première et deuxième parties d'agitation (121, 122) présentent des première et deuxième largeurs, respectivement, qui s'étendent dans une direction parallèle à la longueur intérieure de l'unité de stockage (101), et la deuxième largeur est plus grande que la première largeur.

13. Appareil de fourniture de toner selon l'une quelconque des revendications 1 à 12, dans lequel les première et deuxième parties d'agitation (121, 122) sont élastiquement déformables indépendamment l'une de l'autre.

14. Appareil de fourniture de toner selon l'une quelconque des revendications 1 à 13, dans lequel au moins une des première et deuxième parties d'agitation (121, 122) comporte une ouverture (121b/122b) pour permettre le passage du toner à travers celle-ci.

15. Appareil de fourniture de toner selon l'une quelconque des revendications 1 à 14, dans lequel la première partie d'agitation (121) comporte au moins une première ouverture (121b) pour permettre le passage du toner à travers celle-ci, et la deuxième partie d'agitation (122) comporte une pluralité de deuxièmes ouvertures (122b) pour permettre le passage du toner à travers celle-ci.

16. Appareil de fourniture de toner selon l'une quelconque des revendications 1 à 15, dans lequel la saillie (103) est

une unité de fourniture pour fournir du toner de l'intérieur de l'unité de stockage (101) à l'extérieur de l'unité de stockage (101).

17. Appareil de fourniture de toner selon la revendication 16, comprenant en outre une unité de transport pour transporter le toner jusqu'à l'unité de fourniture.

18. Appareil de fourniture de toner selon l'une quelconque des revendications 1 à 17, dans lequel l'unité d'agitation présente une largeur qui correspond à une longueur intérieure de l'unité de stockage (101).

19. Appareil de fourniture de toner selon l'une quelconque des revendications 1 à 18, dans lequel:

la partie de fourniture (103) comporte une pluralité de saillies; et
la première partie d'agitation (121) comprend une pluralité de premières parties d'agitation qui correspondent à la pluralité de saillies.

20. Procédé d'agitation de toner dans un réservoir de toner (101) comprenant une partie de fourniture (103) qui s'étend dans celui-ci, le procédé comprenant:

l'agitation du toner sur une surface intérieure de l'unité de stockage (101) et une surface (103a) de la saillie (103) en mettant en contact une extrémité d'une première partie d'agitation (121) avec la surface intérieure de l'unité de stockage (101) et avec la surface (103a) de la partie de fourniture (103); et
l'agitation du toner sur une surface intérieure du réservoir de toner (101) en mettant en contact une extrémité d'une deuxième partie d'agitation (122) avec la surface intérieure du réservoir de toner (101),

caractérisé en ce que:

a) les première et deuxième parties d'agitation (121, 122) s'étendent côte à côte en s'écartant radialement d'un axe de rotation (112) de l'unité d'agitation jusqu'à des extrémités respectives (121a, 122a), où les extrémités (121a, 122a) des première et deuxième parties d'agitation (121, 122) sont séparées l'une de l'autre dans un sens de la largeur parallèle à l'axe de rotation (112) par un espace de séparation prédéterminé (g); et
b) l'agitation du toner sur la surface de la partie de fourniture (103) comprend l'entraînement d'une rotation relative du film d'agitation (120) et de l'unité de stockage (101), dans lequel la première partie d'agitation (121) se plie afin de glisser sur la surface (103a) de la partie de fourniture (103), de telle sorte que les première et deuxième parties d'agitation (121, 122) soient séparées dans une direction perpendiculaire à la longueur intérieure du réservoir de toner (101) par une distance prédéterminée.

21. Procédé selon la revendication 20, comprenant en outre l'alignement substantiel des extrémités des première et deuxième parties d'agitation (121, 122) dans la direction perpendiculaire à la longueur intérieure du réservoir de toner (101) après que la première partie d'agitation (121) soit entrée en contact avec la surface de la partie de fourniture (103).

FIG. 1

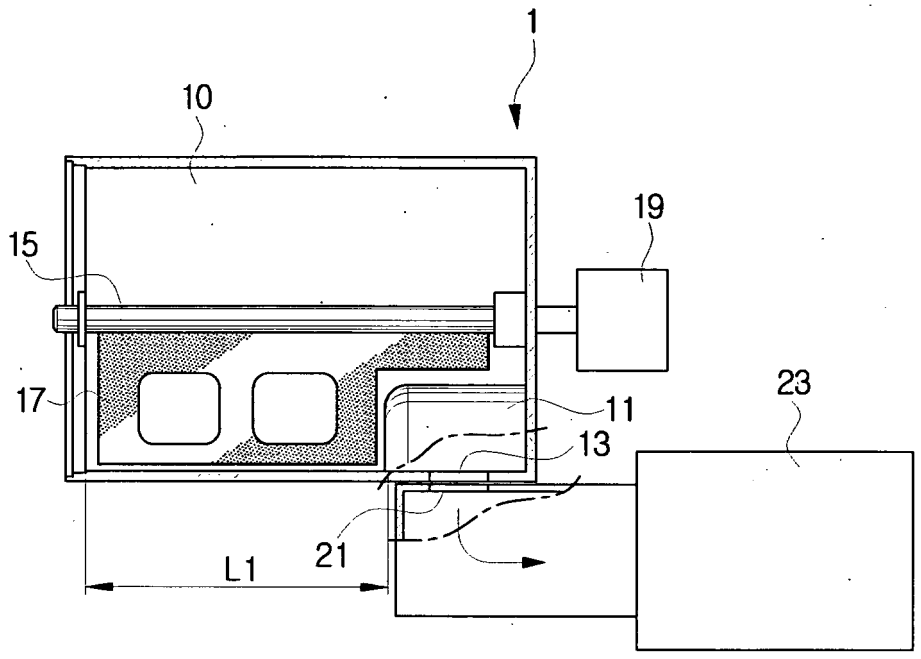


FIG. 2

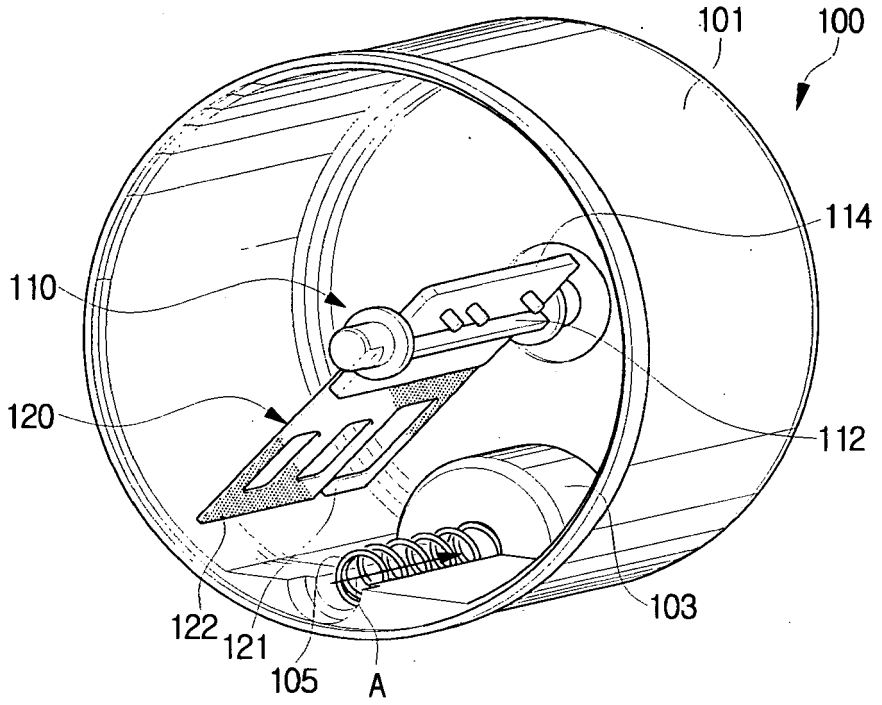


FIG. 3

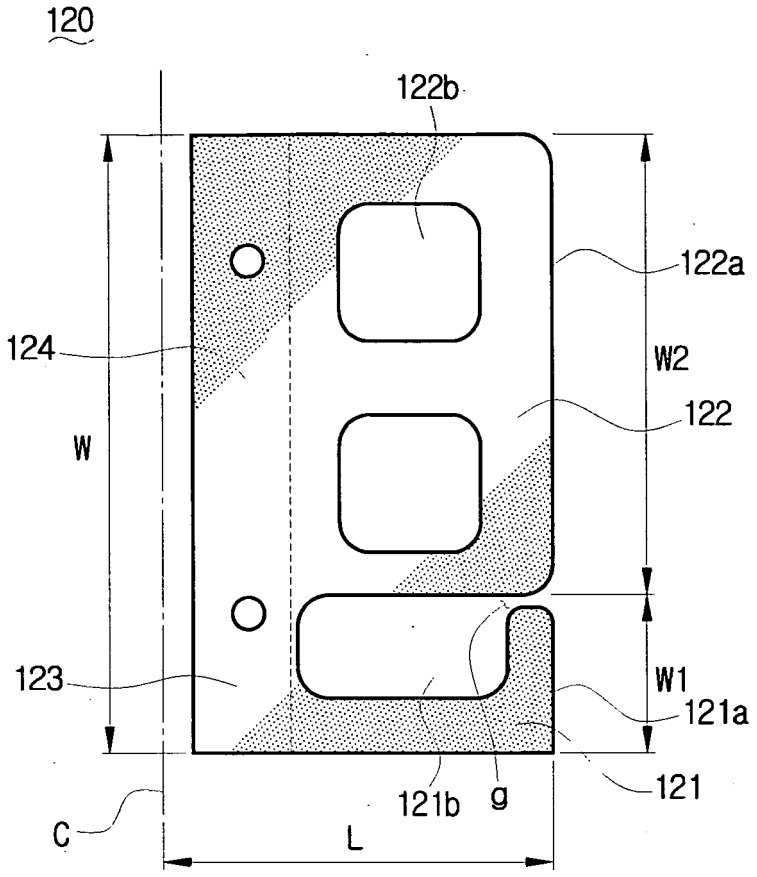


FIG. 4

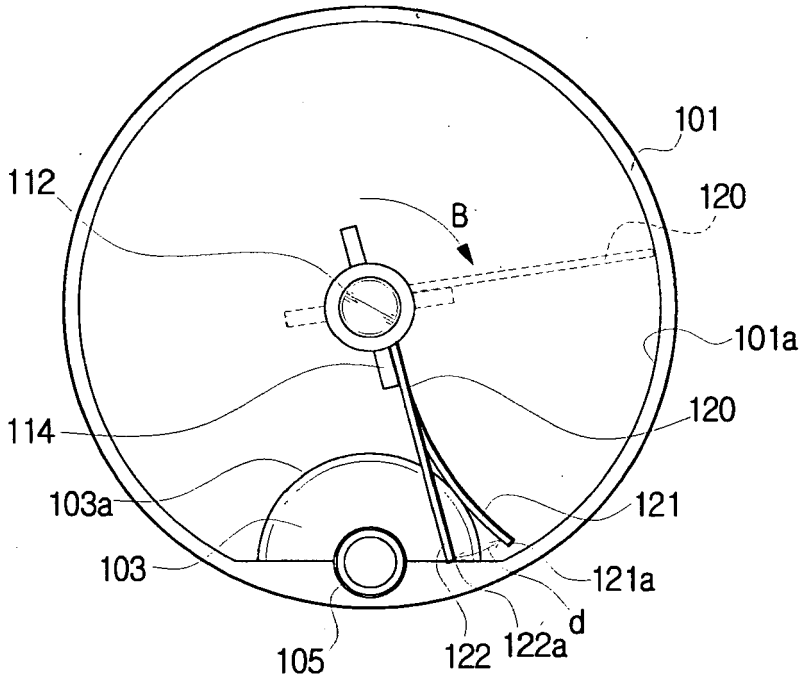
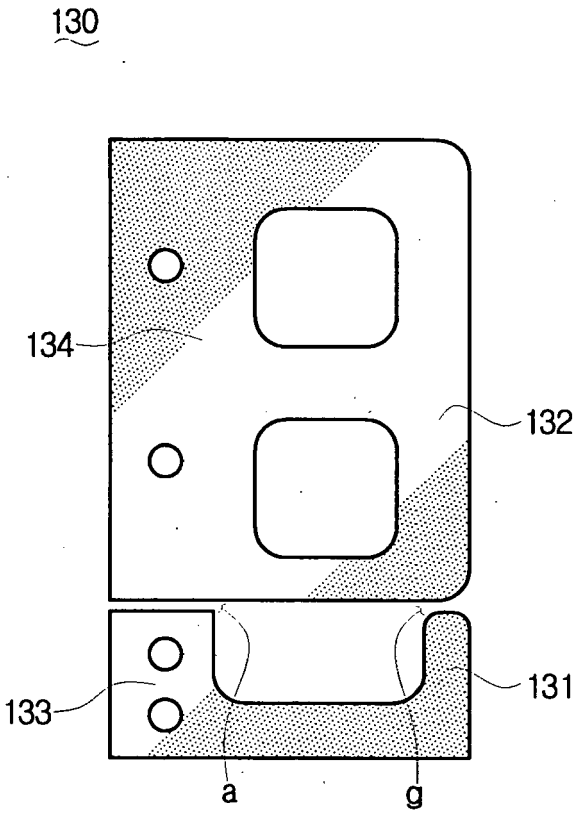


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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