Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a toner cartridge for an electrophotographic printer or the like, and more particularly to a toner cartridge comprising an outer cylinder and an inner cylinder which is slidably contained in the outer cylinder.

Description of the Prior Art

There is known a toner cartridge comprising an outer cylinder having outer cylinder apertures formed at both ends thereof, respectively, and an inner cylinder contained in the outer cylinder in such a relation that it is adjacent to the outer cylinder and slidable, which inner cylinder has inner cylinder apertures formed at opposite ends thereof, respectively. Such a conventional toner cartridge is shown in FIGS. 6-10 and in US-A-3 356 248.

As apparent from FIGS. 6 and 7, the conventional toner cartridge is so arranged that an outer peripheral surface of an inner cylinder 7, including an inner cylinder rib 10, extended in a periphery direction and an inner peripheral surface of an outer cylinder 2, including an outer cylinder rib 6, extended in a periphery direction are formed on a sliding face over the whole periphery.

Referring to FIGS. 7 and 8, an inner cylinder toner discharge opening 9 is closed with an inner wall of the outer cylinder 2. Thus, a toner, not shown, filled up in the inner cylinder 7 is not discharged. If it is required to discharge the toner from an outer cylinder toner discharge opening 5, the inner cylinder 7 is rotatively slided to the outer cylinder 2 in an arrow direction A so that the inner cylinder toner discharge opening 9 is engaged with the outer cylinder toner discharge opening 5.

If inner cylinder 7 is further rotatively slided to the outer cylinder 2 in the arrow direction A, the inner cylinder toner discharge opening 9 is engaged with the outer cylinder toner discharge opening 5, as shown in FIGS. 9 and 10, whereby there is obtained a full opened condition. In such a condition, an inner cylinder rib 10 is aligned with an outer cylinder rib 6.

If it is required to close the inner cylinder toner discharge opening 9, the inner cylinder 7 is rotatively slided to the outer cylinder 2 in an arrow direction B so that the inner cylinder toner discharge opening 9 is closed with an inner wall of the outer cylinder 2.

There is a problem with this arrangement of toner cartridge however. If the inner cylinder 7 or the outer cylinder 2 is deformed, it will be impossible to expect a smooth sliding motion between the outer peripheral surface of the inner cylinder 7 and the inner peripheral surface of the outer cylinder 2, and such a deformation will make occurrence of a galling owing to an interference therebetween.

Further, the conventional toner cartridge is so arranged that outer peripheral surfaces at both ends of the inner cylinder 7 and inner peripheral surfaces at both ends of the outer cylinder 2 are formed on a sliding face over the whole periphery. There is a problem with this arrangement of toner cartridge however. If the outer cylinder 2 is deformed, it will be impossible to expect a smooth sliding motion between the outer peripheral surfaces at both ends of the inner cylinder 7 and the inner peripheral surfaces at both ends of the outer cylinder 2, and such a deformation will make occurrence of a galling owing to an interference therebetween.

Furthermore, the conventional toner cartridge is so arranged that an edge portion 9a of the inner cylinder toner discharge opening 9 and an edge portion 5a of the outer cylinder toner discharge opening 5 are formed in a parallel relation. There is a problem with this arrangement of toner cartridge however. When the inner cylinder toner discharge opening 9 is closed, the respective edge portions are involved with each other. Thus, it would be impossible to close the inner cylinder toner discharge opening 9.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a toner cartridge which solves the foregoing problems.

It is another object of the present invention to provide a toner cartridge which is excellent in slidability in the inner cylinder.

In accordance with this invention, there is disclosed a toner cartridge comprising an outer hollow cylinder having a peripheral surface on which an outer cylinder toner discharge opening is formed to extend in a longitudinal direction thereof, outer cylinder aperture sections provided at opposite ends of the outer cylinder, respectively, an inner cylinder contained within the outer cylinder in such a relation that it is adjacent to said outer cylinder and rotatably slidable relative thereto, the inner cylinder having a cavity in which a toner may be contained, inner cylinder aperture sections provided at opposite ends of the inner cylinder, respectively, and covers provided on the inner cylinder aperture sections, respectively, the inner cylinder having a peripheral surface on which an inner cylinder toner discharge opening is formed in a longitudinal direction thereof to communicate with the cavity, the inner cylinder toner discharge opening being to be engaged with the outer cylinder toner discharge opening, wherein a longitudinal edge of the inner cylinder toner discharge opening is formed at an angle with a longitudinal edge of the outer cylinder toner discharge opening.

In accordance with a further improvement of the invention, there is disclosed a toner cartridge wherein, the opposite ends of the outer cylinder are provided with notches, the outer cylinder toner discharge opening is provided with a single or a plurality of outer cylinder ribs, and the inner cylinder toner discharge opening is provided with a single or a plurality of inner cylinder ribs, being displaced relative to each other in the longitudinal direction such that they are not engaged with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects and features of the present invention will become more apparent from the consideration of the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a preferred embodiment of a toner cartridge in accordance with the present invention;

FIG. 2 is a partial cutway view taken in the direction of the arrows substantially along the lines I-I of FIG. 1;

FIG. 3 is a transverse sectional view of the embodiment shown in FIG. 1;

FIG. 4 is a view for explanation of edge portions of the embodiment;

FIG. 5 is a view for explanation of an outer cylinder toner dischage opening of an alternative embodiment;

FIG. 6 is a partial cutway view in perspective of a conventional toner cartridge;

FIG. 7 is a transverse sectional view of the conventional toner cartridge shown in FIG. 6;

FIG. 8 is a cross-sectional view taken on line II-II of FIG. 7;

FIG. 9 is a transverse sectional view for explanation of a complete open state of the conventional cartrigde; and

FIG. 10 is a cross-sectional view taken on line III-III of FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of a toner cartrige of the invention will be described with reference to FIGS. 1-3. In the figures. the like parts are denoted by the same reference numbers.

A toner cartridge 1 is provided with an outer cylinder 2, which is generally cylindrical and hollow, and extends in its longitudinal direction, as shown. Both ends of the outer cylinder 2 are provided with outer cylinder aperture sections 3, respectively, and in addition a plurality of notches 4, respectively. Further, the outer cylinder 2 is provided with an outer cylinder toner discharge opening 5 extending in the longitudinal direction thereof. The outer cylinder toner discharge opening 5 is provided with an outer cylinder rib 6 located substantially at the center thereof and extended in the periphery direction of the outer cylinder 2.

An inner cylinder 7 is contained in the outer cylinder 2 in such a relation that it is adjacent to the outer cylinder 2 and slidable. The inner cylinder 7, which is also generally cylindrical and hollow, and extends in its longitudinal direction, similarly to the outer cylinder 2, is provided with inner cylinder aperture sections 8 at opposite ends thereof, respectively, each aligned with the associated one of the outer cylinder aperture sections 3. The inner cylinder 7 is also provided with an inner cylinder toner discharge opening 9 extending in a longitudinal direction thereof. The inner cylinder toner discharge opening 9 is provided with innner cylinder ribs 10 each located substantially at a distance substantially equal to 1/4 length of the inner cylinder toner discharge opening 9 extending in the longitudinal direction thereof from the associated one of the respective inner cylinder aperture sections 8 and extended in the periphery direction of the inner cylinder 7. In other words, those inner cylinder ribs 10 are located in such a relation that they are not engaged with the outer cylinder rib 6 with each other.

A cover 11 is provided on one of the inner cylinder aperture sections 8, and a cover 11a is provided on another. The cover 11a is provided with a toner supply opening 12. A cap 13 is detachably mounted on the toner supply opening 12.

In operation, if it is required to discharge a toner, not shown, filled up in the cavity of the inner cylinder 7, the inner cylinder 7 is rotatively slided to the outer cylinder 2 so that the inner cylinder toner discharge opening 9 is engaged with the outer cylinder toner discharge opening 5. If it is required to stop the discharge of the toner, the inner cylinder 7 is rotatively slided to the outer cylinder 2 so that the inner cylinder toner discharge opening 9 is closed with an inner wall of the outer cylinder 2.

It may be arranged that the inner cylinder rib 10 is provided at a place shifted from the center of the the inner cylinder toner discharge opening 9 in the right direction in the figure, while the outer cylinder rib 6 is provided at a place shifted from the center of the the outer cylinder toner discharge opening 5 in the left direction in the figure.

As a matter of course, the outer cylinder rib 6 and the inner cylinder rib 10 are not restricted in their setting positions and the setting number as far as the outer cylinder rib 6 and the inner cylinder rib 10 are not aligned with each other on the same periphery.

Further, as shown in FIG. 2, an edge portion 9a of the inner cylinder toner discharge opening 9 at the side for sealing the toner is formed at an angle with an edge portion 5a of the outer cylinder toner discharge opening 5. According to such an arrangement, when the inner cylinder toner discharge opening 9 is closed by means of rotatively sliding the inner cylinder

7 to the outer cylinder 2, the edge portion 9a of the inner cylinder toner discharge opening 9 is slided to the edge portion 5a of the outer cylinder toner discharge opening 5 on a point contact basis, as shown in FIG. 4. Thus, it is possible to avoid such a situation that the edge portions 5a and 9a are involved with each other, whereby the inner cylinder 7 is smoothly slided to the outer cylinder 2 so that the inner cylinder toner discharge opening 9 is smoothly closed.

Furthermore, as shown in FIG. 5, it is also preferable that an edge portion 5a of the outer cylinder toner discharge opening 5 at the side for sealing the toner is formed at angles with an edge portion 9a of the inner cylinder toner discharge opening 9. According to such an arrangement, when the inner cylinder toner discharge opening 9 is closed by means of rotatively sliding the inner cylinder 7 to the outer cylinder 2, the edge portion 5a of the outer cylinder toner discharge opening 5 is slided to the edge portion 9a of the inner cylinder toner discharge opening 9 on a point contact basis. Thus, it is possible to avoid such a situation that the edge portions 5a and 9a are involved with each other, whereby the inner cylinder 7 is smoothly slided to the outer cylinder 2 so that the inner cylinder toner discharge opening 9 is smoothly closed.

The toner cartrige is so arranged that both the ends of the outer cylinder are provided with notches, the outer cylinder toner discharge opening is provided with a single or a plurality of outer cylinder ribs, and the inner cylinder toner discharge opening is provided with a single or a plurality of inner cylinder ribs, which are located in such a relation that they are not engaged with the outer cylinder ribs. This arrangememt makes it possible to avoid such a situation that an outer peripheral surface of the inner cylinder and an inner peripheral surface of the outer cylinder 2 are formed on a sliding face over the whole periphery. Further it is possible to absorb a deformation of the inner cylinder in the outside direction by the outer cylinder toner discharge opening and the notches, and also possible to absorb a deformation of the outer cylinder in the inside direction by the inner cylinder toner discharge opening. Thus, it is possible to smoothly slide the inner cylinder to the outer cylinder.

Further, the toner cartridge according to the present invention is so arranged that a longitudinal edge portion of the inner cylinder toner discharge opening is formed at an angle with a longitudinal edge portion of the outer cylinder toner discharge opening. This arrangememt makes it possible to avoid such a situation that when the inner cylinder toner discharge opening is closed, the edge portion of the inner cylinder toner discharge opening is involved with the edge portion of the outer cylinder toner discharge opening. Thus, according to the present invention, it is possible to smoothly slide the inner cylinder to the outer cylinder.

Claims

1. A toner cartridge comprising:

an outer hollow cylinder (2), having a peripheral surface on which an outer cylinder toner discharge opening (5) is formed to extend in a longitudinal direction thereof;

outer cylinder aperture sections (3) provided at opposite ends of said outer cylinder (2), respectively;

an inner cylinder (7) contained within said outer cylinder (2) in such a relation that it is adjacent to said outer cylinder (2) and rotatably slidable relative thereto, said inner cylinder (7) having a cavity in which a toner may be contained;

inner cylinder aperture sections (8) provided at opposite ends of said inner cylinder (7), respectively; and

covers (11, 11a) provided on said inner cylinder aperture sections (8), respectively;

said inner cylinder (7) having a peripheral surface on which an inner cylinder toner discharge opening (9) is formed in a longitudinal direction thereof to communicate with the cavity, said inner cylinder toner discharge opening (9) being to be engaged with said outer cylinder toner discharge opening (5);

CHARACTERIZED IN THAT

a longitudinal edge (9a) of said inner cylinder toner discharge opening (9) is formed at an angle with a longitudinal edge (5a) of said outer cylinder toner discharge opening (5).

2. A toner cartridge according to claim 1, CHARACTERIZED IN THAT said inner cylinder toner discharge opening (9) is rectangular.

3. A toner cartridge according to claim 1, CHARACTERIZED IN THAT said outer cylinder toner discharge opening (5) is rectangular.

4. A toner cartridge according to any of claims 1 to 3,

CHARACTERIZED IN THAT

said outer cylinder toner discharge opening (5) is provided with at least one outer cylinder rib (6), and said inner cylinder toner discharge opening (9) is provided with at least one inner cylinder rib (10) said at least one outer and inner ribs being displaced relative to each other in the longitudinal direction, such that they are not engaged with each other.

5. A toner cartridge according any of claims 1 to 4,

CHARACTERIZED IN THAT

the opposite ends of said outer cylinder (2) are provided with notches (4).

7 to the outer cylinder 2, the edge portion 9a of the inner cylinder toner discharge opening 9 is slided to the edge portion 5a of the outer cylinder toner discharge opening 5 on a point contact basis, as shown in FIG. 4. Thus, it is possible to avoid such a situation that the edge portions 5a and 9a are involved with each other, whereby the inner cylinder 7 is smoothly slided to the outer cylinder 2 so that the inner cylinder toner discharge opening 9 is smoothly closed.

Furthermore, as shown in FIG. 5, it is also preferable that an edge portion 5a of the outer cylinder toner discharge opening 5 at the side for sealing the toner is formed at angles with an edge portion 9a of the inner cylinder toner discharge opening 9. According to such an arrangement, when the inner cylinder toner discharge opening 9 is closed by means of rotatively sliding the inner cylinder 7 to the outer cylinder 2, the edge portion 5a of the outer cylinder toner discharge opening 5 is slided to the edge portion 9a of the inner cylinder toner discharge opening 9 on a point contact basis. Thus, it is possible to avoid such a situation that the edge portions 5a and 9a are involved with each other, whereby the inner cylinder 7 is smoothly slided to the outer cylinder 2 so that the inner cylinder toner discharge opening 9 is smoothly closed.

The toner cartrige is so arranged that both the ends of the outer cylinder are provided with notches, the outer cylinder toner discharge opening is provided with a single or a plurality of outer cylinder ribs, and the inner cylinder toner discharge opening is provided with a single or a plurality of inner cylinder ribs, which are located in such a relation that they are not engaged with the outer cylinder ribs. This arrangememt makes it possible to avoid such a situation that an outer peripheral surface of the inner cylinder and an inner peripheral surface of the outer cylinder 2 are formed on a sliding face over the whole periphery. Further it is possible to absorb a deformation of the inner cylinder in the outside direction by the outer cylinder toner discharge opening and the notches, and also possible to absorb a deformation of the outer cylinder in the inside direction by the inner cylinder toner discharge opening. Thus, it is possible to smoothly slide the inner cylinder to the outer cylinder.

Further, the toner cartridge according to the present invention is so arranged that a longitudinal edge portion of the inner cylinder toner discharge opening is formed at an angle with a longitudinal edge portion of the outer cylinder toner discharge opening. This arrangememt makes it possible to avoid such a situation that when the inner cylinder toner discharge opening is closed, the edge portion of the inner cylinder toner discharge opening is involved with the edge portion of the outer cylinder toner discharge opening. Thus, according to the present invention, it is possible to smoothly slide the inner cylinder to the outer cylinder.

Claims

1. A toner cartridge comprising:

an outer hollow cylinder (2), having a peripheral surface on which an outer cylinder toner discharge opening (5) is formed to extend in a longitudinal direction thereof;

outer cylinder aperture sections (3) provided at opposite ends of said outer cylinder (2), respectively;

an inner cylinder (7) contained within said outer cylinder (2) in such a relation that it is adjacent to said outer cylinder (2) and rotatably slidable relative thereto, said inner cylinder (7) having a cavity in which a toner may be contained;

inner cylinder aperture sections (8) provided at opposite ends of said inner cylinder (7), respectively; and

covers (11, 11a) provided on said inner cylinder aperture sections (8), respectively;

said inner cylinder (7) having a peripheral surface on which an inner cylinder toner discharge opening (9) is formed in a longitudinal direction thereof to communicate with the cavity, said inner cylinder toner discharge opening (9) being to be engaged with said outer cylinder toner discharge opening (5);

CHARACTERIZED IN THAT

a longitudinal edge (9a) of said inner cylinder toner discharge opening (9) is formed at an angle with a longitudinal edge (5a) of said outer cylinder toner discharge opening (5).

2. A toner cartridge according to claim 1, CHARACTERIZED IN THAT said inner cylinder toner discharge opening (9) is rectangular.

3. A toner cartridge according to claim 1, CHARACTERIZED IN THAT said outer cylinder toner discharge opening (5) is rectangular.

4. A toner cartridge according to any of claims 1 to 3,

CHARACTERIZED IN THAT

said outer cylinder toner discharge opening (5) is provided with at least one outer cylinder rib (6), and said inner cylinder toner discharge opening (9) is provided with at least one inner cylinder rib (10) said at least one outer and inner ribs being displaced relative to each other in the longitudinal direction, such that they are not engaged with each other.

5. A toner cartridge according any of claims 1 to 4,

CHARACTERIZED IN THAT

the opposite ends of said outer cylinder (2) are provided with notches (4).

* C L M S *

Patentansprüche

1. Tonerkartusche, die folgendes aufweist:

einen äußeren hohlen Zylinder (2), in dessen Umfangs-Oberfläche eine Tonerauslaßöffnung (5) aus dem äußeren Zylinder so ausgebildet ist, daß sie sich in dessen Längsrichtung erstreckt;

Öffnungsabschnitte (3) am äußeren Zylinder, die jeweils an gegenüberliegenden Enden des äußeren Zylinders (2) vorgesehen sind;

einen inneren Zylinder (7), der innerhalb des äußeren Zylinders (2) so angeordnet ist, daß er an den äußeren Zylinder (2) angrenzt und relativ zu diesem drehbar gleitbar ist, wobei der innere Zylinder (7) einen Hohlraum aufweist, in dem sich Toner befinden kann;

Öffnungsabschnitte (8) am inneren Zylinder, die jeweils an gegenüberliegenden Enden des inneren Zylinders (7) vorgesehen sind; und

Deckel (11, 11a), die jeweils an den Öffnungsabschnitten (8) des inneren Zylinders vorgesehen sind;

wobei der innere Zylinder (7) eine Umfangs-Oberfläche aufweist, in der eine Tonerauslaßöffnung (9) aus dem inneren Zylinder in dessen Längsrichtung verlaufend ausgebildet ist, um mit dem Hohlraum in Verbindung zu stehen, wobei die Tonerauslaßöffnung (9) am inneren Zylinder mit der Tonerauslaßöffnung (5) am äußeren Zylinder zusammenwirken soll;

dadurch gekennzeichnet, daß

eine Längskante (9a) der Tonerauslaßöffnung (9) am inneren Zylinder unter einem Winkel zu einer Längskante (5a) der Tonerauslaßöffnung (5) am äußeren Zylinder ausgebildet ist.

2. Tonerkartusche nach Anspruch 1, dadurch gekennzeichnet, daß die Tonerauslaßöffnung (9) am inneren Zylinder rechteckig ist.

3. Tonerkartusche nach Anspruch 1, dadurch gekennzeichnet, daß die Tonerauslaßöffnung (5) am äußeren Zylinder rechteckig ist.

4. Tonerkartusche nach einem der Ansprüche 1 bis 3,

dadurch gekennzeichnet, daß

die Tonerauslaßöffnung (5) am äußeren Zylinder mit mindestens einer Außenzylinder-Rippe (6) versehen ist, und dadurch, daß die Tonerauslaßöffnung (9) am inneren Zylinder mit mindestens einer Innenzylinder-Rippe (10) versehen ist, wobei die zumindest einen äußeren und inneren Rippen in Längsrichtung relativ zueinander so versetzt angeordnet sind, daß sie sich nicht berühren.

5. Tonerkartusche nach einem der Ansprüche 1 bis 4,

dadurch gekennzeichnet, daß

die gegenüberliegenden Enden des äußeren Zylinders (2) mit Nuten (4) versehen sind.

Revendications

1. Cartouche à toner comportant :

un cylindre creux extérieur (2) ayant une surface périphérique sur laquelle une ouverture (5) de décharge de toner du cylindre extérieur est formée de façon à s'étendre dans une direction longitudinale de ce cylindre ;

des sections ajourées (3) du cylindre extérieur prévues à des extrémités opposées dudit cylindre extérieur (2), respectivement ;

un cylindre intérieur (7) contenu dans ledit cylindre extérieur (2) dans une disposition telle qu'il est adjacent audit cylindre extérieur (2) et qu'il peut tourner en glissant par rapport à lui, ledit cylindre intérieur (7) ayant une cavité pouvant contenir un toner ;

des sections ajourées (8) du cylindre intérieur prévues à des extrémités opposées dudit cylindre intérieur (7), respectivement ; et

des couvercles (11, 11a) prévus sur lesdites sections ajourées (8) du cylindre intérieur, respectivement ;

ledit cylindre intérieur (7) ayant une surface périphérique sur laquelle une ouverture (9) de décharge de toner du cylindre intérieur est formée dans une direction longitudinale de celui-ci afin de communiquer avec la cavité, ladite ouverture (9) de décharge de toner du cylindre intérieur étant destinée à être engagée avec ladite ouverture (5) de décharge de toner du cylindre extérieur ;

caractérisée en ce qu'un bord longitudinal (9a) de ladite ouverture (9) de décharge de toner du cylindre intérieur est formé de façon à former un angle avec un bord longitudinal (5a) de ladite ouverture (5) de décharge de toner du cylindre extérieur.

2. Cartouche à toner selon la revendication 1, caractérisée en ce que ladite ouverture (9) de décharge de toner du cylindre intérieur est rectangulaire.

3. Cartouche à toner selon la revendication 1, caractérisée en ce que ladite ouverture (5) de décharge de toner du cylindre extérieur est rectangulaire.

4. Cartouche à toner selon l'une quelconque des revendications 1 à 3, caractérisée en ce que ladite

* C L M S *

ouverture (5) de décharge de toner du cylindre extérieur est pourvue d'au moins une nervure (6) de cylindre extérieur, et ladite ouverture (9) de décharge de toner du cylindre intérieur est pourvue d'au moins une nervure (10) de cylindre intérieur, lesdites nervures extérieure et intérieure étant déplacées l'une par rapport à l'autre dans la direction longitudinale de manière qu'elles ne portent pas l'une contre l'autre.

5. Cartouche à toner selon l'une quelconque des revendications 1 à 4, caractérisée en ce que les extrémités opposées dudit cylindre extérieur (2) sont pourvues d'encoches (4).