Description

This invention relates to a toner cartridge to be used in a latent electrostatic image developing device of an image-forming machine, such as an electrostatic copying machine or electrostatic printing machine.

It is known that a latent electrostatic image developing device for developing a latent electrostatic image to a toner image is installed in an image-forming machine such as a latent electrostatic copying machine or an electrostatic printing machine. One type of the latent electrostatic image developing device in widespread commercial acceptance uses a toner cartridge for supplying a toner to be consumed.

In a typical example of the above type of latent electrostatic image developing device, a cartridge loading section having an open top is disposed and a box-like toner cartridge containing a toner is loaded detachably into the cartridge loading section through the opening at its top, as disclosed in Japanese Laid-Open Utility Model Publication No. 104850/1985 and Japanese Laid-Open Patent Publication No. 170760/1986.

In another known device (US-A-4062 385) a toner cartridge is loaded into a developing device by the use of a loading fixture from which the cartridge can be slid longitudinally to a contiguously located receiving fixture on the developing device. The loading fixture and receiving fixture both include pairs of aligned pinch rails which form guides for respective lateral flanges on the cartridge. A cartridge includes a slide cover which is arranged to separate from the rest of the cartridge during the above mentioned longitudinal sliding movement.

The conventional latent electrostatic image developing devices, however, have one or more problems to be solved. Such problems include:

(a) a structure for maintaining a cartridge exactly at a required position in the cartridge loading section is relatively complex and expensive;

(b) the operation of loading or unloading the toner cartridge into or from the cartridge loading section is not entirely easy; and,

(c) at the time of loading or unloading the cartridge into or from the cartridge loading section, the remaining toner may possibly scatter and soil the operator's clothing.

It is an object of this invention to provide a relatively simple and inexpensive structure for a toner cartridge which enables it to be held exactly at a required position in a cartridge loading section.

Another object of this invention is to be able to load and unload a toner cartridge quite easily into and from a cartridge loading section by improving the toner cartridge.

Still another object of this invention is to sufficiently prevent remaining toner from scattering from a cartridge loading section at the time of loading and unloading a toner cartridge into and from the cartridge loading section by improving the toner cartridge.

In accordance with a first aspect of the present invention there is provided a toner cartridge adapted to be loaded detachably into a cartridge loading section of a latent electrostatic image developing device, said cartridge loading section having an open top and including a pair of upwardly facing supporting shoulder surfaces extending longitudinally in laterally spaced-apart relationship and guiding side surfaces rising respectively from the outside edges of the shoulder surfaces, the guiding side surfaces having respective holding protrusions disposed adjacent their one ends at a first, front end of the cartridge loading section and engaging protrusions disposed at locations spaced rearwardly of the holding protrusions and at a predetermined distance therefrom,

the toner cartridge being characterised by a loading flange having a pair of side flange portions which are adapted to be disposed in correspondence with said pair of shoulder surfaces when the toner cartridge is in its loaded position, and

said toner cartridge being adapted to be loaded detachably into the cartridge loading section by inclining the toner cartridge downwardly towards one end and, in this state, inserting the corresponding one end portion of the loading flange, which is disposed at said one end of the cartridge, between the shoulder surfaces and the holding protrusions in the cartridge loading section, and then lowering the opposite end of the toner cartridge so that the side flange portions of the loading flange pass elastically over the engaging protrusions in the cartridge loading section, respectively.

In accordance with a second aspect of the present invention there is provided a toner cartridge adapted to be loaded detachably into a cartridge loading section of a latent electrostatic image developing device, said cartridge loading section having an open top and including a pair of upwardly facing supporting shoulder surfaces extending longitudinally in laterally spaced-apart relationship, guiding side surfaces rising respectively from the outside edges of the shoulder surfaces and a guiding rear surface extending between the rear ends of the guiding side surfaces,

the toner cartridge being characterised by a closing member surrounding both sides and one end of said cartridge, said closing member being formed of a flexible material, and

said cartridge being adapted to be loaded detachably into the cartridge loading section by inclining the toner cartridge downwardly towards its other end and, in this state, positioning this other end of the cartridge on the shoulder surfaces in the cartridge loading section, and then lowering said one end of the toner cartridge whereby the closing member is brought into intimate contact with the guiding side surfaces

and the guiding rear surface in the cartridge loading section and said one end of the toner cartridge is positioned on the shoulder surfaces in the cartridge loading section.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a sectional view of one embodiment of a latent electrostatic image developing device constructed in accordance with this invention;

Fig. 2 is an exploded perspective view showing a cartridge loading section and a toner cartridge in the developing device shown in Fig. 1;

Fig. 3 is a top plan view showing the cartridge loading section and the toner cartridge in the developing device shown in Fig. 1; and

Figures 4-A and 4-B are sectional views for illustrating the manner of loading the toner cartridge into the cartridge loading section in the developing device shown in Figure 1.

With reference to Figure 1, the latent electrostatic image developing device shown generally at 2 is disposed in relation to a rotating drum 4 in an image-forming machine such as an electrostatic copying machine or an electrostatic printing machine. The rotating drum 4 has a photosensitive material on its peripheral surface, and is adapted to rotate in the direction shown by an arrow 6. A latent electrostatic image is formed on the peripheral surface of the rotating drum 4 by a known method, and in a developing zone shown by numeral 8, is developed to a toner image by a developing device 2. The developed toner image on the rotating drum 4 is transferred to a suitable sheet such as paper and then fixed to it by known methods.

The developing device 2 is comprised of a main portion 10 and a toner supply portion 12. The main portion 10 is provided with a development receptacle 14 having a development opening 16 formed opposite to the rotating drum 4 and a toner supply opening 18 formed in the top right end part of the receptacle 14 in Figure 1. A two-component developer composed of carrier particles and a toner is held in the development receptacle 14. A magnetic brush-type developer applicator 20 is disposed within the development receptacle 14. The applicator 20, which may be comprised of a sleeve 24 to be rotated in the direction shown by an arrow 22 and a stationary permanent magnet 26 disposed within the sleeve 24, magnetically attracts the developer onto its surface, carries it to the developing zone 8, and applies it to the surface of the rotating drum 4. The development receptacle 14 also include therein agitating means for agitating the developer and developer regulating means for controlling the thickness of a layer of the developer attracted to the peripheral surface of the applicator 20 and carried to the developing zone 8 although these additional elements are not shown in the drawings. Since the structure of the main portion 10 of the developing device 2 is known, a detailed description of the main portion 10 is omitted herein.

The toner supply portion 12 of the developing device 2 is comprised of a toner hopper 28 and a toner cartridge 30 to be mounted detachably on the toner hopper 28. The toner hopper 28 has a hopper receptacle 32 that can be molded from a suitable synthetic resin. The lower portion of the hopper receptacle 32 has a left side wall 34 extending substantially vertically and a right side wall 36 extending downwardly and inclined to the left. The lower end portion of the hopper receptacle 32 is permitted to advance into the development receptacle 14 through the toner supply opening 18 formed in the receptacle 14. An elongate toner discharge opening 38 extending in the front-rear direction (the direction perpendicular to the sheet surface in Figure 1) is formed in the lower end portion of the hopper receptacle 32. In relation to the toner discharge opening 38, a toner discharging roller 40 which is known per se and may be formed of sponge rubber is rotatably installed within the lower end portion of the hopper receptacle 32. The toner discharging roller 40 extends along and above the toner discharge opening 38. When the toner discharge roller 40 is out of motion, toner 41 is not supplied to the development receptacle 14 from the hopper receptacle 32. But when the toner discharging roller 40 is rotated in the direction shown by an arrow 44 by a driving source which may be an electric motor 42 (Figure 2) fixed to the lower part of the rear surface of the hopper receptacle 32, the toner 41 in the hopper receptacle 32 adheres to the surface of the toner discharging roller 40 and is carried to the toner discharge opening 38 and then supplied to the development receptacle 14.

A cartridge loading section 46 having an open top is disposed in the upper part of the hopper receptacle 32, and the toner cartridge 30 is loaded detachably into the cartridge loading section 46 through its open top. With reference to Figure 2 as well as Figure 1, the hopper receptacle 32 has formed therein a left shoulder wall 48 projecting substantially horizontally to the left in Figure 1 from the upper end of its left side wall 34 and a right shoulder wall 50 projecting substantially horizontally to the right in Figure 1 from the upper end of its right side wall 36. The upper surfaces of the left and right shoulder walls 48 and 50 constitute a pair of upwardly facing supporting shoulder surfaces 52 and 54 extending substantially parallel to each other and longitudinally (in the front-rear direction) in laterally spaced-apart relationship. Push-up members 53 and 55 formed of a flexible material, preferably sponge rubber, are bonded to the supporting shoulder surfaces 52 and 54. Furthermore, in the hopper receptacle 32, a left guiding wall 56 and a right guiding wall 58 are formed which respectively rise from the outside ends of the left and right shoulder walls 48 and 50. Also, a front wall 60 and a rear wall

62 extend upwardly beyond the supporting shoulder surfaces 52 and 54. It will be easily appreciated by reference to Figure 3 in conjunction with Figures 1 and 2 that the left guiding wall 56 extends upwardly in a substantially vertical direction from the left shoulder wall 48, and the right guiding wall 58 extends upwardly in a substantially vertical direction from the right shoulder wall 50 in correspondence to the left guiding wall 56 and then extends upwardly while being inclined outwardly (to the right in Figure 1). Accordingly, the inside surface of the left guiding wall 56 defines a left guiding side surface 64 rising substantially vertically from the outside edge of the supporting shoulder surface 52, and the inside surface of the right guiding wall 58 defines a right guiding side surface 66 rising substantially vertically from the outside edge of the supporting shoulder surface 54 and then extending upwardly while being inclined outwardly. The front wall 60 and the rear wall 62 of the hopper receptacle 32, in correspondence to the right guiding wall 58, also extend upwardly in a substantially vertical direction beyond the supporting shoulder surfaces 52 and 54, and then extend upwardly while being inclined forwardly and rearwardly, respectively. The inside surfaces of those parts of the front wall 60 and the rear wall 62 which extend upwardly beyond the supporting shoulder surfaces 52 and 54 define a guiding front surface 68 and a guiding rear surface 70. As is clearly depicted in Figures 4-A and 4-B, a substantially vertically extending main portion of the guiding front surface 68, excepting its lower end part, bulges rearwardly and thus has a large thickness. Thus, an engaging lower surface 71 spaced from the supporting shoulder surfaces 52 and 54 by a predetermined distance (ℓ_1) (Figure 4-A) is formed in the guiding front surface 68.

With reference to Figures 4-A and 4-B taken in conjunction with Figures 2 and 3, holding protrusions 72 and 74 are formed at corresponding positions in the front end portions of the left guiding side surface 64 and the right guiding side surface 66. The holding protrusions 72 and 74 respectively have introduction lower surfaces 72a and 74a inclined downwardly in the front direction and holding lower surfaces 72b and 74b extending forwardly in a substantially horizontal direction from the front ends of the introduction lower surfaces 72a and 74a. The angle of inclination, α, (Figure 4-A) of the introduction lower surfaces 72a and 74a may be about 30 to 60 degrees. The distance from the holding lower surfaces 72b and 74b to the supporting shoulder surfaces 52 and 54 is set at a predetermined value ℓ_2 (Figure 4-A) which may be substantially equal to the above predetermined value ℓ_1. Hence, the holding lower surfaces 72b and 74b and the engaging lower surface 71 formed in the guiding front surface 68 are in the same plane. In the left guiding side surface 64 and the right guiding side surface 66, engaging protrusions 76 and 78 are formed behind the holding protrusions 72 and 74 respectively at a predetermined distance therefrom. The engaging protrusions 76 and 78 respectively have introduction inside surface 76a and 78a extending downwardly and inclined laterally inwardly and engaging lower surfaces 76b and 78b extending substantially horizontally and laterally outwardly from the lower ends of the introduction inside surfaces 76a and 78a. The angle of inclination, β, (Figure 1) of the introduction inside surfaces 76a and 78a may be about 20 to 40 degrees. The distance from the engaging lower surfaces 76b and 78b to the supporting shoulder surfaces 52 and 54 is set at a predetermined value ℓ_3 (Figure 4-A) which may be equal to the predetermined values ℓ_1 and ℓ_2.

With reference to Figures 1 and 2, the toner cartridge 30 will be described in detail. The illustrated toner cartridge 30 is provided with a box-like main portion 80 which may be molded from a suitable synthetic resin. The box-like main portion 80 has a rectangular upper wall 82 which is slender in the front-rear direction, a left and a right side wall 84 and 86 extending downwardly from the two side edges of the upper wall 82, and a front and a rear wall 88 and 90 extending downwardly from the front and rear edges of the upper wall 82. A loading flange 92 is disposed on the periphery of the lower end of the main portion 80. It will be appreciated by reference to Figures 3, 4-A and 4-B that the loading flange in the illustrated embodiment has a left and a right flange portion 94 and 96 bulging substantially horizontally and laterally outwardly from the lower ends of the left and right side walls 84 and 86 of the box-like main portion 80, and a front and a rear flange portion 98 and 100 bulging substantially horizontally in the forward and rearward directions from the lower ends of the front and rear walls 88 and 90 of the main portion 80. The distance between the outside edges of the left and right flange portions 94 and 96 is substantially equal to, or slightly smaller than, the distance between the left and right guiding side surfaces 64 and 66 in the cartridge loading section 46. The distance between the front and rear flange portions 98 and 100 corresponds to the distance between the guiding front and rear surfaces 68 and 70 in the cartridge loading section 46. The thickness of the loading flange 92 is slightly smaller than the predetermined value ℓ_1, ℓ_2, and ℓ_3 in the cartridge loading section 46. As shown in Figures 2 and 3, a rectangular notch 102 having a slightly larger width than the width of the box-like main portion 80 is formed in the front flange portion 98 of the loading flange 92. The size m_1 of this notch 102 in the front-rear direction is set at a value slightly larger than the depth m_2 (Figure 3) in the front-rear direction of the engaging lower surface 71 formed in the guiding front surface 68 of the cartridge loading section 46.

Toner is filled in the box-like main portion 80 through its open lower surface, and then the lower

surface of the main portion 80 is releasably sealed up by a sealing member 104. As can be seen by reference to Figure 4-A, the sealing member 104 which is known per se and may be formed of a synthetic resin film has a sealing portion 106 which extends from the front end to the rear end of the box-like main portion 80 and covers the lower surface and an extension 108 extending further from the sealing portion 106. The sealing portion 106 is strippably bonded to the lower surface of the loading flange 92. The extension 108 of the sealing member 104 is folded over the sealing portion 106, and extends forwardly along the lower surface of the box-like main portion 80, then upwardly through the notch 102 formed in the front flange portion 98 and along the front wall 88 of the main portion 80, and further rearwardly along the upper wall 82 of the main portion 80. The free end of the extension 108 is removably anchored on the upper wall 82 of the main portion 80 by suitable means.

With reference to Figure 2, in the toner cartridge 30 provided by this invention, finger-hooking depressed portions 110 and 112 are provided at predetermined positions of the left and right side walls 84 and 86 of the box-like main portion 80. The positions of these depressed portions 110 and 112 in the front-rear direction correspond to the positions of the engaging protrusions 76 and 78 of the cartridge loading section 46 in the front-rear direction. A closing member 114 is disposed on the peripheral surface of the box-like main portion 80 in the illustrated toner cartridge 30. The closing member 114 is formed of a flexible material such as sponge rubber, and extends continuously over the outside surfaces of the left side wall 84, rear wall 90 and right side wall 86. If desired, the closing member 114 may be allowed to extend also over the outside surface of the front wall 88 of the main portion 80. The closing member 114 is positioned above the loading flange 92 and bulges slightly outwardly beyond the outside edge of the loading flange 92. The closing member 114 may be bonded to the outside surfaces of the left side wall 84, rear wall 90 and right side wall 86 of the box-like main portion 80 with its lower end kept in contact with the upper surface of the loading flange 92 or spaced upwardly a little from the loading flange 92. Alternatively, it may be bonded to the upper surfaces of the left flange portion 94, rear flange portion 100 and right flange portion 96 of the loading flange 92.

With reference mainly to Figures 4-A and 4-B, the manner of loading the toner cartridge 30 into the cartridge loading section 46 and the manner of unloading it from the loading section 46 will be described.

In loading the toner cartridge 30 into the cartridge loading section 46, the toner cartridge 30 is inclined downwardly toward its front end and in this state carried into the cartridge loading section 46 as shown in Figure 4-A. The front ends of the left and right flange portions 94 and 96 of the loading flange 92 are placed on the supporting shoulder surfaces 52 and 54 of the cartridge loading section 46, and more specifically on the push-up members 53 and 55 bonded thereto. Then, the toner cartridge 30 is moved forwardly and at the same time, its rear end is lowered. It will be easily understood by reference to Figures 4-A and 4-B that when the toner cartridge 30 is moved forwardly, the front end portions of the left and right flange portions 94 and 96 move on the push-up members 53 and 55 bonded to the supporting shoulder surfaces 52 and 54, and while being guided by the introduction lower surfaces 72a and 74a of the holding protrusions 72 and 74, advance beneath the holding lower surfaces 72b and 74b of the holding protrusions 72 and 74 and the engaging lower surface 71 located forwardly of the holding lower surfaces 72b and 74b. On the other hand, when the rear end of the toner cartridge 30 begins to be lowered from the position shown in Figure 4-A toward the position shown in Figure 4-B, the closing member 114 provided on the peripheral surface of the box-like main portion 80 is first brought into intimate contact with the left and right guiding side surfaces 64 and 66 and the guiding rear surface 70 in the cartridge loading section 46, as shown by a two-dot chain line in Figure 4-A. As a result, the front end portion of the loading flange 92 or the front wall 88 of the box-like main portion 80 in the toner cartridge 30 which has been moved forwardly in the manner described above makes contact with, or approaches, the guiding front surface 68 of the cartridge loading section 46, and the closing member 114 is brought into intimate contact with the left and right guiding side surfaces 64 and 66 and the guiding rear surface 70 of the cartridge loading section 46. Consequently, the upper surface of the cartridge loading section 46 is substantially closed by the toner cartridge 30. From then on, the remaining toner 41 in the hopper receptacle 32 for example is reliably prevented from scattering upwardly. When the rear end of the toner cartridge 30 continues to descend, the left and right flange portions 94 and 96 of the loading flange 92 begin to interfere with the engaging protrusions 76 and 78 of the cartridge loading section 46. As shown by a two-dot chain line in Figure 3, owing to the elastic deformation of the left and right side walls 84 and 86 of the box-like main portion 80, the interfering sites of the left and right flange portions 94 and 96 are gradually elastically displaced inwardly in the lateral direction (in some case, owing to the elastic deformation of the left and right guiding walls 56 and 58 of the cartridge loading section 46, the engaging protrusions 76 and 78 are gradually elastically displaced outwardly in the lateral direction). Accordingly, the left and right flange portions 94 and 96 pass over the introduction inner surfaces 76a and 78a of the engaging protrusions 76 and 78. When the left and right flange portions 94 and 96 have completely passed over the introduction inside surfaces 76a and 78a,

the left and right flange portions 94 and 96 elastically return to the original state outwardly in the lateral direction (in some cases, the engaging protrusions 76 and 78 elastically return to the original state inwardly in the lateral direction). Thus, the interfering sites of the left and right flange portions 94 and 96 advance beneath the engaging lower surfaces 76b and 78b of the engaging protrusions 76 and 78. When the left and right flange portions 94 and 96 abruptly return elastically to the original state after complete passage over the introduction inner surfaces 76a and 78a of the engaging protrusions 76 and 78, the hopper receptacle 32 and the toner cartridge 30 are vibrated, and an air current may occur in the hopper receptacle. However, since at this time, the upper surface of the cartridge loading section 46 is substantially closed by the toner cartridge 30, the vibration and the air current does not cause scattering of the toner 41 out of the hopper receptacle 32.

As can be seen from Figure 4-B, when the toner cartridge 30 is loaded into the cartridge loading section 46 as described above, the push-up members 53 and 55 bonded to the supporting shoulder surfaces 52 and 54 of the cartridge loading section 46 push up the toner cartridge 30 resiliently and press the left and right flange portions 94 and 96 of the loading flange 92 against the holding lower surfaces 72b and 74b of the holding protrusions 72 and 74, and the engaging lower surfaces 76b and 78b of the engaging protrusions 76 and 78. Thus, the toner cartridge 30 is held at the required position in the cartridge loading section 46 with sufficient stability. Furthermore, the stability of holding the toner cartridge 30 is secured more accurately because the closing member 114 of the toner cartridge 30 is kept in intimate resilient contact with the left and right guiding side surfaces 64 and 66 and the guiding rear surface 70 of the cartridge loading section 46. When the loading of the toner cartridge 30 into the cartridge loading section 46 is terminated, the free end portion of the extension 108 in the sealing member 104 is removed from the upper wall 82 of the box-like main portion 80, and pulled forwardly or upwardly. As a result, the sealing portion 106 of the sealing member 104 is gradually stripped from the lower surface of the box-like main portion 80 and the lower surface of the main portion 80 is opened. The sealing member 104 is thus removed from the main portion 80. When the lower surface of the main portion 80 is opened, the toner 41 in the main portion 80 falls into the hopper receptacle 32 as shown in Figure 1.

When the toner 41 in the hopper receptacle 32 is consumed and the toner cartridge 30 is to be unloaded from the loading section 46 to replace it with a fresh one, the first action required is to push the left and right side walls 84 and 86 of the main portion 80 inwardly in the lateral direction by hooking fingers onto the depressed portions 110 and 112 formed in the left and right side walls 84 and 86. Thus, as shown by a two-dot chain line in Figure 3, the left and right side walls 84 and 86 are elastically deformed inwardly in the lateral direction, and the left and right flange portions 94 and 96 of the loading flange 92 are detached laterally inwardly from the engaging lower surfaces 76b and 78b of the engaging protrusions 76 and 78 of the loading section 46. The rear end portion of the toner cartridge is slightly elevated. Then, the toner cartridge 30 is moved rearwardly, and the front end portions of the left and right flange portions 94 and 96 are detached from the engaging lower surface 71 of the guiding front surface 68 and the holding lower surfaces 72b and 74b of the holding protrusions 72 and 74. After this, the cartridge 30 can be freely taken out from the cartridge loading section 46 without any restriction.

While the present invention has been described in detail with reference to one specific embodiment of the latent electrostatic image developing device constructed in accordance with this invention taken in conjunction with the accompanying drawings, it should be understood that various changes and modifications are possible without departing from the scope of the invention as claimed herein.

For example, the illustrated latent electrostatic image developing device is of a type which uses a two-component developer composed of carrier particles and a toner. The present invention, however, can also be applied to a type of latent electrostatic image developing device which uses a one-component developer composed only of a toner. In this case, the cartridge loading section having an open top is disposed in the main portion itself of the developing device, and the toner cartridge can be detachably loaded into this cartridge loading section.

Claims

1. A toner cartridge adapted to be loaded detachably into a cartridge loading section of a latent electrostatic image developing device, said cartridge loading section having an open top and including a pair of upwardly facing supporting shoulder surfaces (52,54) extending longitudinally in laterally spaced-apart relationship and guiding side surfaces (56,58) rising respectively from the outside edges of the shoulder surfaces (52,54), the guiding side surfaces (56,58) having respective holding protrusions (72,74) disposed adjacent their one ends at a first, front end of the cartridge loading section and engaging protrusions (76,78) disposed at locations spaced rearwardly of the holding protrusions (72,74) and at a predetermined distance therefrom,

   the toner cartridge being characterised by a loading flange (92) having a pair of side flange

the left and right flange portions 94 and 96 elastically return to the original state outwardly in the lateral direction (in some cases, the engaging protrusions 76 and 78 elastically return to the original state inwardly in the lateral direction). Thus, the interfering sites of the left and right flange portions 94 and 96 advance beneath the engaging lower surfaces 76b and 78b of the engaging protrusions 76 and 78. When the left and right flange portions 94 and 96 abruptly return elastically to the original state after complete passage over the introduction inner surfaces 76a and 78a of the engaging protrusions 76 and 78, the hopper receptacle 32 and the toner cartridge 30 are vibrated, and an air current may occur in the hopper receptacle. However, since at this time, the upper surface of the cartridge loading section 46 is substantially closed by the toner cartridge 30, the vibration and the air current does not cause scattering of the toner 41 out of the hopper receptacle 32.

As can be seen from Figure 4-B, when the toner cartridge 30 is loaded into the cartridge loading section 46 as described above, the push-up members 53 and 55 bonded to the supporting shoulder surfaces 52 and 54 of the cartridge loading section 46 push up the toner cartridge 30 resiliently and press the left and right flange portions 94 and 96 of the loading flange 92 against the holding lower surfaces 72b and 74b of the holding protrusions 72 and 74, and the engaging lower surfaces 76b and 78b of the engaging protrusions 76 and 78. Thus, the toner cartridge 30 is held at the required position in the cartridge loading section 46 with sufficient stability. Furthermore, the stability of holding the toner cartridge 30 is secured more accurately because the closing member 114 of the toner cartridge 30 is kept in intimate resilient contact with the left and right guiding side surfaces 64 and 66 and the guiding rear surface 70 of the cartridge loading section 46. When the loading of the toner cartridge 30 into the cartridge loading section 46 is terminated, the free end portion of the extension 108 in the sealing member 104 is removed from the upper wall 82 of the box-like main portion 80, and pulled forwardly or upwardly. As a result, the sealing portion 106 of the sealing member 104 is gradually stripped from the lower surface of the box-like main portion 80 and the lower surface of the main portion 80 is opened. The sealing member 104 is thus removed from the main portion 80. When the lower surface of the main portion 80 is opened, the toner 41 in the main portion 80 falls into the hopper receptacle 32 as shown in Figure 1.

When the toner 41 in the hopper receptacle 32 is consumed and the toner cartridge 30 is to be unloaded from the loading section 46 to replace it with a fresh one, the first action required is to push the left and right side walls 84 and 86 of the main portion 80 inwardly in the lateral direction by hooking fingers onto the depressed portions 110 and 112 formed in the left and right side walls 84 and 86. Thus, as shown by a two-dot chain line in Figure 3, the left and right side walls 84 and 86 are elastically deformed inwardly in the lateral direction, and the left and right flange portions 94 and 96 of the loading flange 92 are detached laterally inwardly from the engaging lower surfaces 76b and 78b of the engaging protrusions 76 and 78 of the loading section 46. The rear end portion of the toner cartridge is slightly elevated. Then, the toner cartridge 30 is moved rearwardly, and the front end portions of the left and right flange portions 94 and 96 are detached from the engaging lower surface 71 of the guiding front surface 68 and the holding lower surfaces 72b and 74b of the holding protrusions 72 and 74. After this, the cartridge 30 can be freely taken out from the cartridge loading section 46 without any restriction.

While the present invention has been described in detail with reference to one specific embodiment of the latent electrostatic image developing device constructed in accordance with this invention taken in conjunction with the accompanying drawings, it should be understood that various changes and modifications are possible without departing from the scope of the invention as claimed herein.

For example, the illustrated latent electrostatic image developing device is of a type which uses a two-component developer composed of carrier particles and a toner. The present invention, however, can also be applied to a type of latent electrostatic image developing device which uses a one-component developer composed only of a toner. In this case, the cartridge loading section having an open top is disposed in the main portion itself of the developing device, and the toner cartridge can be detachably loaded into this cartridge loading section.

Claims

1. A toner cartridge adapted to be loaded detachably into a cartridge loading section of a latent electrostatic image developing device, said cartridge loading section having an open top and including a pair of upwardly facing supporting shoulder surfaces (52,54) extending longitudinally in laterally spaced-apart relationship and guiding side surfaces (56,58) rising respectively from the outside edges of the shoulder surfaces (52,54), the guiding side surfaces (56,58) having respective holding protrusions (72,74) disposed adjacent their one ends at a first, front end of the cartridge loading section and engaging protrusions (76,78) disposed at locations spaced rearwardly of the holding protrusions (72,74) and at a predetermined distance therefrom,

the toner cartridge being characterised by a loading flange (92) having a pair of side flange

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portions (94,96) which are adapted to be disposed in correspondence with said pair of shoulder surfaces (52,54) when the toner cartridge is in its loaded position, and

said toner cartridge being adapted to be loaded detachably into the cartridge loading section by inclining the toner cartridge downwardly towards one end and, in this state, inserting the corresponding one end portion of the loading flange (92), which is disposed at said one end of the cartridge, between the shoulder surfaces (52,54) and the holding protrusions (72,74) in the cartridge loading section, and then lowering the opposite end of the toner cartridge so that the side flange portions (94,96) of the loading flange (92) pass elastically over the engaging protrusions (76,78) in the cartridge loading section, respectively.

2. A toner cartridge as claimed in claim 1 which further comprises a pair of side walls (84,86) extending above said pair of side flange portions (94,96) of the loading flange (92), and finger-hooking depressed portions (110,112) corresponding respectively to the pair of engaging protrusions (76,78) in the cartridge loading section, said depressed portions (110,112) being disposed in the pair of side walls (84,86), respectively.

3. A toner cartridge adapted to be loaded detachably into a cartridge loading section (46) of a latent electrostatic image developing device, said cartridge loading section having an open top and including a pair of upwardly facing supporting shoulder surfaces (52,54) extending longitudinally in laterally spaced-apart relationship, guiding side surfaces (56,58) rising respectively from the outside edges of the shoulder surfaces (52,54) and a guiding rear surface (70) extending between the rear ends of the guiding side surfaces (56,68), the toner cartridge being characterised by a closing member (114) surrounding both sides and one end of said cartridge, said closing member (114) being formed of a flexible material, and

said cartridge being adapted to be loaded detachably into the cartridge loading section by inclining the toner cartridge downwardly torwards its other end and, in this state, positioning this other end of the cartridge on the shoulder surfaces (52,54) in the cartridge loading section, and then lowering said one end of the toner cartridge whereby the closing member (114) is brought into intimate contact with the guiding side surfaces (56,58) and the guiding rear surface (70) in the cartridge loading section and said one end of the toner cartridge is positioned on the shoulder surfaces (52,54) in the cartridge loading section.

4. A toner cartridge as claimed in claim 3 wherein the closing member (114) is formed of sponge rubber.

Patentansprüche

1. Tonerkassette, die lösbar in einen Kassettenladeabschnitt einer latenten elektrostatischen Bildentwicklungsvorrichtung geladen wird, wobei der genannte Kassettenladeabschnitt eine offene Oberseite aufweist und ein Paar nach oben gerichteter Stützansatzflächen (52, 54), die in Längsrichtung in einer seitlich voneinander beabstandeten Beziehung verlaufen, sowie Führungsseitenflächen (56, 58) umfaßt, die jeweils von den Außenkanten der Ansatzflächen (52, 54) ansteigen, wobei die Führungsseitenflächen (56, 58) jeweils Haltevorsprünge (72, 74) aufweisen, die neben ihrem einen Ende an einem ersten, vorderen Ende des Kassettenladeabschnittes angeordnet sind und in Vorsprünge (76, 78) eingreifen, die an hinter den Haltevorsprüngen (72, 74) beabstandeten Stellen und in einer vorbestimmten Entfernung von diesen angeordnet sind, wobei die Tonerkassette dadurch gekennzeichnet ist, daß ein Ladeflansch (92) ein Paar Seitenflanschteile (94, 96) aufweist, die entsprechend dem genannten Paar Ansatzflächen (52, 54) angeordnet werden, wenn sich die Tonerkassette in ihrer geladenen Position befindet, und

wobei die genannte Tonerkassette lösbar in den Kasettenladeabschnitt geladen werden kann, indem die Tonerkassette nach unten zu einem Ende hin geneigt und in diesem Zustand der entsprechende eine Endteil des Ladeflansches (92) in den Kassettenladeabschnitt eingesetzt wird, der an dem genannten einen Ende der Kassette zwischen den Ansatzflächen (52, 54) und den Haltevorsprüngen (72, 74) in dem Kassettenladeabschnitt angeordnet ist, und dann das gegenüberliegende Ende der Tonerkassette abgesenkt wird, so daß die Seitenflanschteile (94, 96) des Ladeflansches (92) jeweils elastisch über die eingreifenden Vorsprünge (76, 78) in dem Kassettenladeabschnitt gleiten.

2. Tonerkassette nach Anspruch 1, weiterhin umfassend ein Paar Seitenwände (84, 86), die über dem genannten Paar Seitenflanschteile (94, 96) des Ladeflansches (92) verlaufen, und ausgenommene Fingeransatzabschnitte (110, 112), die jeweils dem Paar eingreifender Vorsprünge (76, 78) in dem Kassettenladeabschnitt entsprechen, wobei die genannten ausgenommenen Abschnitte (110, 112) jeweils in dem Paar Seitenwände (84, 86) angeordnet sind.

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3. Tonerkassette, die lösbar in einen Kassettenladeabschnitt (46) einer latenten elektrostatischen Bildentwicklungsvorrichtung geladen wird, wobei der genannte Kassettenladeabschnitt eine offene Oberseite aufweist und ein Paar nach oben gerichteter Stützansatzflächen (52, 54), die in Längsrichtung in einer seitlich voneinander beabstandeten Beziehung verlaufen, wobei Führungsseitenflächen (56, 58) jeweils von den Außenkanten der Ansatzflächen (52, 54) ansteigen und eine hintere Führungsfläche (70) zwischen den hinteren Enden der genannten Führungsseitenflächen (56, 68) verlaufen, wobei die Tonerkassette dadurch gekennzeichnet ist, daß ein Verschlußelement (114) beide Seiten und ein Ende der genannten Kassette umgibt, wobei das genannte Verschlußelement (114) aus einem flexiblen Material gefertigt ist, und

wobei die genannte Kassette lösbar in den Kassettenladeabschnitt geladen wird, indem die Tonerkassette nach unten in Richtung ihres anderen Endes geneigt und in diesem Zustand dieses andere Ende der Kassette auf den Ansatzflächen (52, 54) in dem Kassettenladeabschnitt positioniert und danach das genannte eine Ende der Tonerkassette abgesenkt wird, wodurch das Verschlußelement (114) in engen Kontakt mit den Führungsseitenflächen (56, 58) und der hinteren Führungsfläche (70) in dem Kassettenladeabschnitt gebracht wird und wobei das genannte eine Ende der Tonerkassette auf den Ansatzflächen (52, 54) in dem Kassettenladeabschnitt positioniert wird.

4. Tonerkassette nach Anspruch 3, wobei das Verschlußelement (114) aus Schaumgummi ausgebildet ist.

Revendications

1. Cartouche de toner adaptée pour être chargée de manière amovible dans une section de chargement de cartouche d'un dispositif de développement d'images électrostatiques latentes, ladite section de chargement de cartouche ayant un dessus ouvert et comportant une paire de surfaces d'épaulement de support tournées vers le haut (52,54) s'étendant longitudinalement espacées latéralement l'une par rapport à l'autre et des surfaces latérales de guidage (56,58) s'élevant respectivement depuis les bords extérieurs des surfaces d'épaulement (52,54), les surfaces latérales de guidage (56,58) ayant des saillies de maintien respectives (72,74) disposées à côté de leur extrémité à une première extrémité frontale de la section de chargement de cartouche et des saillies d'engagement (76,78) disposées à des emplacements espacés à l'arrière des saillies de maintien (72,74) et à une distance prédéterminée de celles-ci,

la cartouche de toner étant caractérisée par une semelle de chargement (92) ayant une paire de parties de semelle latérales (94,96) qui sont adaptées pour être disposées en correspondance avec ladite paire de surfaces d'épaulement (52,54) quand ladite cartouche de toner est dans sa position chargée, et

ladite cartouche de toner étant adaptée pour être chargée de manière amovible dans la section de chargement de cartouche en inclinant la cartouche de toner vers le bas vers une extrémité et, dans cet état, en insérant la partie d'extrémité correspondante de la semelle de chargement (92), qui est disposée à ladite extrémité de la cartouche, entre les surfaces d'épaulement (52,54) et les saillies de maintien (72,74) dans la section de chargement de cartouche, puis en abaissant l'extrémité opposée de la cartouche de toner de sorte que les parties de semelle latérales (94,96) de la semelle de chargement (92) passent de manière élastique au-dessus des saillies d'engagement (76,78) dans la section de chargement de cartouche, respectivement.

2. Cartouche de toner selon la revendication 1, qui comprend en outre une paire de parois latérales (84,86) s'étendant au-dessus de ladite paire de parties de semelle latérales (94,96) de la semelle de chargement (92) , et des parties renfoncées d'accrochage à doigts (110,112) correspondant respectivement à la paire de saillies d'engagement (76,78) dans la section de chargement de cartouche, lesdites parties renfoncées (110,112) étant disposées dans la paire de parois latérales (84,86), respectivement.

3. Cartouche de toner adaptée pour être chargée de manière amovible dans une section de chargement de cartouche (46) d'un dispositif de développement d'images électrostatiques latentes, ladite section de chargement de cartouche ayant un dessus ouvert et comportant une paire de surfaces d'épaulement de support tournées vers le haut (52,54) s'étendant longitudinalement espacées latéralement l'une par rapport à l'autre, des surfaces latérales de guidage (56,58) s'élevant respectivement depuis les des bords extérieurs des surfaces d'épaulement (52,54) et une surface arrière de guidage (70) s'étendant entre les extrémités arrières des surfaces latérales de guidage (56,58), la cartouche de toner étant caractérisée par un organe de fermeture (114) entourant les deux côtés et une extrémité de ladite cartouche, ledit organe de fermeture (114) étant formé d'une matière souple, et

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ladite cartouche étant adaptée pour être chargée de manière amovible dans la section de chargement de cartouche en inclinant la cartouche de toner vers le bas vers son autre extrémité et, dans cet état, en positionnant cette autre extrémité de la cartouche sur les surfaces d'épaulement (52,54) dans la section de chargement de cartouche, puis en abaissant ladite extrémité de la cartouche de toner de telle sorte que l'organe de fermeture (114) soit mis en contact intime avec les surfaces latérales de guidage (56,58) et la surface arrière de guidage (70) dans la section de chargement de cartouche et ladite extrémité de la cartouche de toner soit positionnée sur les surfaces d'épaulement (52,54) dans la section de chargement de cartouche.

4. Cartouche de toner selon la revendication 3, dans laquelle l'organe de fermeture (114) est formé de caoutchouc mousse.

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