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(54) **Method for controlling the distance between the photosensitive member and the developing member in a toner cartridge, and the device thereof**

Verfahren zur Steuerung der Distanz zwischen dem lichtempfindlichen Element und dem Entwicklungselement in einer Tonerkartusche und Vorrichtung dafür

Procédé de contrôle de la distance entre l'élément photosensible et l'élément de développement dans une cartouche de toner et dispositif correspondant

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention generally relates to an electrophotographic image forming device, and more specifically relates to a separated toner cartridge for an electrophotographic image forming device according to the preamble part of claim 1 and a drum unit of the preamble part of claim 5. Such devices are disclosed in US 2006/0159487 A1.

2. Description of the Related Arts

[0002] The conventional invention relates to an electrophotographic image forming device, such as a laser printer, a copier or a facsimile machine, a toner cartridge is used, which is removable from or mountable to the electrophotographic image forming device.

[0003] Conventional toner cartridge comprises integral toner cartridges and separated toner cartridges. An integral toner cartridge is at least provided with a photosensitive member, a developing member, and a developer; a separated toner cartridge is at least provided with a developing member and a developer, and the drum unit used together with the separated toner cartridge is at least provided with a photosensitive member.

[0004] Fig. 1 is a front view of an integral toner cartridge in conventional art, which adopts contact developing mode. The toner cartridge comprises a main part 10, a first lateral plate 11, and a second lateral plate 12; the first lateral plate 11 and the second lateral plate 12 are separately fixed at the two ends of the main part 10; the first lateral plate 11 and the second lateral plate 12 are removable from or mountable to the two ends of the main part 10, or form as one body with the main part 10.

[0005] Fig.2 is a sectional view of the direction A-A in Fig.1; as shown in the figure, the main part 10 of the toner cartridge is at least provided with a photosensitive member 13, a developing member 14, a toner feeding component 15, and a developer (not shown in the figure). After the toner cartridge is mounted to an electrophotographic image forming device, the electrophotographic image forming device receives the data from the outside; the laser scanning component of the electrophotographic image forming device scans the photosensitive member 13 of the toner cartridge, so as to make an electrostatic latent image to be formed on the photosensitive member 13; the toner feeding component 15 receives the power and electric voltage from the electrophotographic image forming device, and feeds the developer stored in the toner cartridge to the developing member 14; with the power and electric voltage provided by the elelectrophotographic image forming device, the developer is adsorbed to the surface of the developing member 14; by contacting the photosensitive member 13 closely, the developing member 14 transports the developer to the photosensitive member 13, and makes the electrostatic latent image on the photosensitive member developed.

[0006] As shown in Fig. 3 and Fig. 4, the first lateral plate 11 and the second lateral plate 12 are respectively provided with the photosensitive member fixing positions 23a, 23b, the developing member fixing positions 24a, 24b, and the toner feeding component fixing positions 25a, 25b.

[0007] The photosensitive member 13, the developing member 14, and the toner feeding component 15 are respectively fixed to the toner cartridge via the photosensitive member fixing positions 23a, 23b, the developing member fixing positions 24a, 24b, and the toner feeding component fixing positions 25a, 25b on the first lateral plate 11 and the second lateral plate 12.For the distances between the photosensitive member fixing positions 23a, 23b, the developing member fixing positions 24a, 24b, and the toner feeding component fixing positions 25a, 25b have been determined when the first lateral plate 11 and the second lateral plate 12 are made, the center distances between the photosensitive member 13, the developing member 14, and the toner feeding component 15 have been set as fixed values. The manufacturing accuracy of the fixing positions (23a, 23b, 24a, 24b, 25a, 25b) for positioning the photosensitive member 13 and the developing member 14 on the first lateral plate 11 and the second lateral plate 12 directly affects the working quality of the photosensitive member 13 and the developing member 14, therefore affect the working quality of the electrophotographic image forming device; any small error that occurs to manufacture the fixing positions for positioning the photosensitive member 13 and the developing member 14 on the first lateral plate 11 and the second lateral plate 12, will all affect the working quality of the toner cartridge, and serious error will even cause that the toner cartridge can not operate properly. So, the requirement to the manufacturing accuracy of the first lateral plate 11 and the second lateral plate 12 will be very high.

[0008] Fig. 5 is a front view of another kind of integral toner cartridge in conventional art, which adopts non-contact developing mode. Fig. 6 is a sectional view of the direction B-B in Fig.5; Fig. 7 and Fig. 8 are respectively schematic diagrams of the two ends of the toner cartridge.

[0009] As shown in Figs. 5-8, the toner cartridge comprises a main part 30, a first lateral plate 31, and a second lateral plate 32; the first lateral plate 31 and the second lateral plate 32 are respectively mounted at the two ends of the main part 30; the first lateral plate 31 and the second lateral plate 32 are removable from or mountable to the two ends of the main part 30, or form as one body with the main part 30.

[0010] The main part 30 of the toner cartridge is at least provided with a photosensitive member 33, a developing member 34, and a developer (not shown in the figure). The working principle of the toner cartridge is the same

with the working principle of the toner cartridge shown in Fig. 1. Specialty, the photosensitive member 33 is one of the organic photosensitive drums; the developing member 34 is one of the magnetic rollers, and the magnetic roller is composed of a magnetic core and a magnetic sleeve; the developer is a kind of magnetic toner.

[0011] The first lateral plate 31 is provided with a photosensitive member fixing position 43a and a developing member fixing position; the second lateral plate 32 is provided with a photosensitive member fixing position 43b and a developing member fixing position 44b.

[0012] The photosensitive member 33 and the developing member 34 of the toner cartridge are respectively fixed to the toner cartridge via the photosensitive member fixing positions 43a, 43b and the developing member fixing position 44b on the first lateral plate 31 and the second lateral plate 32. To make an electrophotographic image forming device work well during the working process, the photosensitive member 33 and the developing member 34 of the toner cartridge are required to keep the clearance between them for a certain magnitude, and the magnitude of the clearance is a constant value; so, the distance between the photosensitive member fixing positions 43a, 43b and the developing member fixing position 44b on the first lateral plate 31 and the second lateral plate 32 is required to be a constant value, and it is required to be changeless during the working process. So, the manufacturing accuracy of the fixing positions (43a, 43b, 44b) on the first lateral plate 31 and the second lateral plate 32 directly affects the magnitude of the clearance between the photosensitive member 33 and the developing member 34 of the toner cartridge, and also affects the working quality of the toner cartridge. The errors that occur during manufacturing the first lateral plate 31 and the second lateral plate 32, will affect the working quality of the toner cartridge and the electrophotographic image forming device; so, the requirement of the manufacturing accuracy of the first lateral plate 31 and the second lateral plate 32 is very high.

[0013] As mentioned above the requirement of the manufacturing accuracy of the first lateral plate 11 or 31 and the second lateral plate 12 or 32 of the toner cartridge is very high, and any small error that occurs as manufacturing will cause that the toner cartridge can not operate properly. The high accuracy requirement of the first lateral plate 11 or 31 and the second lateral plate 12 or 32 of the toner cartridge causes that the product is hard to be manufactured, and the production cost is accordingly increased. At the same time, the fixing positions (23a, 23b, 24a, 24b, or 43a, 43b, 44b) of the first lateral plate 11 or 31 and the second lateral plate 12 or 32 are gradually rubbed off by the photosensitive member 13 or 33 and the developing member 14 or 34. It is hard to ensure the electrophotographic image forming device to operate properly for a long time.

[0014] US 2006/0159487 A1 discloses a developing cartridge which includes a photosensitive drum, a developing roller and an electrophotographic image forming apparatus employing the developing cartridge. The developing cartridge includes a first frame and a second frame. The photosensitive drum is arranged on the first frame and the developing roller is arranged on the second frame. The toner is accommodated in the second frame. The second frame is pivotally coupled to the first frame. A spring provides an elastic force to the second frame. Thus, the second frame is biased in a direction towards the first frame and the photosensitive drum.

[0015] EP 1 703 341 A2 and US 5,089,849 disclose an image forming apparatus.

[0016] EP 0 389 267 A2 teaches a Structure and method of mounting recording units in electrophotographic recording apparatus.

SUMMARY OF THE INVENTION

[0017] It is the object of the present invention to provide an alternative solution for providing the elastic force to the photosensitive member and the developing member, respectively.

[0018] This object is achieved by the subject matter of the independent claims.

[0019] Preferred embodiments of the invention are the subject matter(s) of the dependent claims.

[0020] A method for controlling the distance between the photosensitive member and the developing member in a toner cartridge is disclosed, wherein an elastic member providing an elastic force to the developing member is mounted in the toner cartridge, so as to force the developing member to move towards the photosensitive member; the elastic member is mounted on a main part, a first lateral plate, or a second lateral plate of the toner cartridge, and the developing member is movable relative to the main part of the toner cartridge.

[0021] Another method for controlling the distance between the photosensitive member and the developing member in a toner cartridge is disclosed, wherein an elastic member providing an elastic force to the photosensitive member is mounted in the toner cartridge, so as to force the photosensitive member to move towards the developing member; the elastic member is mounted on a main part, a first lateral plate, or a second lateral plate of the toner cartridge, and the photosensitive member is movable relative to the main part; the elastic member is mounted on the main part to provide the elastic force via a photosensitive member frame.

[0022] A first device for controlling the distance between the photosensitive member and the developing member in a toner cartridge, comprises a main part, a photosensitive member, and a developing member, wherein it also comprises an elastic member providing an elastic force to the developing member, so as to force the developing member to move towards the photosensitive member; it also comprises a main part, a first lateral plate, and a second lateral plate; the first and the second lateral plates are located at the two sides of the main part to support the developing member, and the developing

member is movable relative to the main part; the elastic member is mounted on the main part, the first lateral plate, or the second lateral plate.

[0023] A second device for controlling the distance between the photosensitive member and the developing member in a toner cartridge, comprises a photosensitive member and a developing member, wherein it also comprises an elastic member providing an elastic force to the photosensitive member, so as to force the photosensitive member to move towards the developing member. It also comprises a main part, a first lateral plate, and a second lateral plate; the first and the second lateral plates are located at the two sides of the main part to support the photosensitive member, and the photosensitive member is movable relative to the main part; the elastic member is mounted on the main part, the first lateral plate, or the second lateral plate. It also comprises a photosensitive member frame; the photosensitive member frame is used to support the photosensitive member; the photosensitive member frame is movable relative to the main part; the elastic member provides the elastic force to the photosensitive member via the photosensitive member frame.

[0024] A third device for controlling the distance between the photosensitive member and the developing member in a toner cartridge, comprises a separated toner cartridge being used together with a drum unit; the separated toner cartridge includes a separated main part of the separated toner cartridge, a first side of the separated toner cartridge, a second side of the separated toner cartridge, and a developing member; the developing member is supported on the first side and the second side of the separated toner cartridge; wherein the separated toner cartridge is provided with an elastic member, and the elastic member is used to provide an elastic force to the developing member, so as to force the developing member to move towards a photosensitive member of the drum unit. The developing member is movable relative to the separated main part; the elastic member is mounted on the main part, the first side, or the second side.

[0025] A fourth device for controlling the distance between the photosensitive member and the developing member in a toner cartridge, comprises a drum unit being used together with a separated toner cartridge; the drum unit includes a drum unit main part, a first side of the drum unit, a second side of the drum unit, and a photosensitive member; the photosensitive member is supported on the first side and the second side of the drum unit; wherein the drum unit is provided with an elastic member, and the elastic member is used to provide an elastic force to the photosensitive member, so as to force the photosensitive member to move towards a developing member of the separated toner cartridge. The photosensitive member is movable relative to the drum unit main part; the elastic member is mounted on the main part, the first side, or the second side. It also comprises a photosensitive member frame; the photosensitive member frame is used to support the photosensitive member; the photosensitive member frame is movable relative to the drum unit main part; the elastic member provides the elastic force to the photosensitive member via the photosensitive member frame.

[0026] After adopting the above mentioned technical solutions, for the toner cartridge is separately provided with an elastic member for providing an elastic force to the developing member or to the photosensitive member, so as to force the developing member to move towards the photosensitive member, or to force the photosensitive member to move towards the developing member; the distance between the photosensitive member and the developing member is adjusted via the elastic force provided by the elastic member, so, the production accuracy requirement and the production cost of the toner cartridge are all reduced greatly, and the technical problems that are hard to overcome in batch production are solved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Fig. 1 is a front view of a integral toner cartridge in conventional art;

Fig. 2 is a sectional view of the direction A-A in Fig. 1;

Fig. 3 and Fig. 4 are respectively the left view and the right view of the integral toner cartridge in conventional art shown in Fig. 1;

Fig. 5 is a front view of another kind of integral toner cartridge in conventional art;

Fig. 6 is a sectional view of the direction B-B in Fig. 5;

Fig. 7 and Fig. 8 are respectively the left view and the right view of another kind of integral toner cartridge in conventional art shown in Fig. 5;

Fig. 9 and Fig. 10 are the left view and the right view of the toner cartridge of the first embodiment of the present invention;

Fig. 11 is a sectional view of the direction C-C in Fig. 9;

Fig. 12 is a sectional view of the direction D-D in Fig. 10;

Fig. 13 and Fig. 14 are the left view and the right view of the toner cartridge of the second embodiment of the present invention;

Fig. 15 illustrates a separated toner cartridge and a drum unit of the third embodiment of the present invention;

Fig. 16 is a left view of the separated toner cartridge and the drum unit of the third embodiment of the present invention;

Fig. 17 is a front view of the separated toner cartridge of the third embodiment of the present invention;

Fig. 18 is a sectional view of the direction E-E in Fig. 17;

Fig. 19 and Fig. 20 are the left view and the right view of the separated toner cartridge of the third embodiment of the present invention;

Fig. 21 is a front view of the drum unit of the third

embodiment of the present invention;

Fig. 22 is a sectional view of the direction F-F in Fig. 21;

Fig. 23 and Fig. 24 are separately the left view and the right view of a drum unit of the fourth embodiment of the present invention;

Fig. 25 is a left view of a toner cartridge of the fifth embodiment of the present invention;

Fig. 26 illustrates a toner cartridge of the sixth embodiment of the present invention; and

Fig. 27 illustrates a toner cartridge of the seventh embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Embodiment 1

[0028] In the present embodiment, except for the special explanation, the structure of the toner cartridge is the same with the structure of the toner cartridge as shown in Fig. 1.

[0029] Referring to Fig. 9 and Fig. 10, the toner cartridge comprises a main part 10, a first lateral plate 110, and a second lateral plate 120; the first lateral plate 110 and the second lateral plate 120 are both mounted on the main part 10.The main part 10 comprises a photosensitive member 13, a developing member 14, a toner feeding component 15, and a developer (not shown in the figure); the photosensitive member 13, the developing member 14, and the toner feeding component 15 are all located between the first lateral plate 110 and the second lateral plate 120.As shown in Fig. 9 and Fig. 10, the first lateral plate 110 and the second lateral plate 120 are respectively provided with photosensitive member fixing positions 230a, 230b, a first supporting component 240a, a second supporting component 240b, a first elastic member 260a, a second elastic member 260b, and toner feeding component fixing positions 250a, 250b.

[0030] The relative positions of the photosensitive member fixing positions 230a, 230b and the toner feeding component fixing positions 250a, 250b keep unchanged all along during the working process of the electrophotographic image forming device. The photosensitive member 13 is fixed to the first lateral plate 110 and the second lateral plate 120 via the photosensitive member fixing positions 230a, 230b on the first lateral plate 110 and the second lateral plate 120; the toner feeding component 15 is fixed to the first lateral plate 110 and the second lateral plate 120 via the toner feeding component fixing positions 250a, 250b.So, the positions of the photosensitive member 13 and the toner feeding component 15 keep unchanged all along relative to the main part 10.

[0031] The developing member 14 is supported on the first lateral plate 110 and the second lateral plate 120 respectively by the first supporting component 240a and the second supporting component 240b on the first lateral plate 110 and the second lateral plate 120; the first supporting component 240a and the second supporting component 240b can slide freely on the first lateral plate 110 and the second lateral plate 120; the first elastic member 260a and the second elastic member 260b respectively apply elastic forces to the first supporting component 240a and the second supporting component 240b, and the direction of the elastic forces is along the direction of the connection line of the axis of the photosensitive member 13 and the axis of the developing member 14, pointing to the photosensitive member 13.The developing member 14 can slide relative to the main part 10 along the direction of the connection line of the axis of the photosensitive member 13 and the axis of the developing member 14.

[0032] Fig. 11 is a sectional view of the direction C-C in Fig. 9, and Fig. 12 is a sectional view of the direction D-D in Fig. 10. As shown in Figure. 11, the first supporting component 240a and the first elastic member 260a are located at the positions away from the photosensitive member 13 relative to the developing member 14; the first supporting component 240a supports the developing member 14; the first elastic member 260a applies an elastic force to the first supporting component 240a to make that the developing member 14 can move along the direction of the connection line of the axis of the photosensitive member 13 and the axis of the developing member 14, so as to move towards the photosensitive member 13 relative to the main part 10; the elastic force makes the photosensitive member 13 to closely contact the developing member 14, and adjusts the magnitude of interference between the photosensitive member 13 and the developing member 14.

[0033] In the same way, as shown in Fig. 12, the second supporting component 240b and the second elastic member 260b are located at the positions away from the photosensitive member 13 relative to the developing member 14; an elastic force is applied to the developing member 14 to make the developing member 14 move towards the photosensitive member 13, so as to make the photosensitive member 13 to closely contact the developing member 14; and the elastic force adjusts the magnitude of interference between the photosensitive member 13 and the developing member 14.

[0034] In particular, the first elastic member 260a and the second elastic member 260b are one kind of compression springs, and the elastic force is an elastic thrust.

[0035] Selectively, the first elastic member 260a, the second elastic member 260b, the first supporting component 240a, and the second supporting component 240b can also be located at the two sides of the main part 10, so as to support the developing member 14 and apply an elastic force to it.

[0036] Selectively, the first elastic member 260a, the second elastic member 260b, the first supporting component 240a, and the second supporting component 240b can also be located between the developing member 14 and the photosensitive member 13; the first elastic member 260a and the second elastic member 260b are one kind of elastic extension springs; the first elastic

member 260a and the second elastic member 260b apply elastic forces to the developing member 14 via the first supporting component 240a and the second supporting component 240b, and the direction of the elastic forces is along the direction of the connection line of the axis of the photosensitive member 13 and the axis of the developing member 14, pointing to the photosensitive member 13, so as to make the developing member 14 to move towards the photosensitive member 13.

Embodiment 2

[0037] In the present embodiment, except for the special explanation, the structure of the toner cartridge is the same with the structure of the toner cartridge as shown in Fig. 5.

[0038] Referring to Fig. 13 and Fig. 14, the toner cartridge comprises a main part 30, a first lateral plate 111, and a second lateral plate 121; the first lateral plate 111 and the second lateral plate 121 are both mounted on the main part 30.The main part 30 comprises a photosensitive member 33, a developing member 34, and a developer (not shown in the figure); the photosensitive member 33 and the developing member 34 are located between the first lateral plate 111 and the second lateral plate 121.The first lateral plate 111 is provided with a first elastic member 261a, a first supporting component 231a, and a developing member fixing position (not shown in the figure); the second lateral plate 121 is provided with a second elastic member 261 b, a second supporting component 231b, and a developing member fixing position (not shown in the figure).The two ends of the photosensitive member 33 are respectively supported by the first supporting component 231 a and the second supporting component 231b; the first supporting component 231 a and the second supporting component 231 b can slide freely on the first lateral plate 111 and the second lateral plate 121; the photosensitive member 33 can slide freely relative to the main part 30; the two ends of the developing member 34 are respectively fixed on the developing member fixing positions 241 a, 241 b, and the developing member 34 can not move freely relative to the main part 30.

[0039] As shown in the figures, the first elastic member 261 a and the second elastic member 261 b are respectively located at the positions away from the developing member 34 relative to the photosensitive member 33; elastic forces are respectively applied to the two ends of the photosensitive member 33 via the first supporting component 231 a and the second supporting component 231b; the direction of the elastic forces is along the direction of the connection line of the axis of the photosensitive member 33 and the axis of the developing member 34, pointing to the developing member 34; the elastic forces make the photosensitive member 33 to move towards the developing member 34 relative to the main part 30; the elastic forces make the photosensitive member 33 and the developing member 34 to keep a certain clearance magnitude, and the clearance magnitude between the photosensitive member 33 and the developing member 34 is adjusted by the elastic forces.

[0040] In particular, the first elastic member 261 a and the second elastic member 261 b are one kind of compression springs, and the elastic force is an elastic thrust.

[0041] Selectively, the first elastic member 261a, the second elastic member 261b, the first supporting component 241a, and the second supporting component 241 b can also be located at the two sides of the main part 30, so as to support the developing member 34 and apply an elastic force to it.

[0042] Selectively, the first elastic member 261 a, the second elastic member 261b, the first supporting component 241a, and the second supporting component 241 b can also be located between the developing member 34 and the photosensitive member 33; the first elastic member 261 a and the second elastic member 261 b are one kind of elastic extension springs; the first elastic member 261a and the second elastic member 261 b apply elastic forces to the developing member 34 via the first supporting component 241 a and the second supporting component 241 b, and the direction of the elastic forces is along the direction of the connection line of the axis of the photosensitive member 33 and the axis of the developing member 34, pointing to the photosensitive member 33, so as to make the developing member 34 to move towards the photosensitive member 33.

Embodiment 3

[0043] Fig. 15 illustrates a separated toner cartridge and a drum unit used together with the separated toner cartridge, and the separated toner cartridge and the drum unit adopt contact developing mode. The separated toner cartridge comprises a separated main part 300, a first side 310 and a second side 320 of the separated toner cartridge; the drum unit comprises a drum unit main part 500, a first side 510 and a second side 520 of the drum unit.

[0044] As shown in Fig. 17, the first side 310 and the second side 320 of the separated toner cartridge are respectively located at the two ends of the toner cartridge, and form as one body with the separated main part 300; as shown in Fig. 21, the first side 510 and the second side 520 of the of the drum unit are located at the two ends of the main part 500 of the drum unit, and form as one body with the main part 500 of the drum unit.

[0045] As shown in Fig. 16, Fig. 18, and Fig. 22, the main part 500 of the drum unit contains a photosensitive member 53; the photosensitive member 53 is located between the first side 510 and the second side 520 of the drum unit, which is fixed and not movable; the main part 300 of the separated toner cartridge contains a developing member 54, a toner feeding component 55, and a developer (not shown in the figure); the developing member 54 and the toner feeding component 55 are located between the first side 310 and the second side 320

of the separated toner cartridge.

[0046] As shown in Fig. 19 and Fig. 20, in the present embodiment, the first side 310 of the separated toner cartridge is provided with a developing member supporting hole 440a, a toner feeding component supporting hole 450a, and a first elastic member 460a; the second side 320 of the separated toner cartridge is provided with a developing member supporting hole 440b, a toner feeding component supporting hole 450b, and a second elastic member 460b.The first elastic member 460a and the second elastic member 460b are located on the developing member supporting holes 440a, 440b, and support the two ends of the developing member 54; in the present embodiment, the first and the second elastic members 460a, 460b are made of elastic rubber materials, and can also be springs; the developing member 54 can slide on the developing member supporting holes 440a, 440b relative to the separated main part 300.The two ends of the toner feeding component 55 are supported by the toner feeding component supporting holes 450a, 450b; the toner feeding component 55 is fixed at the first side 310 and the second side 320 via the toner feeding component supporting holes 450a, 450b, which can not move freely relative to the separated main part 300.

[0047] As shown in Fig. 16, after the separated toner cartridge is mounted on the drum unit, the main part 300 of the separated toner cartridge is fixed to the main part 500 of the drum unit, which can not move freely; the first side 310 of the separated toner cartridge is located on the same side with the first side 510 of the drum unit, and the second side 320 of the separated toner cartridge is located on the same side with the second side 520 of the drum unit. The separated toner cartridge can not move freely when it is mounted on the drum unit, and the separated toner cartridge and the drum unit adopt contact developing mode, so, the developing member 54 and the photosensitive member 53 have interference fit between them; the developing member 54 can slide freely above the developing member supporting holes 440a, 440b, and the photosensitive member can not freely move, so, the developing member 54 has the trend to move away from the photosensitive member 53.At this moment, the first elastic member 460a and the second elastic member 460b apply elastic forces to the developing member 54, and the direction of the elastic forces is along the direction of the connection line of the axis of the photosensitive member 53 and the axis of the developing member 54, pointing to the photosensitive member 53; the elastic forces prevent the developing member 54 from moving away from the photosensitive member 53, so as to keep the interference fit between the developing member 54 and the photosensitive member 53, and the magnitude of interference between the photosensitive member 53 and the developing member 54 is adjusted by controlling the magnitude of the elastic forces.

Embodiment 4

[0048] The structure adopted in the present embodiment, except for the special explanation, is the same with the structure as shown in Embodiment 5.

[0049] As shown in Fig. 23 and Fig. 24, the first side 510 of the drum unit is provided with a photosensitive member supporting hole 430a and a first elastic member 461a; the second side 520 of the drum unit is provided with a photosensitive member supporting hole 430b and a second elastic member 461b; the two ends of the photosensitive member 53 are respectively located on the photosensitive member supporting holes 430a, 430b, and are supported by the first and the second elastic members 461 a, 461b; the two ends of the photosensitive member 53 can freely slide on the photosensitive member supporting holes 430a, 430b, and the first and the second elastic members 461 a, 461 b limit the photosensitive member 53 to slide freely.

[0050] As shown in Fig. 16, when the separated toner cartridge is mounted on the drum unit, the separated toner cartridge is fixed relative to the drum unit, and can not move freely; the developing member 54 of the separated toner cartridge and the photosensitive member 53 of the drum unit have interference fit between them; for the photosensitive member 53 can slide freely, the photosensitive member 53 has the trend to move away from the developing member 54; the first and the second elastic members 461 a, 461 b support the photosensitive member 53, and provide elastic forces to the photosensitive member 53; the direction of the elastic forces is along the direction of the connection line of the axis of the photosensitive member 53 and the axis of the developing member 54, pointing to the developing member 54; the elastic forces prevent the photosensitive member 53 from moving away, so as to keep the photosensitive member 53 closely contacting with the developing member 54; the magnitude of interference between the photosensitive member 53 and the developing member 54 is adjusted by controlling the magnitude of the elastic forces. The first and the second elastic members 461a, 461 b are one kind of elastic rubbers or springs.

Embodiment 5

[0051] The structure adopted in the present embodiment, except for the special explanation, is the same with the structure as shown in Embodiment 3.

[0052] As shown in Fig. 25, the first side 510 of the drum unit is provided with a photosensitive member supporting hole 431 a; the first side 310 of the separated toner cartridge is provided with a developing member supporting hole 441 a; a first elastic member 462a is located between the photosensitive member supporting hole 431a and the developing member supporting hole 441a.One end of the photosensitive member 53 is located on the photosensitive member supporting hole 431 a, and one end of the developing member 54 is located on

the developing member supporting hole 441 a; the first elastic member 462a applies an elastic force to the photosensitive member 53 via the photosensitive member supporting hole 431 a, and the direction of the elastic force is along the direction of the connection line of the axis of the photosensitive member 53 and the axis of the developing member 54, pointing to the developing member 54; the first elastic member 462a applies an elastic force to the developing member 54 via the developing member supporting hole 441a, and the direction of the elastic force is along the direction of the connection line of the axis of the photosensitive member 53 and the axis of the developing member 54, pointing to the photosensitive member 53; the elastic forces make the photosensitive member 53 to closely contact with the developing member 54.

[0053] In the same way, the second side 320 of the of the separated toner cartridge and the second side 520 of the drum unit are correspondingly provided with a photosensitive member supporting hole, a developing member supporting hole, and a second elastic member. The first and the second elastic members are one kind of elastic rubbers or springs.

[0054] Selectively, in the present embodiment, one end of the first and the second elastic members is fixed to the drum unit, and the other end is separately connected to one end of the developing member; the separated toner cartridge is fixed to the main part of the drum unit, and is immovable relative to the drum unit; the photosensitive member is fixed to the drum unit; the developing member can move relative to the main part of the separated toner cartridge; when the separated toner cartridge is mounted on the drum unit, the developing member moves towards the photosensitive member by the action of the elastic forces provided by the first and the second elastic members.

[0055] Selectively, in the present embodiment, one end of the of the first and the second elastic members is fixed to the separated toner cartridge, and the other end is separately connected to one end of the photosensitive member; the separated toner cartridge is fixed to the main part of the drum unit, and is immovable relative to the drum unit; the developing member is fixed to the separated toner cartridge to be immovable, and the photosensitive member can freely slide in the drum unit; the photosensitive member moves towards the developing member by the action of the elastic forces provided by the first and the second elastic members.

Embodiment 6

[0056] The structure of the toner cartridge adopted in the present embodiment, except for the special explanation, is the same with the structure as shown in Fig. 5.

[0057] As shown in Fig. 26, the toner cartridge comprises a main part 30, a photosensitive member 33, and a developing member 34; the toner cartridge also comprises a photosensitive member frame 30a and an elastic member 264.

[0058] The photosensitive member frame 30a is at least provided with the photosensitive member 33, and it can also be provided with other components, such as a charge member for charging the photosensitive member, and a cleaning component for cleaning the photosensitive member. The photosensitive member frame 30a is located in the main part 30, and can move relative to the main part 30; the photosensitive member 33 is fixed to the photosensitive member frame 30a, so, the photosensitive member 33 can move relative to the main part 30.The elastic member 264 is located between the main part 30 and the photosensitive member frame 30a, to provide an elastic force to the photosensitive member frame 30a; so, the photosensitive member 33 is made capable of moving relative to the main part 30 together with the photosensitive member frame 30a.The developing member 34 is located at the main part 30, and can not move relative to the main part 30; so, by the action of the elastic force provided by the elastic member 264, the photosensitive member 33 moves relative to the developing member 34 together with the photosensitive member frame 30a, and the distance between the photosensitive member 33 and the developing member 34 is adjusted by elasticity.

Embodiment 7

[0059] The structure of the toner cartridge adopted in the present embodiment, except for the special explanation, is the same with the structure of the toner cartridge as shown in Embodiment 3.

[0060] As shown in Fig. 27, the drum unit comprises a main part 500 of the drum unit, and a photosensitive member 53; it also comprises a photosensitive member frame 500a and an elastic member 463.

[0061] The photosensitive member frame 500a is at least provided with the photosensitive member 53, and also can be provided with other components, such as a transfer member, and a charge member for charging the photosensitive member. The photosensitive member 53 is fixed to the photosensitive member frame 500a; the photosensitive member frame 500a is located in the main part 500, and can be movable in the main part 500; so, the photosensitive member 53 fixed to the photosensitive member frame 500a can move relative to the main part 500.An elastic member 463 is provided between the photosensitive member frame 500a and the main part 500.

[0062] When the separated toner cartridge provided with a developing member is mounted on the drum unit, the elastic member 463 is pressed, and provides an elastic force to the photosensitive member frame 500a; so, the photosensitive member 53 is made to move towards the developing member, and the distance between the photosensitive member 53 and the developing member is adjusted by elasticity.

Claims

1. A separated toner cartridge for being used together with a drum unit, wherein the drum unit comprises an unmovable photosensitive member (53), the separated toner cartridge comprising:

   a main part (300),
   a first side (310),
   a second side (320) and
   a developing member (54), being supported on the first side (310) and the second side (320),
   characterized in that
   the first side (310) and the second side (320) of the separated toner cartridge are respectively provided with developing member supporting holes (440a, 440b), elastic members (460a, 460b) are respectively located on the developing member supporting holes (440a, 440b), and support the two ends of said developing member (54);
   and the elastic members (460a, 460b) are arranged to provide an elastic force to the developing member (54) which, in use, forces the developing member (54) to move towards the photosensitive member (53) of the drum unit for controlling the distance between the photosensitive member (53) and the developing member (54).

2. The separated toner cartridge as claimed in claim 1, wherein the two ends of a toner feeding component (55) are supported by toner feeding component supporting holes (450a, 450b) provided in the first side (310) and in the second side (320), and are fixed at the first side (310) and the second side (320).

3. The separated toner cartridge as claimed in claim 1 or claim 2, wherein, when the separated toner cartridge is mounted on the drum unit, the main part (300) of the separated toner cartridge is fixed to a main part (500) of the drum unit.

4. The separated toner cartridge as claimed in one of claims 1 to 3, **characterized in that** the elastic members (460a, 460b) are made of elastic rubber materials.

5. A drum unit for being used together with a separated toner cartridge comprising a developing member (54) supported on a first and second side (310, 320) of a separated main part (300) of the separated toner cartridge, the drum unit comprising:

   a photosensitive member (53) having a first end and a second end;
   a first side (510) provided with a first photosensitive member supporting hole (430a); and
   a second side (520) provided with a second photosensitive member supporting hole (430b),
   characterized by
   a first elastic member (461a), the first side (510) being provided with the first elastic member located on the first photosensitive member supporting hole (430a);
   a second elastic member (461b), the second side (520) being provided with the second elastic member (461b) located on the second photosensitive member supporting hole (430b); and
   the elastic members (461a, 461b) are arranged to provide an elastic force to the photosensitive member (53) which, in use when used together with the toner cartridge forces the photosensitive member (53) to move towards the developing member (54) of the separated toner cartridge for controlling the distance between the photosensitive member (53) and the developing member (54).

6. The drum unit as claimed in claim 5, **characterized in that** the elastic members (461a, 461b) are made of elastic rubbers.

Patentansprüche

1. Eine abgetrennte Tonerkartusche zur Verwendung gemeinsam mit einer Trommeleinheit, wobei die Trommeleinheit ein unbewegliches lichtempfindliches Bauteil (53) umfasst, wobei die abgetrennte Tonerkartusche:

   ein Hauptteil (300),
   eine erste Seite (310),
   eine zweite Seite (320) und
   ein Entwicklungselement (54) umfasst, das auf der ersten Seite (310) und auf der zweiten Seite (320) gelagert ist,
   dadurch gekennzeichnet, dass
   die erste Seite (310) und die zweite Seite (320) der abgetrennten Tonerkartusche jeweils mit Entwicklungselementlagerlöchern (440a, 440b) ausgestattet sind, wobei sich elastische Elemente (460a, 460b) jeweils auf den Entwicklungselementlagerlöchern (440a, 440b) befinden und die beiden Enden des Entwicklungselements (54) lagern;
   und die elastischen Elemente (460a, 460b) angeordnet sind, um eine elastische Kraft auf das Entwicklungselement (54) auszuüben, die im Gebrauch das Entwicklungselement (54) zwingt, sich in Richtung des lichtempfindlichen Bauteils (53) der Trommeleinheit zum Steuern des Abstands zwischen dem lichtempfindlichen Bauteil (53) und dem Entwicklungselement (54) zu bewegen.

2. Die abgetrennte Tonerkartusche gemäß Anspruch 1, wobei die beiden Enden einer Tonerzuführkomponente (55) durch Tonerzuführkomponentenlagerlöcher (450a, 450b) gelagert werden, die sich in der ersten Seite (310) und in der zweiten Seite (320) befinden und an der ersten Seite (310) und der zweiten Seite (320) befestigt sind.

3. Die abgetrennte Tonerkartusche gemäß Anspruch 1 oder Anspruch 2, wobei die abgetrennte Tonerkartusche auf der Trommeleinheit montiert ist, wobei das Hauptteil (300) der abgetrennten Tonerkartusche an einem Hauptteil (500) der Trommeleinheit befestigt ist.

4. Die abgetrennte Tonerkartusche gemäß einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die elastischen Elemente (460a, 460b) aus elastischen Gummimaterialien gefertigt sind.

5. Eine Trommeleinheit zur Verwendung gemeinsam mit einer abgetrennten Tonerkartusche, die ein Entwicklungselement (54) umfasst, das auf einer ersten und zweiten Seite (310, 320) eines abgetrennten Hauptteils (300) der abgetrennten Tonerkartusche gelagert ist, wobei die Trommeleinheit
ein lichtempfindliches Bauteil (53), das ein erstes Ende und ein zweites Ende aufweist;
eine erste Seite (510), die mit einem ersten Lagerloch für das lichtempfindliche Element (430a) ausgestattet ist; und
einer zweiten Seite (520), die mit einem zweiten Lagerloch für das lichtempfindliche Bauteil (430a) ausgestattet ist, umfasst,
gekennzeichnet durch
ein erstes elastisches Element (461 a), wobei die erste Seite (510) mit dem ersten elastischen Element ausgestattet ist, das sich auf dem ersten Lagerloch des lichtempfindlichen Bauteils (430a) befindet;
ein zweites elastisches Element (461 b), wobei die zweite Seite (520) mit dem zweiten elastischen Element (461 b) ausgestattet ist, das sich auf dem zweiten Lagerloch des lichtempfindlichen Bauteils (430b) befindet;
die elastischen Elemente (461 a, 461 b) angeordnet sind, um eine elastische Kraft auf das lichtempfindliche Bauteil (53) auszuüben, die im Gebrauch, wenn sie zusammen mit der Tonerkartusche verwendet werden, das lichtempfindliche Bauteil (53) zwingen, sich in Richtung des Entwicklungselements (54) der abgetrennten Tonerkartusche zum Steuern des Abstands zwischen dem lichtempfindlichen Bauteil (53) und dem Entwicklungselement (54) zu bewegen.

6. Die Trommeleinheit gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die elastischen Elemente (461 a, 461 b) aus elastischem Gummi gefertigt sind.

Revendications

1. Cartouche de toner séparée à utiliser conjointement avec une unité de tambour, dans laquelle l'unité de tambour comprend un élément photosensible immobile (53), la cartouche de toner séparée comprenant:

   une partie principale (300);
   un premier côté (310);
   un second côté (320); et
   un élément de développement (54) supporté sur le premier côté (310) et le second côté (320);
   caractérisée en ce que:

   le premier côté (310) et le second côté (320) de la cartouche de toner séparée sont respectivement pourvus de trous de support d'élément de développement (440a, 440b), des éléments élastiques (460a, 460b) sont respectivement positionnés sur les trous de support d'élément de développement (440a, 440b) et supportent les deux extrémités dudit élément de développement (54); et
   les éléments élastiques (460a, 460b) sont agencés pour appliquer une force élastique à l'élément de développement (54), qui contraint, en fonctionnement, l'élément de développement (54) à se déplacer en direction de l'élément photosensible (53) de l'unité de tambour pour contrôler la distance entre l'élément photosensible (53) et l'élément de développement (54).

2. Cartouche de toner séparée selon la revendication 1, dans laquelle les deux extrémités d'un composant d'alimentation du toner (55) sont supportées par des trous de support de composant d'alimentation du toner (450a, 450b) prévus dans le premier côté (310) et dans le second côté (320) et fixés au niveau du premier côté (310) et du second côté (320).

3. Cartouche de toner séparée selon la revendication 1 ou 2, dans laquelle, lorsque la cartouche de toner séparée est fixée sur l'unité de tambour, la partie principale (300) de la cartouche de toner séparée est fixée à une partie principale (500) de l'unité de tambour.

4. Cartouche de toner séparée selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** les éléments élastiques (460a, 460b) sont fabriqués à partir de matériaux en caoutchouc élastique.

5. Unité de tambour à utiliser conjointement avec une cartouche de toner séparée comprenant un élément de développement (54) supporté sur un premier et second côté (310, 320) d'une partie principale (300)

séparée de la cartouche de toner séparée, l'unité de tambour comprenant:

un élément photosensible (53) ayant une première extrémité et une seconde extrémité;
un premier côté (510) pourvu d'un premier trou de support d'élément photosensible (430a); et
un second côté (520) pourvu d'un second trou de support d'élément photosensible (430b);
caractérisée par:

un premier élément élastique (461a), le premier côté (510) étant pourvu du premier élément élastique positionné sur le premier trou de support d'élément photosensible (430a);
un second élément élastique (461 b), le second côté (520) étant pourvu du second élément élastique (461 b) positionné sur le second trou de support d'élément photosensible (430b); et
les éléments élastiques (461a, 461b) agencés pour appliquer une force élastique à l'élément photosensible (53) qui contraint, en fonctionnement, lorsqu'utilisée conjointement avec la cartouche de toner, l'élément photosensible (53) à se déplacer en direction de l'élément de développement (54) de la cartouche de toner séparée pour contrôler la distance entre l'élément photosensible (53) et l'élément de développement (54).

6. Unité de tambour selon la revendication 5, **caractérisée en ce que** les éléments élastiques (461 a, 461 b) sont fabriqués à partir de caoutchoucs élastiques.

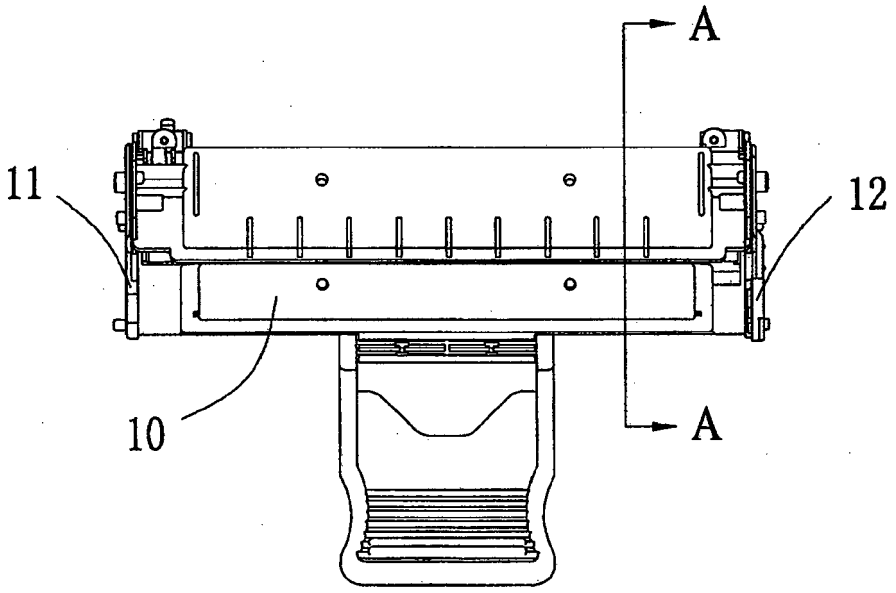

FIG. 1 (Prior Art)

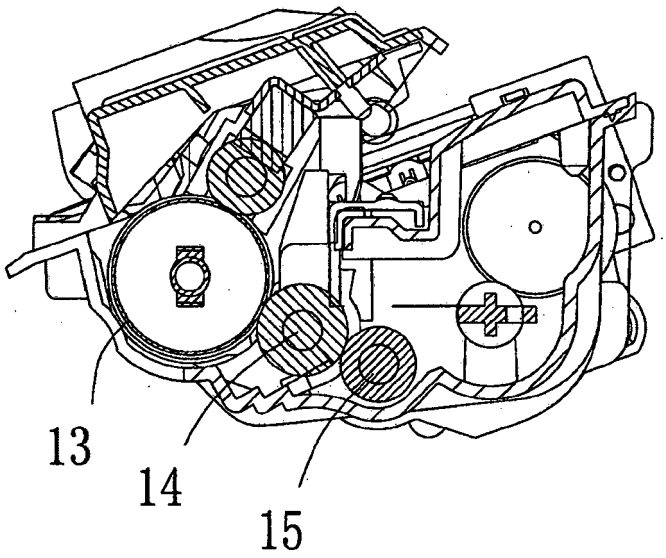

FIG. 2 (Prior Art)

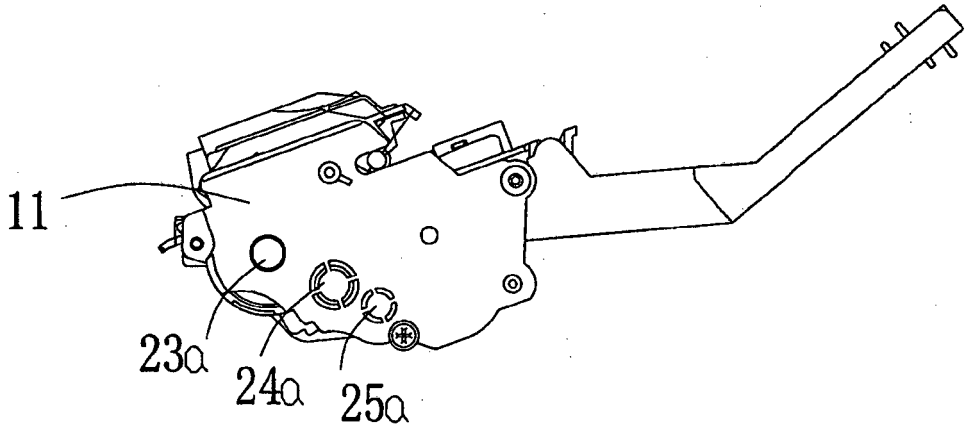

FIG. 3 (Prior Art)

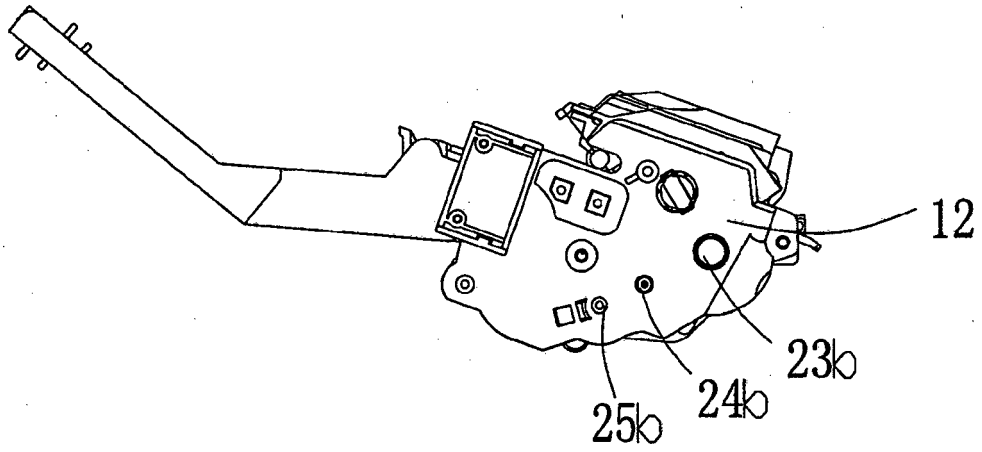

FIG. 4 (Prior Art)

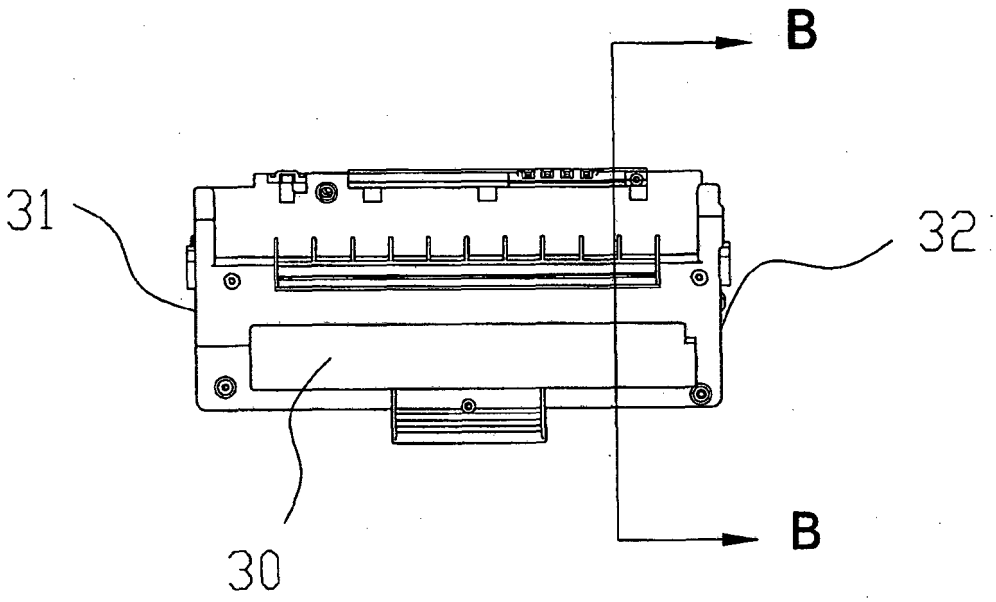

FIG. 5 (Prior Art)

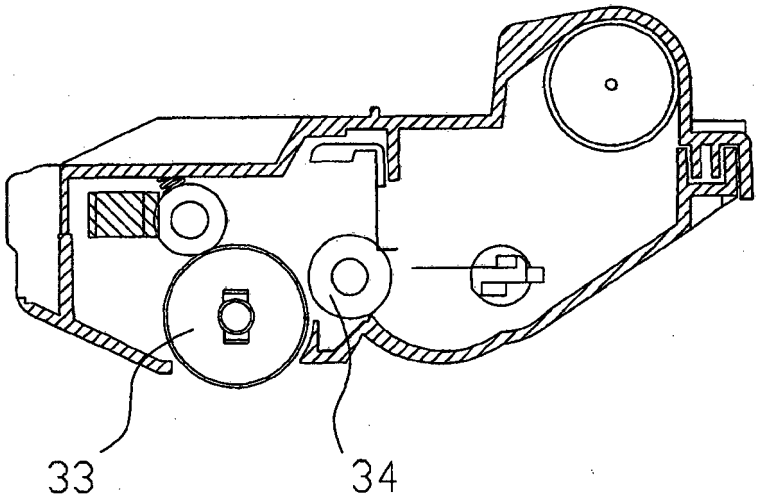

FIG. 6 (Prior Art)

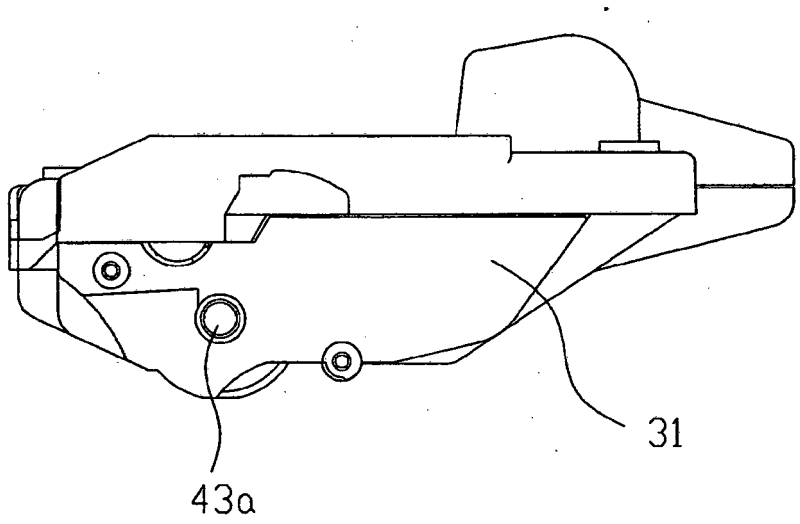

FIG. 7(Prior Art)

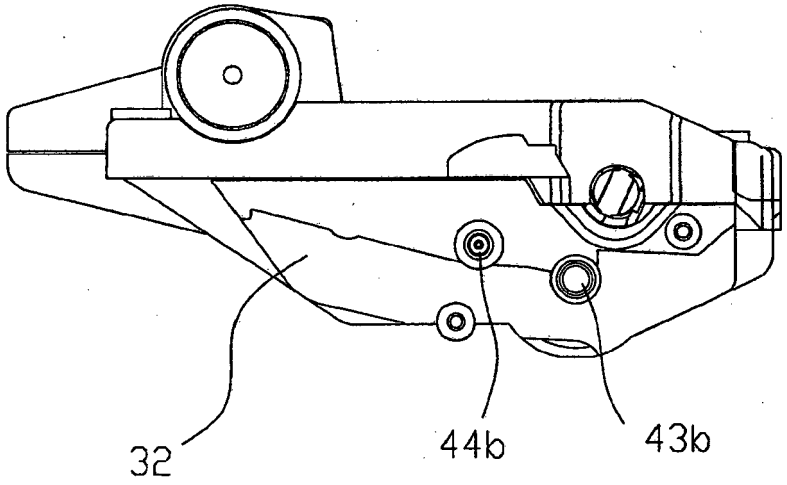

FIG. 8 (Prior Art)

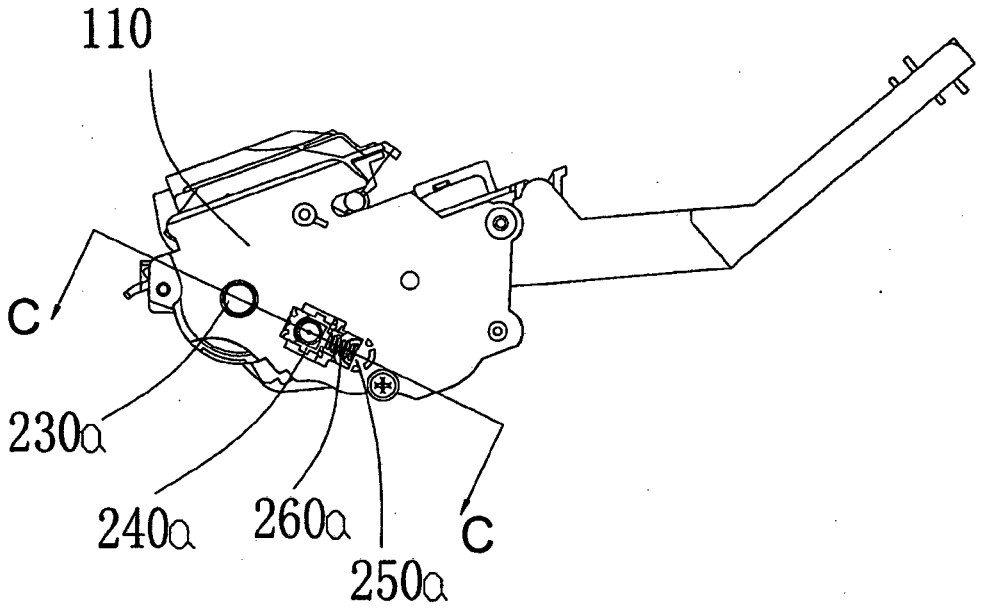

FIG. 9

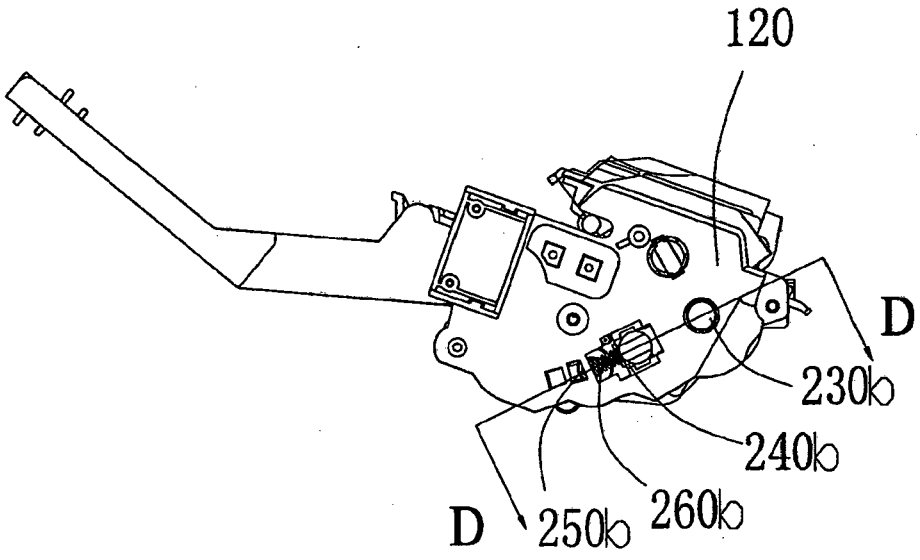

FIG. 10

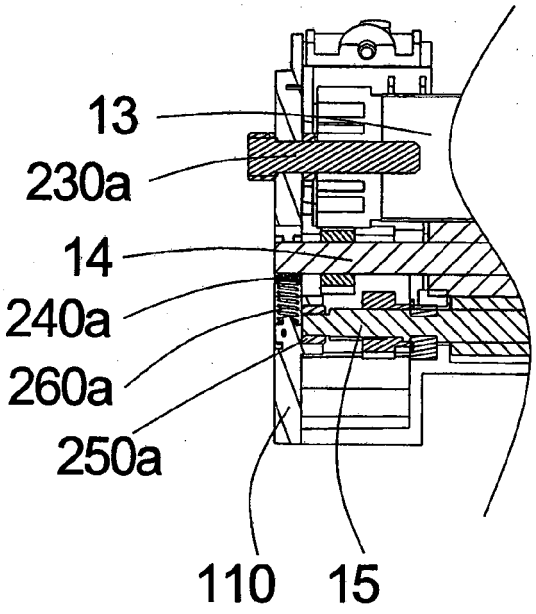

FIG. 11

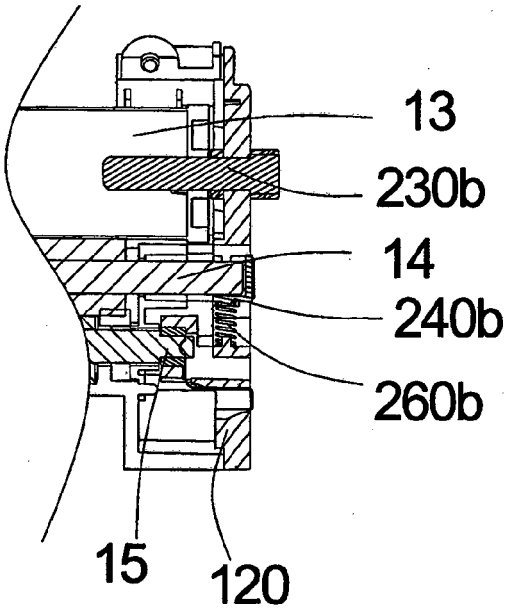

FIG. 12

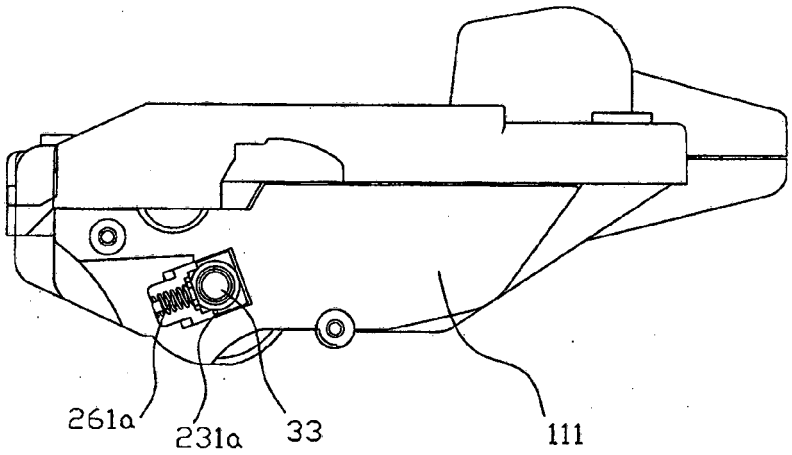

FIG. 13

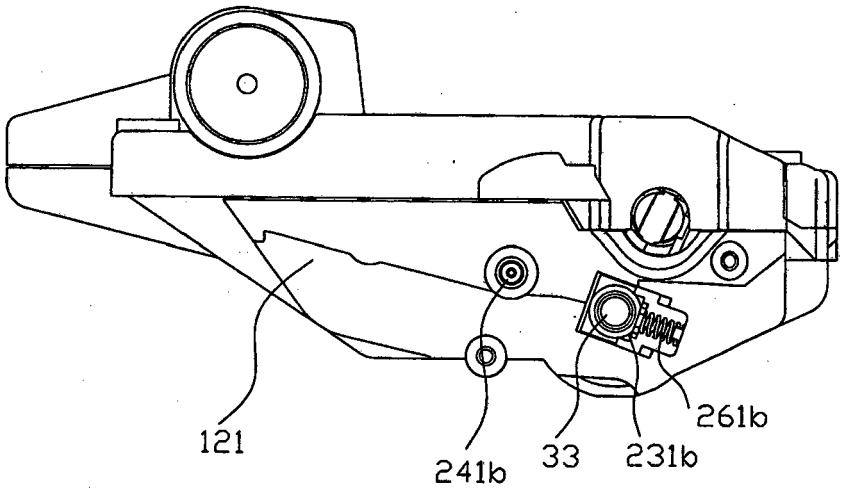

FIG. 14

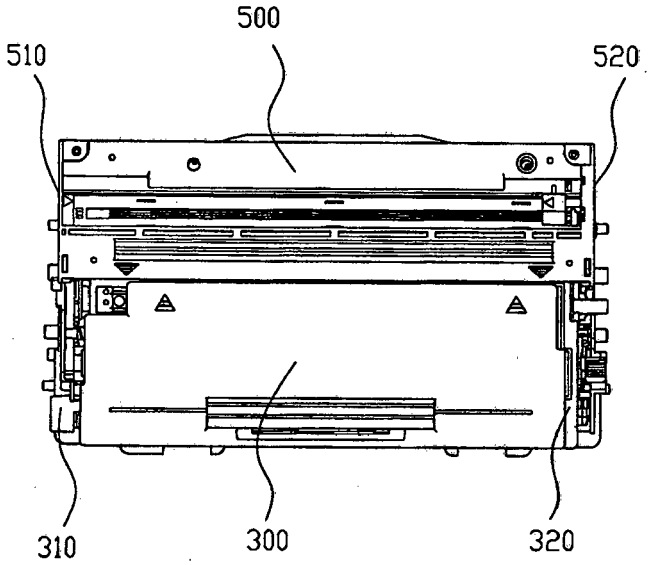

FIG. 15

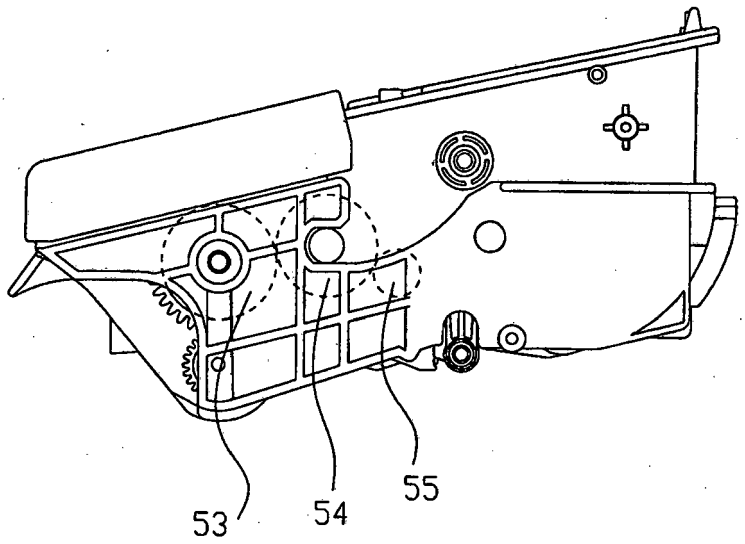

FIG. 16

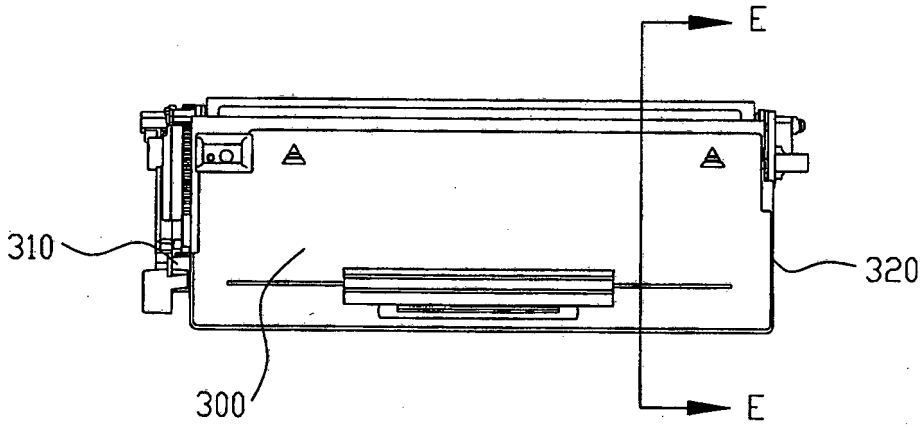

FIG. 17

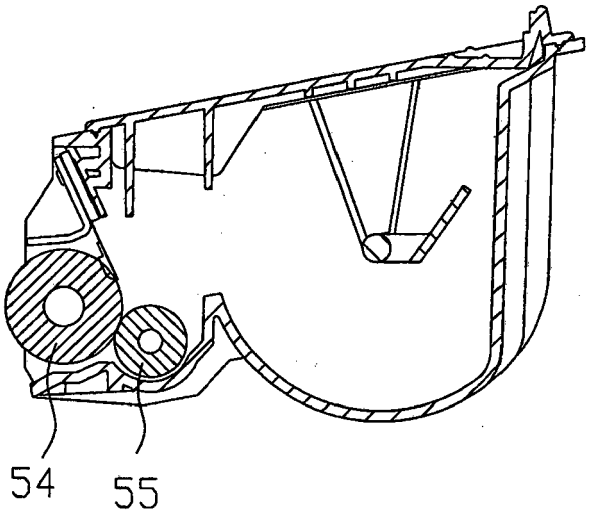

FIG. 18

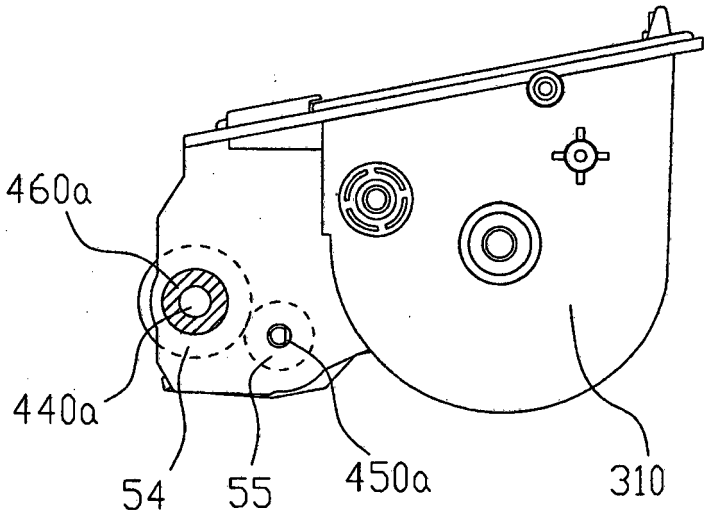

FIG. 19

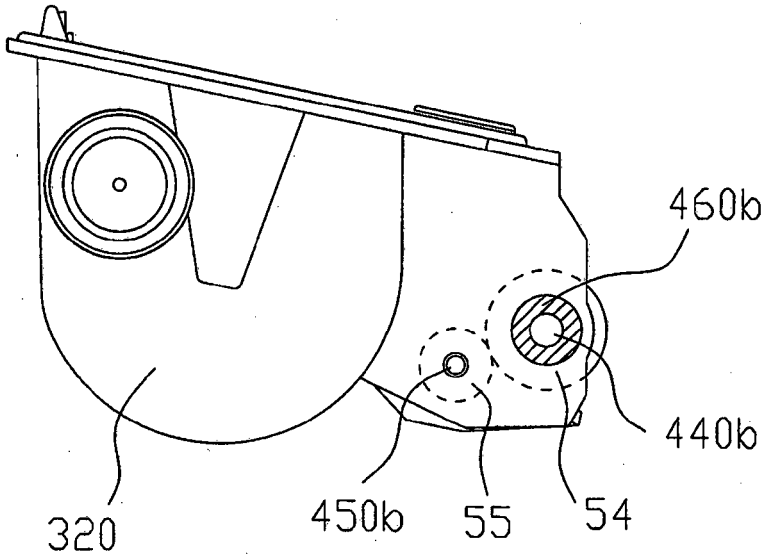

FIG. 20

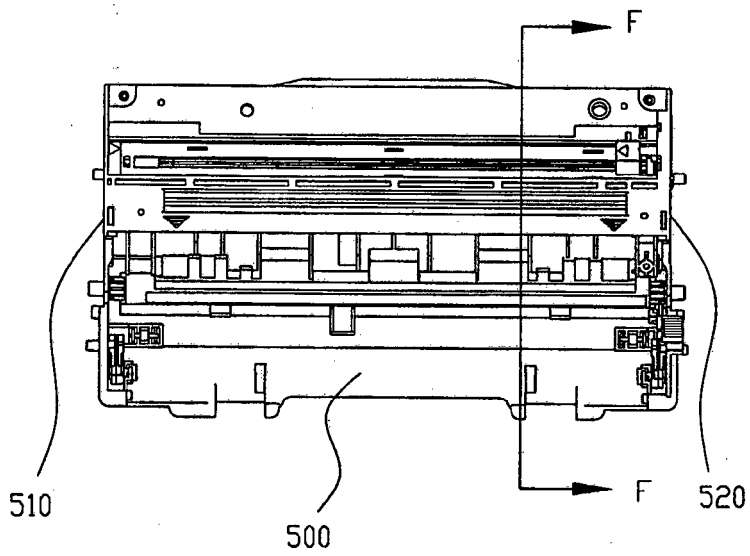

FIG. 21

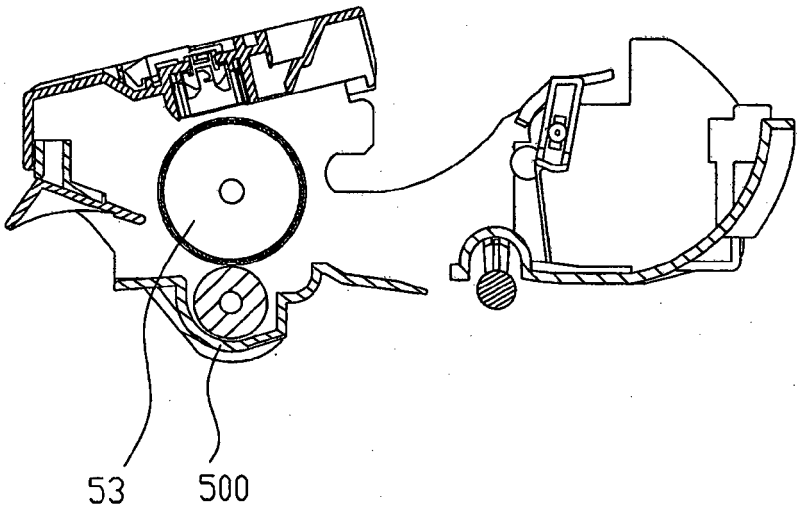

FIG. 22

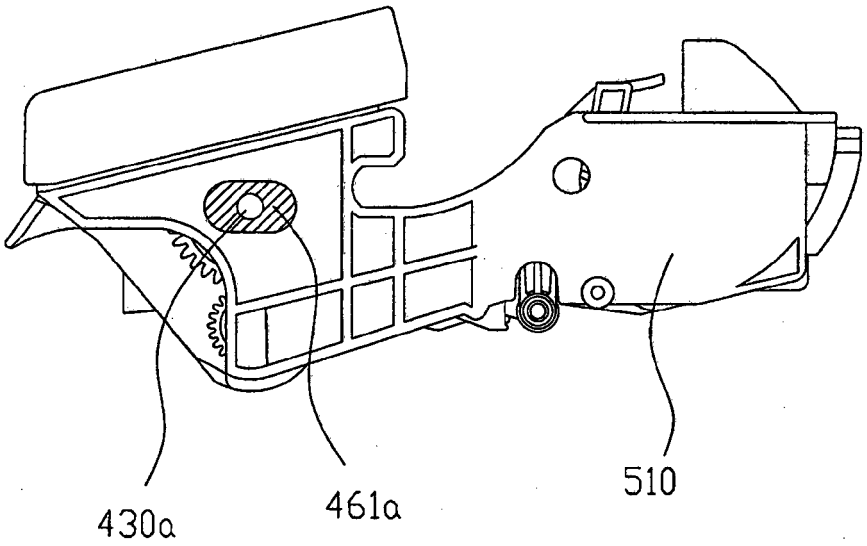

FIG. 23

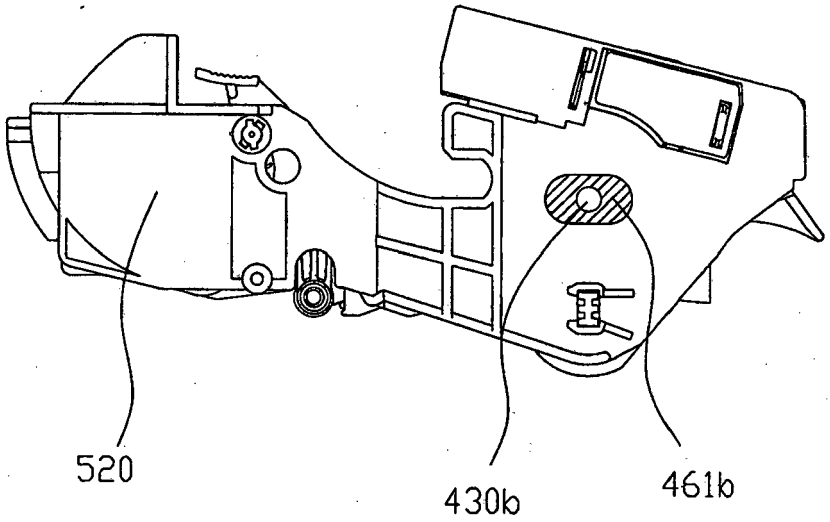

FIG. 24

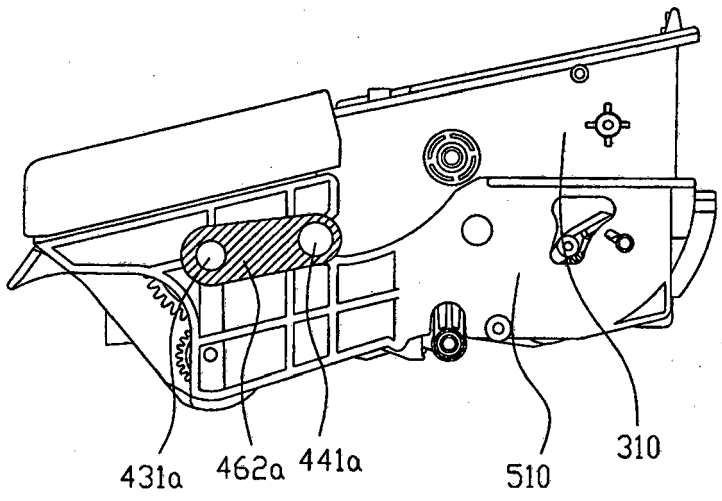

FIG. 25

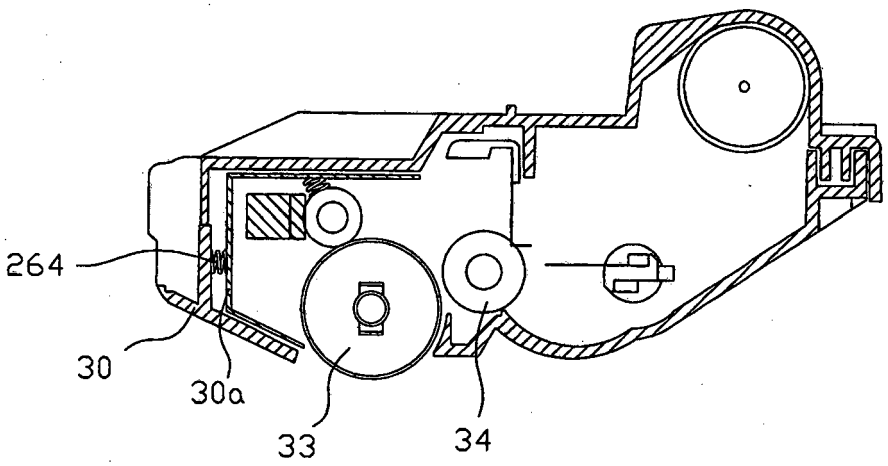

FIG. 26

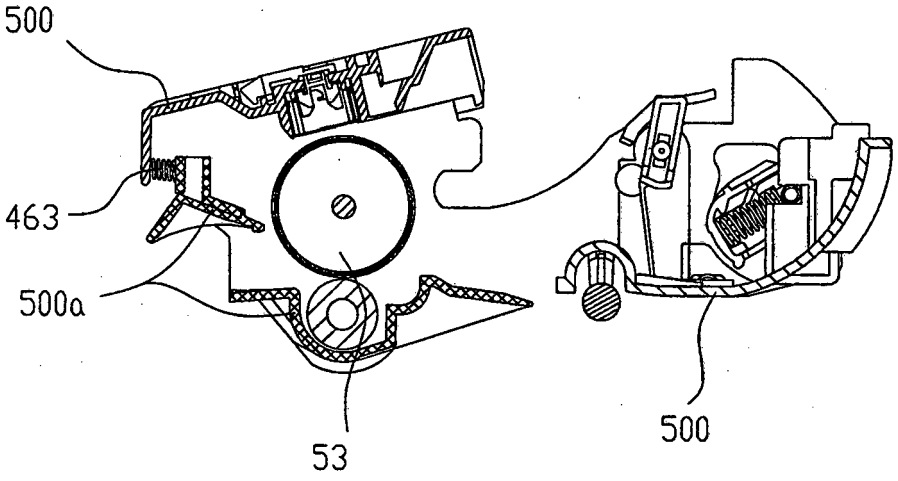

FIG. 27

REFERENCES CITED IN THE DESCRIPTION

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- EP 1703341 A2 **[0015]**
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- EP 0389267 A2 **[0016]**