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(71) Applicant: **CANON KABUSHIKI KAISHA**
Tokyo (JP)

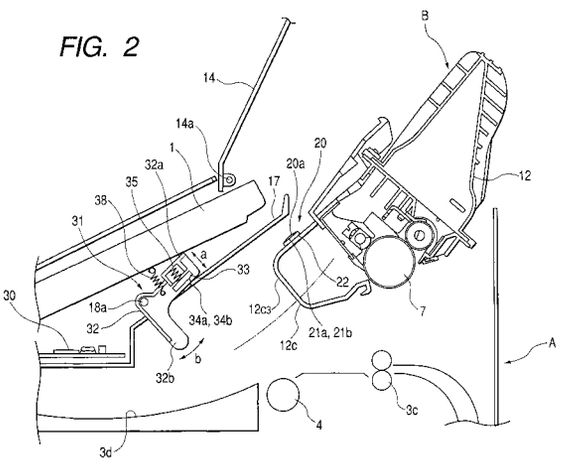
(72) Inventors:
- **Goto, Hiroshi, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)
- **Miura, Seietsu, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)
- **Tamura, Nobuya, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)
- **Miyazaki, Yoshiyuki,**
  c/o Canon Kabushiki Kaisha
  Tokyo (JP)
- **Maeda, Masafumi, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)
- **Tanoue, Masahide, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)
- **Nonaka, Fumito, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)
- **Ibaraki, Yoshihisa, c/o Canon Kabushiki Kaisha**
  Tokyo (JP)

(74) Representative:
Beresford, Keith Denis Lewis et al
BERESFORD & Co.
2-5 Warwick Court,
High Holborn
London WC1R 5DH (GB)

(54) Process cartridge and electrophotographic image forming apparatus

(57) A process cartridge (B) comprises a frame body (12), a substrate (22) having a memory element (20) and a cartridge electrical contact (21) electrically connected and a cartridge pushing portion provided on the frame body. An electrophotographic image forming apparatus (A) on which the process cartridge (B) is loaded comprises main body electrical connecting means (31) and main body electrical contacts (34). The cartridge pushing portion (12c3) moves the main body electrical connecting means (31) so that the process cartridge (B) moves in a direction to be electrically connected with the cartridge electrical contact (21) when the process cartridge (B) is loaded on the electrophotographic image forming apparatus (A). The cartridge pushing portion operates so as to give a pushing force for pushing the main body electrical contact (34) in a direction to be electrically connected with the cartridge electrical contact (21). In this way, the main body electrical contact and the cartridge electrical contact can be stably reliably brought into contact.

FIG. 2



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Description

[0001] The present invention relates to a process cartridge and an electrophotographic image forming apparatus detachably attachable with the process cartridge.

[0002] Examples of an electrophotographic image forming apparatus includes, for example, an electrophotographic copying machine, an electrophotographic printer (for example, a LED printer, a laser printer and the like), an electrophotographic facsimile, an electrophotographic word processor and the like.

[0003] Further, the process cartridge includes an electrophotographic photosensitive body and at least one of charging means, developing means and cleaning means are integrally turned into a cartridge as process means so as to be detachably attachable with an electrophotographic image forming apparatus main body. Or, furthermore, at least developing means and the electrophotographic photosensitive body are integrally turned into a cartridge as process means and detachably attachable with the electrophotographic image forming apparatus main body.

[0004] Conventionally, in the electrophotographic image forming apparatus using an electrophotographic image forming process, a process cartridge system is adopted, wherein an electrophotographic photosensitive body and process means acting on the electrophotographic photosensitive body are integrally incorporated into a cartridge, and this cartridge is made detachable and attachable with the image forming apparatus main body. According to this process cartridge system, maintenance of the apparatus can be performed by a user himself without depending on a service man, so that operability can be exceptionally improved. Hence, this process cartridge system is widely used in the image forming apparatus.

[0005] Further, in this type of the process cartridge system, for example, as described in Japanese Patent Laid-Open No. 9-179476, a process cartridge system is proposed, wherein storage means such as an IC memory and the like for storing information to be transmitted to the image forming apparatus main body is mounted on the process cartridge, and the information is exchanged with the apparatus main body when the process cartridge is loaded on the apparatus main body, so that using conditions and the like of the process cartridge are reported to a control portion of the apparatus main body. Further, is registered a lot number of the process cartridge, characteristic of the image forming apparatus and characteristic of the process means in the storage means mounted on the process cartridge, maintenance of the image forming apparatus or the process cartridge becomes easy, and further an image forming control was performed according to the information registered on the storage means, so that the image forming was performed under the best condition.

[0006] In the image forming apparatus adopting such a process cartridge, as connecting means for electrically connecting the storage means mounted on the process cartridge and the apparatus main body, there are available a contact type for connection by using a contact by means of a connector or a spring material and a non-contact type for communication by using a light-emitting element and a light-receiving element or by wireless by means of magnetic induction of inductor inductance via a magnetic core. Among these means, contact type connecting means using the spring material is simple in the constitution, advantageous cost-wise and generally used.

[0007] However, in the above described conventional art using the contact type connecting means, the electrical connection between the storage means of the process cartridge and the image forming apparatus main body is sometimes unstable as described below.

[0008] The process cartridge attached onto the apparatus main body generates movement in a rotational direction with a photosensitive body drum as a center and movement in a thrust direction of the photosensitive body drum at operation starting time and operation stopping time of the apparatus. Usually, an electrical contact pressure is secured in a state of driving being applied to the process cartridge from the apparatus main body. For this reason, in a state in which driving force is applied and not applied, there was a possibility of causing a change in a posture of the process cartridge and thereby causing irregularity of electrical contact pressure.

[0009] Hence, the present invention has been made in view of the above-described unsolved problems carried by the prior art.

[0010] A concern of the present invention is to provide a process cartridge and an electrophotographic image forming apparatus wherein a main body electrical contact provided on an apparatus main body and a cartridge electrical contact can be stably reliably brought into contact in a condition that the process cartridge has been attached onto the electrophotographic image forming apparatus.

[0011] Another concern of the present invention is to provide a process cartridge and an electrophotographic image forming apparatus wherein accuracy of a position to which a cartridge electrical contact is brought into contact with a main body electrical contact is improved in a condition that the process cartridge has been attached onto an electrophotographic image forming apparatus main body.

[0012] A further concern of the present invention is to provide a process cartridge and an electrophotographic image forming apparatus wherein a main body electrical contact provided on an apparatus main body and a cartridge electrical contact are stably reliably brought into contact when the process cartridge is being attached onto the electrophotographic image forming apparatus main body.

[0013] Another concern of the present invention is to provide a process cartridge and an electrophotographic image forming apparatus wherein a main body electrical

contact provided on an apparatus main body and a cartridge electrical contact provided on an apparatus main body are stably reliably brought into contact without being influenced by a change in a posture of the process cartridge due to the presence or absence of transmission of a driving force and by irregularity in the- dimension of parts.

[0014] Another concern of the present invention is to provide a process cartridge and an electrophotographic image forming apparatus which can prevent wearing and deformation.

[0015] Another concern of the present invention is to provide a process cartridge and an electrophotographic image forming apparatus, which improved operability of a jam process.

[0016] One aspect of the present invention

a process cartridge having main body electrical connection means movably provided and a main body electrical contact provided on the main body electrical connecting means, having:

an electrophotographic photosensitive body or drum;
process means acting on the electrophotographic photosensitive body or drum;
a frame body;
a memory element for storing information;
a cartridge electrical contact, which is electrically connected with the memory element and is electrically connected with the main body electrical contact when the process cartridge is attached onto the apparatus main body;
a substrate provided on the frame body, the substrate body having the memory element and the cartridge electrical contact; and
a cartridge pushing portion provided on the frame body allowing the main body electrical connecting means to move so that the main body electrical contact moves in a direction to be electrically connected with the cartridge electrical contact when the process cartridge is loaded on the apparatus main body and giving a pushing force for pushing the main body electrical contact in a direction to be electrically connected with the cartridge electrical contact after the main body electrical contact and the cartridge electrical contact are electrically connected.

[0017] Further, another aspect of the present invention provides a process cartridge detachably attachable with an electrophotographic image forming apparatus main body having main body electrical connecting means movably provided and a main body electrical contact provided on the main body electrical connecting means, the process cartridge having:

an electrophotographic photosensitive body or drum;
process means acting on the electrophotographic photosensitive body or drum;
a frame body;
a memory element for storing information;
a cartridge electrical contact electrically connected with the memory element, the cartridge electrical contact being connected with the main body electrical contact when the process cartridge is attached onto the apparatus main body,
a substrate provided on the frame body, the substrate having the memory element and the cartridge electrical contact, here the substrate being provided on the upper surface side of the frame body when the process cartridge was loaded on the apparatus main body;
a cartridge pushing portion provided on the frame body allowing the main body electrical connecting means to move so that the main body electrical contact is moved in a direction to be electrically connected with the cartridge electrical contact when the process cartridge is being attached onto the apparatus main body and giving a pushing force for pushing the main body electrical contact in a direction to be electrically connected with the cartridge electrical contact after the main body electrical contact is electrically connected with the cartridge electrical contact, the cartridge pushing portion being provided on a top end of the frame body in the attaching direction of the process cartridge when the cartridge process is attached onto the apparatus main body; and
a cartridge guide portion provided on the frame body, the cartridge guide portion engaging with a main body guide portion provided on the main body electrical connecting means and performing a positioning of the main body electrical connecting means when the process cartridge is being attached onto the apparatus main body, the cartridge guide portion being provided by protruding on the upper surface side of the frame body when the process cartridge was loaded on the apparatus main body.

[0018] Another aspect of the present invention provides an electrophotographic image forming apparatus detachably attachable with a process cartridge and forming an image on a recording medium, the electrophotographic image forming apparatus having:

(i) main body electrical connecting means movably provided;
(ii) a main body electrical contact provided on the main body electrical connecting means;
(iii) attaching means for removably loading the process cartridge having: an electrophotographic photosensitive body or drum; process means acting on the electrophotographic photosensitive body or drum; a frame body; a memory element for storing information; a cartridge electrical contact electrical-

ly connected with the memory element, the cartridge electrical point being electrically connected with the main body electrical contact when the process cartridge is attached onto the electrophotographic image forming apparatus; a substrate provided on the frame body, the substrate having the memory element and the cartridge electrical contact; a cartridge pushing portion provided on the frame body allowing the main body electrical connecting means to move so that the main body electrical contact is moved in a direction to be electrically connected with the cartridge electrical contact when the process cartridge is attached onto the apparatus main body and giving a pushing force for pushing the main body electrical contact in a direction to be electrically connected with the cartridge electrical contact after the main body electrical contact is electrically connected with the cartridge electrical contact; and

(iv)conveying means for conveying the recording medium.

[0019] Another aspect of the present invention provides an electrophotographic image forming apparatus detachably attachable with a process cartridge and forming an image on a recording medium, the electrophotographic image forming apparatus having:

(i) a main body electrical contact to be electrically connected with the cartridge electrical contact when the process cartridge is attached onto the main body of the electrophotographic image forming apparatus;

(ii) a first movable member rotatably provided for the main body electrical contact on the apparatus main body;

(iii) a first spring material provided between the first movable member and the apparatus main body, the first spring material biasing the first movable member in a direction where the main body electrical contact separates from the cartridge electrical contact;

(iv) a second movable member rotatably provided for the first movable member for supporting the main body electrical contact point;

(v) a second spring material provided between the first movable member and the second movable member, the second spring material energizing the second movable member in a direction where the main body electrical contact is electrically connected with the cartridge electrical contact;

(vi) loading means for removably loading the process cartridge, having: an electrophotographic photosensitive body or drum; process means acting on the electrophotographic photosensitive body or drum; a frame body; a memory element for storing information; a cartridge electrical contact electrically connected with the memory element, the cartridge electrical point being electrically connected with the main body electrical contact when the process cartridge is attached onto the main body of the electrophotographic image forming apparatus; a substrate provided on the frame body, the substrate having the memory element and the cartridge electrical contact; a cartridge pushing portion provided on the frame body allowing the main body electrical connecting means to move so that the main body electrical contact is moved in a direction to be electrically connected with the cartridge electrical contact when the process cartridge is being attached onto the apparatus main body and giving a pushing force for pushing the main body electrical contact in a direction to be electrically connected with the cartridge electrical contact after the main body electrical contact is electrically connected with the cartridge electrical contact;

(vii) conveying means for conveying the recording medium.

[0020] Another aspect of the present invention provides a process cartridge detachably attachable with an electrophotographic image forming apparatus having main body electrical connecting means movably provided and a main body electrical contact provided on the main body electrical connecting means, the process cartridge having:

an electrophotographic photosensitive body or drum;

process means acting on the electrophotographic photosensitive body or drum;

a frame body;

a memory element for storing information:

a cartridge electrical contact electrically connected with the memory element, the cartridge electrical contact being electrically connected with the main body electrical contact when the process cartridge is attached onto the apparatus main body;

a substrate provided on the frame body, the substrates having the memory element and the cartridge electrical contact;

a cartridge guide portion provided by protruding from the frame body engaging with a main body guide portion when the process cartridge is being attached onto the apparatus main body and performing positioning of the main body electrical connecting means in a direction to cross the mounting direction of the process cartridge and abutting against the main body electrical connecting means and guiding the main body electrical contact to the cartridge electrical contact portion in a direction where the main body electrical contact is electrically connected with the cartridge electrical contact; and

a cartridge pushing portion provided on the frame body allowing the main body electrical connecting means to move so that the main body electrical contact is moved in a direction to be electrically connected with the cartridge electrical contact when the process cartridge is being attached onto the apparatus main body and giving a pushing force for pushing the main body electrical contact in a direction to be electrically connected with the cartridge electrical contact after the main body electrical contact is electrically connected with the cartridge electrical contact.

[0021] Still another aspect of the present invention provides an electrophotographic image forming apparatus detachably attachable with a process cartridge and forming an image on the recording medium, the electrophotographic image forming apparatus having:

(i) main body electrical connecting means movably provided;
(ii) a main body electrical contact provided on the main body electrical connecting means;
(iii) a main body guide portion provided on the main body electrical connecting means;
(iv) an electrophotographic photosensitive body or drum; process means acting on the electrophotographic photosensitive body or drum; a frame body; a memory element for storing information; a cartridge electrical contact electrically connected with the memory element, the cartridge electrical point being electrically connected with the main body electrical contact when the process cartridge is loaded on the electrophotographic image forming apparatus; a substrate provided on the frame body, the substrate having the memory element and the cartridge electrical contact; a cartridge guide portion provided by protruding from the frame body engaging with a main body guide portion when the process cartridge is loaded on the main body of the electrophotographic image forming apparatus and performing positioning of the main body electrical connecting means in a direction to cross the mounting direction of the process cartridge and abutting against the main body electrical connecting means and guiding the main body electrical contact to the cartridge electrical contact portion in a direction where the main body electrical contact is electrically connected with the cartridge electrical contact; a cartridge pushing portion provided on the frame body allowing the main body electrical connecting means to move so that the main body electrical contact is moved in a direction to be electrically connected with the cartridge electrical contact when the process cartridge is loaded on the apparatus main body and giving a pushing force for pushing the main body electrical contact in a direction to be electrically connected with the cartridge electrical contact after the main body electrical contact is electrically connected with the cartridge electrical contact; and
(v) Conveying means for conveying the recording medium.

[0022] Embodiments of the invention will now be described in detail with reference to the accompanying drawings, in which:

FIG. 1 is a schematic block diagram showing a first embodiment of an image forming apparatus of the present invention;
FIG. 2 is a enlarged block diagram showing components of the first embodiment of the image forming apparatus of the present invention;
FIG. 3 is a cross-sectional view of a process cartridge in the first embodiment of the image forming apparatus of the present invention;
FIG. 4 is an external perspective view of the process cartridge in the first embodiment of the present invention;
FIG. 5 is a schematic perspective view showing a cartridge loading region in the first embodiment of the present invention;
FIG. 6 is a schematic diagram for explaining a force, which the cartridge receives in the cartridge loading region in the first embodiment of the present invention;
FIGS. 7A and 7B are views showing electrical connecting means in the first embodiment of the present invention. FIG. 7A is a perspective view of the whole. FIG. 7B is a perspective view of a contact holder of the electrical connecting means;
FIG. 8 is a block diagram showing a second embodiment of the image forming apparatus of the present invention, and shows a state of the process cartridge being not loaded;
FIG. 9 is a block diagram showing the second embodiment of the image forming apparatus of the present invention, and shows a state of the process cartridge being loaded;
FIG. 10 is a block diagram showing a third embodiment of the image forming apparatus of the present invention, and shows a state of the process cartridge being not loaded;
FIG. 11 is a block diagram showing the third embodiment of the image forming apparatus of the present invention, and shows a state of the process cartridge being loaded;
FIG. 12 is a block diagram showing a fourth embodiment of the image forming apparatus of the present invention, and shows a state of the process cartridge being not loaded;
FIG. 13 is a block diagram showing the fourth embodiment of the image forming apparatus of the

present invention, and shows a state of the process cartridge being loaded;

FIG. 14 is a perspective view showing the electrical connecting means in the fourth embodiment of the image forming apparatus of the present invention;

FIG. 15 is an external perspective view of the process cartridge in the fourth embodiment of the image forming apparatus of the present invention;

FIG. 16 is a block diagram showing a fifth embodiment of the image forming apparatus of the present invention;

FIG. 17 is a block diagram showing a fifth embodiment of the image forming apparatus of the present invention, and shows a state of the process cartridge being loaded;

FIGS. 18A and 18B are views showing the electrical connecting means in the fifth embodiment of the image forming apparatus of the present invention. FIG. 18A shows a perspective view of the electrical connecting means in a state where the contact holder is separated from a holder holding portion. FIG. 18B is a perspective view of the electrical connecting means in a state where the contact holder is adsorptively held by the holder holding portion;

FIG. 19 is an external perspective view of the process cartridge in the fifth embodiment of the image forming apparatus of the present invention;

FIG. 20 is a schematic cross-sectional view showing the constitution of a sixth embodiment of the image forming apparatus of the present invention;

FIG. 21A is a perspective view showing the shape of a region to which storage means of the process cartridge is attached in the sixth embodiment of the image forming apparatus of the present invention, and FIG. 21B is a perspective view showing a state of the storage means being mounted on the process cartridge;

FIG. 22 is a perspective view showing the shape of other region on which the storage means of the process cartridge is mounted in the sixth embodiment of the image forming apparatus of the present invention;

FIG. 23A is a perspective view of the electrical connecting means in the sixth embodiment of the image forming apparatus of the present invention, and FIG. 23B is a perspective view of the electrical connecting means shown in break lines cut along a dashed line of 23B to 23B in FIG. 23A;

FIG. 24 is a schematic perspective view for explaining a connecting operation of both contact portions of the electrical connecting means and the storage means in the sixth embodiment of the image forming apparatus of the present invention;

FIG. 25 is a schematic diagram for explaining the connecting operation of both contact portions of the electrical connecting means and the storage means in the sixth embodiment of the image forming apparatus of the present invention;

FIG. 26 is a schematic diagram for explaining the connecting operation of both contact portions of the electrical connecting means and the storage means in the sixth embodiment of the image forming apparatus of the present invention;

FIG. 27 is a schematic diagram showing a shunting state of connecting means prior to loading the process cartridge on the apparatus main body in a seventh embodiment of the image forming apparatus of the present invention; and

FIG. 28 is a partial cross-sectional view showing a joined relation between the contact holder and a holder arm of connecting means further in a eighth embodiment of the image forming apparatus of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Hereinafter, preferred embodiments of the present invention will be described with reference to the drawings.

(First Embodiment)

[0024] A process cartridge and an electrophotographic image forming apparatus detachably attachable with the process cartridge which are constituted based on the present invention, and subsequently, storage means as a main board of the process cartridge and electrical connecting means of an apparatus main body side will be described with reference to FIG. 1 to FIG. 7. Hereinafter, in the present embodiment, description will be made by taking an electrophotographic laser beam printer as an example.

[0025] An image forming apparatus A, as shown in FIG. 1, forms a latent image on the photosensitive body drum by irradiating a laser beam image based on image information on a cylindrical electrophotographic photosensitive body 7 (hereinafter, referred to simply as a photosensitive body drum) from an optical system (scanner), and develops this latent image to form a developer image by using the developer.

[0026] Synchronizing with formation of the developer image, a recording medium 2 such as a recording paper, OHP sheet, a cloth and the like is conveyed from a recording medium cassette 3a by a pickup roller 3b, a pair of conveying rollers 3c and the like. In the image forming part constituting a cartridge as a process cartridge B, the developer image formed on the photosensitive body drum 7 is applied with voltage on a transferring roller 4, so that the image is transferred on the recording medium 2. The recording medium 2 on which the developer image was transferred is guided by a guiding plate 3d and is conveyed to a fixing means 5. This fixing means 5 comprises a fixing roller 5c, which is built-in with a driving roller 5a and a heater 5c, and fixes the developer image by applying heat and pressure on the recording

medium 2 which passes through. The recording medium 2 on which the developer image was fixed is conveyed through a reversal-conveying path, and is discharged to a discharge tray 6 outside of the apparatus via a pair of discharging rollers 3e.

[0027] The process cartridge B comprises the photosensitive body drum 7 and at least one process means. Here, as the process means, there are available, for example, charging means (8) which charges the electrophotographic photosensitive body, developing means (10, 10a, 10b..) which develops the latent image formed on the electrophotographic photosensitive body, cleaning means (11, 11a, 11b..) which cleans the developer remained on the surface of the electrophotographic photosensitive body and the like (see FIG. 3).

[0028] The process cartridge B of the present embodiment is constituted as shown in FIG. 3. The photosensitive body drum 7 having a photosensitive layer on its peripheral surface is rotated, and its surface is uniformly charged by a charging roller 8, which is charging means. Subsequently, an image information light from the optical system 1 is exposed on the photosensitive body drum 7 via an exposure-opening portion 9 provided on the process cartridge B so as to form the latent image. The latent image formed on the photosensitive body drum 7 is developed by using the developer by the developing means (10, 10a, 10b..).

[0029] The developing means (10, 10a, 10b..) conveys the developer, which is within a developer storing portion 10a, by a developer delivery portion 10b, and allows it to be adhered on the developing roller 10, which is built-in with a fixed magnet. The developer layer given with frictional charging charge by a developing blade 10c is formed on the surface of the developing roller 10. The developer is transferred on the photosensitive body drum 7 according to the latent image, so that the developer image is formed and visualized.

[0030] A voltage having a polarity in reverse to the developer image is applied on the transferring roller 4 provided on the apparatus main body, and the developer image is transferred on the recording medium 2. After that, the developer remained on the photosensitive body drum 7 is scraped off by the cleaning blade 11, and the scraped developer is collected into a removed developer collector 11a.

[0031] Note that the above-described photosensitive body drum 7 and process means (8, 10, 11..) are stored and held within a cartridge frame body 12. The cartridge frame body 12 includes a developer storing frame body 12a for forming a developer storing portion 10a for storing the developer, a developing apparatus frame body 12b for holding the developing roller 10 and the like and a cleaning frame body 12c for holding the photosensitive body drum 7 and cleaning means and forming the removed developer collector 11a. Further, the developer storing frame body 12a and the developing apparatus frame body 12b are unified by welding and the like, which is oscillationally joined to the cleaning frame boy 12c, thereby constituting the process cartridge B.

[0032] The process cartridge B is detachably attached onto cartridge attaching means provided on the apparatus main body A (see FIG. 1, FIG. 5 and FIG. 6). The cartridge attaching means is provided on a region accessible by opening (see FIG. 1 and FIG. 2) a cartridge cover (openable and closable cover) 14 that is openable and closable about an axis 14a with respect to the casing of the apparatus A. In FIG. 5 which shows a cartridge loading-region with the cartridge cover 14 in a state of being opened in a perspective view, a cartridge loading guide member 15 is mounted by opposing to both of the left and right wall surfaces 15d, 15e (note that the other wall surface 15e is not shown) of the cartridge lading region (FIG. 5 shows one side only). The left and right loading guide members 15 comprise guide portions 15a, 15c which are guides when the process cartridge B is inserted and a cartridge positioning portion 15b for positioning the process cartridge B which is continuously formed on the guide portion 15a, respectively. Note that the guide portion 15c is arranged by bending downward in the vicinity of the cartridge positioning portion 15b.

[0033] The guide portion 15a guides a boss 12c1 (see FIG. 4), which is formed on the cleaning frame body 12c of the cartridge frame body 12 of the process cartridge and protrudes to both outsides longitudinally. Further, the guide portion 15c guides a slender-shaped longitudinal guide portion 12c2 (see FIG. 4), which is provided similarly by externally protruding upward of the boss 12c1 of the cartridge frame body 12. The cartridge positioning portion 15b continuing to the guide portion 15a engages with the boss 12c1 of the cartridge frame body 12, and performs positioning for the apparatus main body of the process cartridge B.

[0034] When the process cartridge B is attached onto the cartridge attaching means formed as described above, a cartridge cover 14 is opened, and the boss 12c1 and the longitudinal guide portion 12c2 of the cartridge frame body 12 are inserted, respectively along the guide portion 15a and the guide portion 15c. The cartridge frame body 12 is guided by each guide portions 15a, 15c, and the boss 12c1 of the cartridge frame body 12 is fitted to the cartridge positioning portion 15b so as to be positioned. Note that, at this time, the longitudinal guide portion 12c2 of the cartridge frame body 12 is positioned in a state of being separated from the guide portion 15c. In this way, the process cartridge B is positioned on the apparatus main body A (see FIG. 6). By closing the cartridge cover 14, the process cartridge B is loaded on the apparatus main body A.

[0035] When the process cartridge B is attached onto the cartridge loading means in this way, as shown in FIG. 6, a helical gear G2 provided on an end portion of the photosensitive body drum 7 held by the cartridge gear B is engaged with a helical gear G1 provided on the apparatus main body A. Thereafter, when the helical gear G1 rotates (clockwise in FIG. 6), the photosensitive

body drum 7 rotates via the helical gear G2. In this way, a driving force of the apparatus main body A is transmitted to the process cartridge B.

[0036] At this time, with the boss 12c1 provided on both sides on the same axis as the photosensitive body drum 7 as a center, a force to rotate the process cartridge B clockwise similarly as a rotational direction of the photosensitive body drum 7 acts on the process cartridge B. An abutting concave portion 12c6 (FIGS. 4 and 6) provided on the upper surface of the cleaning frame body 12c abuts against a solidly fixed portion 100 (FIG. 6) provided on the apparatus main body A. In this way, a position of the cleaning frame body 12c of the process cartridge B for the apparatus main body A is set.

[0037] Further, in a longitudinal direction of the process cartridge B (in a direction orthogonal to FIG. 6), a thrust force acts between the helical gear G1 provided on the apparatus main body A and the helical gear G2 of the end portion of the photosensitive body drum 7. Hence, a force to move the process cartridge B in the thrust direction (axial direction of the photosensitive body drum 7) acts. That is, in FIG. 5, a force works in a direction to advance toward the one wall surface 15d for the process cartridge B. In this way, in the case where there exists a slight gap between the side surface of the cartridge frame body 12 of the process cartridge B and the apparatus main body A, when a driving force is applied on the process cartridge B, by this driving force, the process cartridge B moves slightly toward the thrust direction until the boss 12c1 butts against the wall surface 15d. Further, on the contrary, when a state of the driving force being applied on the cartridge B turns into a state of the driving force being not applied, the force being applied on each butting portion ceases to work, and the process cartridge B moves in a direction to separate from the butting portion. In this way, the position and the posture of the process cartridge B become different according to the operating time and the stopping time of the apparatus main body A, and every time the apparatus main body A performs the driving and stopping operation, the position of the process cartridge B moves.

[0038] Note that the above-described boss 12c1 is a protruding member provided by externally protruding from both sides (of the cleaning frame body 12c) of the cartridge frame body 12 on the same axis line as the axis line of the photosensitive body drum 7. This protruding member may be a member where a drum axial portion for supporting the photosensitive body drum 7 on the cartridge frame body 12 (the cleaning frame body 12c) externally protrudes or a member where a part of the cartridge frame body 12 (or the cleaning frame body 12c) externally protrudes.

[0039] In the above described description regarding the driving, though the driving transmitting means toward the process cartridge were described as the helical gears, in the case of the constitution where the driving toward the process cartridge from the apparatus main body is transmitted by using a coupling mechanism, the same action is performed.

[0040] Next, the storage means to be loaded on the process cartridge will be described by using FIG. 3 and FIG. 4.

[0041] The storage means (memory means) 20 is provided on the external surface of the cartridge frame body 12 of the process cartridge B. Particularly, as shown in FIG. 3 and FIG. 4, the storage means is mounted on the upper surface of the cartridge frame body 12 (the cleaning frame body 12c). This storage means 20, as shown clearly in FIG. 4, has specifically a memory chip 20a such as RAM, ROM and the like and contact portions 21a, 21b of both sides thereof on a substrate 22. Further, in this memory chip 20a is inputted in advance the necessary information (for example, a lot number of the process cartridge, initial value and using status such as process conditions, characteristic of the image forming apparatus and characteristic of process means and like). When the process cartridge B was loaded on the apparatus main body A, the information is exchanged with the apparatus main body side, so that the state such as using conditions and the like of the process cartridge B is notified to a control substrate 30 of the apparatus main body A, which is useful for the image forming operation and used for the purpose of displaying to an operator of the status of the process cartridge. Further, since the memory chip 20a can be written even during use, writing can be performed at any time as occasion demands.

[0042] The contact portions 21a, 21b are for the purpose of connecting with electrical contacts of the apparatus main body side in order to perform the writing on the memory chip 20a, and a gold plated bronze plate is mounted on the substrate 22.

[0043] Further, on the upper surface of the cartridge frame body 12 of the process cartridge B is provided a guide pin 23 adjacent to the storage means 20 (see FIG. 4). When the process cartridge B is being attached onto the apparatus main body A, this guide pin 23 is arranged at a position to engage with a guide rib 36 of electrical connecting means 31 in order to decide the position of the thrust direction of the electrical connecting means 30 to be described later of the apparatus main body side.

[0044] Next, the constitution of the electrical connecting means provided on the apparatus main body side will be described by using FIG. 1, FIG. 2 and FIG. 7.

[0045] The electrical connecting means 31, as shown in FIG. 1, is arranged at a position opposing to the storage means 20 when the process cartridge B is attached onto the apparatus main body A. The electrical connecting means 31, as shown in FIG. 7A and 7B, is constituted by a rotary arm 32 which is a first movable member formed almost in the shape of L character and a contact holder 33 which is a second movable member. The rotary arm 32 is formed almost in the shape of L character by a main body portion 32a which movably holds parallel the contact holder 33 and a downward protruding por-

tion 32b, which protrudes downward and is a connecting means abutting portion arranged so as to abut against a top end portion 12c3 which is a pushing member of the cartridge frame body 12 when the process cartridge B is attached. Further, on the lateral side of the main body portion 32a of the rotary arm 32 is integrally provided a guide portion 32c, on whose under surface side is formed a pair of guide ribs 36. This pair of guide ribs 36 is for the purpose of guiding and positioning the guide pin (engaging portion) provided on the process cartridge B. The direction from which the guide pin 23 advances is in an opened state so that the guide pin 23 can be reliably guided. The rotary arm 32 in its L character shaped bent portion is rotatably and sliderably supported in an axial direction (thrust direction) by an axial member 18a which is axially supported by a bearing member 18 provided on a frame portion 17 of the apparatus main body A.

[0046] Further, in the contact holder 33 to be held on the main body portion 32a of the rotary arm 32, as shown in FIG. 7B, are built-in the electrical contact portions 34a, 34b by being pressed into a boss (not shown), which are treated with gold plating on the plate spring member of phosphor bronze. Further, on the external side portion of the electrical contact portions 34a, 34b are formed convex portions 33a, 33b. The electrical contact portions 34a, 34b are connected with the control substrate 30 via a lead wire (not shown). When the contact holder 33 contacts the storage means 20, the electrical contact portions 34a, 34b are brought into contact with storage means contact portions 21a, 21b. The convex portions 33a, 33b are constituted so as to abut against the upper surface portion of the cleaning frame body 12c. The bosses 33c, 33d formed on the upper surface (in FIG. 7A) of the contact holder 33 sliderably fit to holes provided on the main body portion 32a of the rotary arm 32. Hence, the contact holder 33 is movably mounted in parallel to the direction shown by an arrow mark a for the main body portion 32a. Between the contact holder 33 and the main body portion 32a is arranged a spring 35, which energizes the contact holder 33 in a protruding direction shown by the arrow mark a.

[0047] As described above, in the bent portion of the L-shaped rotary arm 32, the electrical connecting means 31 is rotatably and sliderably supported in an axial direction (thrust direction) by an axial member 18a which is axially supported by the bearing member 18 provided on the frame portion 17 of the apparatus main body A. Hence, the electrical connecting means 31 can rotate in the direction shown by an arrow mark b, and further can rotate in the direction shown by an arrow mark c. Further, the rotary arm 32 is energized counterclock wise around an axial portion 18a by a spring 38 (see FIG. 1 and FIG. 2).

[0048] Next, a connecting constitution between the storage means 20 at the process cartridge loading time and the electrical connection means 31 of the apparatus main body side will be described.

[0049] When the process cartridge B is not attached onto the apparatus main body A, as shown in FIG. 2, the rotary arm 32 of the electrical connecting means 31 biased in a counter-clockwise direction by an energizing force of the spring 38 with an axial member 18a as a center, and is at a standstill. In this way, the contact holder 33 held by the main body portion 32a of the rotary arm 32 and the electrical contact portions 34a, 34b are held in a shunting state upward of the frame portion 17.

[0050] When the process cartridge B is being attached onto a cartridge attaching region of the apparatus main body A and the process cartridge B is inserted, the top end portion 12c3 of the cartridge frame body 12 (the cleaning frame body 12c) abuts against the downward protruding portion 32b of the rotary arm 32. The downward protruding portion 32b is pushed clockwise corresponding to further insertion of the process cartridge B, so that the rotary arm 32 of the electrical connecting means 31 rotates clockwise by opposing to the energizing force of the spring 38. When the process cartridge B is loaded on a predetermined cartridge loading region, the rotary arm 32 of the electrical connecting means 31 comes to a stand still at the position shown in FIG. 1.

[0051] At the rotational time of the rotary arm 32 of the electrical connecting means 31, the contact holder 33 held by the main body portion 32a of the rotary arm 32 moves clockwise at the same time. The electrical contact portions 34a, 34b comprising the spring member of the contact holder 33 are brought into contact with the storage means contact portions 21a, 21b of the process cartridge B. The convex portions 33a, 33b formed on the contact holder 33 abut against the upper surface portion of the cleaning frame body 12c. In this way, the contact holder 33 comes to a stand still at the position shown in FIG. 1. Here, a spring force of the spring 35 which energizes the contact holder 33 in a direction to protrude downward in the drawing is largely set for a sum of the spring forces of the electrical contact portions 34a, 34b. Hence, the convex portions 33a, 33b of the contact holder 33 abut against the cleaning frame body 12c by the spring force of the spring 35. In this way, since the convex portions 33a, 33b of the contact holder 33 directly abuts against the cleaning frame body 12c, there is few positional shift due to common difference of parts, and it is possible to obtain precise positional accuracy of the electrical contact portions 34a, 34b and the storage means contacts 21a, 21b. Note that a timing for the electrical contact portion 34a, 34b to contact the storage means contact portions 21a, 21b may be either during the process cartridge B is attached onto the apparatus main body A or after the process cartridge B is attached onto the apparatus main body A.

[0052] Further, at the loading time of the process cartridge B, the guide pin 23 provided adjacent to the storage means 20 of the process cartridge 20 is guided by a pair of guide ribs 36 of the guide portion 32c so as to be finally positioned. A this time, since the contact holder

33 is movable together with the rotary arm 32 in a longitudinal direction (direction shown by the arrow mark c) along the axial member 18a, the contact holder 33 moves by following the process cartridge B. For this reason, even with respect to the longitudinal direction (direction shown by the arrow mark c), the electrical contact portions 34a, 34b and the storage means contact portions 23a, 23b can be precisely positioned.

[0053] As described above, according to the present embodiment, in a state where the cartridge cover 14 is opened and the process cartridge B is not attached onto the apparatus main body A similarly as when the process cartridge B is removed, the electrical contact portions 34a, 34b of the electrical connecting means 31 of the apparatus main body side are in a state of shunting upward of the frame portion 17 of the apparatus main body A, and therefore are not touchable to the user. For this reason, the operability at the time when the user has access to the interior of the apparatus main body A because of a jam process and the like can be enhanced and, at the same time, no trouble is caused to the electrical contact portions 34a, 34b due to the static electricity carried by the user. Further, the electrical contact portions 34a, 34b can be prevented from becoming deformed and the like due to the jam process and the like.

[0054] Further, when the process cartridge B is attached onto the apparatus main body A and the apparatus main body is applied with driving so that the process cartridge B (the cartridge frame body 12) moves, the contact holder 33 moves by following both of the rotational direction and the longitudinal direction of the cartridge frame body 12. Hence, regardless of the apparatus main body being applied with driving or not being applied with driving, stable contact pressure and positional accuracy can be always obtained. Further, since the contact holder 33 and the cartridge frame body 12 directly abut against each other, it is possible to obtain precise positional accuracy of the electrical contact portions 34a, 34b and the storage means contacts 21a, 21b.

[0055] By constituting the electrical connecting means of the apparatus main body A as described above, electrical connection between the storage means 20 of the process cartridge B and the apparatus main body A can be stabilized.

(Second Embodiment)

[0056] Next, a second embodiment of the image forming apparatus of the present invention will be described by using FIG. 8 and FIG. 9. The present embodiment is different from the first embodiment in the constitution of the electrical connecting means of the apparatus main body side which is electrically connected with the storage means. Here, the points only, which are different from the first embodiment, will be described, and the other points will be omitted. Note that the description will be made by giving the same reference symbols to the same members as those of the first embodiment.

[0057] Electrical connecting means 41 in the present embodiment, as shown in FIG. 8 and FIG. 9, is constituted by a rotary arm 42 which is a first movable member formed almost in the shape of L character and a contact holder 43 which is a second movable member. This electrical connecting means 41 is arranged at a position opposing to the storage means 20 when the process cartridge B is loaded on the apparatus main body A (see FIG. 9).

[0058] The rotary arm 42 is formed almost in the shape of L character by a main body portion 42a which oscillationally holds a contact holder 43 and a downward protruding portion 42b, which protrudes downward and is arranged so as to abut against a top end portion of the cartridge frame body 12 at the loading time of the process cartridge B. Further, on the lateral side of the main body portion 42a of the rotary arm 42, though not shown, similarly as the first embodiment, is integrally provided a guide portion, on whose under surface side is formed a pair of guide ribs for guiding and fitting the guide pin 23. The rotary arm 42 in its L character shaped bent portion is rotatably and sliderably supported in an axial direction (thrust direction) by an axial member 18a which is axially supported by a bearing member 18 provided on a frame portion 17 of the apparatus main body A.

[0059] Further, the contact holder 43 is rotatably mounted in a direction shown by the arrow mark d with a rotational axis 43p as a center for the almost L-shaped rotary arm 42, and is biased in a clockwise direction in FIG. 8 by a spring 45 arranged between the rotary arm 42 and the contact holder 43. In the under surface of the contact holder 43 is built-in and formed electrical contact portions 44a, 44b by press fit, which is treated with gold plating on the plate spring member of phosphor bronze, and which are connected with a control substrate 30 via a lead wire (not shown). Further, in the external side portion of the electrical contact portions 44a, 44b is formed a convex portion (not shown) similarly as the first embodiment. Accordingly, when the contact holder 43 contacts the storage means 20, the electrical contact portions 44a, 44b are brought into contact with storage means contact portions 21a, 21b, and the convex portion (not shown) is constituted so as to abut against the upper surface portion of the cartridge frame body 12 (the cleaning frame body 12c).

[0060] As described above, in the bent portion of the almost L-shaped rotary arm 42, the electrical connecting means 41 is arranged rotatably and sliderably in an axial direction (thrust direction) by an axial member 18a which is axially supported by a bearing member 18 of a frame portion 17 of the apparatus main body. Further, the rotary arm 42 is biased in a counter-clockwise direction around the axial member 18a by a spring 48 (see FIG. 8 and FIG. 9) arranged between the apparatus main body and the rotary arm 42.

[0061] Next, a connecting constitution between the

electrical connecting means 41 of the apparatus main body side A and the storage means 20 will be described.

[0062] When the process cartridge B is not attached onto the apparatus main body A, as shown in FIG. 8, the rotary arm 42 of the electrical connecting means 41 is at a standstill on a position energized counter-clockwise with the axial member 18a as a center. In this way, the contact holder 43 and electrical contact portions 44a, 44b held by the main body portion 42a of the rotary arm 42 are held in a shunting state upward of the frame portion 17.

[0063] When the process cartridge B is being attached, a top end portion 12c3, which is a cartridge pushing portion of the cleaning frame body 12c of the process cartridge B, abuts against a downward protruding portion 42b of the rotary arm 42. The downward protruding portion 42b is pushed clockwise corresponding to further insertion of the process cartridge B, so that the rotary arm 42 of the electrical connecting means 41 rotates clockwise by opposing to an biasing force of the spring 48. When the process cartridge B is loaded on a predetermined loading region, the rotary arm 42 of the electrical connecting means 41 comes to a standstill at a position shown in FIG. 9. At the rotational time of the rotary arm 42 of the electrical connecting means 41, the contact holder 43 held by the main body portion 42a of the rotary arm 42 moves clockwise at the same time. The electrical contact portions 44a, 44b comprising the spring member of the contact holder 43 are brought into contact with the storage means contact portions 21a, 21b of the process cartridge B and, at the same time, the convex portions (not shown) formed on the contact holder 43 abut against the upper surface portion of the cleaning frame body 12c similarly as the above-described embodiment. Here, a spring force of the spring 45 which energizes the contact holder 43 in a protruding direction of an arrow mark d direction is largely set for a sum of the spring forces of the electrical contact portions 44a, 44b. Hence, the convex portions of the contact holder 33 abut against the cleaning frame body 12c by the spring force of the spring 45. In this way, since the convex portions of the contact holder 33 directly abut against the cleaning frame body 12c, there is few positional shift due to common difference of parts, and it is possible to obtain precise positional accuracy of the electrical contact portions 44a, 44b and the storage means contacts 21a, 21b. Note that a timing for the electrical contact ports 44a, 44b to contact the storage means contact portions 21a, 21b may be either during the process cartridge B is attached onto the apparatus main body A or after the process cartridge B is loaded on the apparatus main body A.

[0064] Further, even with respect to the longitudinal position of the electrical connecting means at the loading time of the process cartridge B, similarly as the first embodiment, the electrical connecting means moves by following the process cartridge B and can be precisely positioned.

[0065] As described above, in the present embodiment also, in a state where the cartridge cover 14 is opened and the process cartridge B is not attached onto the apparatus main body A similarly as when the process cartridge B is removed, the electrical contact portions 34a, 34b of the apparatus main body side are in a state of shunting upward of the frame portion 17 of the apparatus main body A, and therefore are not touchable to the user. For this reason, operability at the time when the user has access to the interior of the apparatus main body A because of a jam process and the like can be enhanced and, at the same time, no trouble is caused to the electrical contact portions 44a, 44b due to the static electricity carried by the user.

[0066] Further, when the process cartridge B is loaded on the apparatus main body A and the apparatus main body is applied with driving so that the process cartridge B (the cartridge frame body 12) moves, the contact holder 43 moves by following both of the rotational direction and the longitudinal direction of the cartridge frame body 12. Hence, regardless of the apparatus main body being applied with driving or not being applied with driving, stable contact pressure and positional accuracy can be always obtained. Further, since the contact holder 43 and the cartridge frame body 12c directly abut against each other, it is possible to obtain precise positional accuracy of the electrical contact portions 44a, 44b and the storage means contacts 21a, 21b.

[0067] By constituting the electrical connecting means of the process cartridge and the apparatus main body as described above, electrical connection between the storage means 20 and the apparatus main body can be stabilized.

(Third Embodiment)

[0068] Next, a third embodiment of the image forming apparatus of the present invention will be described by using FIG. 10 and FIG. 11. The present embodiment is different from the first and the second embodiments in the constitution of electrical connecting means of the apparatus main body to be electrically connected with storage means. Here, the points only, which are different from the first and the second embodiments, will be described, and the other points will be omitted. Note that the description will be made by giving the same reference symbols to the same members as those of the first and the second embodiments.

[0069] Electrical connecting means 51 in the present embodiment, as shown in FIG. 10 and FIG. 11, is arranged at a position opposing to the storage means 20 when a process cartridge B was attached onto an apparatus main body A. This electrical connection means 51 has an almost L-shaped rotary arm 52, and this rotary arm 52 is formed by a main body portion 52a, into which electrical contact portions 54a, 54b treated with gold plating on a phosphor bronze spring material is built, and a downward protruding portion 52b, which protrudes

downward and is arranged so as to abut against a top end portion 12c3, which is a cartridge pushing member of a cartridge frame body 12 at the loading time of the process cartridge B. Further, in the under surface of the main body portion 52a of the rotary arm 52 is formed a convex portion 52c which abuts against the upper surface of the cleaning frame body 12c. Further, on the lateral side of the main body portion 52a of the rotary arm 52, though not shown, similarly as the first embodiment, is integrally provided a guide portion on whose under surface side is formed a pair of guide ribs for guiding and fitting the guide pin 25.

[0070] The rotary arm 52 has a long hole 52d formed in its L-shaped bent portion, and is supported by an axial member 18a, which is axially supported by a bearing member 18 provided on a frame portion 17 of the apparatus main body, and is sliderably movable in a direction shown by an arrow mark h and rotatable in a direction shown by an arrow mark g. Further, the rotary arm 52 is based in a counter-clockwise direction around the axial member 18a by a spring 58 arranged between the apparatus main body A and the rotary arm 52. Accordingly, when the process cartridge is not attached onto the apparatus main body A, as shown in FIG. 10, the rotary arm 52 is biased in a counter-clockwise direction in a state where an upper end of the long hole 52d contacts the axial member 18a, and comes to a standstill at a position shown in FIG. 10. In this way, the electrical contact portions 54a, 54b are placed at a position shutting upward of the frame portion 17 of the apparatus main body.

[0071] Here, when the process cartridge B is attached, the top end portion of the cleaning frame body 12c of the process cartridge B abuts against the downward protruding portion 52b of the rotary arm 52. The downward protruding portion 52b is pushed clockwise corresponding to further insertion of the process cartridge B, so that the rotary arm 52 of the electrical connecting means 51 rotates clockwise by opposing to an energizing force of the spring 58. For this reason, when the process cartridge B is attached onto a predetermined cartridge loading region, the rotary arm 52 comes to a standstill at a position as shown in FIG. 11. Further, a convex portion 52c formed on the under surface of the rotary arm 52 abuts against the upper surface portion of the cleaning frame body 12c, so that, with respect to a position in a rotary direction, the rotary arm 52 is positioned in a position shown in FIG. 11 and comes to a standstill. In this way, similarly as the first and the second embodiments, the positioning between the electrical contact portions 54a, 54b and storage means contacts 21a, 21b can be precisely performed.

[0072] Here, a spring force of the spring 58 is largely set for the sum of the spring force of the electrical contact portions 54a, 54b. Hence, the convex portion 52c of the rotary arm 52 abuts against the cleaning frame body 12c by the spring force of the spring 58. Here, since the rotary arm 52 and the cleaning frame body 12c directly abut against each other, there is few positional shift due to common difference of parts, and it is possible to obtain precise positional accuracy of the electrical contact portions 54a, 54b and the storage means contacts 21a, 21b. Note that a timing for the electrical contact ports 54a, 54b to contact the storage means contact portions 21a, 21b may be either during the process cartridge B is attached onto the apparatus main body A or after the process cartridge B is attached onto the apparatus main body A.

[0073] Further, even with respect to the longitudinal position of the electrical connecting means at the loading time of the process cartridge B, similarly as the first and the second embodiments, the electrical connecting means moves by following the process cartridge B and can be precisely positioned.

[0074] As described above, even in the present embodiment, in a state where a cartridge cover 14 is opened and the process cartridge B is not attached onto the apparatus main body A similarly as when the process cartridge B is removed, the electrical contact portions 54a, 54b of the apparatus main body side are in a state of shunting upward of the frame portion 17 of the apparatus main body A, and therefore are not touchable to the user. For this reason, operability at the time when the user has access to the interior of the apparatus main body A because of a jam process and the like can be enhanced and, at the same time, no trouble is caused to the electrical contact portions 54a, 54b due to the static electricity carried by the user. Further, similarly as the first embodiment, the electrical contact portions 54a, 54b can be prevented from becoming deformed and the like due to the jam process and the like.

[0075] Further, when the process cartridge B is attached onto the apparatus main body A and the apparatus main body is applied with driving so that the process cartridge B (the cartridge frame body 12) moves, the rotary arm 52 moves by following the rotational direction and the longitudinal direction of the cartridge frame body 12. Hence, regardless of the apparatus main body being applied with driving or not being applied with driving, stabilized contact pressure can be always obtained. Further, since the rotary arm 52 and the cleaning frame body 12c directly abuts against each other, it is possible to obtain precise positional accuracy of the electrical contact portions 54a, 54b and the cartridge electrical contacts 21a, 21b.

[0076] Further, in the present embodiment, since the electrical connecting means 51 is constituted solely by the rotary arm, the number of parts is few, and the cost thereof is advantageous.

[0077] By constituting the electrical connecting means of the process cartridge and the apparatus main body as described above, the electrical connection between the storage means 20 and the apparatus main body can be stabilized.

(Fourth Embodiment)

[0078] Next, a fourth embodiment of the image forming apparatus of the present invention will be described by using FIG. 12 to FIG. 15. The present embodiment is different from the above-described embodiments in the constitution of electrical connecting means of the apparatus main body to be electrically connected with storage means. Here, the points only, which are different from the above-described embodiments, will be described, and the other points will be omitted. Note that the description will be made by giving the same reference symbols to the same members as those of the first to the third embodiments.

[0079] The process cartridge B in the present embodiment, as shown in FIG. 15, has storage means 20 mounted on the external surface of a cartridge frame body 12, particularly, on the upper surface of a cleaning frame body 12c. The storage means 20, similarly as the above-described embodiments, has a memory chip 20a and contact portions 21a, 21b of both sides thereof on a substrate 22. A guide pin 23 is provided adjacent to the storage means 20. This guide pin 23 is arranged at a position to engage with a guide rib 66 of electrical connecting means 61 in order to decide a position in a thrust direction of electrical connecting means 61 of the apparatus main body side when the process cartridge B is being attached onto the main body A.

[0080] Next, a constitution of the electrical connecting means provided on the apparatus main body side will be described by using FIG. 12 to FIG. 14.

[0081] The electrical connecting means 61 for reading and writing information for the storage means 20 arranged on the process cartridge B, as shown in FIG. 12, is arranged at a position opposing to the storage means 20 when the process cartridge B is attached onto the apparatus main body A. The electrical connecting means 61, as shown in FIG. 14, includes electrical contact portions 63a, 63b consisting of a spring material for performing communication of the information by contacting storage means contact portions 21a, 21b and a contact holder 62 having at its under surface a pair of guide ribs for guiding and positioning a guide pin 23 provided on the process cartridge B. In one end periphery of a contact holder 62 and one end peripheral portion of a guide rib 66 is formed a taper portion 62a to precisely perform the loading of the process cartridge B.

[0082] Further, a contact holder 62 includes also an axial member 62b, which is rotatably axially supported in a direction shown by an arrow mark j by a bearing member 18 provided on a frame portion 17 of the apparatus main body A. This bearing member 62b is further removable in the thrust direction shown by an arrow mark k for the bearing member 18, and has a length longer than a back-lash in the thrust direction at the time when the process cartridge B was loaded on the apparatus main body. The bearing member 62b never comes off from the bearing member 18 by movement toward the thrust direction.

[0083] Between the contact holder 62 and the frame portion 17 is arranged a compression spring 68, and the contact holder 62 is biased in a direction (clockwise with the axial member 62b as a center) to separate from the frame portion 17. At this time, a rotation stopping portion (not shown) of the contact holder 62 and the frame portion abuts against each other, so that the contact holder is not allowed to rotate more than a certain position.

[0084] Next, a connecting constitution between the storage means 20 at the loading time of the process cartridge and the electrical connecting means 61 of the apparatus main body will be described.

[0085] The contact holder 62 of the electrical connecting means 61 is in a state as shown in FIG. 12 when the process cartridge B is not loaded. When the process cartridge B is loaded from this state, a top end portion of the cartridge frame body 12 of the process cartridge B abuts against the taper portion 62a of the contact holder 62, so that the contact holder 62 rotates counterclockwise by opposing to a spring force of the compression spring 68 with the axial member 62b as a center. Thereafter, as shown in FIG. 13, electrical contact portions 63a, 63b comprising a spring material of the contact holder 62 are positioned so as to abut against the storage means contact portions 21a, 21b with adequate contact pressure. At this time, the guide pin 23 of the cartridge frame body 12, as shown in FIG. 14, is positioned at grooves of a pair of guide ribs 66.

[0086] When the apparatus main body A is applied with driving in this state and the process cartridge B moves in the thrust direction, the guide pin 23 of the cartridge frame body 12 and a pair of guide ribs 66 fit to one another in the thrust direction. Hence, accompanied with movement of the cartridge frame body 12, the axial member 62b of the contact holder 62 slides against the bearing portion 18, and the contact holder 62 moves in the thrust direction, so that the storage means contact portion 21a, 21b and the electrical contact portion 63a, 63b integrally move in the thrust direction. In this way, the storage means contact portions 21a, 21b and the electrical contact portions 63a, 63b are never rubbed together in the thrust direction.

[0087] Further, when driving force is applied to the apparatus main body A, the process cartridge B makes a thrust movement in a direction opposite to the above direction. However, even in this case, similarly as described above, the storage means contact portions 21a, 21b and the electrical contact portions 63a, 63b integrally move together.

[0088] As described above, when the process cartridge B having the storage means 20 and the guide pin 23 was loaded on the apparatus main body A, the contact holder 62 having a pair of guide ribs 66 positioned in the thrust direction for the process cartridge B is loaded on the apparatus main body A. Hence, simultaneously with movement in the thrust direction of the process cartridge B, the contact holder 62 also integrally moves,

so that the electrical connection can be stabilized without causing cutting and deformation of the storage means 20 and the electrical contact portions 63a, 63b.

(Fifth Embodiment)

[0089] Next, a fifth embodiment of the image forming apparatus of the present invention will be described by using FIG. 16 to FIG. 19. The present embodiment is different from the above-described embodiments in the constitution of electrical connecting means of the apparatus main body side to be electrically connected with storage means of a process cartridge. Here, the points only, which are different from the above-described embodiments will be described, and other points will be omitted. Note that the description will be made by giving the same reference symbols to the same members as those of the first to the fourth embodiments.

[0090] A process cartridge B in the present embodiment, as shown in FIG. 19, has storage means 20 mounted on the external surface of a cartridge frame body 12, particularly, on the upper surface of a cleaning frame body 12c. The storage means 20, similarly as the above-described embodiments, has a memory chip 20a and contact portions 21a, 21b of both sides thereof on a substrate 22. Metal plates 24a, 24b for mounting magnets on symmetric positions are provided adjacent to the storage means 20. Although these metal plates 24a, 24b may be kept uncovered in the metal surfaces, the plates may be covered by other members to such a degree to mount the magnets. Further, when the process cartridge B is loaded on the apparatus main body, two pieces of pushing ribs 25a, 25b for pushing out the magnets by abutting against the electrical connecting means are formed.

[0091] Next, a constitution of the electrical connecting means provided on the apparatus main body will be described by using FIG. 16 to FIG. 18.

[0092] Electrical connecting means 71 in the present embodiment, as shown in FIG. 18A and FIG. 18B, is constituted by a contact holder 72 which is adjacent to the storage means contact portions 21a, 21b and forms electrical contact portions 73a, 73b comprising a spring material for performing communication of the information and a holder holding member 80, which abuts against a contact holder 72 and holds it separable.

[0093] In the contact holder 72 is formed a central concave portion 74, which is constituted by a surface 74a parallel to the under surface at the under surface central portion and a taper surface 74b sloping upward to the side to which the process cartridge B is loaded. In this taper surface 74b is arranged electrical contact portions 73a, 73b comprising a pair of springs. The under surfaces positioned at both sides of a central concave portion 74 are flat contact surfaces 75 formed so as to abut against the upper surface of a cartridge frame body 12 (12c) of the process cartridge B. In the contact surfaces 75, built-in magnets 76a, 76b at the positions corresponding to metal plates 24a, 24b are arranged on the upper surface of the cartridge frame body 12 (12c). Further, the surface at the side where the process cartridge B comes to be loaded in the surface orthogonal to the composition surface 75 is taken as a holder pushing surface 77, and in the holder pushing surface 77 is built-in magnets 78a, 78b for absorbing a holder holding member 80. From the contact holder 72 a lead wire 79 (see FIG. 16 and FIG. 17) to perform an electrical communication with a control portion (not shown) of the apparatus main body is connected.

[0094] On the other hand, the holder holding member 80 for separably holding the contact holder 72 is constituted by an abutted surface 81 to be absorbed by the magnets 78a, 78b of the holder pushing surface 77 by opposing to the holder pushing surface 77 of the contact holder 72 and an U-shaped support portion 82 which is inserted into the central concave portion 74 of the contact holder 72 and is formed so as to support the contact holder 72. The length in the width direction of the abutted surface 81 is narrower than the width of the contact holder 72. This holder holding member 80 may be constituted by a metal as a whole, or may be constituted by incorporating metal into a part only which abuts against the magnets 78a, 78b.

[0095] The electrical connecting means 71 constituted as described above, as shown in FIG. 16 and FIG. 17, is mounted on the frame portion 17 upward of the cartridge loading region for loading the process cartridge B. The holder holding member 80 of the electrical connecting means 71 is mounted at a region slightly biased to the side where the process cartridge B comes to be loaded than the cartridge loading region. In a state where the process cartridge B is not attached, as shown in FIG. 16 and FIG. 18B, the contact holder 72 has the U-shaped support portion 82 of the holder holding member 80 inserted into the central concave portion 74. The magnets 78a, 78b abut against the abutted surface 81, and are absorbed and held by the holder holding member 80.

[0096] When the process cartridge is being attached onto the apparatus main body, the electrical connecting means 71 is in a state as shown in FIG. 16 and FIG. 18A, and is in an uncovered state with the pushing surface 77 of the contact holder 72 protruded from the abutted surface 81 of the holder holding member 80. When the process cartridge B is being attached in this state, pushing ribs 25a, 25b of the process cartridge B abut against both side end portions of the holder pushing surface 77 of the contact holder 72, so that the magnets 78a, 78b of the contact holder 72 are pushed so as to be separated from the abutted surface 81. At the same time, the metal plates 24a, 24b arranged on the process cartridge B come to a position opposing to a composition surface 75 of the contact holder 72. Hence, the magnets 78a, 78b are separated from the abutted surface 81, and simultaneously, the magnets 78a, 76b built in the composition surface 75 absorb the metal plates 24a, 24b of

the process cartridge B, and the contact holder 72 is absorbed and held on the upper surface of the process cartridge B (see FIG. 17).

[0097] At this time, the contact holder is connected with the apparatus main body by a lead wire 79 only, and can flexibly move for the apparatus main body A. In this way, the contact holder 72 is unified with the process cartridge B, and integrally moves with the movement in the thrust direction of the process cartridge B. Hence, the electrical contact portions 73a, 73b and the storage means contact portions 21a, 21b are not rubbed together, and cutting and deformation of the electrical contact portions 73a, 73b and the storage means contact portions 21a, 21b can be prevented.

[0098] Further, in the case where the process cartridge B is pulled out from the apparatus main body A, the central concave portion 74 of the contact holder 72 and the U-shaped support portion 82 of the holder holding member 80 are positioned linearly for a detachably attachable direction of the process cartridge B. Hence, accompanied with a pulling-out operation of the process cartridge B, the U-shaped support portion 82 of the holder holding member 80 come to contact a surface 74a from a taper surface 74b of the central concave portion 74, and the contact holder 72 receives a force in a direction to be stripped from the process cartridge B. At the same time, since the contact holder 72 moves toward an abutted surface 81, the magnets 78a, 78b and the abutted surface 81 draw closer. When the process cartridge B is further pulled out from this state, as shown in FIG. 16 and FIG. 18, the magnets 78a, 78b and the abutted surface 81 are put into an attached state, and the contact holder 72 is separated from the process cartridge B so as to be held by the holder holding member 80.

[0099] In the above described embodiment, though a joining method for the contact holder 72 and the holder holding member 80 and the contact holder 72 and the process cartridge B was constituted by magnets and metals, by using flexible members and by using means such as snap fit mechanism and the like, the contact holder may be held.

[0100] As described above, according to the present embodiment, the electrical contact portion of the electrical connecting means of the apparatus main body side can be integrally joined with the process cartridge at the loading time of the process cartridge. Further, even when the change in the posture of the process cartridge and movement toward the thrust direction are caused due to the presence or absence of driving, the electrical connection with the storage means of the process cartridge and the electrical connecting means of the apparatus main body can be reliably and satisfactorily performed.

(Sixth Embodiment)

[0101] A process cartridge and an image forming apparatus detachably attachable with the process cartridge which are constituted based on an sixth embodiment of the present invention will be described. Subsequently, storage means to be mounted on the process cartridge and connecting means provided on the apparatus main body side will be described with reference to FIG. 20 to FIG. 26. In the present embodiment also, description will be made by taking an electrophotographic laser beam printer as an example.

[0102] The image forming apparatus of the present embodiment, as shown in FIG. 20, emits a laser beam image based on image information from an optical system 101, and irradiates the laser beam on a photosensitive body drum 107 built inside a process cartridge B via an exposure opening 109. On the photosensitive body drum 107 is formed an electrostatic latent image, and this electrostatic latent image is developed by a developer by developing means within the process cartridge B so as to form a developer image.

[0103] On the other hand, a recording medium 102 loaded on a recording medium cassette 103a is synchronized with formation of the developer image, and is separated and fed by a pickup roller 103b, and is conveyed via conveying means having a pair of conveying rollers 103c and the like. The recording medium 102 is transferred with the developer image formed on the photosensitive body drum 107 by a transferring roller 104. The recording medium 102 transferred with the developer image is conveyed further downstream side via a guide plate 103d, and is conveyed to fixing means 105. The fixing means 105 fixes the developer image on the recording medium 102 by applying heat and pressure. The recording medium 102 fixed with the developer image is discharged to a discharge tray 106 outside of the apparatus by an ejection roller 130e.

[0104] The process cartridge B comprises the photosensitive body drum 107 and at least one process means. The process cartridge B in the present embodiment is constituted as shown in FIG. 20. The photosensitive body drum 107 having a photosensitive layer on its peripheral surface is rotated and is uniformly charged on the surface by applying a voltage to a charging roller 108, which is charging means. Subsequently, an image information light from the optical system 101 is exposed on the photosensitive body drum 107 via the exposure opening portion 109 provided on the process cartridge B so as to form the electrostatic latent image. The electrostatic latent image formed on this photosensitive body drum 107 is developed by using the developer by the developing means (110, 110a, 110b..).

[0105] The developing means (110, 110a, 110b..) delivers the developer, which is within a developer storing portion 110a, to a developer delivery portion 110b, and the developer is given to a developing roller 110 where a fixed magnet is built-in. A developer layer given with a frictional charging charge by a developer blade 110c is formed on the surface of the developer roller 110, and the developer is transferred on the photosensitive body

drum 107 according to the latent image, so that a developer image is formed and visualized.

[0106] After the developer image has been transferred on the recording medium 102 by applying a voltage of polarity reverse to the developer image on the transferring roller 104, the developer remained on the photosensitive body drum 107 is scraped off by a cleaning blade 111. The scraped developer is collected into a removed developer collector 111a.

[0107] Note that the above-described photosensitive body drum 107 and the process means (108, 110, 111..) are held within a cartridge frame body 112 which is a frame body. The cartridge frame body 112 is constituted by a developer storing frame body forming a developer storing portion 110a which stores the developer, a developing apparatus frame body for holding the developer 110 and the like and a cleaning frame body 112c (FIG. 21A and FIG. 21B) which holds the photosensitive body drum 107 and the cleaning means and forms the removed developer collector 111a. The developer storing frame body is unified with the developing apparatus frame body, and is joined with the cleaning frame body 112c, thereby constituting the process cartridge B.

[0108] Next, a constitution of storage means (chip memory) in the present embodiment will be described by using FIG. 21. FIG. 21A is a perspective view showing a form of the region to mount the storage means in the process cartridge, and FIG. 21B is a perspective view showing a mounting state of the storage means on the process cartridge.

[0109] The storage means 120 in the present embodiment is mounted on the outside of the cartridge frame body 112 of the process cartridge B. Particularly, as shown in FIG. 20 and FIG. 21A and 21B, the storage means 120 is mounted on the upper surface of the cleaning frame body 112c of the cartridge frame body 112. This storage means 120, as shown in FIG. 21B, has a memory chip 120a which is a memory element such as RAM, ROM and the like and memory element contact portions 121a, 121b of both sides thereof on a substrate 122. In this memory chip 120a is inputted in advance the necessary information (for example, such as a lot number of the process cartridge, initial value and using status such as process conditions, characteristic of the image forming apparatus and characteristic of process means and the like). When the process cartridge B was loaded on the apparatus main body A, the information is exchanged with the apparatus main body side, so that the state such as using status and the like of the process cartridge B is notified to a control substrate 130 (FIG. 20) of the apparatus main body A, which is useful for the image forming operation and used for the purpose of displaying to an operator of the status of the process cartridge.

[0110] The memory element contact portions 121a, 121b are electrically connected or integrally joined with a memory chip 120a which is positioned in a central portion, and the memory element portions 121a, 121b are constituted by gold plating on its surface. In this way, even when the memory element contact portions 121a, 121b are mounted on the surface of the process cartridge B and exposed to the open air, electrical contact resistance is never increased. Further, in the external side of these memory element contact portions 121a, 121b are formed abutting portions 122a, 122b, against which abutting ribs 134a, 134b (to be described later) of electrical connecting means 131 provided on the apparatus main body abut. Further, on the substrate 122 of the storage means 120 is provided a concave portion 122h in the central portion at a side peripheral portion along a longitudinal direction as shown in FIG. 21B so that the positioning in a longitudinal and a transversal direction can be performed, and on both end portions of the side peripheral portion along the longitudinal direction are provided concave portion 122f and 122g.

[0111] Next, a mounting portion to mount the storage means 120 will be described. A mounting surface 112e of the storage means 120 of the process cartridge B, as shown in FIG. 21A, is positioned on the upper surface of the cleaning portion frame body 112c of the cartridge frame body 112. The concave portion 122h of the substrate 122 is fitted to a central positioning rib 112h so that a positioning in a longitudinal direction for the cartridge frame body 112 of the substrate 122 is performed. Further, a positioning in the transversal direction is performed by butting the butting concave portions 122f and 112g against the positioning ribs 112f and 112g of the cartridge frame body 112. That is, by the central positioning rib 112h and both positioning ribs 112f and 112g, a positioning member to position the storage means 120 for the frame body is constituted. The mounting surface 112e of the storage means 120, as shown in FIG. 21A, is constituted by a plurality of ribs so that accuracy of surface of the mounting surface can be enhanced when preparing a mould. In this way, positioning accuracy for a vertical direction of the upper surface (surface having a contact portion) of the storage means 120 can be enhanced.

[0112] Further, as a storage means support member, ribs 112m and 112n, which are protrusively provided at both end portions in a longitudinal direction of the mounting surface 112e, have their intervals set slightly wider than a longitudinal length of the storage means 120, and are constituted higher than a thickness of the storage means 120. In this way, a finger is not allowed to touch both end portions in a longitudinal direction of the storage means 120, so that the storage means 120 is prevented from dislocating from the mounting surface 112e.

[0113] Note that, in FIG. 21A and 21B, a butting rib 112d is a butting member cartridge pushing portion, which is formed at a front end portion in a cartridge inserting direction of the cartridge frame body 112 at a region adjacent to the mounting surface 112e of the storage means 120, and abuts against electrical connecting means 131 to be described later of the apparatus main

body side so as to move main body contact portions 133a, 133b which are main body electrical contacts toward the storage means 120. Further, reference numeral 121j denotes a guide rib, which extends frontward in a cartridge inserting direction from the central positioning rib 112h.

From among upward end surfaces 112ja, 112jb thereof, the upward end surface 121ja of a front portion in an inserting direction of the cartridge has its height formed high, and the 121jb following the former is formed so as to become low in the height by gradually inclining to the height of the central positioning rib 112h. This guide rib 112j, as to be described later, has a guide portion to control the position in a direction orthogonal to the loading direction of the process cartridge B of the electrical connecting means 131 which is the connecting means to support the main body side contact portion. Further, the guide rib 112j controls the position in a height direction of the main body contact portion 133 of the electrical connecting means 131, and performs also an operation as an abutting portion to guide the main body contact portions 133a, 133b in a direction to contact the memory element contact portions 121a, 121b.

[0114] The mounting of the storage means 120 on the mounting surface 112e can be performed by using a double-coated tape, a bonding agent, heat calking and the like. At this time, in the case where the operator touches or when the process cartridge is loaded on the apparatus main body, adhering strength not easily dislocated by contact with the electrical connecting means 131 to be described later has to be given, and in the mounting surface 112e constituted by a plurality of ribs as shown in FIG. 21A, thickness of the ribs and the number of ribs are decided so that the surface 112e becomes a contact area capable of having a required contact strength. Further, in a material renewal recycle process of the used process cartridge, it is necessary to take out the storage means 120 from the cartridge frame body 112. At this time, since the mounting surface 112e of the storage means 120 is a rib constitution, even if the mounting surface 112e is fixed by, for example, the double-coated tape and the like, a sticking force does not become abnormally high, and therefore, the used storage means 120 can be easily stripped off from the mounting surface 112e. As shown in FIG. 22, in a part of the rib is provided a small chip portion 112p. In this way, or by arranging a rib which can directly abut against a removal tool (not shown) on the reverse side of the storage means 120, there is an advantage in that a removal operation of the storage means 120 from the cartridge frame 112 of the process cartridge B becomes easy.

[0115] Next, a constitution of the electrical connecting means provided on the apparatus main body and an electrical connecting operation with the connecting means and the storage means of the process cartridge will be described by using FIG. 20 and FIG. 23 to FIG. 26.

[0116] The electrical connecting means 131 which is the connecting means to support a main body side contact portion in the present embodiment, as shown in FIG. 20, is provided at a position opposed to the storage means 120 of the process cartridge B when the process cartridge B was loaded on the apparatus main body A. This electrical connecting means 131 is provided on a mounting base which is the main body support member arranged at a frame portion 117 for supporting the optical system 101 sliderably and movably in a direction (vertical direction to the paper surface in FIG. 20) orthogonal to the loading direction of the process cartridge. The electrical connecting means 131, as shown in FIG. 23A and 23B, is constituted by a contact holder 132a for holding a connector 134, a holder arm 132b, which is a butting receiving portion, against which the butting rib 112d provided on the process cartridge butts and a holder spring 132c butts. Further, the connector 134 which is the main body contact support portion holds the main body contact portions 133a, 133b which are the spring members, and on the outside of the main body contact portions 133a, 133b are formed the abutting ribs 134a, 134b. The main body contact portions 133a, 133b are electrically connected with the control substrate 130 of the apparatus main body side mounted on the frame portion 117 via a wire harness (see FIG. 20). Further, in the contact holder 132a is provided a slit portion 132h as a guide portion for guiding the electrical connecting means 131 in a direction orthogonal to the loading direction of the process cartridge and a upper wall surface portion 132j of the slip portion 132h as means for controlling movement in a direction vertical to the cartridge inserting direction. When the process cartridge B was loaded on the apparatus main body by this electrical connecting means 131, the main body contact portions 132a, 133b of the connector 134 about against the memory element contact portions 121a, 121b of the storage means 120, and electrically connect the storage means 120 with the control substrate 130, and further abutting portions 134a, 134b are allowed to butt against the abutting portions 122a, 122b of the storage means 120.

[0117] The holder spring 132c of the electrical connecting means 131, as shown in FIG. 23B, which is a view on arrow of FIG. 23A, abuts against the contact holder 132a and the holder arm 132b. This holder spring 132c energizes the contact holder 132a clockwise in the drawing with an axis (132f) around which the holder spring 132c is wound as a center, and biases the holder arm 132b in a counter-clockwise direction in the drawing. Further, the holder arm 132b is constituted so as to be able to rotate to the position shown by a two-dot chain line in the drawing.

[0118] The electrical connecting means 131, as described above, is rotatably hung by the mounting base 118 (see FIG. 20 and FIG. 24) arranged at the frame portion 117 which is a partition member. When the process cartridge B is not yet attached, the whole of the elec-

trical connecting means 131 is biased in a counterclockwise direction by a biasing force of the arm spring 132e (FIG. 23) arranged at the outside of the holder arm 132b with the axis 132f as a center in FIG. 24 and FIG. 25. As a result, the main body contact portions 133a, 133b which are supported by the contact holder 132a are shunted and stored more upward than the frame portion 117, and are constituted so as not to interfere with the process cartridge B when the process cartridge B is inserted.

[0119] On the other hand, as described above, in the process cartridge B is provided, as shown in FIG. 21A and 21B and FIG. 24 to FIG. 26, the guide rib 112j for introduction adjacent to the mounting surface 112e of the storage means 120 in such a manner as to correspond to the slit portion 132h in front of the mounting surface 112e. This guide rib 112j for introduction is constituted so as to jump into the slip portion 132h of the contact holder 132a when the process cartridge B is inserted into the apparatus main body. In the upper end surface of this guide rib 112j, as shown in FIG. 21 or FIG. 24 and FIG. 25, is formed an upper end surface portion 112ja in front of the cartridge inserting direction with its height high. Further, the 112jb which is a portion following therefrom is formed in such a manner as to become low by gradually inclining to the height of the central positioning rib 112h.

[0120] At the inserting time of the process cartridge B, as shown in FIG. 24 and FIG. 25, the butting rib 112d formed at an end portion in a inserting direction (an arrow mark X direction) of the cartridge frame body 112 butts against a connecting means abutting portion 132k of the holder arm 132b of the electrical connecting means. Accompanied with further insertion of the process cartridge B, as shown in FIG. 25, the holder arm 132b rotates clockwise, and allows the whole electrical connecting means 131 to rotate clockwise (an arrow mark Z direction in the drawing). Note that, in FIG. 25 and FIG. 26, reference numeral 115 denotes a cartridge loading member which is constituted in the apparatus main body A, and reference numeral 115a denotes a guide portion, and reference numeral 115b a cartridge positioning portion.

[0121] By the rotation in a clockwise direction (the arrow mark Z direction in the drawing) of the whole electrical connecting means 131, the guide rib 112j of the process cartridge B enters in the slip portion 132h of the contact holder 132a. In this way, when a position in a direction (vertical direction to the paper surface in the drawing) orthogonal to the loading direction of the process cartridge B is slightly shifted in the apparatus main body, the guide rib 112j of the process cartridge B butts against the side surface of the slip portion 132h of the contact holder 132a. By pushing the whole electrical connecting means 131 in a direction (thrust direction) orthogonal to the loading direction of the process cartridge B, the electrical connecting means 131 and the storage means 120 of the process cartridge B are mutually moved to an adequate position. Note that this positioning operation in the thrust direction is performed during an inserting operation of the process cartridge B. A physical relationship between the guide rib 112j and the slip. portion 132h of the contact holder 132a is decided so that the positioning operation is terminated before the main body contact portions 133a, 133b of the electrical connecting means 131 lands on the memory element contact portions 121a, 121b of the storage means 120. That is, in a state where the upper wall surface portion 132j of the slit portion 132h abuts against the upper end surface portion of the guide rib 112j or the inclined portion 112jb following thereof, it is desirable that the positioning operation in the thrust direction is set to be terminated. In this way, after the main body contact portions 133a, 133b of the contact holder 132a of the electrical connecting means 131 have landed on the memory element contact portions 121a, 121b, the contact portions 133a, 133b can be prevented from moving in the thrust direction above the storage means contact portion 120b.

[0122] When the process cartridge B is further inserted into the arrow mark X direction, the electrical connecting means 131 further rotates clockwise, and the upper wall surface portion 132j of the slit portion 132h moves along the inclined portion 112jb of the guide rib 112j. The main body contact portions 133a, 133b of the contact holder 132a of the electrical connecting means 131 lands on the memory element contact portions 121a, 121b. Further, abutting ribs 134a, 134b of the contact holder 132a rotate till butting against the abutting portions 122a, 122b (see FIG. 22) of the storage means 120. When the process cartridge B is further inserted after the abutting ribs 134a, 134b have butt against the abutting portions 122a, 122b of the storage means 120, the holder arm 132b only of the electrical connecting means 131 defies the biasing force of the holder spring 132c and rotates clockwise so as to compress the force. The main body contact portions 133a, 133b move by sliding over the memory element contact portions 121a, 121b and finally come into a state as shown in FIG. 26. Note that a timing for the main body contact portions 133a, 133b to touch down onto the memory element contact portions 121a, 121b may be during the process cartridge is being attached onto the apparatus main body A or after the process cartridge is attached onto the apparatus main body A. In the case of the former, by elastic deformation of the main body contact portions 133a, 133b including a spring material and movement of the process cartridge, the main body contact portions 133a, 133b slide over the memory element contact portion 121b. In the case of the latter, by elastic deformation of the main body contact portions 133a, 133b, the main body contact portion 133a moves by sliding over the memory element contact portions 121a, 121b.

[0123] In this way, even when there exist component irregularity such as variation and the like of the position of the butting rib 112d of the process cartridge B and the

mounting position of the electrical connecting means 131 at production and assembly time, variation of the posture at the inserting time of the process cartridge B, or the posture change by receiving driving after the process cartridge B is loaded on the apparatus main body A, the holder arm 133b of the electrical connection means 131 is constituted so as to be able to follow the posture change in the process cartridge B. Hence, the abutting ribs 134a, 134b of the electrical connecting means 131 can surely butt against the abutting portions 122a, 112b of the storage means 120.

[0124] Further, the abutting ribs 134a, 134b of the connector 134 are arranged at both sides of the main body contact portions 133a, 133b so as to be lower than the main body contact portions 133a, 133b. In this way, the abutting ribs 134a, 134b butt against the abutting portions 122a, 122b of the storage means 120, so that strokes of the main body contact portions 133a, 133b which are spring materials can be made constant, and contact pressure (contact pressure) of both contact portions can be stabilized.

[0125] Further, the contact holder 132a of the electrical connecting means 131, as shown in FIG. 12B, is energized clockwise by the holder spring 132c. Hence, the abutting ribs 134a, 134b of the connector 134 always butt against the memory element contact portions 121a, 121b of the storage means 120 by the spring pressure of the holder spring 132c. Here, the spring pressure of the holder spring 132c is set in a condition such that the spring pressure of the holder spring 132c is higher than the spring pressure of the main body contact portions 133a, 133b, so that the abutting ribs 134a, 134b of the electrical connecting means 131 always butt against the storage means 120.

[0126] As described above, at the loading time of the process cartridge B, the holder arm 132b of the electrical connecting means 131 is pushed by the butting rib 112d, so that the guide rib 121j is introduced to the slit portion 132h of the contact holder 132a. The upper wall surface portion 132j fastened by the slit portion 132h lands on the upward end surface portion 112ja of the guide rib 112j or the inclined portion 112jb following thereof. That is, by being constituted in this way, the main body contact portions 133a, 133b of the electrical contact means 131 abut against a region other than the memory element contact portions 121a, 121b of the storage means 120 so that no deformation nor any damage is received.

[0127] The guide rib 112j of the process cartridge B has the inclined portion 112jb, whose height gradually lowers toward the storage means 120 from the upward end surface portion 112ja in front of the cartridge inserting direction. The guide rib 112j shall take such a form that the main body contact portions 133a, 133b of the electrical connecting means 131 and the memory element contact portions 121a, 121b mutually perform a wiping between a certain distance in the cartridge inserting direction. That is, the upper wall surface portion of the slit portion 132h of the contact holder 132a moves along the inclined portion 112 of the guide rib 112j. In other words, the memory element contact portions 121a, 121b have a sliding area, on which the main body contact portions 133a, 133b which are the main body side contact portions slide and contact.

[0128] Accordingly, by the wiping operation at this sliding time, both contact portions can remove foreign materials such as the developer adhered on the mutual contact portions and paper dusts and the like of the recording paper, which is the recording medium. Hence, reliability for the electrical connection of both contact portions can be enhanced. Further, in the present embodiment, when the process cartridge B is taken out from the apparatus main body, the main body contact portions 133a, 133b of the electrical connecting means 131 shunt from a jam process space (a space in which the user puts his hands at the jam process time) of the apparatus interior. For this reason, the contact portions 133a, 133b are at a position difficult to touch when the operator put his hands into the interior of the apparatus interior.

[0129] Further, in the present embodiment, when a positional adjustment is made by following the process cartridge B loaded on the electrical connecting means 131 of the main body apparatus side, the main body contact portions 133a, 133b of the electrical connecting means 131 reliably abut against the memory element contact portions 121a, 121b of the storage means 120, and can stabilize the electrical connection.

[0130] Further, accuracy of position of contact between the main body contact portions 133a, 133b and the memory element contact portions 121a, 121b can be enhanced.

(Seventh Embodiment)

[0131] Next, a seventh embodiment of the image forming apparatus according to the present invention will be described with reference to FIG. 27. Here, the points only, which are different from the sixth embodiment, will be described, and other points will be omitted. Note that the description will be made by giving the same reference symbols to the same member as those of the sixth embodiment.

[0132] Electrical connecting means 131 in the present embodiment, similarly as the sixth embodiment, is rotatably hung by a mounting base 118 arranged at an optical system base 117 which fixes a laser scanner 101. In the optical system base 117 is provided an opening 117a, which is possible to pass through, when the connecting means 131 rotates. When the process cartridge B is not yet loaded, the connecting means 131 shunts upward to a position which does not interfere with the process cartridge B at its inserting time by an arm spring 131f arranged at the outside of a holder arm 131d. The connecting means contact portion 131a is energized so as to be always stored upward of the optical system base. Accordingly, connecting means contact portion 131a is

completely stored upward of the optical system base 117 when the cartridge B is in a state of being not yet loaded.

[0133] In this way, when the process cartridge is not yet loaded, the connection means contact portion 131a is at the upper portion of the inserting space of the process cartridge, and can completely shunt from this inserting space by a space divided by the optical system base 117 (dividing portion). Hence, operability such as a paper jam process (jam process) and the like can be improved. Further, the control means and the storage means can be controlled so as not to be influenced from the static electricity. Furthermore, by forming the optical system base 117 (dividing member) by metallic material, the effect thereof can be further increased.

(Eighth Embodiment)

[0134] Next, an eighth embodiment of the image forming apparatus according to the present invention will be described with reference to FIG. 28. In the present embodiment also, the points only, which are different from the sixth embodiment, will be described and other points will be omitted. Note that the same reference symbols will be given to the same members as those of the sixth embodiment.

[0135] FIG. 28 is a cross-sectional view cut along the line 28-28 in FIG. 26, and is a cross-sectional view showing a joined portion between a contact holder 131c and a holder arm 131d in connecting means 131.

[0136] The arm holder 131d of connecting means 131 is rotatably axially supported by a frame 117, and comprises a central axial portion 131d-1 which supports a central rib 131c-1 of the contact holder 131c and axial portions 131d-2 which support the left and right outside ribs 131c-2 of the contact holder 131c. On the other hand, a mounting hole 131c-1a formed on the central rib 131c-1 of the contact holder 131c has a central portion set with a circular arc apex by a fitting dimension, and the left and right outside mounting holes 131c-2a of a rib 131c-2 are set with long holes.

[0137] The contact holder 131c and the holder arm 131d are joined as shown in FIG. 28. That is, in a mounting hole 131c-1a with a central portion taken as the circular arc apex is inserted the central axial portion 131d-1. The outside ribs 131c-2 are inserted into long hole mounting holes 131c-2a. Hence, the contact holder 131c is rotatably axially supported by the holder arm 131d and, at the same time, is constituted so as to be able to equalize with the holder arm 131d like an arrow marks H and I in FIG. 28 with the circular arc apex of the central portion of the mounting hole 131c-1a as a support.

[0138] Accordingly, even when the surface (J surface) of the storage means on the process cartridge B inclines as shown by the two-dot chain line shown in FIG. 28, the contact holder 131c can also equalize, and abutting ribs 131g at the left and right places on the contact holder 131c can stably butt against the surface (J surface) of the storage means 120.

[0139] The contact holder 131c and the holder arm 131d of the connecting means 31 are received at one place of the center, and back-lashes such as a long hole and the like are provided on the left and right portions, so that an equalizing function can be given. Even when the storage means 120 on the process cartridge inclines more or less, since the abutting ribs of the left and right two places of connecting means 31 can always stably butt against the storage means 120, the electrical connection between the connecting means 131 and the storage means 120 can be stably performed.

[0140] As described above, according to the present invention, when the process cartridge is loaded on the electrophotographic image forming apparatus, the main body electrical contacts provided on the apparatus main body and the cartridge electrical contacts can be stably reliably connected.

[0141] Further, when the process cartridge is loaded on the electrophotographic image forming apparatus, the main body electrical contacts provided on the apparatus main body and the cartridge electrical contacts can be stably reliably connected.

Claims

1. A process cartridge detachably attachable with an electrophotographic image forming apparatus having main body electrical connecting means movably provided and a main body electrical contact provided in said main body electrical connecting means, the process cartridge having:

an electrophotographic photosensitive body drum;
process means acting on said electrophotographic photosensitive body drum;
a frame body;
a memory element for storing information;
a cartridge electrical contact electrically connected with said memory element, the cartridge electrical contact being electrically connected with said main body electrical contact when said process cartridge is attached onto said apparatus main body;
a substrate provided on said frame body, said substrate having said memory element and said cartridge electrical contact;
a cartridge pushing portion provided in said frame body allowing said main body electrical connecting means to move so that said main body electrical contact moves in a direction to be electrically connected with said cartridge electrical contact when said process cartridge is being attached onto said apparatus main body and giving a pushing force for pushing

said main body electrical contact in a direction to be electrically connected with said cartridge electrical contact after said main body electrical contact and said cartridge electrical contact are electrically connected.

2. A process cartridge according to claim 1, wherein said cartridge pushing portion is provided on a top end of said frame body in a attaching direction of said process cartridge when said process cartridge is being attached onto said apparatus main body.

3. A process cartridge according to claim 1 and claim 2, wherein said substrate is provided on the upper surface side of said frame body when said process cartridge is attached onto said apparatus main body.

4. A process cartridge according to claim 1, wherein said process cartridge is further:

a cartridge guide portion provided on said frame body, the cartridge guide portion engaging with the main body guide portion provided on said main body connecting means when said process cartridge is being attached onto said apparatus main body and performing positioning of said main body electrical connecting means in a direction to cross the attaching direction of said process cartridge.

5. A process cartridge according to claim 4, wherein said cartridge guide portion is provided by protruding on the upper surface side of said frame body when said process cartridge is attached onto said apparatus main body.

6. A process cartridge detachably attachable with an image forming apparatus having main body electrical connecting means movably provided and a main body electrical contact provided in said main body electrical connecting means, the process cartridge having:

an electrophotographic photosensitive body drum;
process means acting on said electrophotographic photosensitive body drum;
a frame body;
a memory element for storing information;
a cartridge electrical contact electrically connected with said memory element, the cartridge electrical contact being connected with said main body electrical contact when said process cartridge is attached onto said apparatus main body;
a substrate provided on said frame body, said substrate having said memory element and said cartridge electrical contact, here said substrate being provided on the upper surface side of said frame body when said process cartridge is being attached onto said apparatus main body;
a cartridge pushing portion provided in said frame body allowing said main body electrical connecting means to move so that said main body electrical contact moves in a direction to be electrically connected with said cartridge electrical contact when said process cartridge is being attached onto said apparatus main body and giving a pushing force for pushing said main body electrical contact in a direction to be electrically connected with said cartridge electrical contact after said main body electrical contact and said cartridge electrical contact are electrically connected, and here said cartridge pushing portion being provided on a top end of said frame body in the attaching direction of said process cartridge when said process cartridge is attached onto said apparatus main body;
a cartridge guide portion provided on said frame body engaging with the main body guide portion provided on said main body electrical connecting means when said process cartridge is being attached onto said apparatus main body and performing a positioning of said main body electrical connecting means in a direction to cross the attaching direction of said process cartridge, here said cartridge guide portion being provided by protruding on the upper surface side of said frame body when said process cartridge is attached onto said apparatus main body.

7. An electrophotographic image forming apparatus detachably attachable with a process cartridge, having:

(i) a main body electrical connecting means movably provided;
(ii) a main body electrical contact provided on said main body electrical connecting means;
(iii) attaching means for detachably attachably loading a process cartridge, having: an electrophotographic photosensitive body drum; process means acting on said electrophotographic photosensitive body drum; a frame body; a memory element for storing information; a cartridge electrical contact electrically connected with said memory element, the cartridge electrical contact being electrically connected with said main body electrical contact when said process cartridge is being attached onto said electrophotographic image forming apparatus;
a substrate provided on said frame body, said

substrate having said memory element and said cartridge electrical contact; a cartridge pushing portion provided in said frame body allowing said main body electrical connecting means to move so that said main body electrical contact moves in a direction to be electrically connected with said cartridge electrical contact when said process cartridge is attached onto said apparatus main body and giving a pushing force for pushing said main body electrical contact in a direction to be electrically connected with said cartridge electrical contact after said main body electrical contact and said cartridge electrical contact are electrically connected; and
(iv) conveying means for conveying said recording medium.

8. An electrophotographic image forming apparatus according to claim 7, wherein said main body electrical connecting means has a movable member movably provided for said apparatus main body and supporting said main body electrical contact and a spring member provided between said movable member and said apparatus main body, the spring member energizing said movable member in a direction where said main body electrical contact separates from said cartridge electrical contact.

9. An electrophotographic image forming apparatus according to claim 7, wherein said main body electrical connecting means comprises:

a first movable member movably provided for said apparatus main body;
a first spring member provided between said fist movable member and said apparatus main body, the first spring member energizing said first movable member in a direction where said main body electrical contact separates from said cartridge electrical contact;
a second movable member movably provided for said first movable member and supporting said main body electrical contact; and
a second spring member provided between said first movable member and said second movable member, the second spring member biasing said second movable member in a direction where said main body electrical contact is electrically connected with said cartridge electrical contact.

10. An electrophotographic image forming apparatus according to claim 7, wherein said main body electrical connecting means is a main body guide portion engaged with the cartridge guide portion provided on said process cartridge when said process cartridge is being attached onto said apparatus main body and having a main body guide portion for positioning said main body connecting means in a direction to cross the loading direction where said process cartridge is attached onto said apparatus main body.

11. An electrophotographic image forming apparatus according to claim 8, wherein said main body electrical contact is stored upper than a frame portion which forms a space where said process cartridge can be attached when said process cartridge is not attached onto said main body.

12. An electrophotographic image forming apparatus detachably attachable with a process cartridge having a memory element for storing information and a cartridge electrical contact electrically connected with said memory element and forming an image on a recording medium, having:

(i) a main body electrical contact for electrically connecting with said cartridge electrical contact when said process cartridge is attached onto the main body of said electrophotographic image forming apparatus;
(ii) a first movable member rotatably provided for said apparatus main body;
(iii) a first spring member provided between said first movable member and said apparatus main body, the first spring member biasing said first movable member in a direction where said main body electrical contact separates from said cartridge electrical contact;
(iv) a second movable member rotatably provided for said first movable member and supporting said main body electrical contact;
(v) a second spring member provided between said first movable member and said second movable member, the second spring member biasing said second movable member in a direction where said main body electrical contact is electrically connected with said cartridge electrical contact;
(vi) loading means removably detachably attachable with a process cartridge, having: an electrophotographic photosensitive body drum; process means acting on said electrophotographic photosensitive body drum; a frame body; a memory element for storing information; a cartridge electrical contact electrically connected with said memory element electrically connecting said main body electrical contact when said process cartridge is attached onto the main body of said electrophotographic image forming apparatus; a substrate provided on said frame body, said substrate having said memory element and said cartridge electrical contact; a cartridge pushing portion provided

on said frame body allowing said main body electrical connecting means to move so that said main body electrical contact moves in a direction to be electrically connected with said cartridge electrical contact when said process cartridge is being attached onto said apparatus main body and giving a pushing force for pushing said main body electrical contact in a direction to be electrically connected with said cartridge electrical contact after said main body electrical contact and said cartridge electrical contact are electrically connected; and
(vii) conveying means for conveying said receding medium.

13. A process cartridge detachably attachable to an electrophotographic image forming apparatus having main body electrical connecting means movably provided, a main body electrical contact provided on said main body electrical connecting means and a main body guide portion provided on said main body electrical connecting means, having:

an electrophotographic photosensitive body drum;
process means acting on said electrophotographic photosensitive body drum;
a frame body;
a memory element for storing information;
a cartridge electrical contact electrically connected with said memory element, the cartridge electrical contact being electrically connected with said main body electrical contact when said process cartridge is attached onto said apparatus main body;
a substrate provided on said frame body, said substrate having said memory element and said cartridge electrical contact;
a cartridge guide portion provided by protruding from said frame body and engaging with said main body guide portion when said process cartridge is being attached onto said apparatus main body and performing positioning of said main body electrical connecting means in a direction to cross the loading direction of said process cartridge and abutting against said main body electrical connecting means so that said main body electrical contact is guided to said cartridge electrical contact portion in a direction where said main body electrical contact is electrically connected with said cartridge electrical contact; and
a cartridge pushing portion provided on said frame body and allowing said main body electrical connecting means to move so that said main body electrical contact moves in a direction to be electrically connected with said cartridge electrical contact when said process cartridge is being attached onto said apparatus main body and pushing said main body electrical connecting means so that said main body electrical connecting means is guided along said cartridge guide portion when said main body electrical connecting means abuts against said cartridge guide portion and, further, giving a pushing force for pushing said main body electrical contact in a direction to be electrically connected with said cartridge electrical contact after said main body electrical contact and said cartridge electrical contact are electrically connected.

14. A process cartridge according to claim 13, wherein said cartridge guide portion is a protrusion protruding from said frame body, and a side surface of said protrusion engages with the main body guide portion and performs a positioning of said main body electrical connecting means in a direction to cross the attaching direction of said process cartridge, and the upper surface of said protrusion abuts against said main body electrical connecting means so as to guide said main body electrical contact to said cartridge electrical contact portion.

15. An electrophotographic image forming apparatus detachably attachable with the process cartridge and forming an image on a recording medium, having:

(i) a main body connecting means movably provided;
(ii) a main body electrical contact provided on said main body electrical connecting means;
(iii) a main body guide portion provided on said main body electrical connecting means;
(iv) attaching means removably detachably attachable with a process cartridge, having: an electrophotographic photosensitive body drum; process means acting on said electrophotographic photosensitive body drum; a frame body; a memory element for storing information; a cartridge electrical contact electrically connected with said memory element, the cartridge electrical contact being electrically connected with said main body electrical contact when said process cartridge is attached onto said apparatus main body; a substrate provided on said frame body, said substrate having said memory element and said cartridge electrical contact; a cartridge guide portion provided by protruding from said frame body, the cartridge guide portion engaging with said main body guide portion when said process cartridge is being attached onto the main body of said electrophotographic image forming apparatus and performing positioning of said main body elec-

trical connecting means in a direction to cross the attaching direction of said process cartridge and abutting against said main body electrical connecting means so that said main body electrical contact is guided to said cartridge electrical contact portion in a direction where said main body electrical contact is electrically connected with said cartridge electrical contact; a cartridge pushing portion provided on said frame body allowing said main body electrical connecting means to move so that said main body electrical contact moves in a direction to be electrically connected with said cartridge electrical contact when said process cartridge is being attached onto said apparatus main body and pushing said main body electrical connecting means so that said main body electrical connecting means is guided along said cartridge guide portion when said main body electrical connecting means abuts against said cartridge guide portion and, further, giving a pushing force for pushing said main body electrical contact in a direction to be electrically connected with said cartridge electrical contact after said main body electrical contact and said cartridge electrical contact are electrically connected.

(v) conveying means for conveying said receding medium.

16. An electrophotographic image forming apparatus according to claim 15, wherein said main body guide portion is in the shape of a groove, and a portion which abuts against a cartridge guide portion for guiding said main body electrical contact to said cartridge electrical contact portion is a bottom of said groove.

17. An electrophotographic image forming apparatus according to claim 15, wherein said main body electrical contact is oscillationally supported against said'main body electrical connecting means so that the main body electrical contact follows also an inclination of said substrate in said orthogonal direction in a direction orthogonal to said loading direction.

18. An electrophotographic image forming. apparatus according to claims 8 and 9, wherein said movable member is provided with a connecting means abutting portion to which a cartridge pressure portion abuts.

19. An electrophotographic image forming apparatus according to claim 11, wherein said frame portion is a metallic material.

20. A process cartridge according to any one of claims 1 to 6, wherein said process cartridge integrally unifies at least one of charging means as said process means, developing means and cleaning means into a cartridge with said electrophotographic photosensitive body and makes it detachably attachable to said electrophotographic image forming apparatus main body.

21. An electrophotographic image forming apparatus

(A) to which a process cartridge (B) is detachably mountable, the process cartridge including a memory (20) and an electrical contact (21) connected to the memory, and the image forming apparatus comprising:

guide means (15) for guiding a process cartridge in a mounting direction to a mounted position relative to the image forming apparatus;

an electrical contact (34a, 34b) movably mounted to the image forming apparatus;

an abutment (32b) associated with the electrical contact (34a, 34b) an engageable with the process cartridge (B) during its movement towards the mounted position to cause the electrical contact (34a, 34b) of the apparatus to move toward the electrical contact (21) of the cartridge; and

means (35) for urging the electrical contact (34a, 34b) of the apparatus into engagement with the electrical contact (21) of the cartridge when the cartridge is in the mounted position.

22. An image forming apparatus according to claim 21, wherein the electrical contact (34a, 34b) is movable relative to the apparatus in a second direction transverse to the mounting direction defined by the cartridge guide means (15), and wherein a guide surface (32c) associated with the electrical contact (34a, 34b) of the apparatus is engageable with a cooperating abutment (23) of the cartridge to align the electrical contact (34a, 34b) of the apparatus with the electrical contact of the cartridge in the second direction during mounting of the cartridge to the apparatus.

23. A process cartridge detachably mountable to an electrophotographic image forming apparatus having an electrical contact (34a, 34b) movable relative to the apparatus (A) and associated with an abutment (32), the cartridge comprising:

a memory (20);

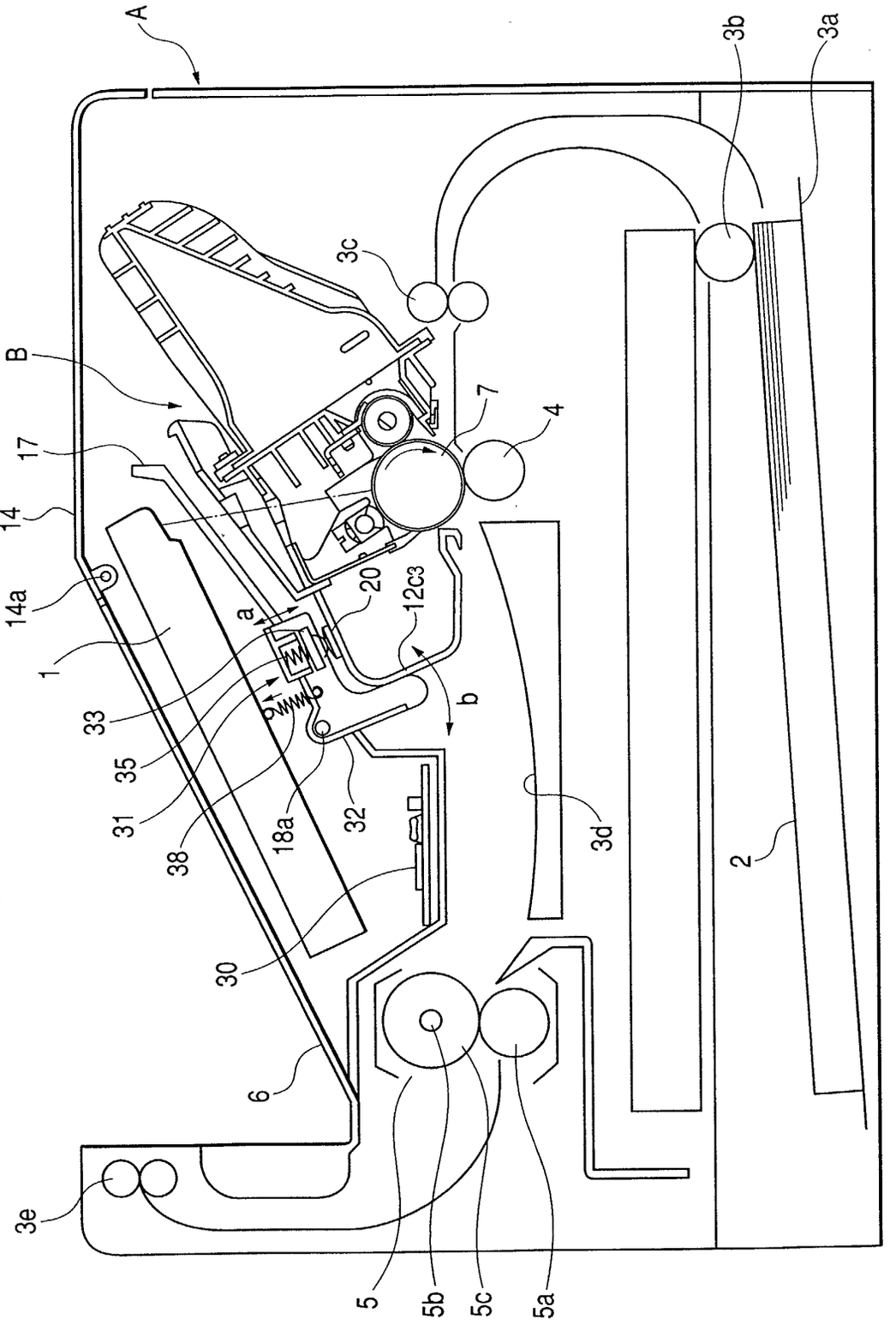
an electrical contact (21) connected to the memory (20); and

an engagement portion (12c3) engageable with

the abutment (32) of the apparatus as the cartridge is moved in a mounting direction to a mounted position relative to the apparatus so as to move the electrical contact (34a, 34b) of the apparatus toward the electrical contact (21) of the cartridge in a first direction transverse to the mounting direction.

24. A process cartridge according to claim 23, wherein a second engagement portion (23) of the cartridge is cooperable with a guide surface (32) associated with the electrical contact (34a, 34b) of the apparatus to align the electrical contact of the apparatus with the electrical contact of the cartridge in a second direction transverse to the mounting direction of the cartridge.

FIG. 1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B
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3b
3c
3d
3e
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5b
5c
6
7
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14a
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2
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12c3
a
b
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35
31
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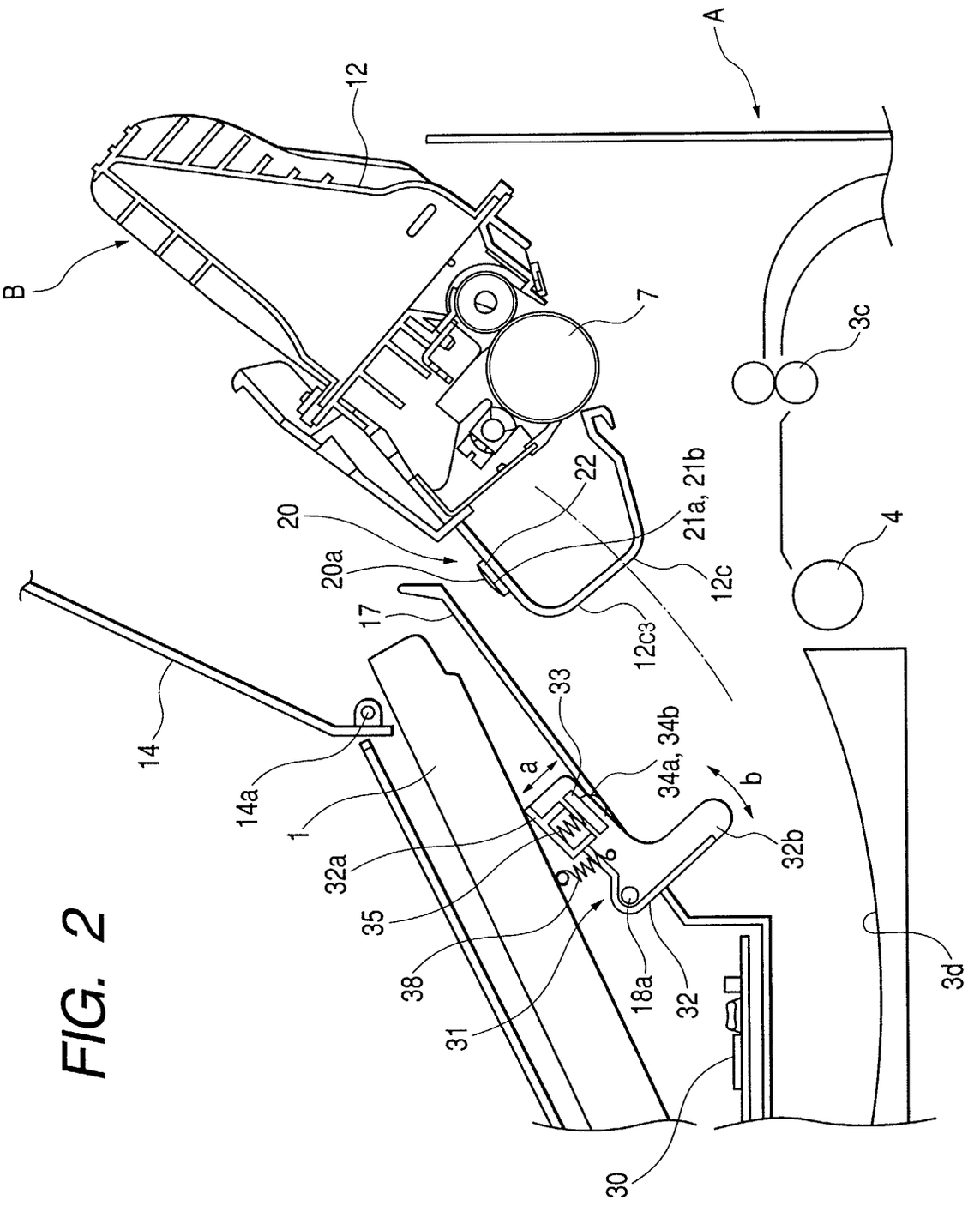
18a
32
30

FIG. 2


A
B
12
7
3c
4
22
21a, 21b
20
20a
12c
17
12c3
14
33
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32b
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35
38
31
18a
32
3d
30

FIG. 3

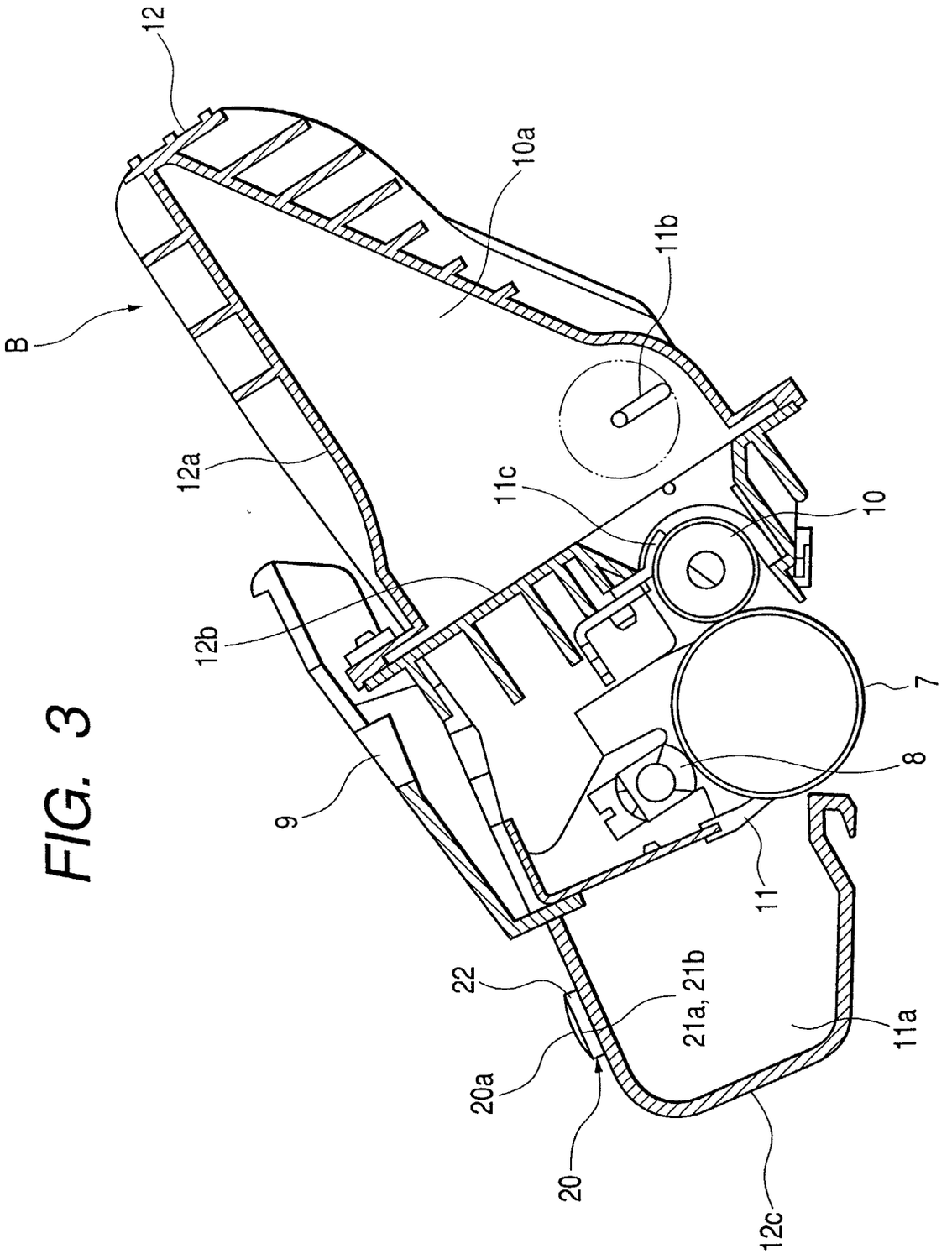


FIG. 4

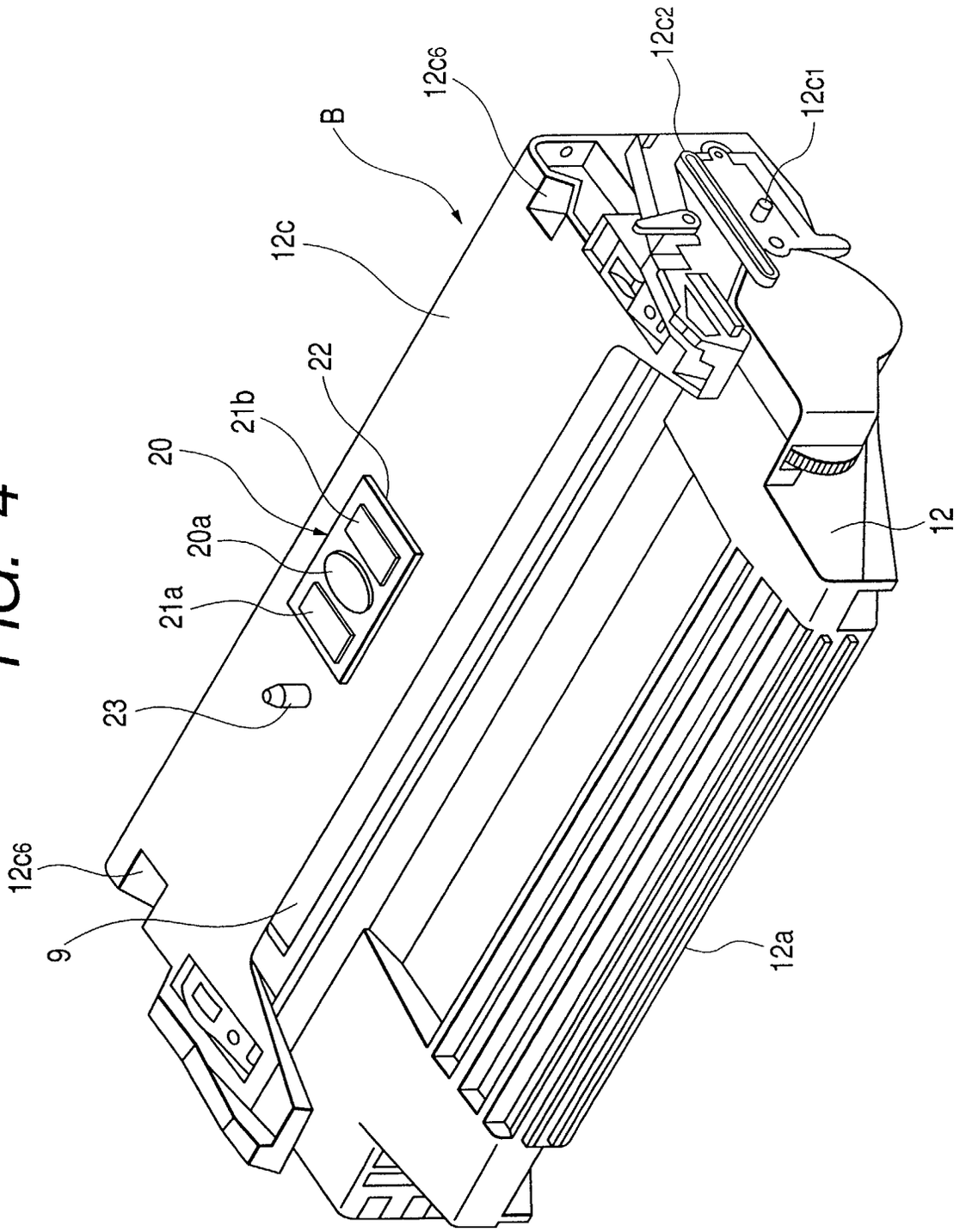


FIG. 5

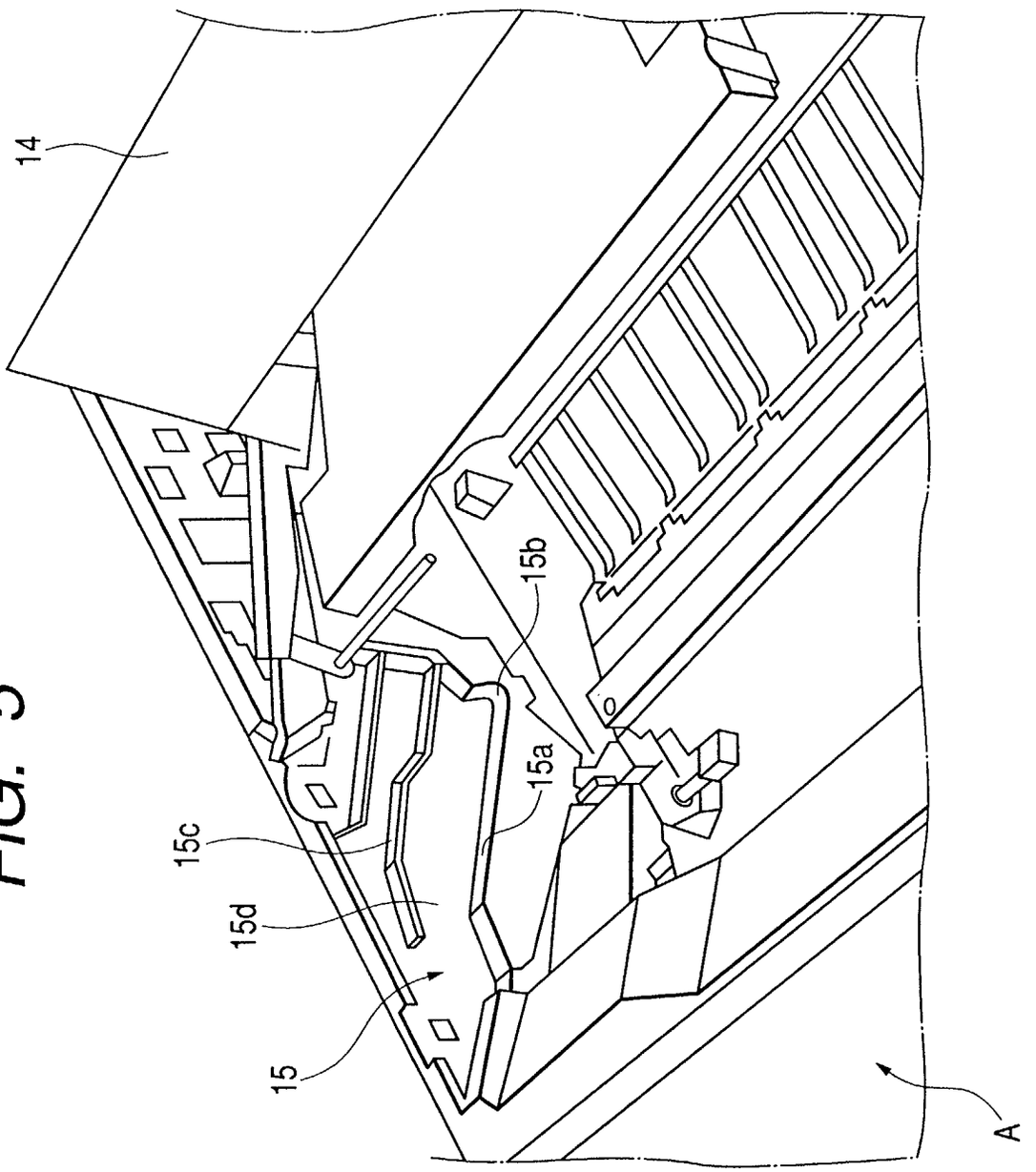


FIG. 6

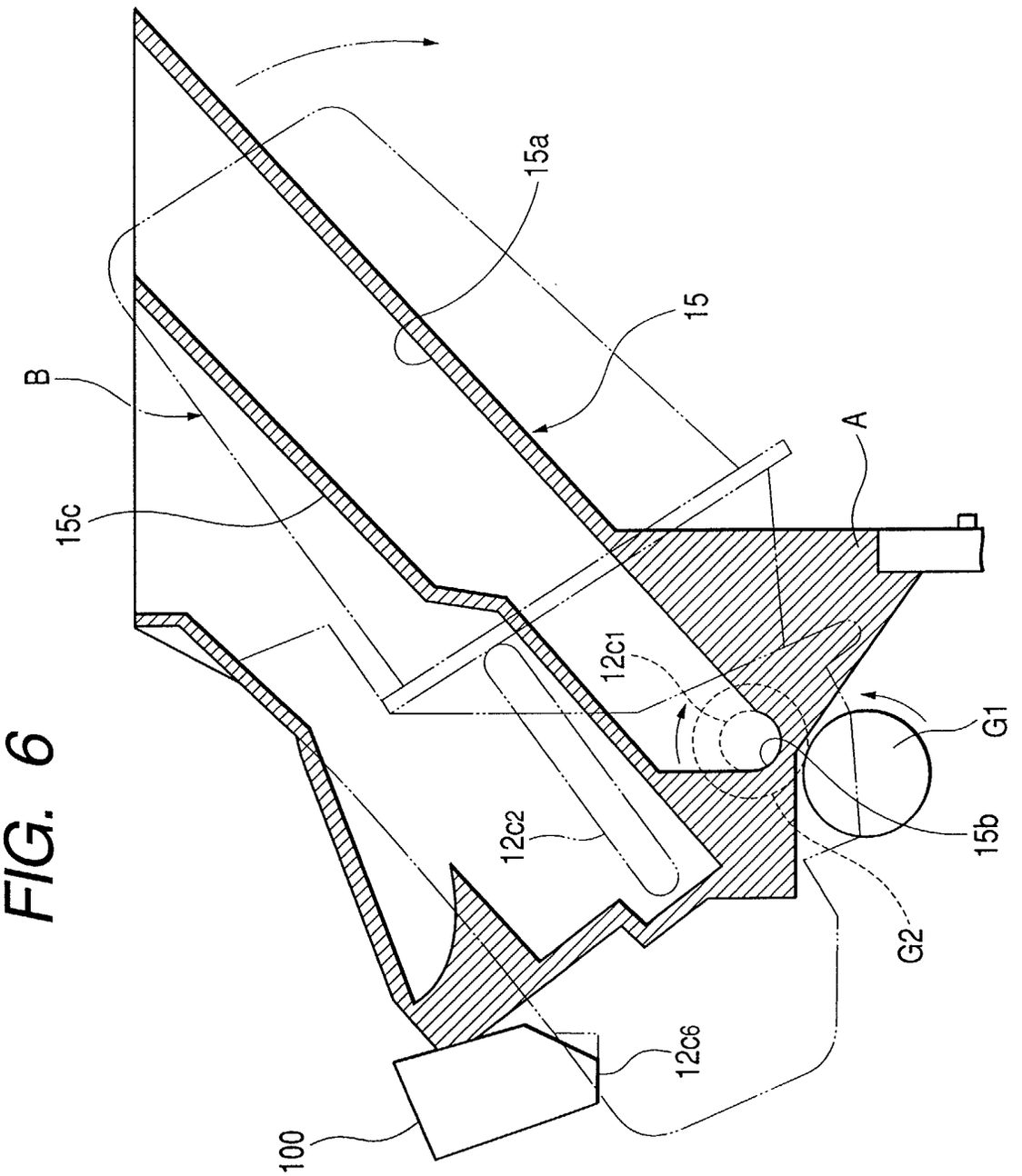


FIG. 7A

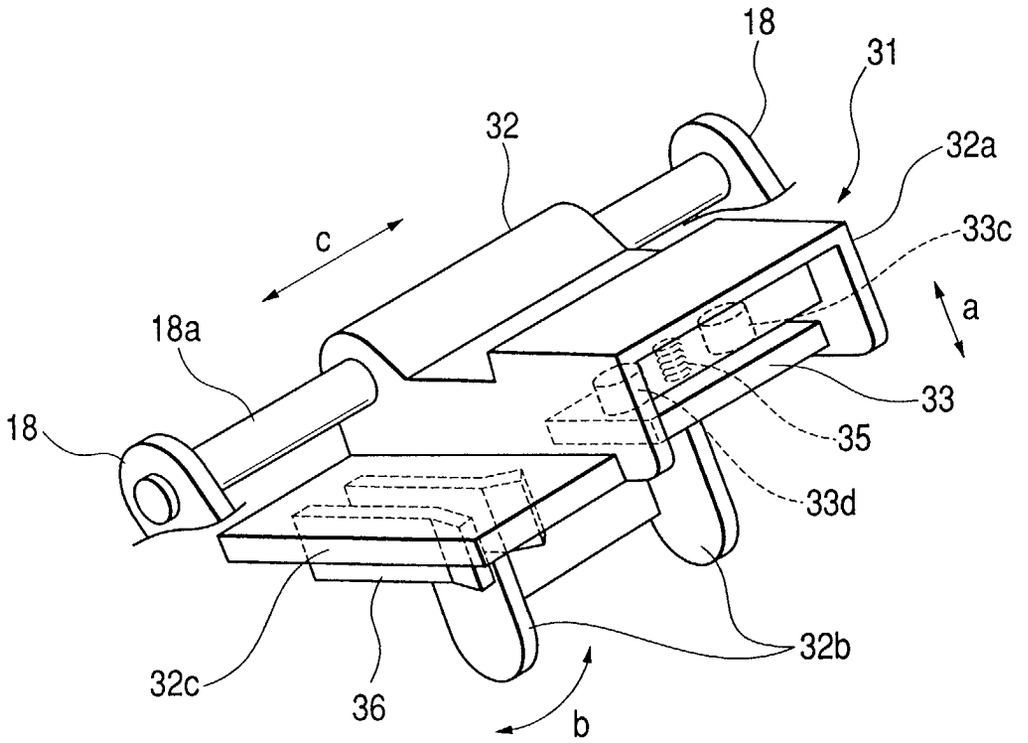


FIG. 7B

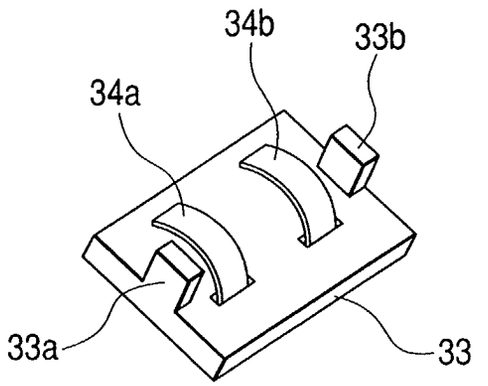


FIG. 8

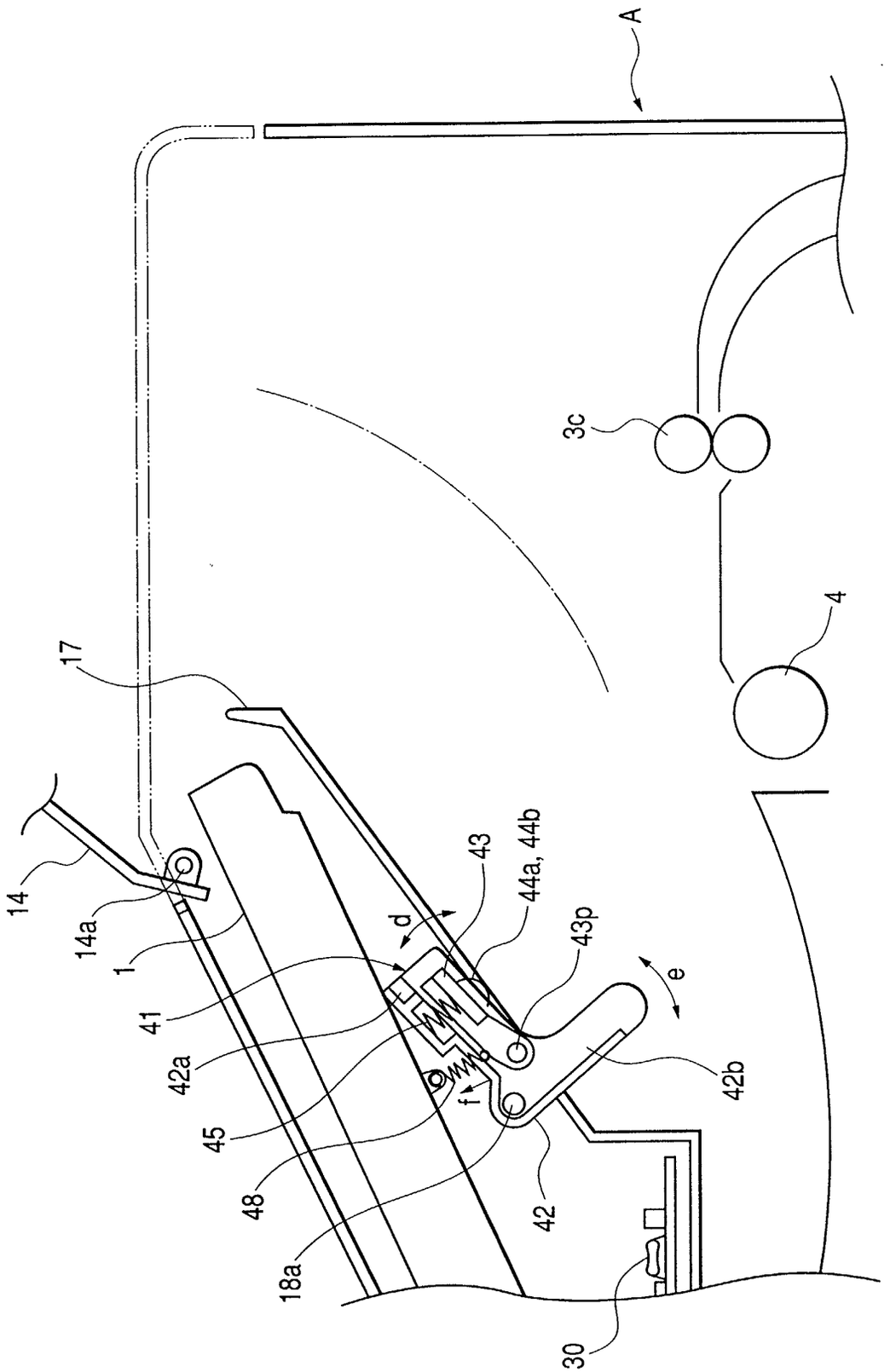


FIG. 9

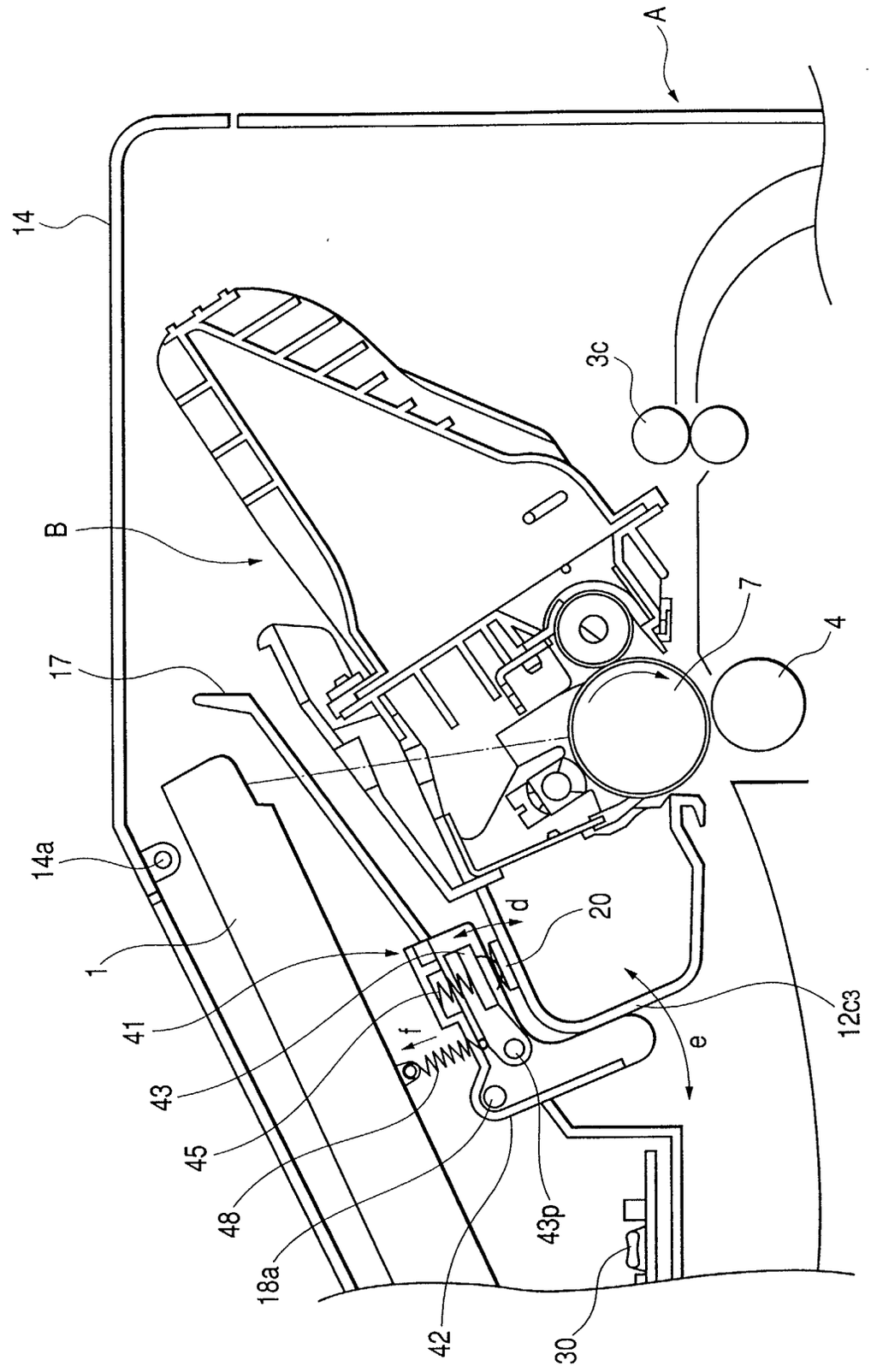


FIG. 10

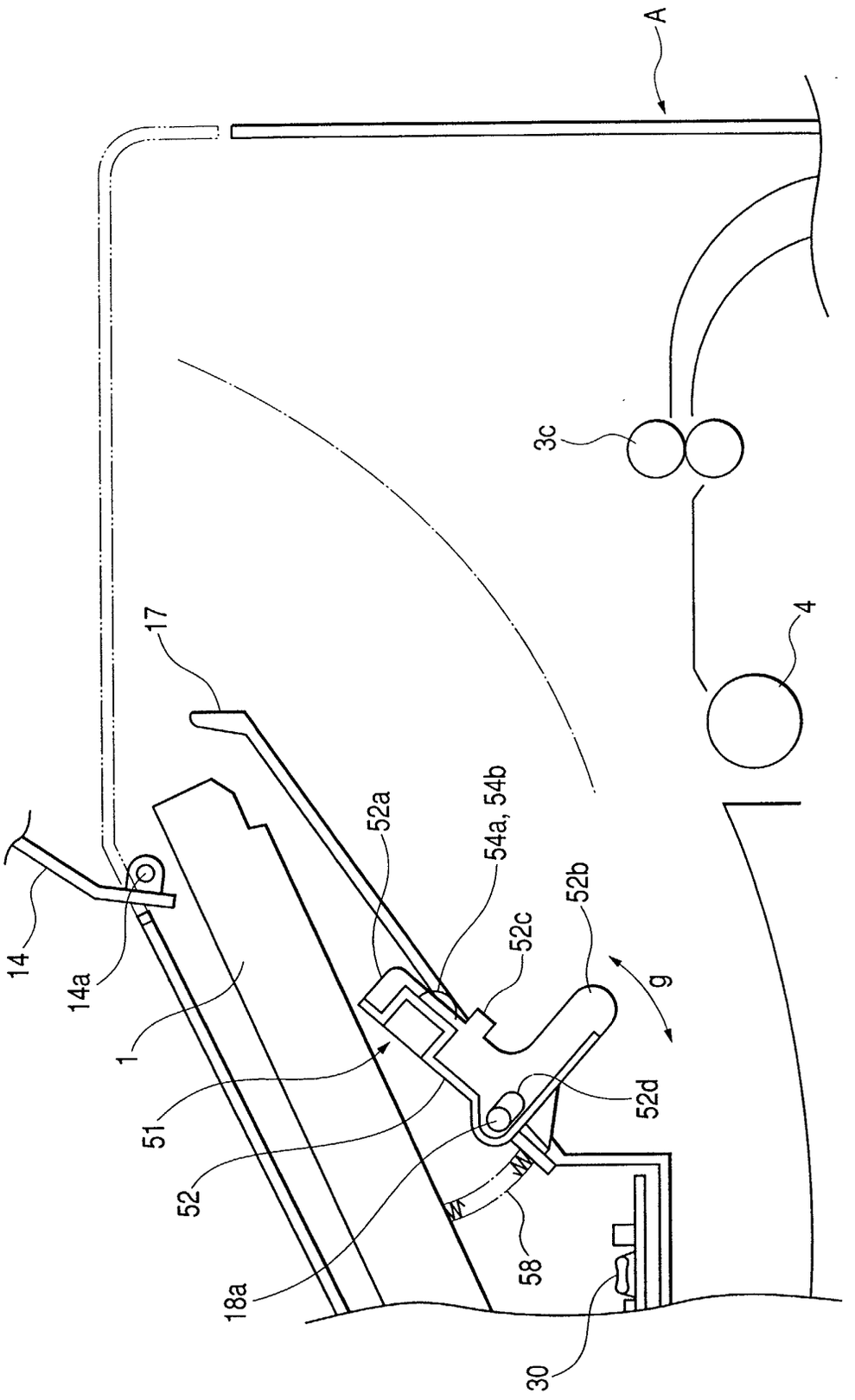
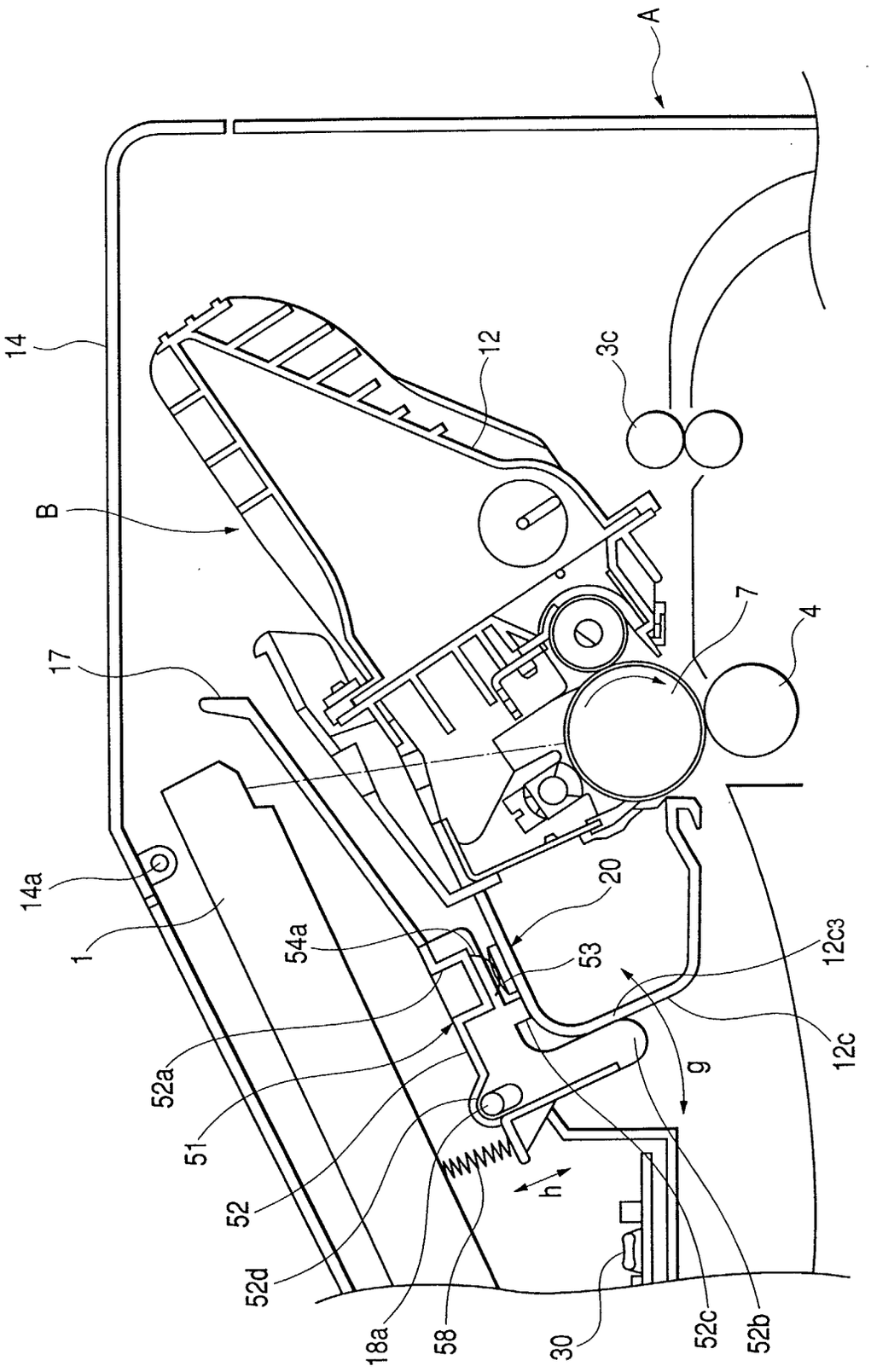


FIG. 11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14
B
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3c
17
7
4
14a
1
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12c
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52d
g
h
18a
58
30
52c
52b

FIG. 12

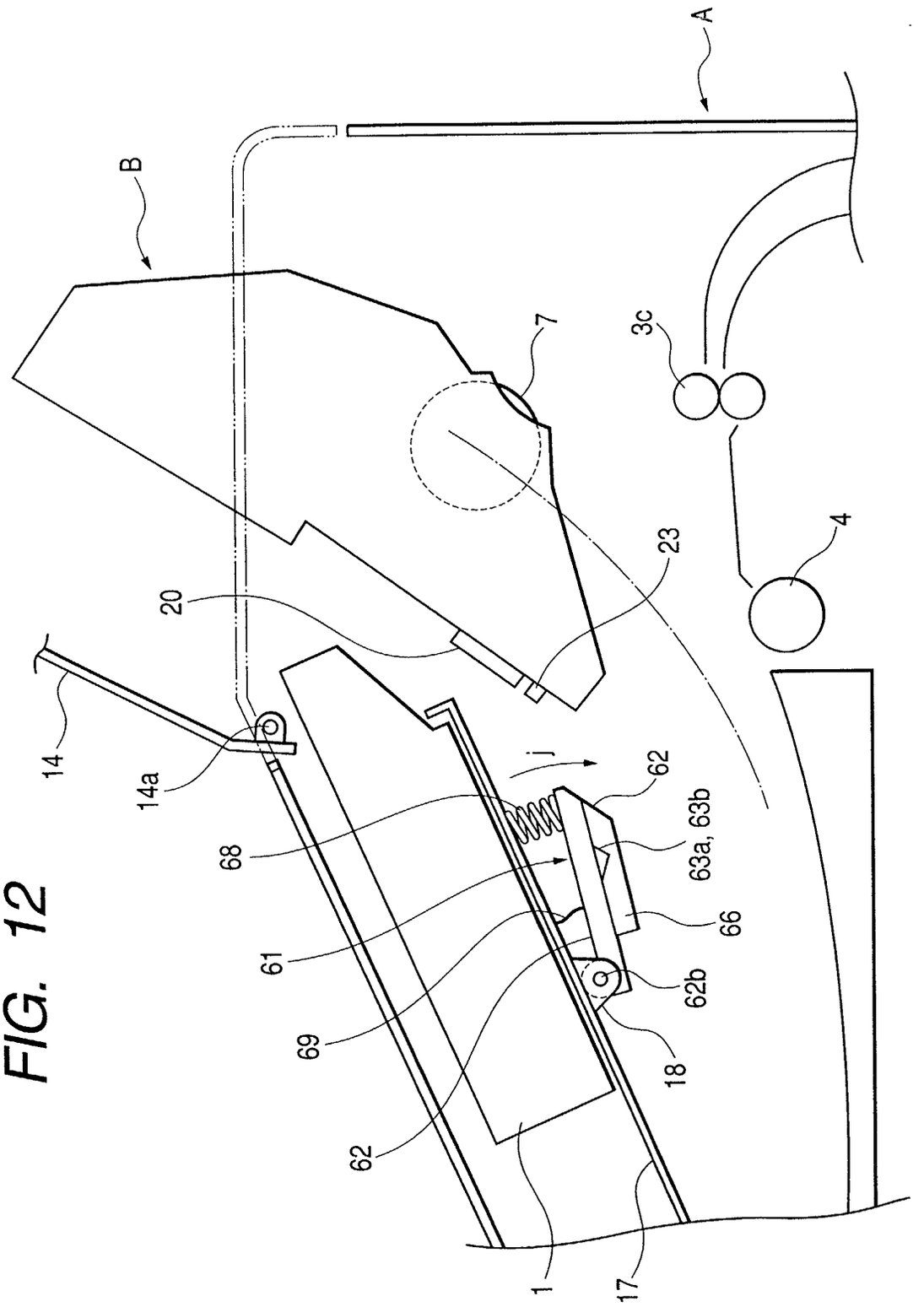


FIG. 13

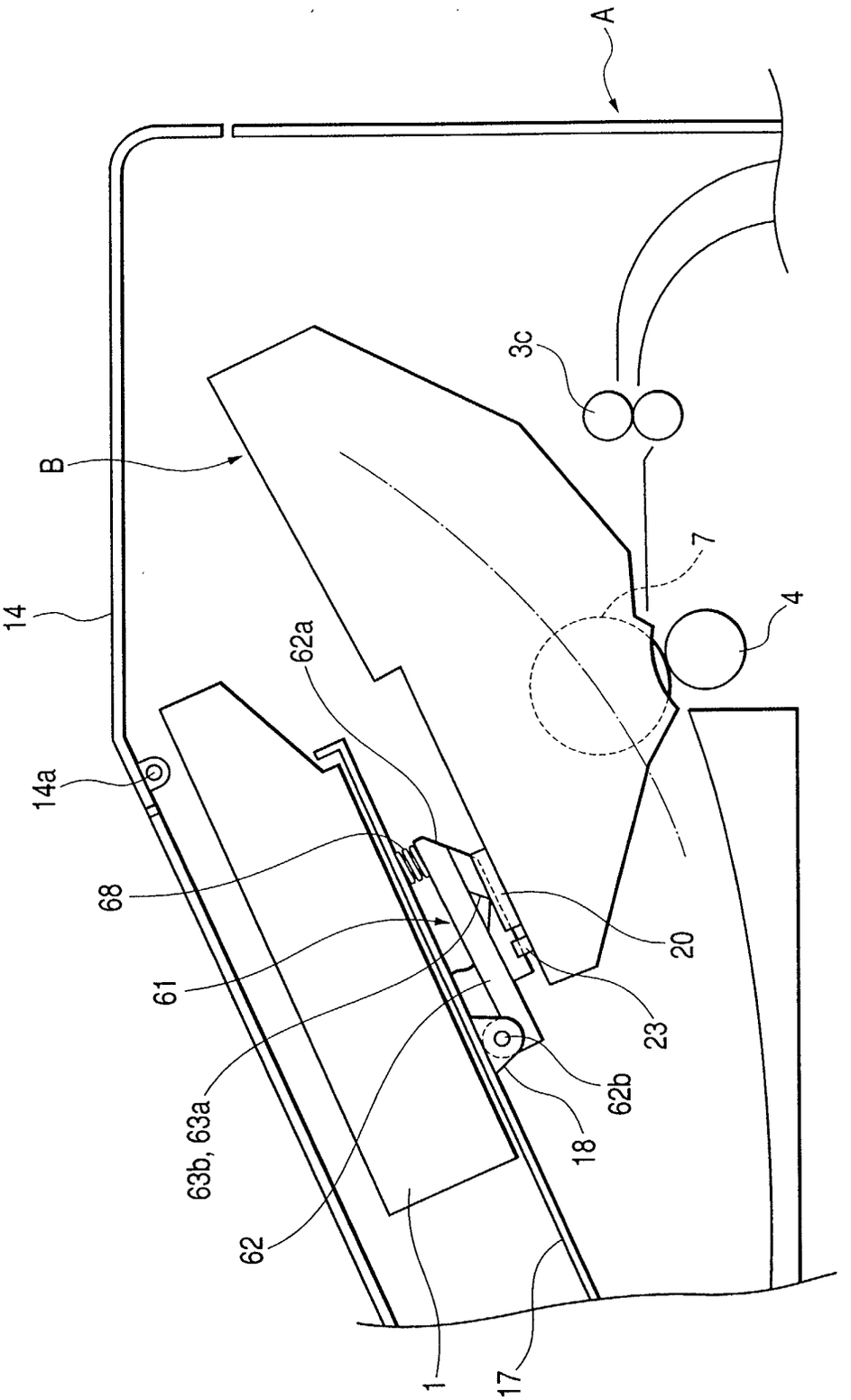


FIG. 14

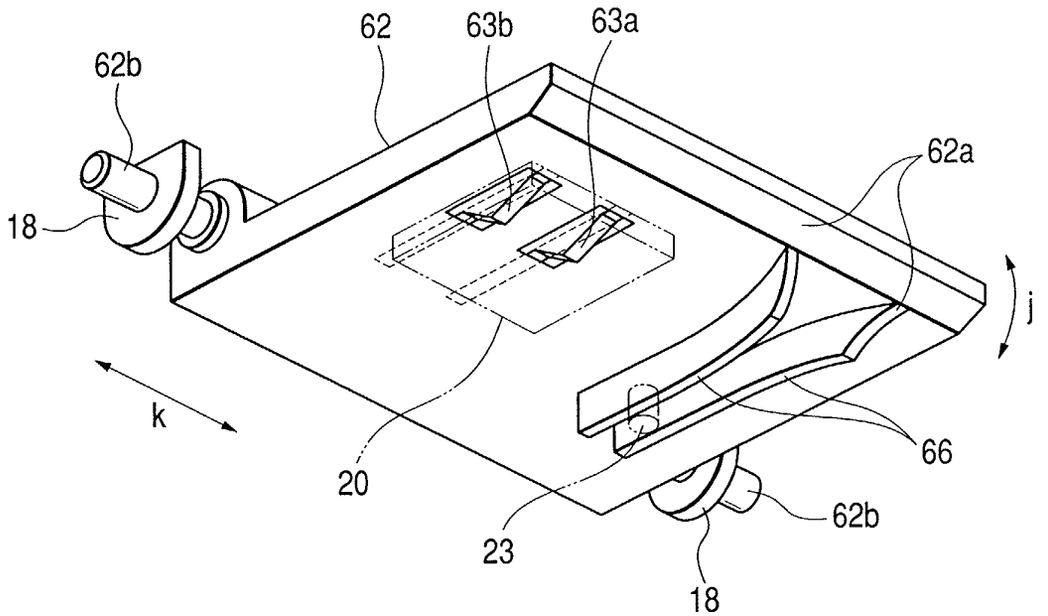
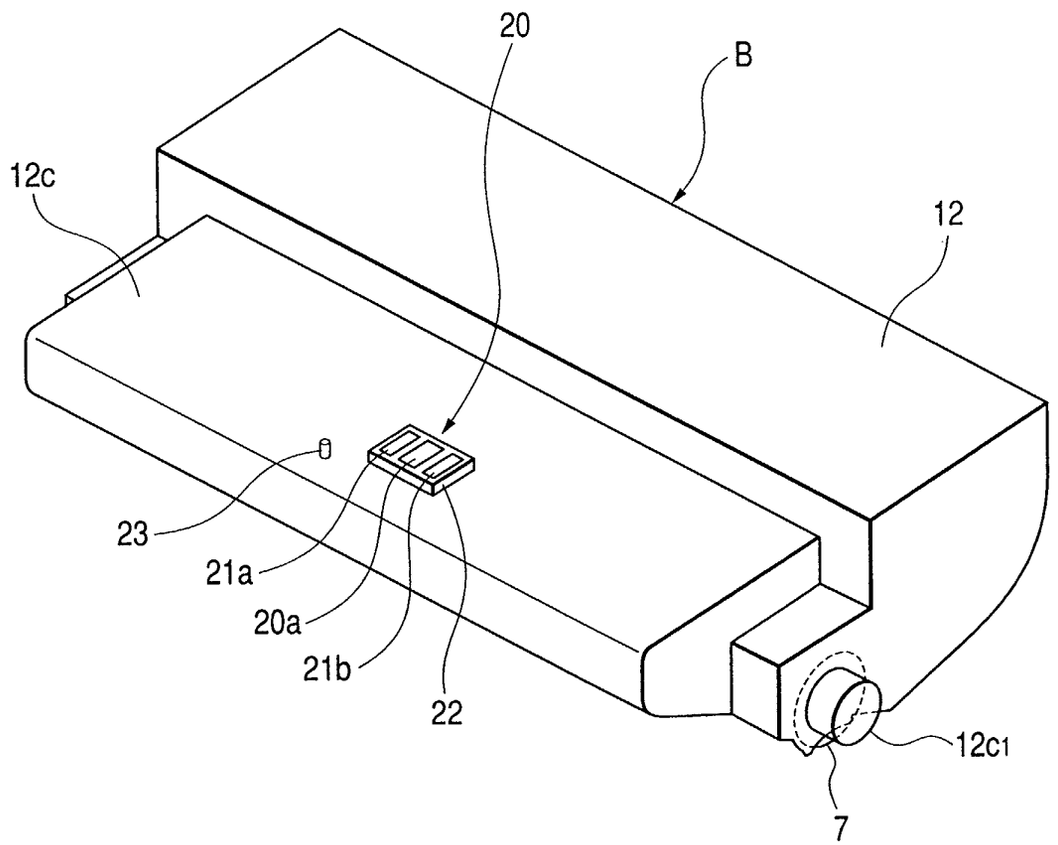

62
63b
63a
62b
62a
18
j
k
66
20
62b
23
18

FIG. 15


20
B
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θ
23
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20a
21b
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12c1
7

FIG. 16

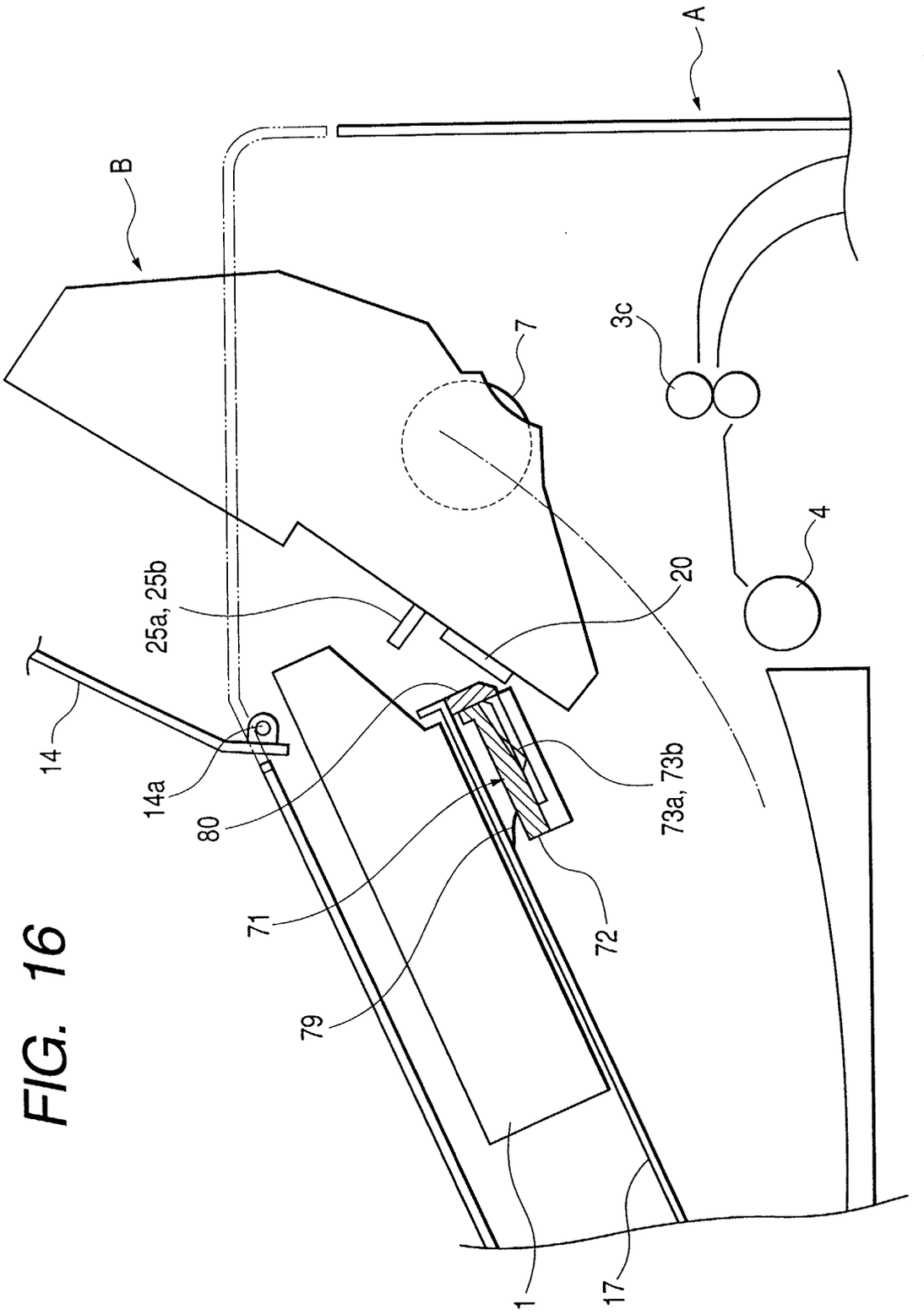


FIG. 17

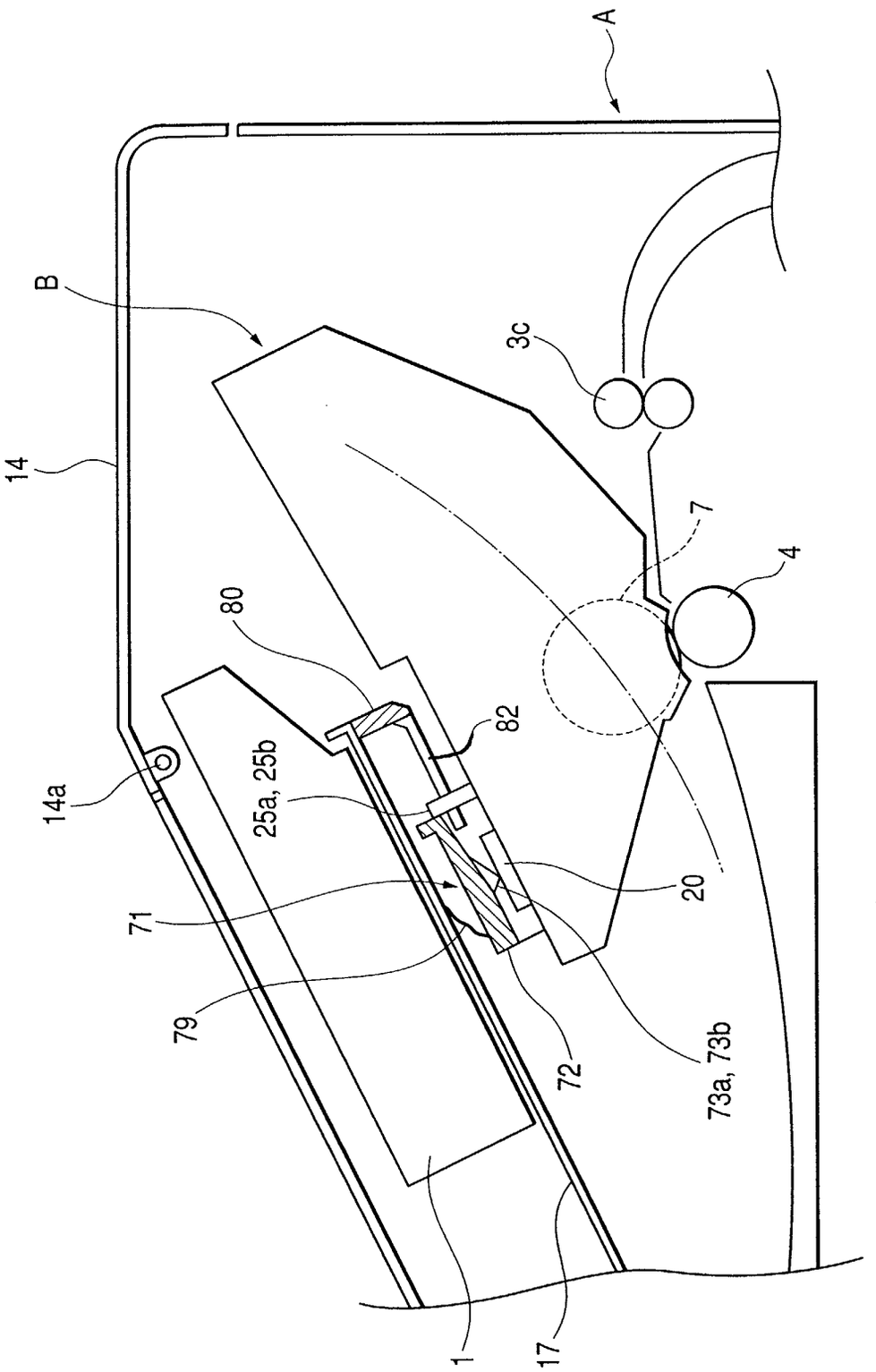


FIG. 18A

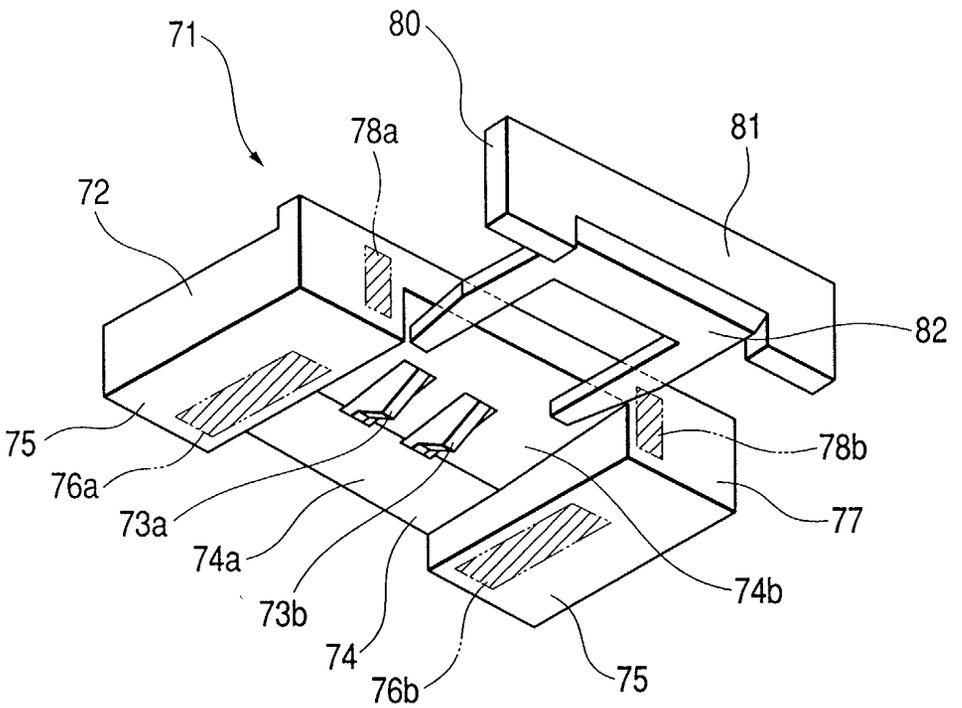


FIG. 18B

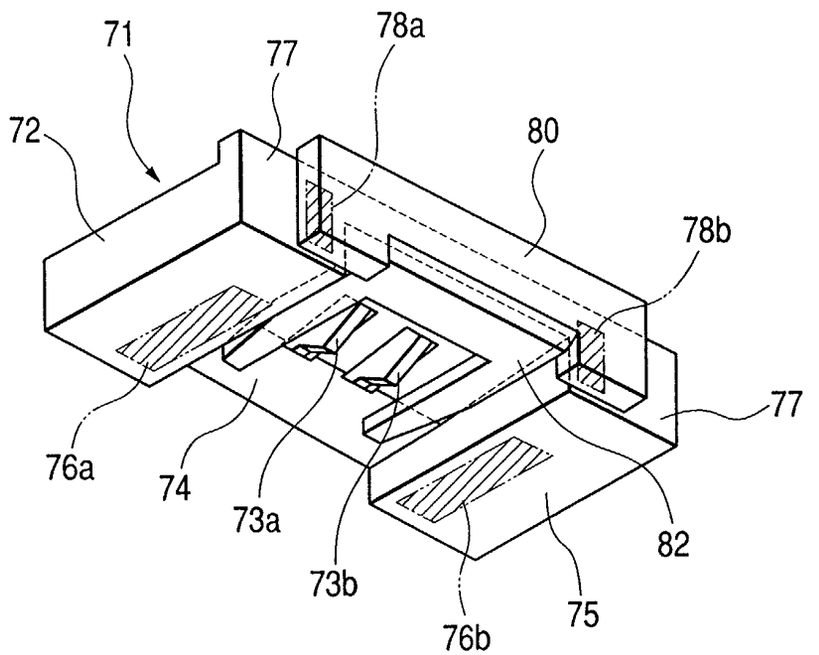
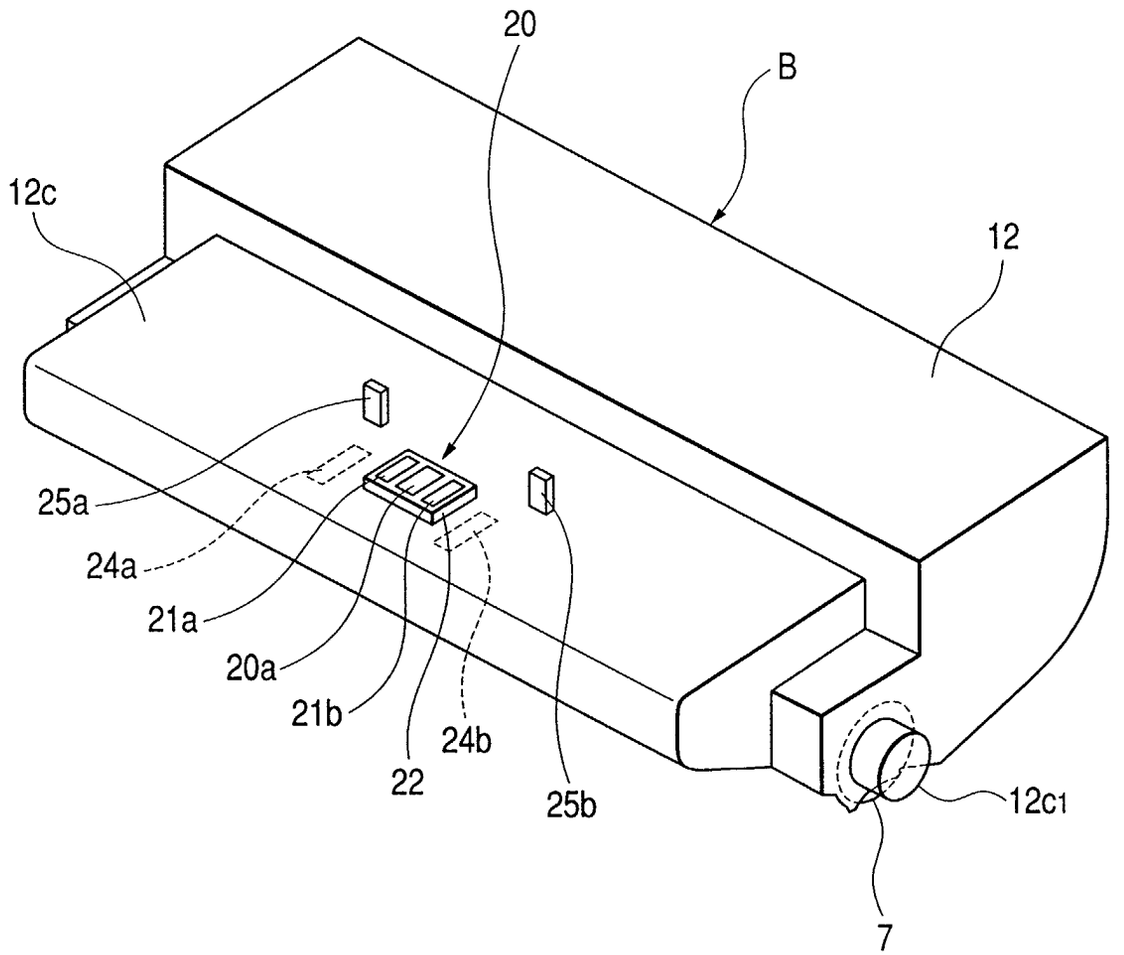


FIG. 19



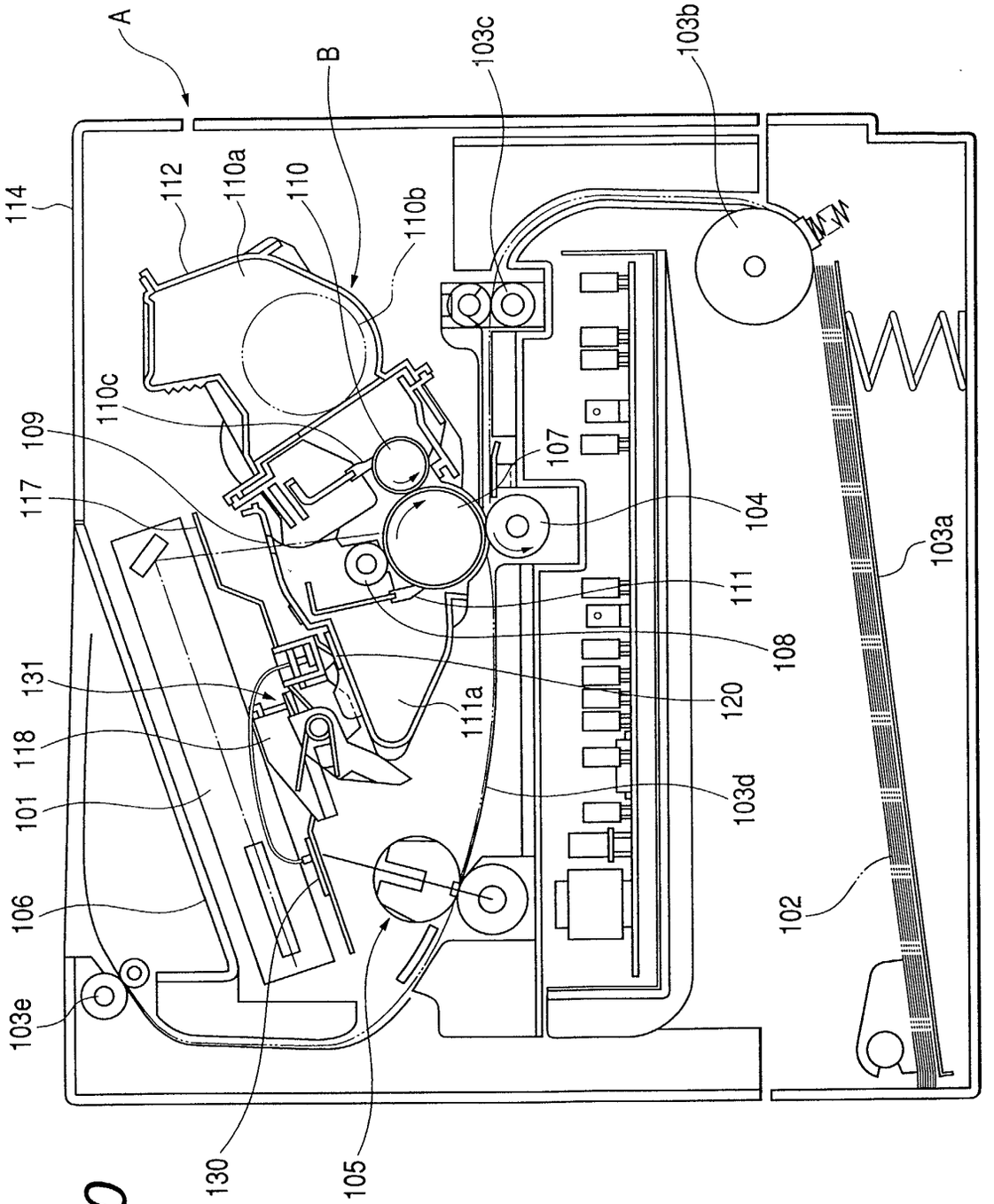

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FIG. 20

FIG. 21A

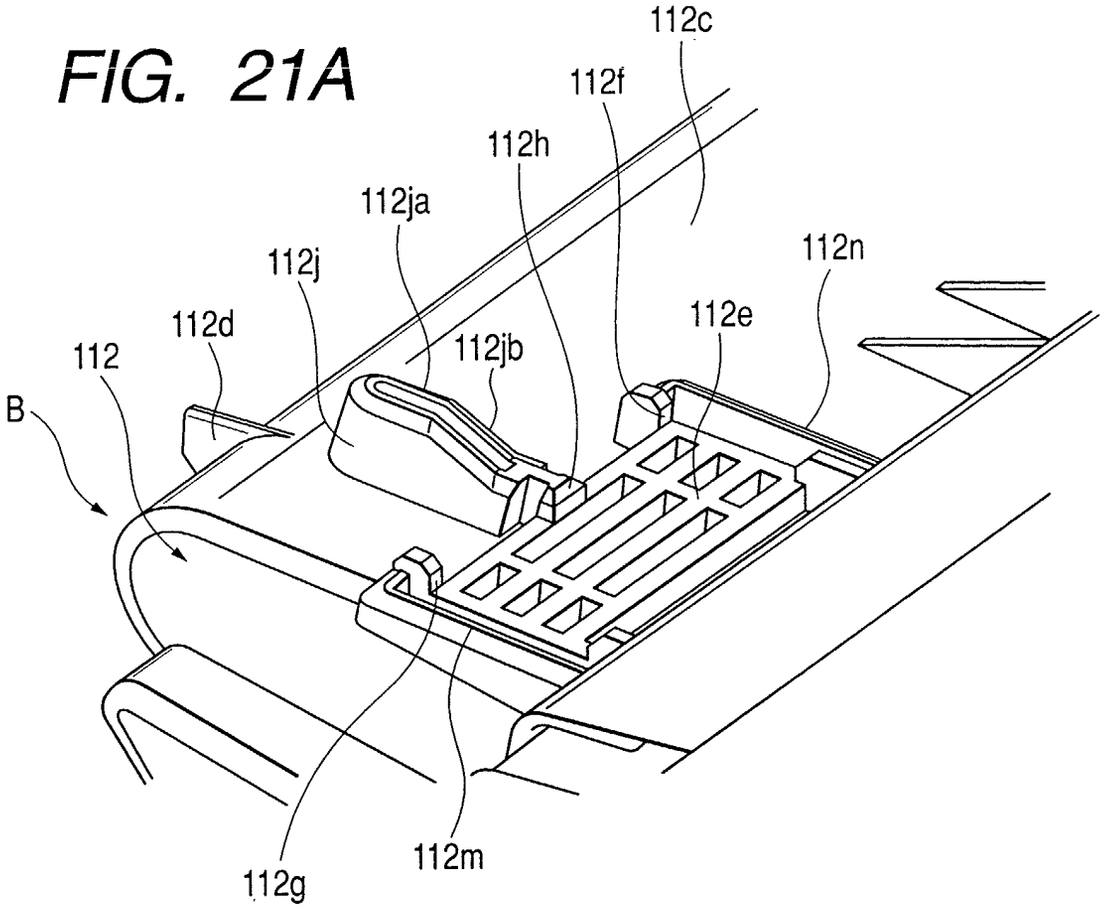

FIG. 21B

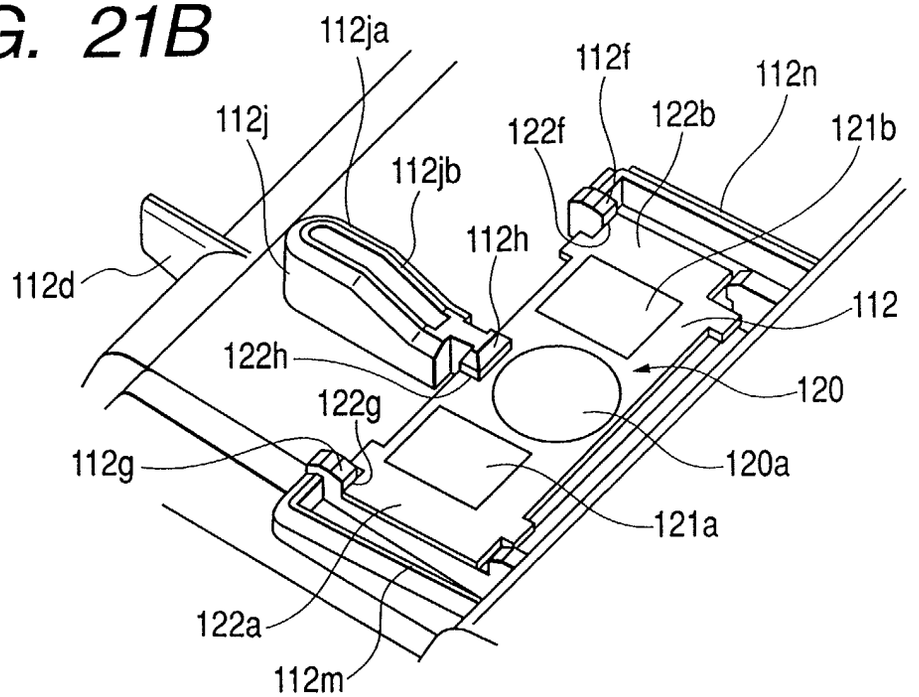

FIG. 22

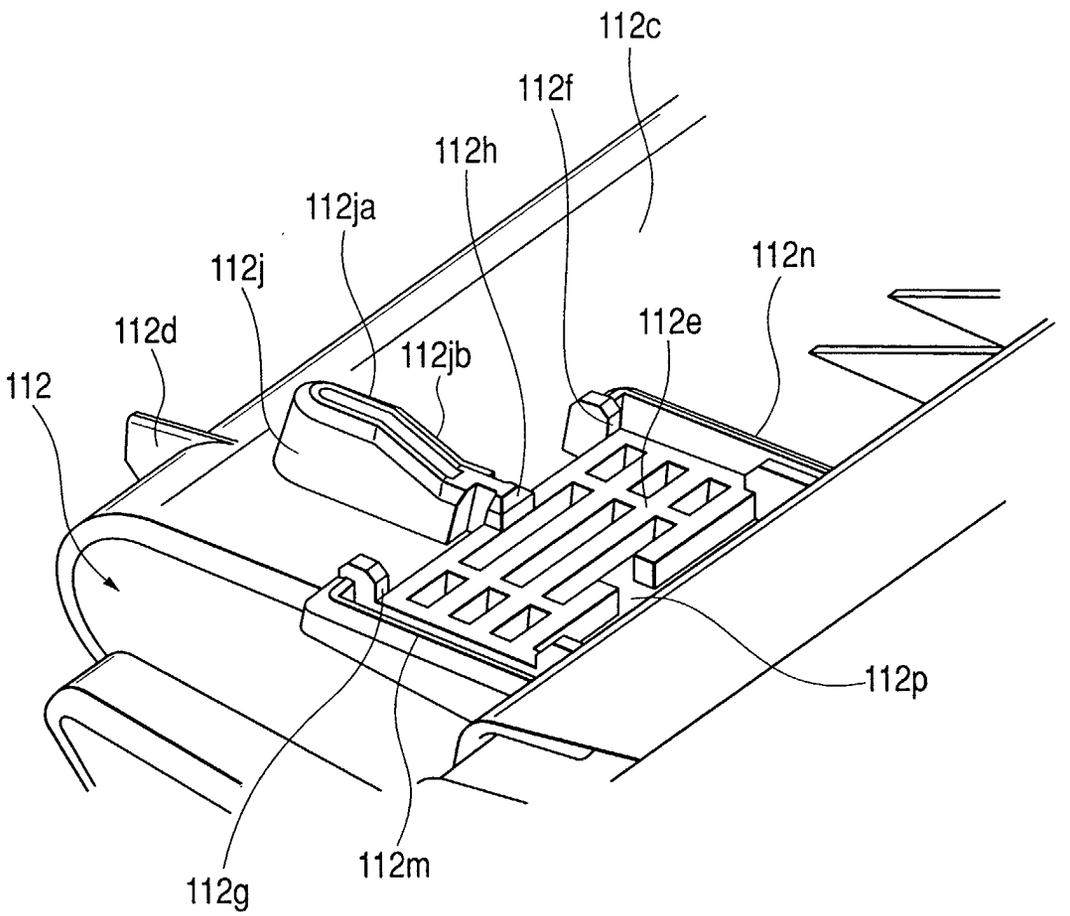
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FIG. 23A

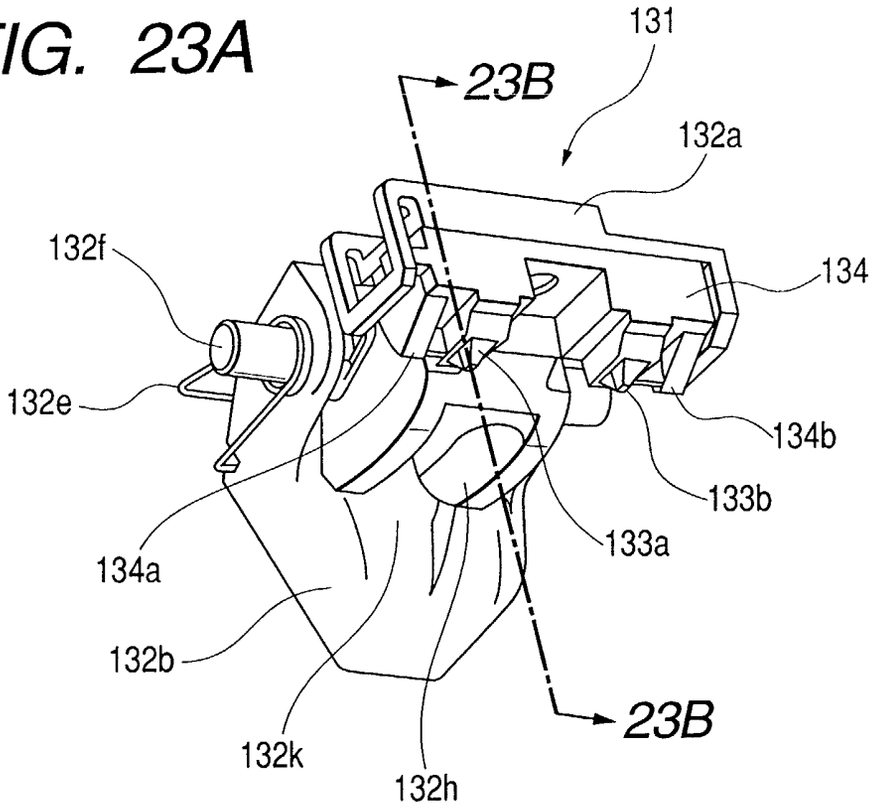


FIG. 23B

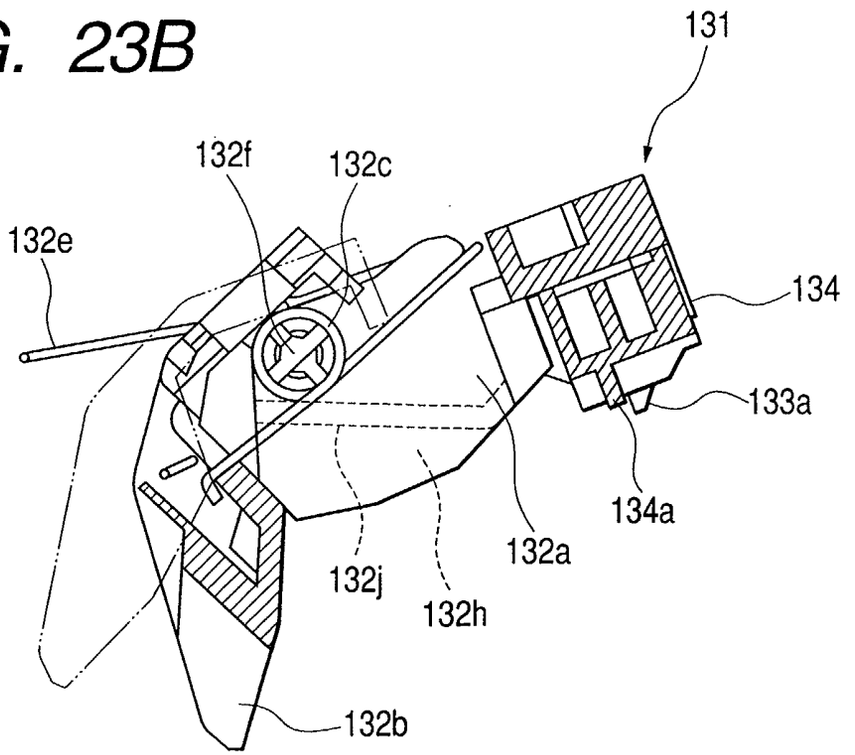
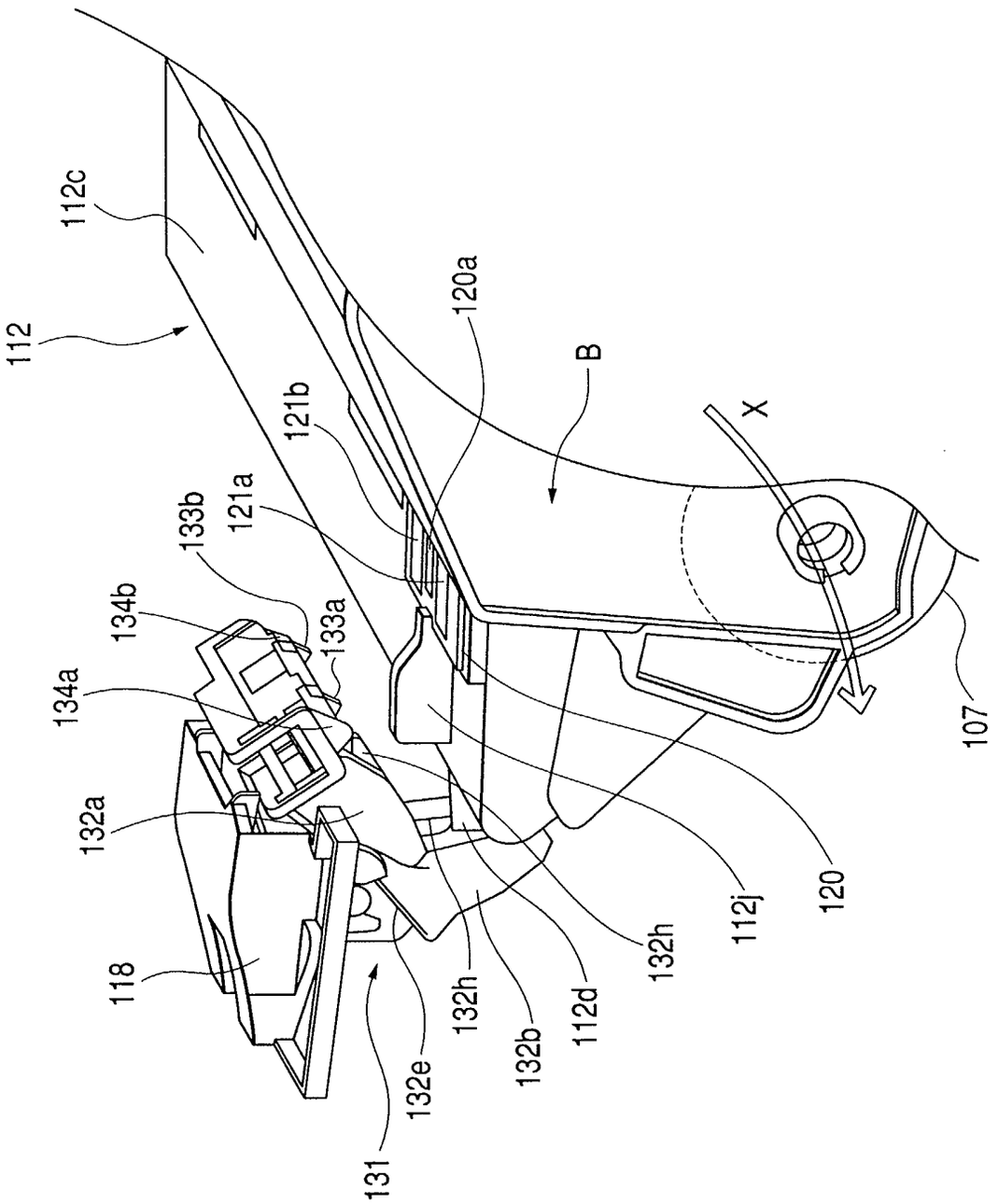


FIG. 24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132a
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112d
132h
112j
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107

FIG. 25

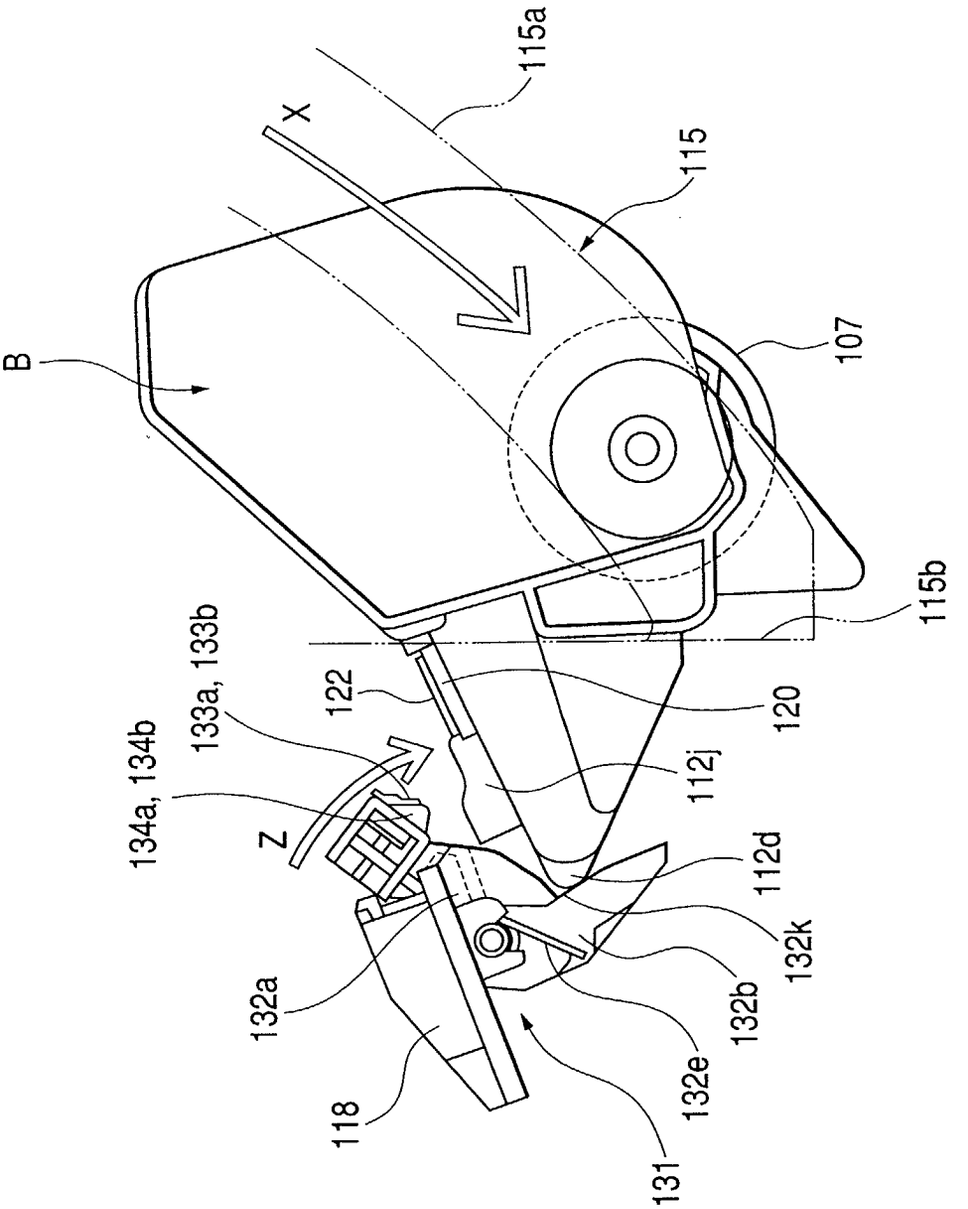
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FIG. 26

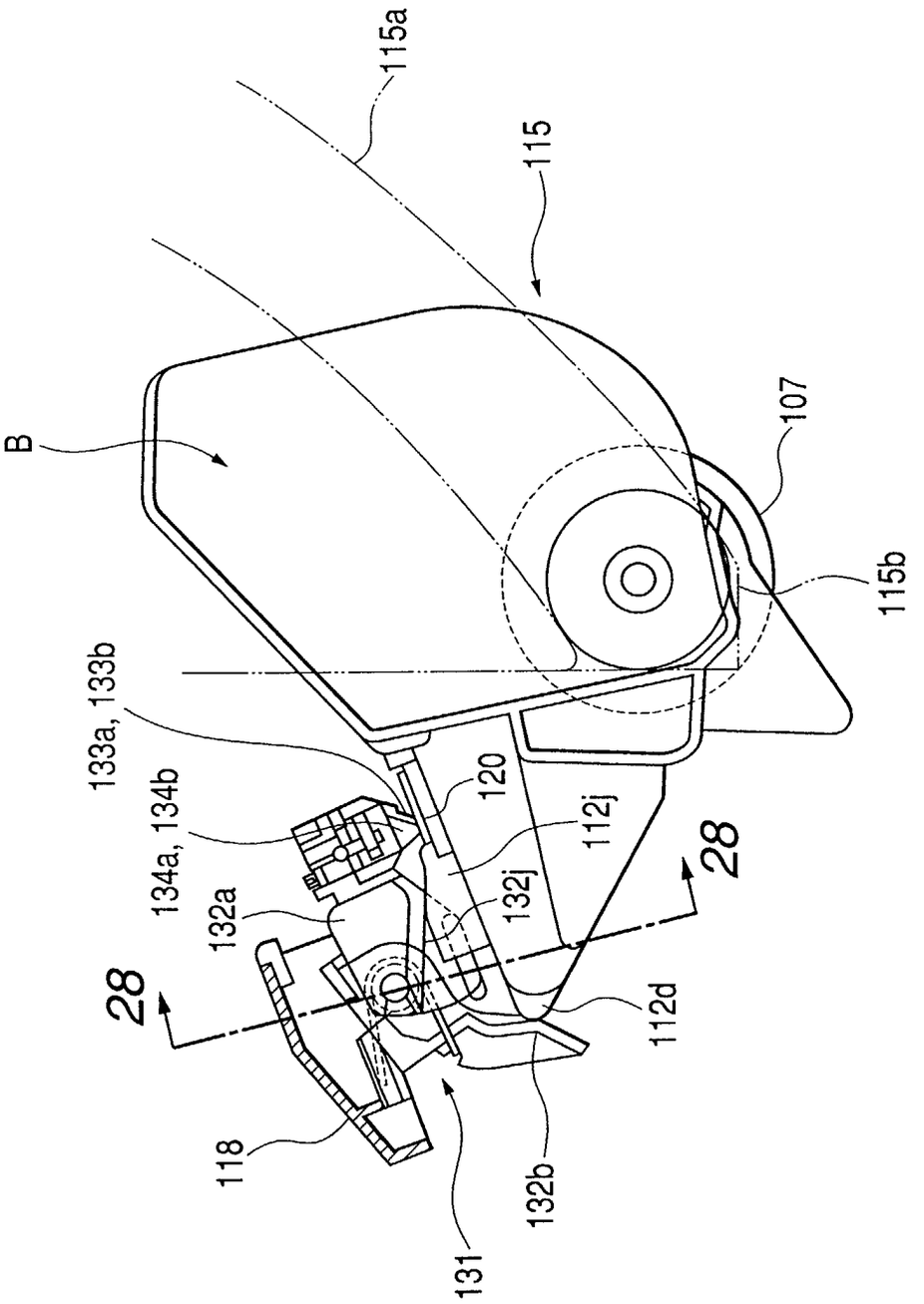
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FIG. 27

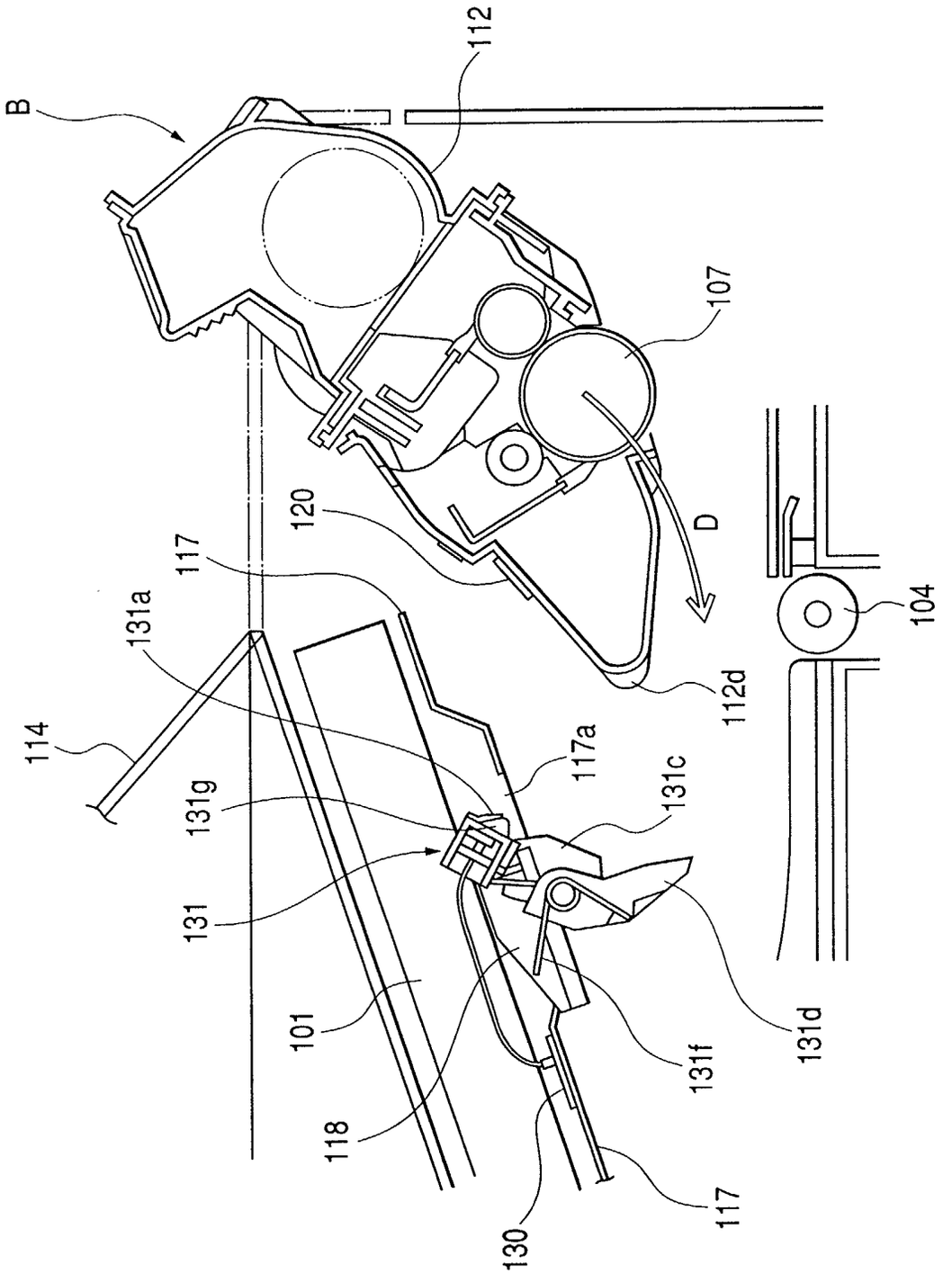
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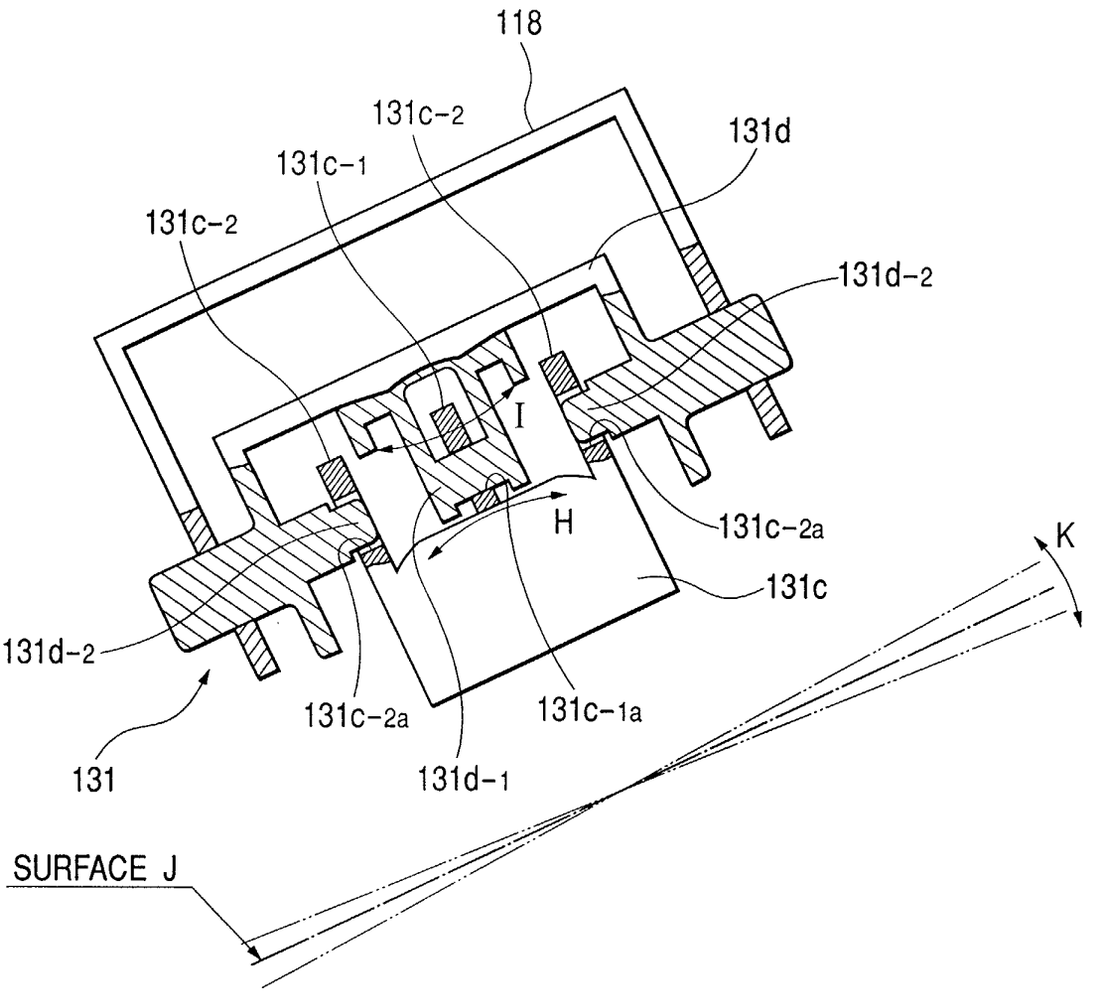
FIG. 28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131d-1
SURFACE J

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 5980

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 011 941 A (MATSUZAKI HIROOMI ET AL) 4 January 2000 (2000-01-04) * column 4, line 55 - column 7, line 47; figures 3,11 *	1-24	G03G21/18 G03G15/00
A	US 5 331 372 A (TSUDA TADAYUKI ET AL) 19 July 1994 (1994-07-19) * column 5, line 33 - column 6, line 15 * * column 29, line 28 - column 30, line 51; figures 1,42,34,40 *	1-24	
A	EP 0 770 936 A (CANON KK) 2 May 1997 (1997-05-02) * column 4, line 16 - column 9, line 57; figure 2 *	1-24	
A	EP 0 827 048 A (CANON KK) 4 March 1998 (1998-03-04) * column 40, line 11 - column 44, line 14; claim 1; figures 3,10-12 *	1-24	
A	EP 0 821 445 A (CANON KK) 28 January 1998 (1998-01-28) * column 10, line 43-55 * * column 11, line 30 - column 13, line 26; figures 1,7,8 *	1-24	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G03G
A	US 5 221 943 A (HASEGAWA HIROFUMI) 22 June 1993 (1993-06-22) * abstract *	1-24	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	19 May 2003	Waern, G

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-05-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6011941 A	04-01-2000	JP 10228224 A	25-08-1998
US 5331372 A	19-07-1994	JP 6075439 A	18-03-1994
EP 0770936 A	02-05-1997	JP 3359245 B2	24-12-2002
		JP 9179476 A	11-07-1997
		CN 1156851 A ,B	13-08-1997
		EP 0770936 A1	02-05-1997
		US 5937239 A	10-08-1999
EP 0827048 A	04-03-1998	JP 3332818 B2	07-10-2002
		JP 10123918 A	15-05-1998
		AU 712401 B2	04-11-1999
		AU 3611297 A	05-03-1998
		CN 1175713 A	11-03-1998
		DE 69717219 D1	02-01-2003
		EP 0827048 A2	04-03-1998
		KR 270224 B1	16-10-2000
		US 5926666 A	20-07-1999
EP 0821445 A	28-01-1998	JP 10039722 A	13-02-1998
		CN 1173748 A ,B	18-02-1998
		DE 69710394 D1	21-03-2002
		DE 69710394 T2	14-08-2002
		EP 0821445 A1	28-01-1998
		KR 265021 B1	01-09-2000
		US 5907748 A	25-05-1999
US 5221943 A	22-06-1993	JP 2210462 A	21-08-1990
		DE 4003695 A1	23-08-1990
		US 5773438 A	30-06-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82