Description

BACKGROUND OF THE INVENTION

The present invention relates to a cartridge unit for containing toner powder and adapted to a developer of a copying machine etc. to supply toner powder.

One type of conventional toner cartridges is shown in the Japanese Published Unexamined Utility Model Application No. S60-145452, whose structure is illustrated in Fig. 15A. The mouth of the toner cartridge 201 is closed by a seal member 202, and an extension of the seal member 202 is folded back. When the toner cartridge 201 is attached to a toner hopper 203, the end of the extension is hooked by a pin 204 provided near the entrance of the toner hopper 3, as shown in Fig. 15B. As the cartridge 201 is pushed down the entrance of the toner hopper 203, the seal member 202 is deprived from the mouth and the toner powder in the cartridge falls down to the toner hopper 203.

Another example is shown the in the Japanese Published Unexamined Utility Model Application No. S59-9364, whose structure is illustrated in Fig. 16A. In this case, the mouth of a toner cartridge 205 is sealed by a plug 208. The toner cartridge 205 is attached to the toner hopper 207 by a male screw 206 formed on the outside surface of the cartridge body and a female screw formed on the inside surface of the entrance of the toner hopper 207. On a shelf provided at a midway of the hopper entrance stands a thrust rod 209. As the cartridge body is screwed down the entrance of the hopper 207, the thrust rod 209 pushes up the plug 208 and opens the mouth.

A third type of a conventional toner cartridge is contemplated in EP-0 225 745 A1. The according toner dispensing cartridge has an exit aperture for dispensing toner material to the machine and this exit aperture is closable by a sliding seal arrangement. The sliding seal arrangement comprises an inner sliding seal and an outer sliding seal. In the closed position of the seal arrangement the outer seal covers and prevents access to the inner seal. Only the inner seal is in direct contact with the toner and it is only accessible when the outer seal is removed.

In any case, once the seal of the mouth of conventional toner cartridges is broken, the seal cannot recover the mouth. One problem is that when the toner powder in the cartridge is finished and the cartridge is removed from the toner hopper, the mouth is open and the remnant powder scatters. Another problem is that an operator can easily break the seal member 202 or push the plug 208 outside the hopper 203, 207 by mistake. The problem is more serious in this case.

SUMMARY OF THE INVENTION

An object of the present invention is to solve such problems and provide a cartridge unit that can assuredly contain powder (e.g., toner powder for a copying machine, etc.) and prevents unintentional spill-out of the powder.

Another object of the present invention is to provide a shutter for the cartridge that surely locks while the cartridge is not attached to a powder receiver (such as a toner hopper) but is easily and automatically released when the cartridge is attached to the powder receiver.

Still another object of the present invention is to keep the outside of the cartridge unit always clean even after the cartridge is used to supply toner powder to the toner hopper.

These and other objects of the present invention are achieved by the cartridge unit of the present invention which comprises:

a cartridge for containing powder and having a mouth through which the powder is supplied;

an adapter fixed to the mouth of the cartridge and having a hole through which the powder is supplied and a slit engraved from a side end of the adapter across the hole, the adapter being attachable to the powder receiver;

an inner shutter that can be inserted in the slit of the adapter for shutting the hole; and

an outer shutter that can be attached on the outside of the adapter for covering the hole of the adapter.

Many other features of the present invention is revealed in detail in the following description of an embodiment.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

Fig. 1 is an inside view of a copying machine that a toner cartridge as an embodiment of the present invention is attached.

Fig. 2A is a perspective view of a hopper shutter, Fig. 2B is a perspective view of the entrance of the toner hopper of the copying machine, Fig. 2C show the detail of a notch formed at the front end of the hopper shutter shown in Fig. 2A, and Fig. 2D show the detail of a claw placed on a supplying site of the toner hopper entrance shown in Fig. 2B.

Fig. 3 is a perspective view of the toner cartridge with an adapter.

Fig. 4A is a perspective view of the toner cartridge, Fig. 4B is a perspective view of the adapter as detached from the cartridge, and Fig. 4C is a perspective view of the reverse side of the adapter shown in Fig. 4B.

Fig. 5 is a perspective view of an inner shutter of the adapter.

Fig. 6 is a perspective view of an outer shutter of the adapter.

Fig. 7 is a plan view of the hopper entrance as the cartridge/adapter unit is placed at a preparation site.

Fig. 8 is a cross-sectional view of the hopper entrance and the cartridge/adapter unit before the unit is placed on the preparation site.

Fig. 9A is a cross-sectional view of the hopper entrance and the cartridge/adapter unit when the unit is placed on the preparation site, Fig. 9B shows the detail of a hook 126 and a table 105 when the hook 126 is pushed up by the table 105, Fig. 9C shows the detail of a leader 1212, claw 107 and a notch when the claw 107 engages with the notch, and Fig. 9D shows the detail when the claw 107 is pushed down by the leader 1212 and is disengaged from the notch.

Fig. 10 is a cross-sectional view of the hopper entrance and the cartridge/adapter unit when the unit is being moved from the preparation site to the supplying site.

Fig. 11 is a cross-sectional view of the hopper entrance and the cartridge/adapter unit when the unit is placed at the supplying site.

Fig. 12 is a cross-sectional view of the hopper entrance and the cartridge/adapter unit when the unit is placed at the supplying site and the inner shutter is drawn out to supply toner powder to the toner hopper.

Fig. 13A shows the detail of a cantilever 145, foot 132 and recess 129 when the cantilever 145 engages with the recess 129, and Fig. 13B is a cross-sectional view of the hopper entrance and the cartridge/adapter unit when the unit is placed at the supplying site and the inner shutter returns to the shutting position.

Fig. 14A is a cross-sectional view of the hopper entrance and the cartridge/adapter unit when the unit is being moved from the supplying site to the preparation site, and Fig. 14B shows the detail of a handle of the inner shutter 13, the hook 126 and a rear notch 146 when the hook 126 locks the inner shutter 13.

Fig. 15A is a cross-sectional view of a conventional toner cartridge before the seal is broken, and Fig. 15B shows after the seal is broken.

Fig. 16A is a cross-sectional view of another conventional toner cartridge before it is completely attached to the toner hopper, and Fig. 16B shows after it is completely attached.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the toner cartridge unit of the present invention is used in a copying machine as shown in Fig. 1. The copying machine is equipped with: an automatic document handler 3 on the top of the housing 1; a paper supplier boxes 2 at the right side of the housing 1; and a sorter 9 at the left side of the housing 1. Inside of the housing 1 is provided: an optical system 4 for reading an original; a photoconductive drum 5 for producing an electrostatic latent image of the original; a developer unit 6 for developing the latent image into a toner powder image; a transferer 7 for transferring the toner image on the drum 5 to a sheet of paper; and a fuser 8 for heat-fixing the toner image on the paper sheet.

A toner hopper 10 is provided above the developer unit 6 to supply toner powder to the developer unit 6. The toner hopper 10 is high enough to reach the upper deck of the housing 1. Fig. 2B shows the entrance of the toner hopper 10. A circular hole 101 at the center of the hopper entrance is for admitting the toner powder. At either side of the hole 101 is provided a guide rail 102 whose cross section is inverse-L shaped. A hopper shutter 103 as shown in Fig. 2A slides on the guide rails 102 to shut the hole 101. A stiff edge 103a is formed at either lateral edge of the shutter 103 to slide on the rail 102 and the shutter 103 moves as shown by the arrow S. At the front (left in Fig. 2B) end of the hopper entrance is provided a preparation site 104 for initially attaching a toner cartridge before sliding the cartridge to the hole 101. The whole hopper entrance is normally closed by a cover 105. The above-mentioned members are made of plastics.

The toner cartridge adaptable to the toner hopper 10 is shown in Fig. 3. The toner cartridge 11 is shaped cylindrical with the mouth 15 at the bottom, and an adapter 12 is attached around the mouth 15. As shown in Figs. 4A and 4B, a ring 121 is formed on a base plate 122 of the adapter 12, and the mouth 15 of the cartridge 11 is forcefully inserted into the ring 121. Instead of the friction fixture, the mouth 15 and the adapter 12 can be fixed by a screw. At the center of the rectangular base plate 122 is formed a hole 124. The diameter of the hole 124 is the same as the inner diameter of the ring 121. At the center of the thickness of the base plate 122 is formed a slit 123, and the slit 123 opens at the periphery of the hole 124 and at one end (front end) 127 of the base plate 122. Side extensions 125 are formed at opposing lateral ends of the rectangular base plate 122 for sliding on the guide rails 102.

In the slit 123 of the base plate 122 is inserted an inner shutter 13 as shown in Fig. 5 to shut the hole 124 of the adapter 12. Besides the inner shutter 13, an outer shutter 14 as shown in Fig. 6 is provided for the adapter 12. At either lateral edge of the outer shutter 14 is formed a guide rail 141 for admitting each of the side extensions 125. The outer shutter 14 is normally attached to the adapter 12 with the guide rails 141 engaged with the side extensions 125 (Fig. 3). The inner shutter 13 and the outer shutter 14 both shut the hole 124 of the adapter 12 and prevent toner powder from coming out of the cartridge 11. As shown in Fig. 5, a handle 131 (an embodiment of the first member) is formed at the front end of the inner shutter 13 for facilitate the handling of the inner shutter 13. Similarly, a handle 142 is formed at the front end of the outer

shutter 14. The height of the plate-like handle 142 of the outer shutter 14 is designed high enough so that the handel 142 of the outer shutter 14 pushes the handle 131 of the inner shutter 13 when the outer shutter 14 is slid on the side extensions 125 of the base plate 122 to shut the hole 124 (Fig. 3).

From the front end of the base plate 122 project two T-shaped hooks 126 The hooks 126 are vertically resilient. At the front end of the outer shutter 14 (and at the sides of the handle 142) are formed front notches 143 and at the other (rear) end of the outer shutter are formed rear notches 146. At the end of each of the rear notches 146 is formed a slope. The position of the front notches 143 and the rear notches 146 of the outer shutter 14 correspond to the hooks 126 of the base plate 122. When the adapter 12 is slid on the outer shutter 14 to shut or open the hole 124, the slopes of the rear notches 146 facilitates the lower edge of the T-shaped hooks 126 to ride on or off the outer shutter 14. When the outer shutter 14 completely shuts the hole 124, the lower edge of the T-shaped hook 126 engages with each of the front notches 143, thus the outer shutter 14 is locked on the adapter 12.

As shown in Fig. 2B, two low circular protrusions 106 are formed on the floor of the front preparation site 104. At the corresponding places of the outer shutter 14 are formed circular holes 144 for admitting the protrusions 106. When the adapter 12 with the outer shutter 14 is placed on the preparation site 104, the outer shutter 14 alone is arrested by the protrusions 106. At the front end of the preparation site 104 are formed two rectangular tables 105 corresponding to the front notches 143 of the outer shutter 14. The height of the tables 105 is larger than the thickness of the plate of the outer shutter 14, so that the hooks 126 are pushed up by the tables 105 and is disengaged from the front notches 143 when the adapter 12 with the outer shutter 14 is placed on the preparation site 104. The outer shutter 14 and the corresponding members are so designed that only the outer shutter 14 is left on the preparation site 104 when the cartridge 11 and the adapter 12 (cartridge/adapter unit) are pushed toward the hole 101. When the cartridge/adapter unit is placed above the hole 101 (supplying site 109), the handle 131 of the inner shutter 13 is released from the handle 142 of the outer shutter 14 and the inner shutter 13 can be drawn out of the slit 123.

As shown in Fig. 2A, a thick end 103b is formed at the front end of the hopper shutter 103. At the rear end of the lower surface of the base plate 122 of the adapter 12 is formed a recess 128 (Fig. 4C). When the cartridge/adapter unit is placed on the preparation site 104, the recess 128 fits the thick end 103b of the hopper shutter 103 closing the hole 101. When the adapter 12 is slid toward the hole 101, the edge of the recess 128 pushes the thick end 103b and so the hopper shutter 103 opens the hole 101 (Fig. 10).

As shown in Fig. 5, two feet 132 are formed at the front end of the inner shutter 13. At the rear end of the outer shutter 14 corresponding to the positions of the feet 132 are formed two vertically resilient cantilevers 145 whose ends rise up with slopes to the front side (Fig. 6). At the front end of the lower surface of the base plate 122 of the adapter 12 are formed two recesses 129 corresponding to the positions of the rising up ends of the cantilevers 145 (Figs. 4B and 4C). As shown in Fig. 13B, when the cartridge/adapter unit is placed just above the hole 101 and the inner shutter 13 completely inserted in the slit 123, the feet 132 of the inner shutter 13 pushes down the cantilevers 145 of the outer shutter 14 and disengages the cantilevers 145 from the recesses 129 of the base plate 122. When the inner shutter 13 is drawn out of the slit 123, the feet 132 no more pushes down the cantilevers 145 and the cantilevers 145 return to the straight position to engage with the recesses 129 of the base plate 122 of the adapter 12. This prevents the base plate 122 (so the adapter 12 and the cartridge 11) from being dragged to the preparation site 104 when the inner shutter 13 is drawn out of the slit 123, and the cartridge 11 assuredly remains above the hole 101. On the other hand, when the inner shutter 13 is completely inserted in the slit 123, the cantilevers 145 are pushed down and the base plate 122 (so the adapter 12 and the cartridge 11) can be moved to the preparation site 104.

As shown in Fig. 2A, an angle 103c is formed at the center of the front end of the hopper shutter 103. Corresponding to that, as shown in Figs. 4B and 4C, an angle 1211 is formed at the rear end of the back surface of the adapter 12. When the adapter 12 is placed at the preparation site 104, the angle 1211 of the adapter 12 comes to the rear of the angle 103c of the hopper shutter 103, as shown in Fig. 7. Thus, when the adapter 12 is moved from the site of the hole 101 (supplying site 109) to the preparation site 104, the angle 1211 of the adapter 12 pulls the hopper shutter 103 by the angle 103c to shut the hole 101. At each side corner of the rear end of the hopper shutter 103 is formed a hook 103f which engages with one of the guide rails 102 to stop the hopper shutter 103 just above the hole 101 when the hopper shutter 103 is pulled by the adapter 12.

As shown in Fig. 5, a protrusion 133 is formed at the rear end of the inner shutter 13 in order to prevent the inner shutter 13 from falling off the slit 123.

As shown in Fig. 2A, a notch 103d is formed at either corner of the front end of the hopper shutter 103, which is detailed in Fig. 2C. The notch 103d is shaped rectangular with a small peninsula 103d1, forming an L-shaped notch with an outer notch 103d3 and an inner notch 103d2. Corresponding to each of the notches 103d, a vertically resilient claw 107 is formed at a rather front end and inside of each guide rail 102 on the upper surface of the hopper 10, as

shown in Fig. 2B. The claw 107 is detailed in Fig. 2D, in which the free end of the claw 107 rises upward, and half 107a of the free end is straight-cut and the other half 107b is round. The straight-cut half 107a engages with the inner notch 103d2 of the hopper shutter 103 and prevents the shutter 103 from moving rearward when the shutter 103 completely shuts the hole 101. Corresponding to each of the claws 107, a leader 1212 is formed at the rear end of the undersurface of the adapter 12. When the adapter 12 is pushed rearward toward the hole 101, the leaders 1212 push down the round half 107b part of the claws 107 and releases the hopper shutter 103 to be pushed rearward by the adapter 12.

The operation of embodiment is now described. The cross-sectional figures in Fig. 8 etc. are not necessarily taken on the same line. First, a toner cartridge 11 as shown in Fig. 4A is fixed to the adapter 12 as shown in Fig. 3. Then the inner shutter 13 is inserted in the slit 123 of the base plate 122 of the adapter 12, and the outer shutter 14 is attached to the adapter 12 with the guide rails 141 fit on the side extensions 125. When the outer shutter 14 is completely attached to the adapter 12, the hooks 126 engage with the front notches 143 of the outer shutter 14 and the outer shutter 14 is locked on the adapter 12. Since the handle 142 of the outer shutter 14 restricts the handle 131 of the inner shutter 13, the inner shutter 13 is also locked on the adapter 12. These shutter locking mechanisms of the adapter 12 assuredly prevent the toner from mistakenly spilling out of the cartridge 11.

Then, as shown in Fig. 8, the toner cartridge/adapter unit is placed on the preparation site 104 of the toner hopper 10. Sponge sealant 50 is shown in Fig. 8 for completely sealing the gap between the mouth of the slit 123 and the inner shutter 13. The adapter 12 is placed at a preset appropriate position on the preparation site 104 with the protrusions 106 on the floor of the preparation site 104 adapted in the holes 144 of the outer shutter 14. At this position of the adapter 12, the angle 1211 at the rear end of the adapter 12 comes to the rear of the front end angle 103c of the hopper shutter 103, and the recess 128 of the base plate 122 of the adapter 12 comes to the front of the thick front end 103b of the hopper shutter 103.

As shown in Fig. 9B in detail, when the adapter 12 is correctly placed, the hooks 126 of the adapter 12 are pushed upward by the tables 105 and the outer shutter 14 is released from the hooks 126. Further, as shown in Fig. 9A, the other arms of the T-shaped hooks 126 stop the handle 131 of the inner shutter 13 when the hooks 126 are pushed upward by the tables 105. While the cartridge/adapter unit is being pushed rearward, the hooks 126 slide on the surface of the outer shutter 14 and the inner shutter 13 keeps locking the hole 124.

At this position (i.e., at the preparation site 104) of the adapter 12, the straight-cut half ends 107a of the claws 107 engage with the inner notch 103d2 of the hopper shutter 103 and the shutter 103 is locked above the hole 101 of the hopper 10 (Figs. 2C, 2D and 7). The other round half ends 107b rise up from the level of the hopper shutter 103 through the outer notch 103d3 (Figs. 2C and 2D).

Then the operator pushes the toner cartridge 11 rearward to the hole 101. As the adapter 12 moves rearward, the leaders 1212 of the base plate 122 push down the round half ends 107b, as shown in Figs. 9C and 9D, and the straight-cut half ends 107a are released from the inner notch 103d2. Thus the hopper shutter 103 is released and become movable.

As shown in Fig. 10, as the toner cartridge 11 is pushed rearward, the edge of the recess 128 pushes the thick front end 103b of the hopper shutter 103 and the hopper shutter 103 opens the hole 101. While the toner cartridge 11 is pushed at a rather high position, the cartridge 11 does not fall rearward because the side extensions 125 are guided by the guide rails 102 (Figs. 2B and 4B).

When the cartridge 11 is further pushed and the rear end 103e of the hopper shutter 103 abuts the rear end 108 of the hopper entrance, the adapter 12 comes just above the hole 101 of the hopper 10. At this position of the adapter 12, the hooks 126 fall in the rear notches 146 of the outer shutter remaining on the preparation site 104 and the handle 131 of the inner shutter 13 is released from the hooks 126.

Then the inner shutter 13 is drawn out of the slit 123. As shown in Figs. 13A and 13B, when the inner shutter 13 is drawn slightly forward, the feet 132 at the front end of the inner shutter 13 release the cantilevers 145 of the outer shutter 14. The cantilevers 145 rise up and the tip come in the recesses 129 of the front end of the base plate 122 of the adapter 12. This prevents the adapter 12 and the toner cartridge 11 from being dragged forward as the inner shutter 13 is drawn out of the slit 123.

As shown in Fig. 12, the toner powder in the cartridge 11 falls down to the hopper 10 when the inner shutter 13 clears the hole 124 of the adapter 12. The inner shutter 13 cannot be removed from the slit 123 because of the protrusion 133.

After the cartridge-load of the toner powder is supplied to the developer unit 6, the inner shutter 13 is pushed to shut the hole 124 of the adapter 12, as shown in Fig. 13B. As the inner shutter 13 shuts the hole 124, the feet 132 of the inner shutter 13 push down the cantilevers 145 of the outer shutter 14. This releases the recesses 129 from the rising up tips of the cantilevers 145, and the cartridge/adapter unit can be moved forward.

After the inner shutter 13 is completely inserted in the slit 123, the cartridge/adapter unit is moved toward the preparation site 104. While the adapter 12

is moved this way, the angle 1211 of the adapter 12 pulls the hopper shutter 103 by the angle 103c (Fig. 14A). When the adapter 12 is placed just at the preset preparation site 104, the hopper shutter 103 completely shuts the hole 101 of the hopper 10. Thus no toner powder comes out of the hopper 10 and the environment of the copying machine is kept clean, and dusts are prevented from coming in the developer unit 6. Further, when the adapter 12 is moved forward, the hooks 126 of the adapter 12 slide up the slopes of the rear notches 146 and ride on the level of the outer shutter 14, which locks the inner shutter 13 (Fig. 14B).

When the cartridge/adapter unit is correctly placed on the preparation site 104, as shown in Figs. 7 and 9A, the side extensions 125 of the adapter 12 are out of the guide rails 102 and the cartridge/adapter unit can be lifted from the preparation site 104 of the hopper 10. When the cartridge 11 and the adapter 12 is lifted, the outer shutter 14 is also lifted because the guide rails 141 of the outer shutter 14 engages with the side extensions 125. When the adapter 12 is lifted, the hooks 126 that have been pushed upward by the tables 105 become straight and the outer shutter 14 is locked by the hooks 126 and the front notches 143. The inner shutter 13 is also locked by handle 142 of the outer shutter 14. Thus, there is no opening of the inner and outer shutters 13 and 14 of the cartridge/adapter unit when it is removed from the hopper 10.

Since the outer shutter 14 stays on the preparation site 104 while the toner is supplied from the cartridge 11 to the developer unit 6, the outer shutter 14 is free from the contamination of the toner powder. Thus the cartridge/adapter unit is always clean. In the embodiment, it is preferable to make resilient members, such as the hooks 126 etc., from elastic plastics.

As described above, the mouth 15 of the toner cartridge 11 is shut by the inner shutter 13 and the outer shutter 14, and the shutters 13 and 14 are locked to the adapter 12 when the cartridge/adapter unit is not attached to the hopper 10. Since the outer shutter 14 cannot be contaminated by toner powders when the toner powder is supplied from the cartridge 11 to the hopper 10 of the developer unit 6, the cartridge/adapter unit is always clean and does not contaminate the operator or the environment of the copying machine. The locking/releasing mechanisms of the shutters 13, 14 and 103 are dexterously designed in the present invention so that sequential locking/releasing operations are performed automatically and erroneous operations can be prevented. For example, when the cartridge/adapter unit is not attached to the hopper 10, the inner shutter 13 and outer shutter 14 are both locked and cannot be removed from the adapter 12. When the cartridge/adapter unit is placed on the preparation site 104 of the toner hopper 10, the outer shutter 14 is released from the adapter 12 and fixed on the preparation site 104. When the cartridge/adapter unit is pushed toward the supplying site 109, the hopper shutter 103 is automatically unlocked and pushed away to clear the hole 101. When the inner shutter 13 is drawn out of the adapter 12 against the friction between the slit 123, the cartridge/adapter unit is automatically locked on the supplying site 109.

Claims

1. A cartridge unit having an inner shutter and an outer shutter for closing a mouth of a cartridge containing powder, which is attached by way of a preparation site to a supplying site of a powder receiver for supplying the powder thereto,

an adaptor (12) fixed to the mouth (15) of the cartridge (11) and attachable to the powder receiver, and having a hole (124) through which the powder is supplied, characterized by a slit (123) engraved from a front end of the adaptor (12) across the hole (124) for inserting the inner shutter (13) thereinto, and a side extension (125) extending from either lateral side of the adaptor (12) for attaching the outer shutter (14) thereto, wherein the outer shutter (14) keeps the inner shutter (13) at a closed position and covers a bottom surface of the adaptor (12) including the hole (124) when the outer shutter (14) is at a closed position;

a first locking mechanism (126,143) for locking the outer shutter (14) to the adaptor (12) at a closed position, when the cartridge (11) is not attached to the powder receiver;

a first releasing mechanism (105) for releasing the outer shutter (14) which has been locked to the adaptor (12) by the first locking mechanism (126,143), when the cartridge (11) is disposed at the preparation site (104) of the powder receiver;

a second locking mechanism (126,131) for locking the inner shutter (13) to the adaptor (12) at a closed position, when the cartridge (11) is disposed at the preparation site (104);

a third locking mechanism (106,144) for locking the outer shutter (14) at the preparation site (104), when the cartridge (11) is attached to the powder receiver;

a second releasing mechanism (146) for releasing the inner shutter (13) which has been locked to the adaptor (12) by the second locking mechanism (126,131), when the cartridge (11) is moved to the supplying site (109) of the powder receiver;

a fourth locking mechanism (129,145) for locking the adaptor (12) at the supplying site

is moved this way, the angle 1211 of the adapter 12 pulls the hopper shutter 103 by the angle 103c (Fig. 14A). When the adapter 12 is placed just at the preset preparation site 104, the hopper shutter 103 completely shuts the hole 101 of the hopper 10. Thus no toner powder comes out of the hopper 10 and the environment of the copying machine is kept clean, and dusts are prevented from coming in the developer unit 6. Further, when the adapter 12 is moved forward, the hooks 126 of the adapter 12 slide up the slopes of the rear notches 146 and ride on the level of the outer shutter 14, which locks the inner shutter 13 (Fig. 14B).

When the cartridge/adapter unit is correctly placed on the preparation site 104, as shown in Figs. 7 and 9A, the side extensions 125 of the adapter 12 are out of the guide rails 102 and the cartridge/adapter unit can be lifted from the preparation site 104 of the hopper 10. When the cartridge 11 and the adapter 12 is lifted, the outer shutter 14 is also lifted because the guide rails 141 of the outer shutter 14 engages with the side extensions 125. When the adapter 12 is lifted, the hooks 126 that have been pushed upward by the tables 105 become straight and the outer shutter 14 is locked by the hooks 126 and the front notches 143. The inner shutter 13 is also locked by handle 142 of the outer shutter 14. Thus, there is no opening of the inner and outer shutters 13 and 14 of the cartridge/adapter unit when it is removed from the hopper 10.

Since the outer shutter 14 stays on the preparation site 104 while the toner is supplied from the cartridge 11 to the developer unit 6, the outer shutter 14 is free from the contamination of the toner powder. Thus the cartridge/adapter unit is always clean. In the embodiment, it is preferable to make resilient members, such as the hooks 126 etc., from elastic plastics.

As described above, the mouth 15 of the toner cartridge 11 is shut by the inner shutter 13 and the outer shutter 14, and the shutters 13 and 14 are locked to the adapter 12 when the cartridge/adapter unit is not attached to the hopper 10. Since the outer shutter 14 cannot be contaminated by toner powders when the toner powder is supplied from the cartridge 11 to the hopper 10 of the developer unit 6, the cartridge/adapter unit is always clean and does not contaminate the operator or the environment of the copying machine. The locking/releasing mechanisms of the shutters 13, 14 and 103 are dexterously designed in the present invention so that sequential locking/releasing operations are performed automatically and erroneous operations can be prevented. For example, when the cartridge/adapter unit is not attached to the hopper 10, the inner shutter 13 and outer shutter 14 are both locked and cannot be removed from the adapter 12. When the cartridge/adapter unit is placed on the preparation site 104 of the toner hopper 10, the outer shutter 14 is released from the adapter 12 and fixed on the preparation site 104. When the cartridge/adapter unit is pushed toward the supplying site 109, the hopper shutter 103 is automatically unlocked and pushed away to clear the hole 101. When the inner shutter 13 is drawn out of the adapter 12 against the friction between the slit 123, the cartridge/adapter unit is automatically locked on the supplying site 109.

Claims

1. A cartridge unit having an inner shutter and an outer shutter for closing a mouth of a cartridge containing powder, which is attached by way of a preparation site to a supplying site of a powder receiver for supplying the powder thereto,

an adaptor (12) fixed to the mouth (15) of the cartridge (11) and attachable to the powder receiver, and having a hole (124) through which the powder is supplied, characterized by a slit (123) engraved from a front end of the adaptor (12) across the hole (124) for inserting the inner shutter (13) thereinto, and a side extension (125) extending from either lateral side of the adaptor (12) for attaching the outer shutter (14) thereto, wherein the outer shutter (14) keeps the inner shutter (13) at a closed position and covers a bottom surface of the adaptor (12) including the hole (124) when the outer shutter (14) is at a closed position;

a first locking mechanism (126,143) for locking the outer shutter (14) to the adaptor (12) at a closed position, when the cartridge (11) is not attached to the powder receiver;

a first releasing mechanism (105) for releasing the outer shutter (14) which has been locked to the adaptor (12) by the first locking mechanism (126,143), when the cartridge (11) is disposed at the preparation site (104) of the powder receiver;

a second locking mechanism (126,131) for locking the inner shutter (13) to the adaptor (12) at a closed position, when the cartridge (11) is disposed at the preparation site (104);

a third locking mechanism (106,144) for locking the outer shutter (14) at the preparation site (104), when the cartridge (11) is attached to the powder receiver;

a second releasing mechanism (146) for releasing the inner shutter (13) which has been locked to the adaptor (12) by the second locking mechanism (126,131), when the cartridge (11) is moved to the supplying site (109) of the powder receiver;

a fourth locking mechanism (129,145) for locking the adaptor (12) at the supplying site

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(109), when the inner shutter (13) is opened; and

a third releasing mechanism (132) for releasing the adaptor (12) which has been locked at the supplying site (109) by the fourth locking mechanism (129,145), when the inner shutter (13) is closed.

2. A cartridge unit according to claim 1, characterized in that

the inner shutter (13) is provided with a handle (131) on a front end thereof,

the outer shutter (14) is provided with a handle (142) on a front end thereof, which abuts the handle (131) of the inner shutter (13) and keeps the inner shutter (13) at the closed position when the outer shutter (14) is at the closed position,

the first locking mechanism (126,143) comprises a T-shaped resilient hook (126) provided on a front end of the adaptor (12) and a notch (143) formed in the front end of the outer shutter (14),

the first releasing mechanism (105) is a table (105) formed on a front end of a floor of the preparation site (104), which disengages the T-shaped resilient hook (126) from the notch (143),

the second locking mechanism (126,131) comprises the T-shaped resilient hook (126) of the adaptor (12) and the handle (131) of the inner shutter (13),

the third locking mechanism (106,144) comprises a protrusion (106) provided on the floor of the preparation site (104), and a hole (144) provided in the outer shutter (14),

the second releasing mechanism (146) is a notch (146) formed at a rear end of the outer shutter (14), which disengages the T-shaped resilient hook (126) from the handle (131),

the fourth locking mechanism (129,145) comprises a recess (129) formed at the front end of the adaptor (12), and a cantilever (145) provided at the rear end of the outer shutter (14), and

the third releasing mechanism (132) is a foot (132) projecting downward from the front end of the inner shutter (13), which disengages the cantilever (145) from the recess (129).

3. A cartridge unit according to claim 1, characterized in that

a guiding mechanism is provided for guiding movement of the cartridge (11) and the adaptor (12) between the preparation site (104) and the supplying site (109) of the powder receiver, which comprises:

the side extension (125) extending from either lateral side of the adaptor (12);

a guide rail (141) provided at either lateral side of the outer shutter (14), which engages with the side extension (125) of the adaptor (12) when the cartridge (11) is at the preparation site (104); and

a guide rail (102) provided at either side of a floor of the supplying site (109), which engages with the side extension (125) of the adaptor (12) when the cartridge (11) is at the supplying site (109).

4. A cartridge unit according to claim 3, characterized in that

a third shutter (103) having a stiff edge is provided at the supplying site (109) of the powder receiver for shutting a hole (101) for admitting powder in the powder receiver, and the third shutter (103) is pushed by the adaptor (12) with the stiff edge being guided by the guide rail (102) of the supplying site (109) when the cartridge (11) is moved from the preparation site (104) to the supplying site (109).

5. A cartridge unit according to claim 1, characterized by

a third shutter (103) provided at the supplying site (109) of the powder receiver for shutting a hole (101) for admitting powder in the powder receiver;

a fifth locking mechanism (103d,107) for locking the third shutter (103) at a closed position, when the cartridge (11) is not disposed on the supplying site (109);

a fourth releasing mechanism (1212) for releasing the third shutter (103) locked by the fifth locking mechanism (103d,107), when the cartridge (11) is being moved from the preparation site (104) to the supplying site (109), the third shutter (103) being pushed to an open position by the adaptor (12) after released; and

a linking mechanism (103c,1211) for linking the third shutter (103) to the adaptor (12), when the cartridge (11) is being moved from the supplying site (109) to the preparation site (104), whereby the third shutter (103) is dragged to the closed position.

6. A cartridge unit according to claim 5, characterized in that

the fifth locking mechanism (103d,107) comprises a notch (103d) formed at a front end of the third shutter (103) and a resilient claw (107) provided at a front end of a floor of the supplying site (109) of the powder receiver,

the fourth releasing mechanism (1212) is a leading protrusion (1212) formed at a rear end of the adaptor (12), which disengages the claw (107) from the notch (103d), and

the linking mechanism (103c,1211) comprises an angle (103c) provided at a front edge of

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the third shutter (103) and an angle (1211) provided at a rear edge of the adaptor (12).

Patentansprüche

1. Kartuscheneinheit mit einem inneren Verschluß und einem äußeren Verschluß zum Verschließen einer Öffnung einer Pulver enthaltenden Kartusche, die über einen Vorbereitungsbereich an einem Zufuhrbereich einer Pulveraufnahmeeinrichtung zur Zufuhr des Pulvers zu dieser angeordnet ist und einem Anschluß (12), der an der Öffnung (15) der Kartusche (11) angeordnet ist, an der Pulveraufnahmeeinrichtung angeordnet werden kann und eine Bohrung (124) aufweist, durch die das Pulver zugeführt wird,
gekennzeichnet durch
einen von einem vorderen Ende des Anschlusses (12) über die Bohrung (124) eingeprägten Schlitz (123) zum Einführen des inneren Verschlusses (13) und eine seitliche Verlängerung (125), die sich von einer der Seiten des Anschlusses (12) zum Anordnen des äußeren Verschlusses (14) erstreckt, wobei der äußere Verschluß (14) den inneren Verschluß (13) in einer geschlossenen Position hält und eine Bodenfläche des Anschlusses (12) einschließlich der Bohrung (124) bedeckt, wenn sich der äußere Verschluß (14) in einer geschlossenen Position befindet;
einen ersten Riegelmechanismus (126, 143) zum Verriegeln des äußeren Verschlusses (14) an dem Anschluß (12) in einer geschlossenen Position, wenn die Kartusche (11) nicht an der Pulveraufnahmeeinrichtung angeordnet ist;
einen ersten Freigabemechanismus (105) zum Lösen des äußeren Verschlusses (14), der beim Anordnen der Kartusche (11) an dem Vorbereitungsbereich (104) der Pulveraufnahmeeinrichtung durch den ersten Riegelmechanismus (126, 143) an dem Anschluß (12) verriegelt wurde;
einen zweiten Riegelmechanismus (126, 131) zum Verriegeln des inneren Verschlusses (13) an dem Anschluß (12) in einer geschlossenen Position, wenn die Kartusche (11) an dem Vorbereitungsbereich (104) angeordnet ist;
einen dritten Riegelmechanismus (106, 144) zum Verriegeln des äußeren Verschlusses (14) an dem Vorbereitungsbereich (104), wenn die Kartusche (11) an der Pulveraufnahmeeinrichtung angeordnet ist;
einen zweiten Freigabemechanismus (146) zum Lösen des inneren Verschlusses (13), der beim Bewegen der Kartusche (11) zu dem Zufuhrbereich (109) der Pulveraufnahmeeinrichtung durch den zweiten Riegelmechanismus (126, 131) an dem Anschluß (12) verriegelt wurde;
einen vierten Riegelmechanismus (129, 145) zum Verriegeln des Anschlusses (12) an dem Zufuhrbereich (109), wenn der innere Verschluß (13) geöffnet wird; und
einen dritten Freigabemechanismus (132) zum Lösen des Anschlusses (12), der beim Schließen des inneren Verschlusses (13) durch den vierten Riegelmechanismus (129, 145) an dem Zufuhrbereich (109) verriegelt wurde.

2. Kartuscheneinheit nach Anspruch 1,
dadurch gekennzeichnet, daß
der innere Verschluß (13) an seinem vorderen Ende einen Griff (131) aufweist;
der äußere Verschluß (14) an seinem vorderen Ende einen Griff(142) aufweist, der gegen den Griff (131) des inneren Verschlusses (13) stößt und den inneren Verschluß (13) in der geschlossenen Position hält, wenn sich der äußere Verschluß (14) in der geschlossenen Position befindet,
der erste Riegelmechanismus (126, 143) einen T-förmigen elastischen Haken (126), der am vorderen Ende des Anschlusses (12) vorgesehen ist, und eine am vorderen Ende des äußeren Verschlusses (14) ausgebildete Kerbe (143) umfaßt,
der erste Freigabemechanismus (105) eine an einem vorderen Ende eines Bodens des Vorbereitungsbereichs (104) ausgebildete Platte (105) ist, die den T-förmigen, elastischen Haken (126) von der Kerbe (143) löst,
der zweite Riegelmechanismus (126, 131) den T-förmigen, elastischen Haken (126) des Anschlusses (12) und den Griff(131) des inneren Verschlusses (13) umfaßt,
der dritte Riegelmechanismus (106, 144) einen am Boden des Vorbereitungsbereichs (104) vorgesehenen Vorsprung (106) und eine in dem äußeren Verschluß (14) vorgesehene Bohrung (144) umfaßt,
der zweite Freigabemechanismus (146) eine an einem hinteren Ende des äußeren Verschlusses (14) ausgebildete Kerbe (146) ist, die den T-förmigen elastischen Haken (126) von dem Griff (131) löst,
der vierte Riegelmechanismus (129, 145) eine an dem vorderen Ende des Anschlusses (12) ausgebildete Aussparung (129) und einen an dem hinteren Ende des äußeren Verschlusses (14) ausgebildeten Ausleger (145) umfaßt, und
der dritte Freigabemechanismus (132) ein Fuß (132) ist, der von dem vorderen Ende des inneren Verschlusses (13) nach unten ragt und den Ausleger (145) von der Aussparung (129) löst.

3. Kartuscheneinheit nach Anspruch 1,
dadurch gekennzeichnet, daß
ein Führungsmechanismus zum Führen der Bewegung der Kartusche (11) und des Anschlusses

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(12) zwischen dem Vorbereitungsbereich (104) und dem Zufuhrbereich (109) der Pulveraufnahmeeinrichtung vorgesehen ist, folgendes umfassend:
die seitliche Verlängerung (125), die sich von einer der Seiten des Anschlusses (12) erstreckt;
eine an einer der Seiten des äußeren Verschlusses (14) vorgesehene Führungsschiene (141), die sich mit der seitlichen Verlängerung (125) des Anschlusses (12) verhakt, wenn sich die Kartusche (11) an dem Vorbereitungsbereich (104) befindet; und
eine an einer der Seiten eines Bodens des Zufuhrbereichs (109) vorgesehene Führungsschiene (102), die sich mit der seitlichen Verlängerung (125) des Anschlusses (12) verhakt, wenn sich die Kartusche (11) an dem Zufuhrbereich (109) befindet.

4. Kartuscheneinheit nach Anspruch 3, dadurch gekennzeichnet, daß
zum Schließen einer Bohrung (101) zum Einlassen von Pulver in die Pulveraufnahmeeinrichtung ein dritter Verschluß (103) mit einer steifen Kante an dem Zufuhrbereich (109) der Pulveraufnahmeeinrichtung vorgesehen ist und der dritte Verschluß (103) von dem Anschluß (12) gedrückt wird, wobei die steife Kante von der Führungsschiene (102) des Zufuhrbereichs (109) geführt wird, wenn die Kartusche (11) von dem Vorbereitungsbereich (104) zu dem Zufuhrbereich (109) bewegt wird.

5. Kartuscheneinheit nach Anspruch 1, gekennzeichnet durch
einen zum Schließen einer Bohrung (101) zum Einlassen von Pulver in die Pulveraufnahmeeinrichtung an dem Zufuhrbereich (109) der Pulveraufnahmeeinrichtung vorgesehenen dritten Verschluß;
einen fünften Riegelmechanismus (103d, 107) zum Verriegeln des dritten Verschlusses (103) in einer geschlossenen Position, wenn die Kartusche (11) nicht an dem Zufuhrbereich (109) angeordnet ist;
einen vierten Freigabemechanismus (1212) zum Lösen des durch den fünften Riegelmechanismus (103d, 107) verriegelten dritten Verschlusses (103), wenn die Kartusche (11) von dem Vorbereitungsbereich (104) zu dem Zufuhrbereich (109) bewegt wird, wobei der dritte Verschluß (103) nach dem Lösen von dem Anschluß (12) in eine geöffnete Position gedrückt wird; und
einen Verbindungsmechanismus (103c, 1211) zum Verbinden des dritten Verschlusses (103) mit dem Anschluß (12), wenn die Kartusche (11) von dem Zufuhrbereich (109) zu dem Vorbereitungsbereich (104) bewegt wird, wodurch der dritte Verschluß (103) zu der geschlossenen Position gezogen wird.

6. Kartuscheneinheit nach Anspruch 5, dadurch gekennzeichnet, daß
der fünfte Riegelmechanismus (103d, 107) eine an einem vorderen Ende des dritten Verschlusses (103) ausgebildete Kerbe (103d) und eine an einem vorderen Ende eines Bodens des Zufuhrbereichs (109) der Pulveraufnahmeeinrichtung vorgesehene elastische Klaue (107) umfaßt,
der vierte Freigabemechanismus (1212) ein an einem hinteren Ende des Anschlusses (12) vorgesehener führender Vorsprung (1212) ist, der die Klaue (107) von der Kerbe (103d) löst, und
der Verbindungsmechanismus (103c, 1211) einen an einer Vorderkante des dritten Verschlusses (103) vorgesehenen Winkel (103c) und einen an einer Hinterkante des Anschlusses (12) vorgesehenen Winkel (1211) umfaßt.

Revendications

1. Ensemble à cartouche ayant un obturateur interne et un obturateur externe destinés à fermer l'embouchure d'une cartouche contenant une poudre, fixé, par l'intermédiaire d'un emplacement de préparation, à un emplacement de distribution d'un récepteur de poudre afin que la poudre lui soit transmise, un adaptateur (12) fixé à l'embouchure (15) de la cartouche (11) et destiné à être fixé au récepteur de poudre et ayant un trou (124) par lequel la poudre est transmise, caractérisé par une fente (123) formée depuis l'extrémité avant de l'adaptateur (12) transversalement au trou (124) pour l'introduction de l'obturateur interne (13) dans la fente, et un prolongement (125) partant de chaque côté latéral de l'adaptateur (12) pour la fixation de l'obturateur externe (14) à ce prolongement, l'obturateur externe (14) maintenant l'obturateur interne (13) en position de fermeture et recouvrant une surface inférieure de l'adaptateur (12) qui comporte le trou (124) lorsque l'obturateur externe (14) est en position de fermeture,
un premier mécanisme (126, 143) de blocage de l'obturateur externe (14) sur l'adaptateur (12) en position de fermeture, lorsque la cartouche (11) n'est pas fixée au récepteur de poudre,
un premier mécanisme (105) de libération de l'obturateur externe (14) qui a été bloqué sur l'adaptateur (12) par le premier mécanisme (126, 143) de blocage lorsque la cartouche (11) est disposée à l'emplacement de préparation (104) du récepteur de poudre,
un second mécanisme (126, 131) de blocage de l'obturateur interne (13) sur l'adaptateur

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(12) en position de fermeture, lorsque la cartouche (11) est disposée à l'emplacement de préparation (104),

un troisième mécanisme (106, 144) de blocage de l'obturateur externe (14) à l'emplacement de préparation (104) lorsque la cartouche (11) est fixée au récepteur de poudre,

un second mécanisme (146) de libération de l'obturateur interne (13) qui a été bloqué sur l'adaptateur (12) par le second mécanisme (126, 131) de blocage, lorsque la cartouche (11) est déplacée vers l'emplacement de distribution (109) du récepteur de poudre,

un quatrième mécanisme (129, 145) de blocage de l'adaptateur (12) à l'emplacement de distribution (109) lorsque l'obturateur interne (13) est ouvert, et

un troisième mécanisme (132) de libération de l'adaptateur (12) qui a été bloqué à l'emplacement de distribution (109) par le quatrième mécanisme (129, 145) de blocage lorsque l'obturateur interne (13) est fermé.

2. Ensemble à cartouche selon la revendication 1, caractérisé en ce que :

l'obturateur interne (13) a une poignée (131) à son extrémité avant,

l'obturateur externe (14) a une poignée (142) à son extrémité avant, en butée contre la poignée (131) de l'obturateur interne (13) et maintenant l'obturateur interne (13) en position de fermeture lorsque l'obturateur externe (14) est en position de fermeture,

le premier mécanisme (126, 143) de blocage comprend un crochet élastique en T (126) placé à une extrémité avant de l'adaptateur (12) et une encoche (143) formée à l'extrémité avant de l'obturateur externe (14),

le premier mécanisme (105) de libération est une table (105) formée à une extrémité avant d'un plancher de l'emplacement de préparation (104) et sépare le crochet élastique en T (126) de l'encoche (143),

le second mécanisme (126, 131) de blocage comprend un crochet élastique en T (126) de l'adaptateur (12) et la poignée (131) de l'obturateur interne (13),

le troisième mécanisme (106, 144) de blocage comprend une saillie (106) formée sur le plancher de l'emplacement de préparation (104) et un trou (144) formé dans l'obturateur externe (14),

le second mécanisme (146) de libération est une encoche (146) formée à une extrémité arrière de l'obturateur externe (14) et qui sépare le crochet élastique en T (126) de la poignée (131),

le quatrième mécanisme (129, 145) de blocage comporte une cavité (129) formée à l'extrémité avant de l'adaptateur (12) et un organe en porte-à-faux (145) placé à l'extrémité arrière de l'obturateur externe (14), et

le troisième mécanisme (132) de libération est un pied (132) qui dépasse vers le bas à l'extrémité avant de l'obturateur interne (13) et qui sépare l'organe en porte-à-faux (145) de la cavité (129).

3. Ensemble à cartouche selon la revendication 1, caractérisé en ce que :

un mécanisme de guidage est destiné à guider le déplacement de la cartouche (11) et de l'adaptateur (12) entre l'emplacement de préparation (104) et l'emplacement de distribution (109) du récepteur de poudre et comprend :

le prolongement latéral (125) qui dépasse de chaque côté latéral de l'adaptateur (12),

un rail (141) de guidage placé à chaque côté latéral de l'obturateur externe (14) et qui coopère avec le prolongement latéral (125) de l'adaptateur (12) lorsque la cartouche (11) est à l'emplacement de préparation (104), et

un rail (102) de guidage placé de chaque côté d'un plancher de l'emplacement de distribution (109) et qui coopère avec le prolongement latéral (125) de l'adaptateur (12) lorsque la cartouche (11) est à l'emplacement de distribution (109).

4. Ensemble à cartouche selon la revendication 3, caractérisé en ce que :

un troisième obturateur (103) ayant un bord rigide est disposé à l'emplacement de distribution (109) du récepteur de poudre afin qu'il ferme un trou (101) d'admission de poudre dans le récepteur de poudre, et le troisième obturateur (103) est poussé par l'adaptateur (12) avec guidage du bord rigide par le rail de guidage (102) de l'emplacement de distribution (109) lorsque la cartouche (11) est déplacée de l'emplacement de préparation (104) à l'emplacement de distribution (109).

5. Ensemble à cartouche selon la revendication 1, caractérisé par :

un troisième obturateur (103) disposé à l'emplacement de distribution (109) du récepteur de poudre et destiné à fermer un trou (101) pour l'admission de poudre dans le récepteur de poudre,

un cinquième mécanisme (103d, 107) de blocage du troisième obturateur (103) en position de fermeture, lorsque la cartouche (11) ne se trouve pas à l'emplacement de distribution (109),

un quatrième mécanisme (1212) de libération du troisième obturateur (103) bloqué par le

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cinquième mécanisme (103d, 107) de blocage lorsque la cartouche (11) est déplacée de l'emplacement de préparation (104) vers l'emplacement de distribution (109), le troisième obturateur (103) étant poussé vers une position d'ouverture par l'adaptateur (12) après sa libération, et

un mécanisme de liaison (103c, 1211) destiné à relier le troisième obturateur (103) à l'adaptateur (12) lorsque la cartouche (11) est déplacée de l'emplacement de distribution (109) à l'emplacement de préparation (104), si bien que le troisième obturateur (103) est tiré vers la position de fermeture.

6. Ensemble à cartouche selon la revendication 5, caractérisé en ce que :

le cinquième mécanisme (103d, 107) de blocage comporte une encoche (103d) formée à une extrémité avant du troisième obturateur (103) et une griffe élastique (107) placée à une extrémité avant du plancher de l'emplacement de distribution (109) du récepteur de poudre,

le quatrième mécanisme (1212) de libération est une saillie de guidage (1212) formée à une extrémité arrière de l'adaptateur (12) et qui sépare la griffe (107) de l'encoche (103d), et

le mécanisme de liaison (103c, 1211) comprend une partie inclinée (103c) placée à un bord avant du troisième obturateur (103) et une partie inclinée (1211) placée à un bord arrière de l'adaptateur (12).

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