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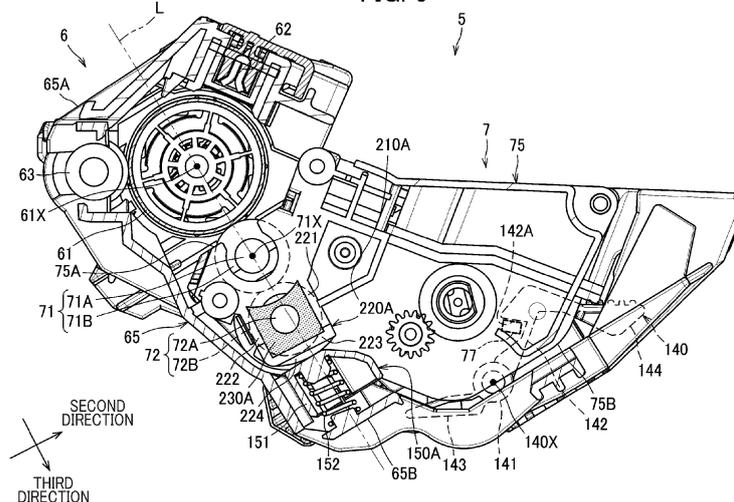
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(54) **PROCESS CARTRIDGE**

(57) A process cartridge (5) includes: a drum cartridge (6); and a developing cartridge (7) attachable to and detachable from the drum cartridge. The drum cartridge includes: a photosensitive drum (61) rotatable about a drum axis (61X) extending in a first direction; and a pressing member (150A, 150B) pressing the developing cartridge toward the photosensitive drum in a state where the developing cartridge is attached to the drum cartridge. The developing cartridge includes: a developing roller (71) rotatable about a developing-roller

axis extending in the first direction; a supply roller (72) including a supply roller shaft (72A) extending in the first direction; and a developing frame. The developing frame includes: a side wall (210A, 210B) positioned at one end in the first direction of the developing frame; and a pressure-receiving wall (220A, 220B, 210A, 221, 222, 223, 210B) protruding in the first direction from the side wall. In the state where the developing cartridge is attached to the drum cartridge, the pressure-receiving wall is pressed by the pressing member.

FIG. 5



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## Description

**[0001]** The present invention relates to a process cartridge.

**[0002]** There has been conventionally known a process cartridge including a drum cartridge, and a developing cartridge attachable to and detachable from the drum cartridge (see Japanese Patent Application Publication No. 2014-016480). The drum cartridge includes a photosensitive drum, pressing members, and a drum frame supporting the photosensitive drum and the pressing members. In a state where the developing cartridge is attached to the drum cartridge, the pressing members press the developing cartridge toward the photosensitive drum. The developing cartridge includes a developing roller, and a developing frame supporting the developing roller. In the state where the developing cartridge is attached to the drum cartridge with this technology, a wall of the developing frame that is positioned at an end portion far from the photosensitive drum is pressed by the pressing members.

**[0003]** However, a loss in a pressing force occurs when the drum frame deforms due to a reaction force that the pressing members receive from the developing cartridge in reaction to the pressing force of the pressing members. This loss of the pressing force caused by deformation of the drum frame is greater when the pressing members are configured to press the end portion of the developing frame that is far from the photosensitive drum.

**[0004]** Therefore, it is desired that the pressing members can press the developing cartridge toward the photosensitive drum at positions close to the photosensitive drum.

(1) In order to attain the above and other object, the present invention provides a process cartridge including: a drum cartridge; and a developing cartridge attachable to and detachable from the drum cartridge. The drum cartridge includes: a photosensitive drum; and a pressing member. The photosensitive drum is rotatable about a drum axis extending in a first direction. The pressing member presses the developing cartridge toward the photosensitive drum in a state where the developing cartridge is attached to the drum cartridge. The developing cartridge includes: a developing roller; a supply roller; and a developing frame. The developing roller is rotatable about a developing-roller axis extending in the first direction. The supply roller is rotatable about a supply-roller axis extending in the first direction. The supply roller includes a supply roller shaft extending in the first direction. The developing frame includes: a side wall; and a pressure-receiving wall. The side wall is positioned at one end in the first direction of the developing frame. The pressure-receiving wall protrudes in the first direction from the side wall. The pressure-receiving wall surrounds one end portion in the first direction of the supply roller shaft. In the state

where the developing cartridge is attached to the drum cartridge, the pressure-receiving wall is pressed by the pressing member.

In the above structure, the pressure-receiving wall, which surrounds the one end portion in the first direction of the supply roller shaft, is pressed by the pressing member. Accordingly, the pressing member can press the developing cartridge toward the photosensitive drum at a position near the photosensitive drum.

(2) In the process cartridge according to aspect (1), it is preferable that: the pressure-receiving wall includes: a first wall; a second wall opposing the first wall in a second direction orthogonal to the first direction; and a third wall connecting one end of the first wall and one end of the second wall to each other; the one end portion in the first direction of the supply roller shaft is positioned between the first wall and the second wall; and in the state where the developing cartridge is attached to the drum cartridge, the third wall is pressed by the pressing member.

(3) Preferably, in the process cartridge according to aspect (2), a dimension in the first direction of the third wall is greater than a dimension in the first direction of the first wall and is greater than a dimension in the first direction of the second wall.

Since the dimension in the first direction of the third wall that is configured to be pressed by the pressing member is made greater, the pressing member can stably press the developing cartridge toward the photosensitive drum when pressing the third wall.

(4) In the process cartridge according to aspect (1), it is preferable that: the developing frame is configured to accommodate toner therein; and the developing cartridge further includes: a seal positioned between the supply roller shaft and the pressure-receiving wall.

Since the seal is provided between the supply roller shaft and the pressure-receiving wall, the seal can restrain leakage of toner from a gap between the supply roller shaft and the pressure-receiving wall. Also, the pressure-receiving wall that surrounds the supply roller shaft can serve as a part that supports the seal.

(5) Preferably, in the process cartridge according to aspect (1), the pressure-receiving wall includes: a rib protruding toward the pressing member and pressed by the pressing member in the state where the developing cartridge is attached to the drum cartridge.

Since the pressure-receiving wall includes the rib, the pressure-receiving wall that is configured to be pressed by the pressing member can be reinforced.

(6) Preferably, in the process cartridge according to aspect (5), the rib has an arc shape when viewed in the first direction.

Since the rib has an arc shape, the rib is less likely to

catch on the pressing member when the developing cartridge is attached to and detached from the drum cartridge, thereby enabling the developing cartridge to be attached to and detached from the drum cartridge easily.

(7) Preferably, in the process cartridge according to aspect (5) or aspect (6), a plurality of the ribs is provided to be arranged in first direction.

Since the plurality of ribs is arranged in the first direction, the pressing member can stably press the developing cartridge toward the photosensitive drum when pressing the plurality of ribs. Further, the plurality of ribs can further reinforce the pressure-receiving wall.

(8) Preferably, in the process cartridge according to aspect (1), in the state where the developing cartridge is attached to the drum cartridge, the pressure-receiving wall is positioned on a virtual straight line when viewed in the first direction, the virtual straight line passing through both the drum axis and the developing-roller axis.

Since the pressure-receiving wall is positioned on the virtual straight line passing through both the drum axis and the developing-roller axis, the developing roller can be pressed toward the drum axis of the photosensitive drum when the pressing member presses the pressure-receiving wall.

(9) In the process cartridge according to aspect (2) or aspect (3), it is preferable that: a supply roller bearing in which the supply roller shaft is fitted. It is also preferable that the supply roller bearing and the third wall are arranged in a direction orthogonal to both the first direction and the second direction.

Since the third wall and the supply roller bearing are arranged in the direction orthogonal to both the first direction and the second direction, the developing cartridge can be made compact in the first direction. Consequently, the drum cartridge and the process cartridge can also be made compact in the first direction.

(10) Preferably, in the process cartridge according to aspect (1), the pressure-receiving wall and the supply roller are arranged in the first direction.

(11) Preferably, the process cartridge according to aspect (1) further includes: a supply roller gear positioned at the one end portion in the first direction of the supply roller shaft, the supply roller gear being rotatable about the supply-roller axis together with the supply roller. It is also preferable that the pressure-receiving wall is positioned between the supply roller gear and the side wall.

(12) Preferably, in the process cartridge according to aspect (1), in the state where the developing cartridge is attached to the drum cartridge, the supply roller shaft is positioned on a virtual straight line when viewed in the first direction. It is also preferable that the virtual straight line passes through both the drum axis and the developing-roller axis.

Fig. 1 is a diagram illustrating an image forming apparatus employing a process cartridge according to one embodiment.

Fig. 2 is a diagram illustrating the image forming apparatus from which the process cartridge is detached.

Fig. 3A is a perspective view of the process cartridge. Fig. 3B is a perspective view of a drum cartridge and a developing cartridge.

Fig. 4 is a perspective view illustrating a locking lever, a first pressing member, and a second pressing member in the drum cartridge.

Fig. 5 is a cross-sectional view illustrating the first pressing member in the drum cartridge and a first pressure-receiving wall in the developing cartridge.

Fig. 6 is a perspective view illustrating the first pressure-receiving wall and a second pressure-receiving wall in the developing cartridge.

Fig. 7 is a cross-sectional view illustrating a state where the developing cartridge is lifted upward from the drum cartridge.

Fig. 8 is an exploded perspective view illustrating one end portion of the developing cartridge.

Fig. 9 is a cross-sectional perspective view illustrating one end portion of the process cartridge.

Fig. 10 is a cross-sectional view illustrating the one end portion and another end portion of the process cartridge.

30 **[0005]** Hereinafter, one embodiment of the present invention will be described while referring to the accompanying drawings.

35 **[0006]** As illustrated in Fig. 1, an image forming apparatus 1 includes a housing 2, a sheet-feeding unit 3, an exposure unit 4, a process cartridge 5, and a fixing unit 8.

**[0007]** The sheet-feeding unit 3 is positioned at a lower portion inside the housing 2. The sheet-feeding unit 3 includes a sheet tray 31, a lifter plate 32, and a sheet-feeding mechanism 33. The sheet tray 31 is configured to accommodate therein sheets S of paper or the like. The lifter plate 32 is configured to lift the sheets S accommodated in the sheet tray 31 upward. The sheet-feeding mechanism 33 is configured to feed the sheets S lifted upward by the lifter plate 32 toward the process cartridge 5.

**[0008]** The exposure unit 4 is positioned upward of the sheet tray 31. The exposure unit 4 includes a light source, a deflector, lenses, mirrors, and the like. The exposure unit 4 is configured to emit a laser beam as indicated by a phantom line in Fig. 1 in order to expose a surface of a photosensitive drum 61 to light.

**[0009]** The process cartridge 5 is positioned upward of the sheet-feeding mechanism 33. The process cartridge 5 includes a drum cartridge 6, and a developing cartridge 7.

**[0010]** The drum cartridge 6 includes the photosensitive drum 61, a charger 62, a transfer roller 63, and a drum frame 65. The photosensitive drum 61 is rotatable about a

drum axis 61X extending in the first direction. In the present embodiment, the first direction corresponds to a left-right direction of the image forming apparatus 1.

[0011] The charger 62 is configured to charge the surface of the photosensitive drum 61. The transfer roller 63 is rotatable about a transfer-roller axis 63X extending in the first direction. The drum frame 65 holds the photosensitive drum 61, the charger 62, and the transfer roller 63.

[0012] The developing cartridge 7 includes a developing roller 71, a supply roller 72, a thickness-regulating blade 73, an agitator 74, and a developing frame 75.

[0013] The developing roller 71 is rotatable about a developing-roller axis 71X extending in the first direction. The supply roller 72 is rotatable about a supply-roller axis 72X extending in the first direction. The thickness-regulating blade 73 is configured to regulate a layer of toner on the developing roller 71 so that the layer is formed to have a constant thickness.

[0014] The developing frame 75 holds the developing roller 71, the supply roller 72, the thickness-regulating blade 73, and the agitator 74. The developing frame 75 is configured to accommodate therein toner. Specifically, the developing frame 75 has a toner-accommodating portion 76 configured to accommodate therein toner.

[0015] The agitator 74 is rotatable about an agitator axis 74X extending in the first direction. By rotating, the agitator 74 is configured to agitate toner in the toner-accommodating portion 76. The supply roller 72 is configured to supply toner accommodated in the toner-accommodating portion 76 to the developing roller 71.

[0016] The fixing unit 8 is positioned upward of the process cartridge 5. The fixing unit 8 includes a heating roller 81, and a pressure roller 82. The heating roller 81 is configured to heat the sheets S. The pressure roller 82 is configured to nip the sheets S at a position between the pressure roller 82 and the heating roller 81.

[0017] The image forming apparatus 1 charges the surface of the photosensitive drum 61 using the charger 62. The image forming apparatus 1 subsequently exposes the charged surface of the photosensitive drum 61 to light with a laser beam emitted from the exposure unit 4. As a result, an electrostatic latent image is formed on the photosensitive drum 61 based on image data. Next, the image forming apparatus 1 supplies toner from the developing roller 71 onto the photosensitive drum 61, thereby forming a toner image on the photosensitive drum 61.

[0018] The image forming apparatus 1 subsequently conveys a sheet S supplied from the sheet-feeding unit 3 at a position between the photosensitive drum 61 and the transfer roller 63, whereby the toner image formed on the photosensitive drum 61 is transferred onto the sheet S. Thereafter, the image forming apparatus 1 conveys the sheet S on which the toner image has been transferred at a position between the heating roller 81 and the pressure roller 82. As a result, the toner image transferred onto the sheet S is fixed to the sheet S.

[0019] With a discharge roller 9, the image forming apparatus 1 discharges the sheet S on which the toner image has been fixed onto a discharge tray 2A.

[0020] The housing 2 has a housing body 21, and a cover 22. The housing body 21 has an opening 21A. The cover 22 is configured to open and close the opening 21A. The cover 22 is movable relative to the housing body 21 between a closed position illustrated in Fig. 1 and an open position illustrated in Fig. 2. Specifically, the cover 22 is pivotally movable relative to the housing body 21 between the closed position and the open position. In the closed position, the cover 22 closes the opening 21A. In the open position, the cover 22 opens the opening 21A.

[0021] As illustrated in Fig. 2, the process cartridge 5 is attachable to and detachable from the housing 2. Specifically, the process cartridge 5 is attachable to and detachable from the housing body 21 through the opening 21A in a state where the cover 22 is in the open position.

[0022] As illustrated in Figs. 3A and 3B, the developing cartridge 7 is attachable to and detachable from the drum cartridge 6. Fig. 3A illustrates the process cartridge 5 in which the developing cartridge 7 is attached to the drum cartridge 6. Fig. 3B illustrates a state where the developing cartridge 7 is detached from the drum cartridge 6.

[0023] Hereinafter, in the referenced drawings, arrows are used to indicate the first direction, a second direction, and a third direction. In these drawings, each arrow points to one side in the corresponding direction. Specifically, a leading side of each arrow represents one side in the corresponding direction, and a trailing side of each arrow represents the other side in the corresponding direction. The second direction is orthogonal to the first direction. The third direction is orthogonal to both the first direction and the second direction.

[0024] As illustrated in Fig. 4, the drum cartridge 6 further includes a locking lever 140, a first pressing member 150A, and a second pressing member 150B. The drum frame 65 has a first drum end portion 65A, and a second drum end portion 65B. Each of the first pressing member 150A and the second pressing member 150B is an example of the "pressing member".

[0025] The first drum end portion 65A is an end portion in the third direction of the drum frame 65 that is close the photosensitive drum 61. In other words, the first drum end portion 65A is another end portion in the third direction of the drum frame 65. The second drum end portion 65B is an end portion in the third direction of the drum frame 65 that is far from the photosensitive drum 61. In other words, the second drum end portion 65B is one end portion in the third direction of the drum frame 65.

[0026] The locking lever 140 locks the developing cartridge 7 relative to the drum cartridge 6 in a state where the developing cartridge 7 is attached to the drum cartridge 6. The locking lever 140 is positioned at another end in the first direction of the drum frame 65. The locking lever 140 is positioned closer to the second drum end portion 65B than the photosensitive drum 61 is to the

second drum end portion 65B in the third direction.

**[0027]** The first pressing member 150A and the second pressing member 150B press the developing cartridge 7 toward the photosensitive drum 61 in the state where the developing cartridge 7 is attached to the drum cartridge 6. As a result, the first pressing member 150A and the second pressing member 150B press the developing roller 71 against the photosensitive drum 61.

**[0028]** The first pressing member 150A is positioned at one end in the first direction of the drum frame 65. The second pressing member 150B is positioned at the other end in the first direction of the drum frame 65. The first pressing member 150A and the second pressing member 150B are positioned closer to the photosensitive drum 61 than the locking lever 140 is to the photosensitive drum 61 in the third direction. The first pressing member 150A and the second pressing member 150B have configurations that are symmetrical to each other in the first direction.

**[0029]** As illustrated in Fig. 5, the first pressing member 150A includes a pressing member body 151, and a spring 152. The second pressing member 150B (see Fig. 10) similarly includes a pressing member body 151, and a spring 152.

**[0030]** Each of the pressing member bodies 151 is in contact with the developing cartridge 7 in the state where the developing cartridge 7 is attached to the drum cartridge 6. Each of the pressing member bodies 151 is held by the drum frame 65. Each of the pressing member bodies 151 is linearly movable along the third direction relative to the drum frame 65.

**[0031]** Each of the springs 152 is positioned between the corresponding pressing member body 151 and the second drum end portion 65B of the drum frame 65. Each of the springs 152 urges the corresponding pressing member body 151 toward the other side in the third direction. Each of the springs 152 is a compression coil spring, for example.

**[0032]** As illustrated in Figs. 5 and 6, the developing frame 75 includes a first pressure-receiving wall 220A, and a second pressure-receiving wall 220B. The developing frame 75 has a first developing end portion 75A, and a second developing end portion 75B. Each of the first pressure-receiving wall 220A and the second pressure-receiving wall 220B is an example of the "pressure-receiving wall".

**[0033]** The first developing end portion 75A is an end portion in the third direction of the developing frame 75 that is close to the photosensitive drum 61 in the state where the developing cartridge 7 is attached to the drum cartridge 6. In other words, the first developing end portion 75A is another end portion in the third direction of the developing frame 75.

**[0034]** The second developing end portion 75B is an end portion in the third direction of the developing frame 75 that is far from the photosensitive drum 61 in the state where the developing cartridge 7 is attached to the drum cartridge 6. In other words, the second developing end

portion 75B is one end portion in the third direction of the developing frame 75.

**[0035]** In the state where the developing cartridge 7 is attached to the drum cartridge 6, the first pressure-receiving wall 220A is pressed by the first pressing member 150A. The first pressure-receiving wall 220A is positioned at one end in the first direction of the developing frame 75.

**[0036]** In the state where the developing cartridge 7 is attached to the drum cartridge 6, the second pressure-receiving wall 220B is pressed by the second pressing member 150B (see Fig. 10). The second pressure-receiving wall 220B is positioned at another end in the first direction of the developing frame 75.

**[0037]** As illustrated in Fig. 5, in the state where the developing cartridge 7 is attached to the drum cartridge 6, the first pressure-receiving wall 220A is aligned with both the photosensitive drum 61 and the developing roller 71 when viewed in the first direction. Specifically, in the state where the developing cartridge 7 is attached to the drum cartridge 6, the first pressure-receiving wall 220A is positioned on a virtual straight line L when viewed in the first direction. The virtual straight line L passes through both the drum axis 61X and the developing-roller axis 71X. The same is applied with respect to the second pressure-receiving wall 220B.

**[0038]** The developing roller 71 includes a developing roller shaft 71A, and a developing roller body 71B. The developing roller shaft 71A extends in the first direction. The developing roller shaft 71A is made of metal, for example. The developing roller body 71B covers an outer circumferential surface of the developing roller shaft 71A. The developing roller body 71B is made of rubber, for example.

**[0039]** The supply roller 72 includes a supply roller shaft 72A, and a supply roller body 72B. The supply roller shaft 72A extends in the first direction. The supply roller shaft 72A is made of metal, for example. The supply roller body 72B covers an outer circumferential surface of the supply roller shaft 72A. The supply roller body 72B is made of sponge, for example.

**[0040]** In the state where the developing cartridge 7 is attached to the drum cartridge 6, the supply roller 72 is aligned with both the photosensitive drum 61 and the developing roller 71 when viewed in the first direction. Specifically, in the state where the developing cartridge 7 is attached to the drum cartridge 6, the supply roller shaft 72A is positioned on the virtual straight line L when viewed in the first direction.

**[0041]** The locking lever 140 is movable relative to the drum frame 65 between a locking position illustrated in Fig. 5, and a lock release position illustrated in Fig. 7. Specifically, the locking lever 140 is pivotally movable relative to the drum frame 65 between the locking position and the lock release position.

**[0042]** The locking lever 140 includes a shaft portion 141, a lock portion 142, a pressing portion 143, and an operating portion 144.

**[0043]** The shaft portion 141 defines a lever axis 140X about which the locking lever 140 is pivotably movable. The lever axis 140X extends in the first direction. The shaft portion 141 is supported by the drum frame 65 so as to be pivotally movable.

**[0044]** In a state where the locking lever 140 is in the locking position illustrated in Fig. 5, the lock portion 142 locks the developing cartridge 7 relative to the drum frame 65. In the state where the locking lever 140 is in the locking position, the lock portion 142 extends toward the one side in the second direction from the shaft portion 141. The lock portion 142 has a recess 142A into which a protrusion 77 of the developing cartridge 7 is configured to be fitted.

**[0045]** The operating portion 144 is a part that is configured to be operated by a user for moving the locking lever 140 from the locking position to the lock release position. In the state where the locking lever 140 is in the locking position, the operating portion 144 extends diagonally toward the one side in the second direction and toward the one side in the third direction from the lock portion 142.

**[0046]** When the locking lever 140 moves from the locking position to the lock release position, the pressing portion 143 contacts the developing cartridge 7 and presses the developing cartridge 7 upward. In the state where the locking lever 140 is in the locking position, the pressing portion 143 extends toward the other side in the second direction from the shaft portion 141.

**[0047]** The locking lever 140 is in the locking position in the state where the developing cartridge 7 is attached to the drum cartridge 6. In this state, the protrusion 77 of the developing cartridge 7 is positioned inside the recess 142A of the lock portion 142. As a result, the developing cartridge 7 is locked relative to the drum cartridge 6.

**[0048]** When the locking lever 140 moves from the locking position to the lock release position illustrated in Fig. 7, the recess 142A of the lock portion 142 disengages from the protrusion 77 of the developing cartridge 7 and the pressing portion 143 presses the developing cartridge 7 upward. Accordingly, lock of the developing cartridge 7 relative to the drum cartridge 6 is released, and the second developing end portion 75B of the developing cartridge 7 primarily separates from the drum frame 65, whereby the developing cartridge 7 is detached from the drum cartridge 6.

**[0049]** As illustrated in Fig. 8, the developing cartridge 7 further includes a first seal 230A, and a first bearing 240A. The developing frame 75 includes a first side wall 210A. The first seal 230A is an example of the "seal". The first side wall 210A is an example of the "side wall".

**[0050]** The first side wall 210A is positioned at the one end in the first direction of the developing frame 75. In the present embodiment, the first side wall 210A is orthogonal to the first direction.

**[0051]** The first pressure-receiving wall 220A protrudes toward the one side in the first direction from the first side wall 210A. The first pressure-receiving wall

220A surrounds one end portion in the first direction of the supply roller shaft 72A. Specifically, the first pressure-receiving wall 220A includes a first wall 221, a second wall 222, and a third wall 223.

5 **[0052]** Each of the first wall 221 and the second wall 222 extends in the third direction. The second wall 222 opposes the first wall 221 in the second direction. The one end portion in the first direction of the supply roller shaft 72A is positioned between the first wall 221 and the second wall 222. The first wall 221 is positioned on the one side of the supply roller shaft 72A in the second direction. The second wall 222 is positioned on the other side of the supply roller shaft 72A in the second direction.

10 **[0053]** The third wall 223 extends in the second direction. The third wall 223 connects one end of the first wall 221 and one end of the second wall 222 to each other. Specifically, the third wall 223 connects one end in the third direction of the first wall 221 and one end in the third direction of the second wall 222 to each other.

15 **[0054]** The third wall 223 protrudes further in the first direction than both the first wall 221 and the second wall 222. Specifically, a dimension in the first direction of the third wall 223 is greater than a dimension in the first direction of the first wall 221 and is greater than a dimension in the first direction of the second wall 222. In the present embodiment, the dimension in the first direction of the first wall 221 and the dimension in the first direction of the second wall 222 are the same as each other. The third wall 223 directly opposes the supply roller shaft 72A.

20 **[0055]** The first pressure-receiving wall 220A also includes ribs 224. The ribs 224 protrude toward the first pressing member 150A (see Fig. 5) in the state where the developing cartridge 7 is attached to the drum cartridge 6. Specifically, the ribs 224 protrude toward the one side in the third direction from the third wall 223.

25 **[0056]** The plurality of ribs 224 are arranged in the first direction. In the present embodiment, two of the ribs 224 are arranged in the first direction. Each of the ribs 224 has an arc shape when viewed in the first direction. Specifically, one side surface in the third direction of each of the ribs 224 has an arc shape when viewed in the first direction.

30 **[0057]** As illustrated in Fig. 9, the third wall 223 of the first pressure-receiving wall 220A is pressed by the first pressing member 150A in the state where the developing cartridge 7 is attached to the drum cartridge 6. Specifically, the ribs 224 of the first pressure-receiving wall 220A that protrude from the third wall 223 are pressed by the first pressing member 150A in the state where the developing cartridge 7 is attached to the drum cartridge 6.

35 **[0058]** The first seal 230A restricts toner from leaking through a gap between the supply roller shaft 72A and the first pressure-receiving wall 220A. The first seal 230A is positioned between the supply roller shaft 72A and the first pressure-receiving wall 220A. The first pressure-receiving wall 220A holds the first seal 230A. Specifically, the first pressure-receiving wall 220A holds the first seal 230A at a position between the first wall 221 (see Fig. 5)

and the second wall 222.

**[0059]** The first seal 230A is mounted in the developing frame 75 together with the supply roller 72 prior to mounting the developing roller 71 in the developing frame 75. Specifically, the first seal 230A is mounted in the developing frame 75 together with the supply roller 72 while the supply roller shaft 72A is inserted in a through-hole 231 (see Fig. 8) of the first seal 230A. The first seal 230A is mounted in a portion inside the first pressure-receiving wall 220A from the first developing end portion 75A of the developing frame 75 toward the one side in the third direction.

**[0060]** Referring back to Fig. 8, the first bearing 240A supports the developing roller 71 and the supply roller 72 so that the developing roller 71 and the supply roller 72 are rotatable. The first bearing 240A includes a first developing bearing 241A, and a first supply bearing 242A. The first supply bearing 242A is an example of the "supply roller bearing".

**[0061]** The first developing bearing 241A supports the developing roller 71 so that the developing roller 71 is rotatable. One end portion in the first direction of the developing roller shaft 71A is fitted in the first developing bearing 241A.

**[0062]** The first supply bearing 242A supports the supply roller 72 so that the supply roller 72 is rotatable. The one end portion in the first direction of the supply roller shaft 72A is fitted in the first supply bearing 242A. In the present embodiment, the first developing bearing 241A and the first supply bearing 242A are formed as a single member.

**[0063]** As illustrated in Fig. 10, the third wall 223 of the first pressure-receiving wall 220A and the first supply bearing 242A are arranged in the third direction. The third wall 223 of the first pressure-receiving wall 220A is positioned on the one side of the first supply bearing 242A in the third direction.

**[0064]** The developing cartridge 7 also includes a supply roller gear 72G. The supply roller gear 72G is rotatable together with the supply roller 72 about the supply-roller axis 72X. The supply roller gear 72G is positioned at the one end portion in the first direction of the supply roller shaft 72A. The supply roller gear 72G is fixed to the supply roller shaft 72A. The supply roller 72 rotates upon input of a driving force into the supply roller gear 72G.

**[0065]** The first pressure-receiving wall 220A is positioned between the supply roller gear 72G and the first side wall 210A of the developing frame 75. The first pressure-receiving wall 220A is positioned on the one side of the first side wall 210A in the first direction. The first pressure-receiving wall 220A is positioned on the other side of the supply roller gear 72G in the first direction.

**[0066]** The first pressure-receiving wall 220A and the supply roller 72 are arranged in the first direction. The first pressure-receiving wall 220A is positioned on the one side of the supply roller 72 in the first direction. Specifically, the first pressure-receiving wall 220A and the sup-

ply roller body 72B are arranged in the first direction. The first pressure-receiving wall 220A is positioned on the one side of the supply roller body 72B in the first direction.

**[0067]** The developing cartridge 7 further includes a second seal 230B, and a second bearing 240B. The developing frame 75 further includes a second side wall 210B. The second seal 230B is also an example of the "seal". The second side wall 210B is also an example of the "side wall".

**[0068]** The second side wall 210B is positioned at the other end in the first direction of the developing frame 75. In the present embodiment, the second side wall 210B is orthogonal to the first direction. The second side wall 210B opposes the first side wall 210A in the first direction.

**[0069]** The second pressure-receiving wall 220B protrudes toward the other side in the first direction from the second side wall 210B. The second pressure-receiving wall 220B surrounds another end portion in the first direction of the supply roller shaft 72A. The second pressure-receiving wall 220B has a configuration that is symmetrical to the first pressure-receiving wall 220A in the first direction. Specifically, as with the first pressure-receiving wall 220A, the second pressure-receiving wall 220B includes a first wall 221, a second wall 222, a third wall 223, and ribs 224. Note that the first wall 221 and the second wall 222 of the second pressure-receiving wall 220B are omitted from the drawings.

**[0070]** The other end portion in the first direction of the supply roller shaft 72A is positioned between the first wall 221 and the second wall 222 (which are not illustrated) of the second pressure-receiving wall 220B. The ribs 224 of the second pressure-receiving wall 220B protrude toward the second pressing member 150B in the state where the developing cartridge 7 is attached to the drum cartridge 6.

**[0071]** The third wall 223 of the second pressure-receiving wall 220B is pressed by the second pressing member 150B in the state where the developing cartridge 7 is attached to the drum cartridge 6. Specifically, the ribs 224 of the second pressure-receiving wall 220B are pressed by the second pressing member 150B in the state where the developing cartridge 7 is attached to the drum cartridge 6.

**[0072]** The second seal 230B restricts toner from leaking through a gap between the supply roller shaft 72A and the second pressure-receiving wall 220B. The second seal 230B is positioned between the supply roller shaft 72A and the second pressure-receiving wall 220B. The second pressure-receiving wall 220B holds the second seal 230B. The second seal 230B is mounted in the developing frame 75 in the same manner as the first seal 230A.

**[0073]** The second bearing 240B includes a second developing bearing 241B, and a second supply bearing 242B. The second supply bearing 242B is an example of the "supply roller bearing".

**[0074]** The second developing bearing 241B supports the developing roller 71 so that the developing roller 71 is

rotatable. Another end portion in the first direction of the developing roller shaft 71A is fitted in the second developing bearing 241B.

**[0075]** The second supply bearing 242B supports the supply roller 72 so that the supply roller 72 is rotatable. The other end portion in the first direction of the supply roller shaft 72A is fitted in the second supply bearing 242B. In the present embodiment, the second developing bearing 241B and the second supply bearing 242B are formed as a single member.

**[0076]** The third wall 223 of the second pressure-receiving wall 220B is juxtaposed with the second supply bearing 242B in the third direction. The third wall 223 of the second pressure-receiving wall 220B is positioned on the one side of the second supply bearing 242B in the third direction.

**[0077]** The second pressure-receiving wall 220B is juxtaposed with the supply roller 72 in the first direction. The second pressure-receiving wall 220B is positioned on the other side of the supply roller 72 in the first direction. Specifically, the second pressure-receiving wall 220B is juxtaposed with the supply roller body 72B in the first direction. The second pressure-receiving wall 220B is positioned on the other side of the supply roller body 72B in the first direction.

**[0078]** Next, the advantageous effects according to the present embodiment will be described.

**[0079]** By pressing the first pressure-receiving wall 220A and the second pressure-receiving wall 220B, which surround the respective end portions in the first direction of the supply roller shaft 72A, the first pressing member 150A and the second pressing member 150B can press the developing cartridge 7 toward the photosensitive drum 61 at positions close to the photosensitive drum 61.

**[0080]** Since a distance from the first pressure-receiving wall 220A and the second pressure-receiving wall 220B to the photosensitive drum 61 is short, the drum frame 65 is less likely to be deformed due to a reaction force that the first pressing member 150A and the second pressing member 150B receive from the developing cartridge 7 in reaction to the pressing force of the first pressing member 150A and the second pressing member 150B. As a result, the loss of the pressing force caused by deformation of the drum frame 65 can be reduced.

**[0081]** Reducing the loss of the pressing force allows the developing cartridge 7 to be pressed toward the photosensitive drum 61 with a small pressing force. In other words, the first pressing member 150A and the second pressing member 150B can press the developing cartridge 7 toward the photosensitive drum 61 with a sufficient force, even if the urging force of the springs 152 of the first pressing member 150A and the second pressing member 150B is small.

**[0082]** In the process cartridge 5, the first pressure-receiving wall 220A and the second pressure-receiving wall 220B of the developing cartridge 7, which are

pressed by the first pressing member 150A and the second pressing member 150B, respectively, are provided on the side walls in the first direction of the developing frame 75, rather than on the second developing end portion 75B of the developing frame 75. This arrangement allows the toner-accommodating portion 76 of the developing frame 75 to be made larger toward the one side in the second direction and/or the one side in the third direction, thereby making it possible to increase the accommodating capacity of toner in the developing cartridge 7.

**[0083]** Since the third walls 223, which are pressed by the first pressing member 150A and the second pressing member 150B, have a large dimension in the first direction, the developing cartridge 7 can be stably pressed toward the photosensitive drum 61 when the first pressing member 150A and the second pressing member 150B press the respective third walls 223.

**[0084]** The developing cartridge 7 includes the first seal 230A and the second seal 230B at positions between the supply roller shaft 72A and the respective first pressure-receiving wall 220A and second pressure-receiving wall 220B. The first seal 230A and the second seal 230B can restrain toner from leaking through gaps between the supply roller shaft 72A and the respective first pressure-receiving wall 220A and second pressure-receiving wall 220B. The first pressure-receiving wall 220A and the second pressure-receiving wall 220B, which surround the supply roller shaft 72A, can serve as the parts that hold the first seal 230A and the second seal 230B, respectively.

**[0085]** Since each of the first pressure-receiving wall 220A and the second pressure-receiving wall 220B includes the ribs 224, the first pressure-receiving wall 220A and the second pressure-receiving wall 220B, which receive a pressing force from the first pressing member 150A and the second pressing member 150B, respectively, can be reinforced.

**[0086]** Since each of the ribs 224 has an arc shape, the ribs 224 are unlikely to catch on the first pressing member 150A and the second pressing member 150B during attachment and detachment of the developing cartridge 7 to and from the drum cartridge 6, thereby enabling the developing cartridge 7 to be easily attached to and detachable from the drum cartridge 6.

**[0087]** The plurality of ribs 224 is arranged in the first direction. Accordingly, the developing cartridge 7 can be pressed stably toward the photosensitive drum 61 when the ribs 224 are pressed by the first pressing member 150A and the second pressing member 150B. Also, the plurality of ribs 224 can better reinforce the first pressure-receiving wall 220A and the second pressure-receiving wall 220B.

**[0088]** By positioning the first pressure-receiving wall 220A and the second pressure-receiving wall 220B on the virtual straight line L, which passes through both the drum axis 61X and the developing-roller axis 71X, the developing roller 71 can be pressed toward the drum axis

61X of the photosensitive drum 61 when the first pressure-receiving wall 220A and the second pressure-receiving wall 220B are pressed by the first pressing member 150A and the second pressing member 150B, respectively.

**[0089]** Since the third walls 223 of the first pressure-receiving wall 220A and the second pressure-receiving wall 220B are aligned with the first supply bearing 242A and the second supply bearing 242B, respectively, in the third direction, the developing cartridge 7 can be made more compact in the first direction in comparison with a configuration in which the third walls 223 of the first pressure-receiving wall 220A and the second pressure-receiving wall 220B are offset from the respective first supply bearing 242A and second supply bearing 242B in the first direction. As a result, the drum cartridge 6 and the process cartridge 5 can be made more compact in the first direction.

**[0090]** While the invention has been described in conjunction with various example structures outlined above and illustrated in the figures, various alternatives, modifications, variations, improvements, and/or substantial equivalents, whether known or that may be presently unforeseen, may become apparent to those having at least ordinary skill in the art. Accordingly, the example embodiments of the disclosure, as set forth above, are intended to be illustrative of the invention, and not limiting the invention. Various changes may be made without departing from the spirit and scope of the disclosure. Therefore, the disclosure is intended to embrace all known or later developed alternatives, modifications, variations, improvements, and/or substantial equivalents. Some specific examples of potential alternatives, modifications, or variations in the described invention are provided below:

**[0091]** Each of the ribs 224 has an arc shape in the above-described embodiment. However, the ribs 224 may have a trapezoidal shape or a rectangular shape, for example.

**[0092]** Although the first pressure-receiving wall 220A is configured so that the first pressure-receiving wall 220A includes two of the ribs 224 in the above embodiment, the first pressure-receiving wall 220A may be configured so that the first pressure-receiving wall 220A includes three or more ribs 224, example. Alternatively, the first pressure-receiving wall 220A may be configured so that the first pressure-receiving wall 220A includes only one rib 224. Still alternatively, the ribs 224 may be omitted from the first pressure-receiving wall 220A. The second pressure-receiving wall 220B may be similarly configured.

**[0093]** In the embodiment described above, the third wall 223 has a dimension in the first direction that is greater than that of the first wall 221 and the second wall 222, but the third wall 223 may have the same dimension in the first direction as at least one of the first wall 221 and the second wall 222, for example. In other words, at least one of the first wall 221 and the second wall 222 may have

the same dimension in the first direction as the third wall 223. Moreover, the first wall 221 and the second wall 222 may have dimensions in the first direction different from each other.

**[0094]** In the embodiment described above, the third wall 223 of the first pressure-receiving wall 220A is positioned between the supply roller gear 72G and the first side wall 210A so as to overlap the supply roller gear 72G when viewed in the first direction. However, the third wall 223 may be positioned so as not to overlap the supply roller gear 72G when viewed in the first direction, for example.

**[0095]** In the embodiment described above, the first pressure-receiving wall 220A is juxtaposed with the supply roller 72 in the first direction so as to overlap the supply roller 72 when viewed in the first direction. However, the first pressure-receiving wall 220A may be positioned so as not to overlap the supply roller 72 when viewed in the first direction, for example. The same is applied with respect to the second pressure-receiving wall 220B.

**[0096]** In the embodiment described above, the first pressure-receiving wall 220A is juxtaposed with the first supply bearing 242A in the third direction. However, the first pressure-receiving wall 220A may be disposed in a different position in the first direction from the first supply bearing 242A, for example. The same is applied with respect to the second pressure-receiving wall 220B and the second supply bearing 242B.

**[0097]** In the embodiment described above, the first pressure-receiving wall 220A and the second pressure-receiving wall 220B are positioned on the virtual straight line L, but the first pressure-receiving wall 220A and the second pressure-receiving wall 220B need not be positioned on the virtual straight line L, for example. Similarly, the supply roller shaft 72A need not be positioned on the virtual straight line L.

**[0098]** In the embodiment described above, the developing cartridge 7 has the toner-accommodating portion 76 configured to accommodate therein toner. However, the developing cartridge 7 may be configured without the toner-accommodating portion 76, for example. In this case, a toner cartridge configured to accommodate therein toner may be attachable to and detachable from the developing cartridge 7 without the toner-accommodating portion 76. In other words, the process cartridge 5 may be configured so that the process cartridge 5 includes the drum cartridge 6, the developing cartridge 7, and the toner cartridge.

**[0099]** The elements appearing in the embodiment and modifications described above may be implemented in any suitable combination.

## Claims

1. A process cartridge (5) comprising:
  - a drum cartridge (6); and

a developing cartridge (7) attachable to and detachable from the drum cartridge (6), the drum cartridge (6) including:

a photosensitive drum (61) rotatable about a drum axis (61X) extending in a first direction; and  
a pressing member (150A, 150B) pressing the developing cartridge (7) toward the photosensitive drum (61) in a state where the developing cartridge (7) is attached to the drum cartridge (6),

the developing cartridge (7) including:

a developing roller (71) rotatable about a developing-roller axis (71X) extending in the first direction;  
a supply roller (72) rotatable about a supply-roller axis (72X) extending in the first direction, the supply roller (72) including a supply roller shaft (72A) extending in the first direction; and  
a developing frame (75) including:

a side wall (210A, 210B) positioned at one end in the first direction of the developing frame (75); and  
a pressure-receiving wall (220A, 220B) protruding in the first direction from the side wall (210A, 210B), the pressure-receiving wall (220A, 220B) surrounding one end portion in the first direction of the supply roller shaft (72A),

wherein, in the state where the developing cartridge (7) is attached to the drum cartridge (6), the pressure-receiving wall (220A, 220B) is pressed by the pressing member (150A, 150B).

**2.** The process cartridge (5) according to claim 1,

wherein the pressure-receiving wall (220A, 220B) includes:

a first wall (221);  
a second wall (222) opposing the first wall (221) in a second direction orthogonal to the first direction; and  
a third wall (223) connecting one end of the first wall (221) and one end of the second wall (222) to each other,

wherein the one end portion in the first direction of the supply roller shaft (72A) is positioned between the first wall (221) and the second wall (222), and

wherein, in the state where the developing car-

tridge (7) is attached to the drum cartridge (6), the third wall (223) is pressed by the pressing member (150A, 150B).

**3.** The process cartridge (5) according to claim 2, wherein a dimension in the first direction of the third wall (223) is greater than a dimension in the first direction of the first wall (221) and is greater than a dimension in the first direction of the second wall (222).

**4.** The process cartridge (5) according to claim 1, wherein the developing frame (75) is configured to accommodate therein toner, and wherein the developing cartridge (7) further includes:  
a seal (230A, 230B) positioned between the supply roller shaft (72A) and the pressure-receiving wall (220A, 220B).

**5.** The process cartridge (5) according to claim 1, wherein the pressure-receiving wall (220A, 220B) includes:  
a rib (224) protruding toward the pressing member (150A, 150B) and pressed by the pressing member (150A, 150B) in the state where the developing cartridge (7) is attached to the drum cartridge (6).

**6.** The process cartridge (5) according to claim 5, wherein the rib (224) has an arc shape when viewed in the first direction.

**7.** The process cartridge (5) according to claim 5 or 6, wherein a plurality of the ribs (224) is provided to be arranged in the first direction.

**8.** The process cartridge (5) according to claim 1, wherein, in the state where the developing cartridge (7) is attached to the drum cartridge (6), the pressure-receiving wall (220A, 220B) is positioned on a virtual straight line (L) when viewed in the first direction, the virtual straight line (L) passing through both the drum axis (61X) and the developing-roller axis (71X).

**9.** The process cartridge (5) according to claim 2 or 3, further comprising:

a supply roller bearing (242A, 242B) in which the supply roller shaft (72A) is fitted, wherein the supply roller bearing (242A, 242B) and the third wall (223) are arranged in a direction orthogonal to both the first direction and the second direction.

**10.** The process cartridge (5) according to claim 1, wherein the pressure-receiving wall (220A, 220B)

and the supply roller (72) are arranged in the first direction.

11. The process cartridge (5) according to claim 1, further comprising: 5

a supply roller gear (72G) positioned at the one end portion in the first direction of the supply roller shaft (72A), the supply roller gear (72G) being rotatable about the supply-roller axis (72X) together with the supply roller (72), wherein the pressure-receiving wall (220A) is positioned between the supply roller gear (72G) and the side wall (210A). 10 15

12. The process cartridge (5) according to claim 1, wherein, in the state where the developing cartridge (7) is attached to the drum cartridge (6), the supply roller shaft (72A) is positioned on a virtual straight line (L) when viewed in the first direction, the virtual straight line (L) passing through both the drum axis (61X) and the developing-roller axis (71X). 20 25 30 35 40 45 50 55

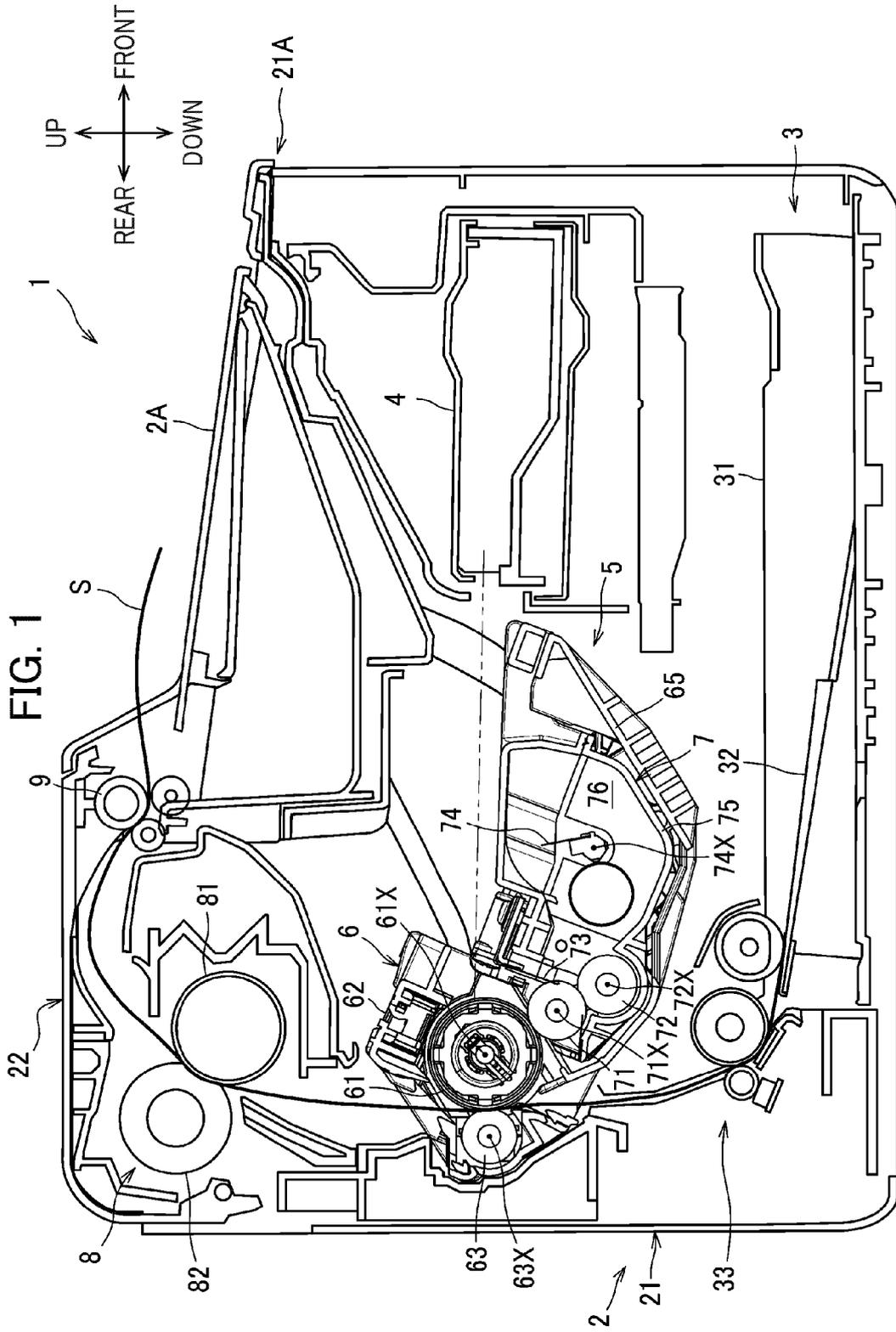




FIG. 3A

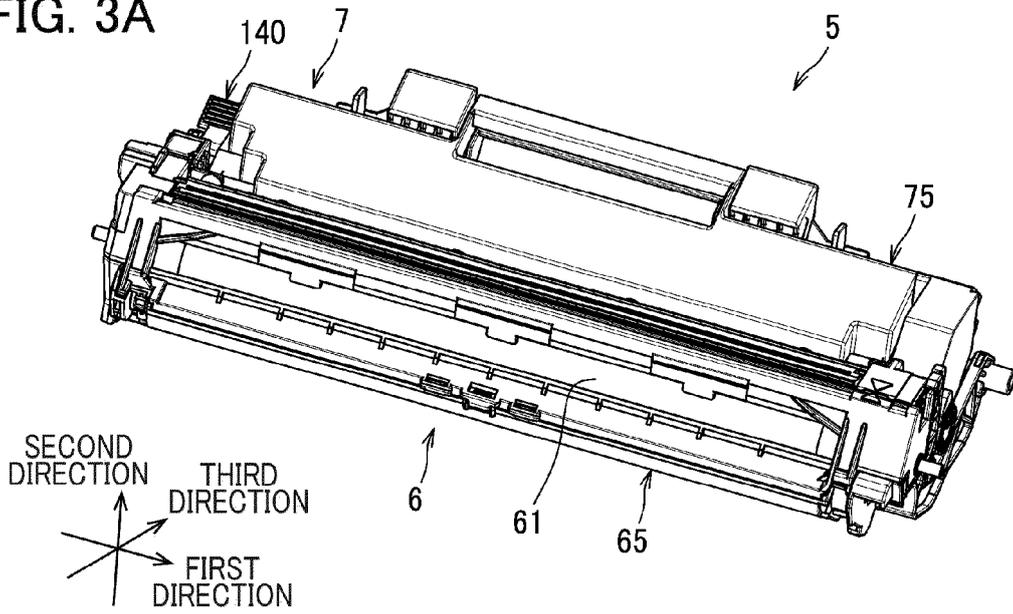
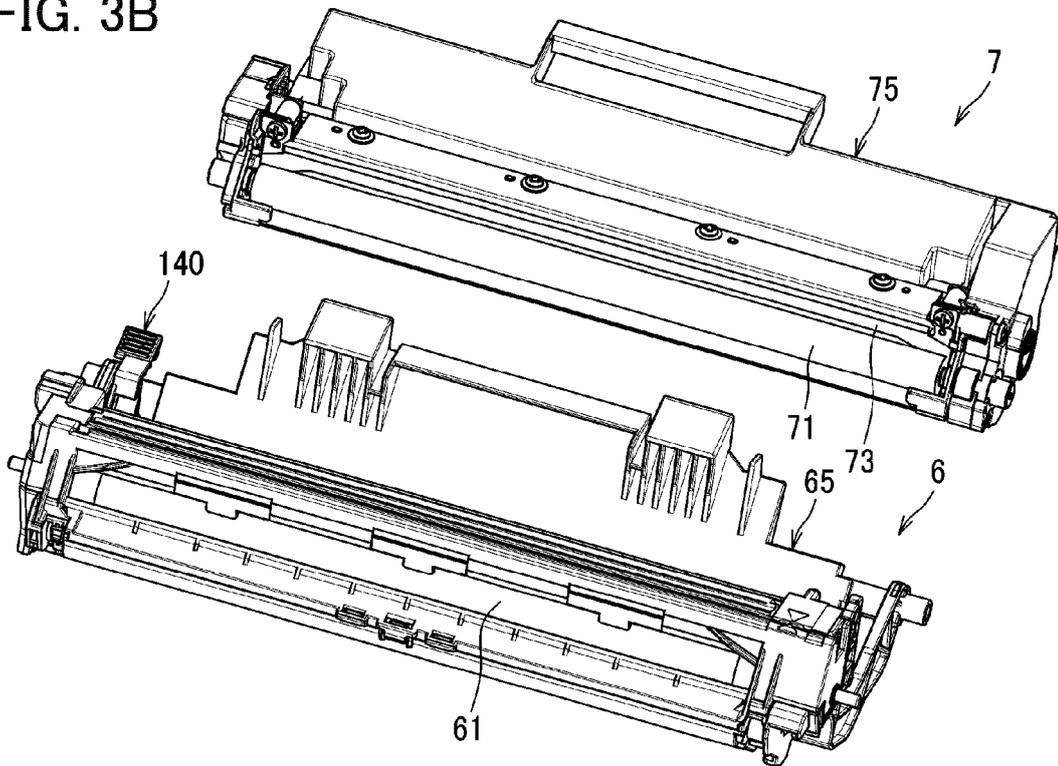


FIG. 3B



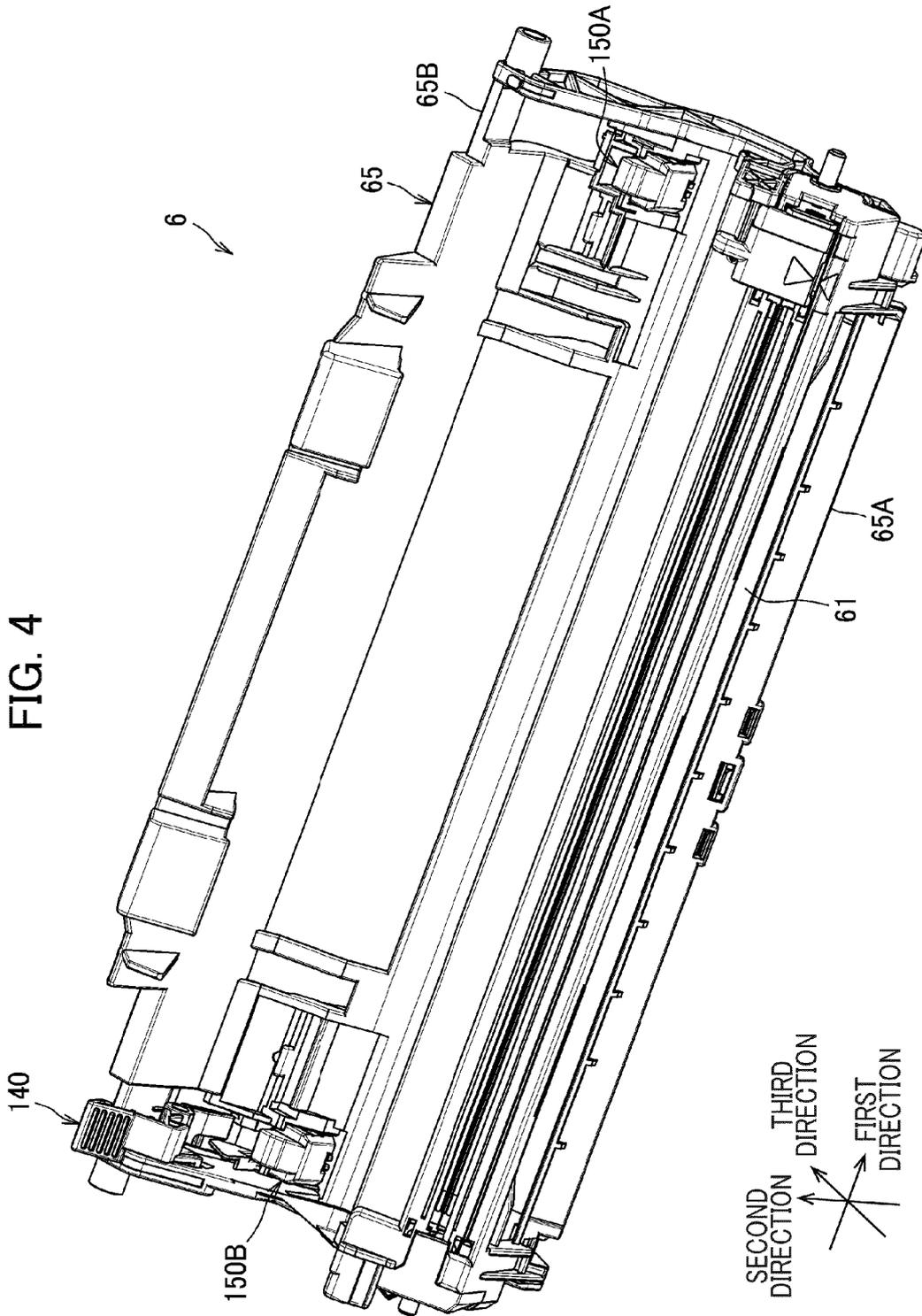


FIG. 5

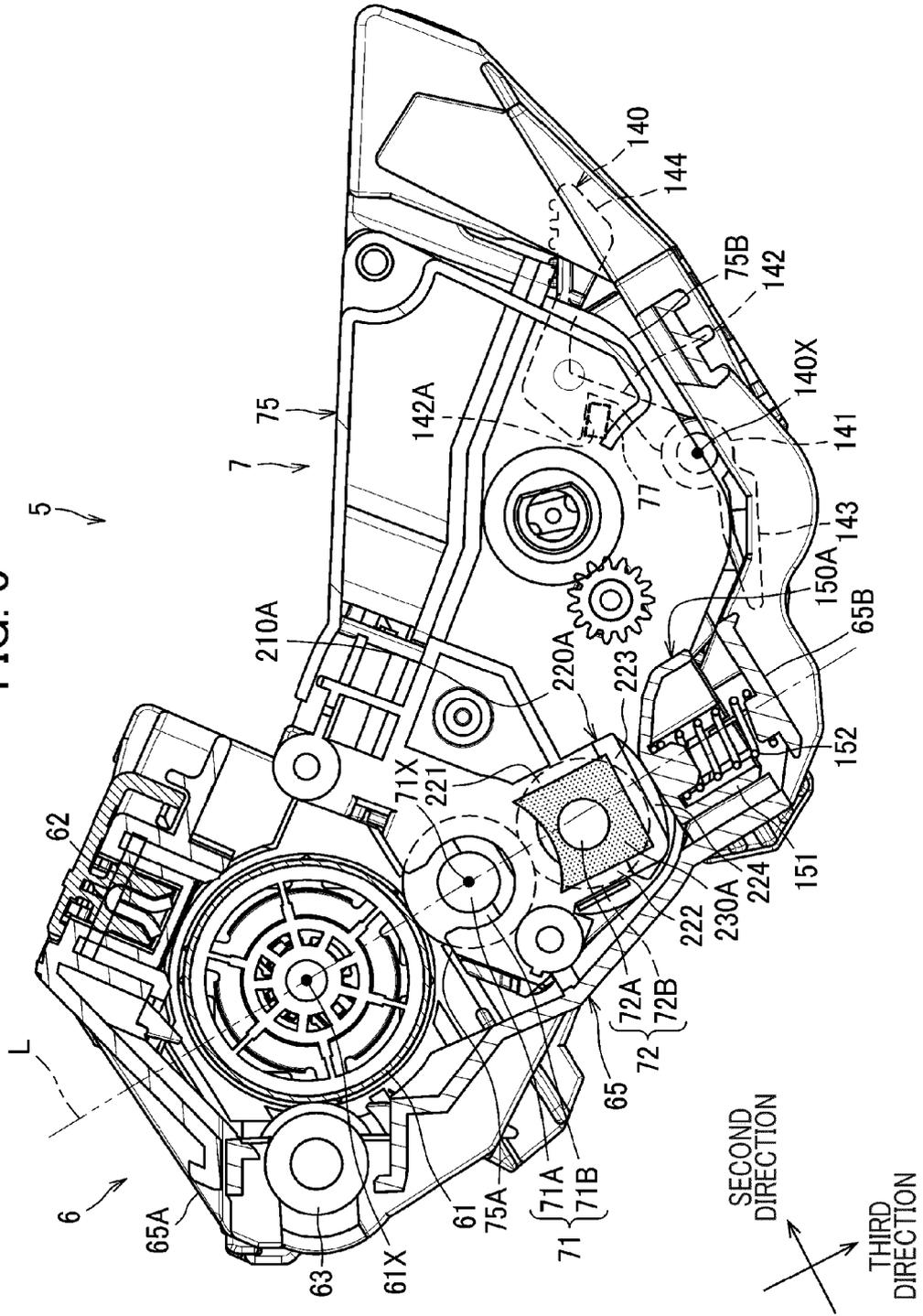


FIG. 6

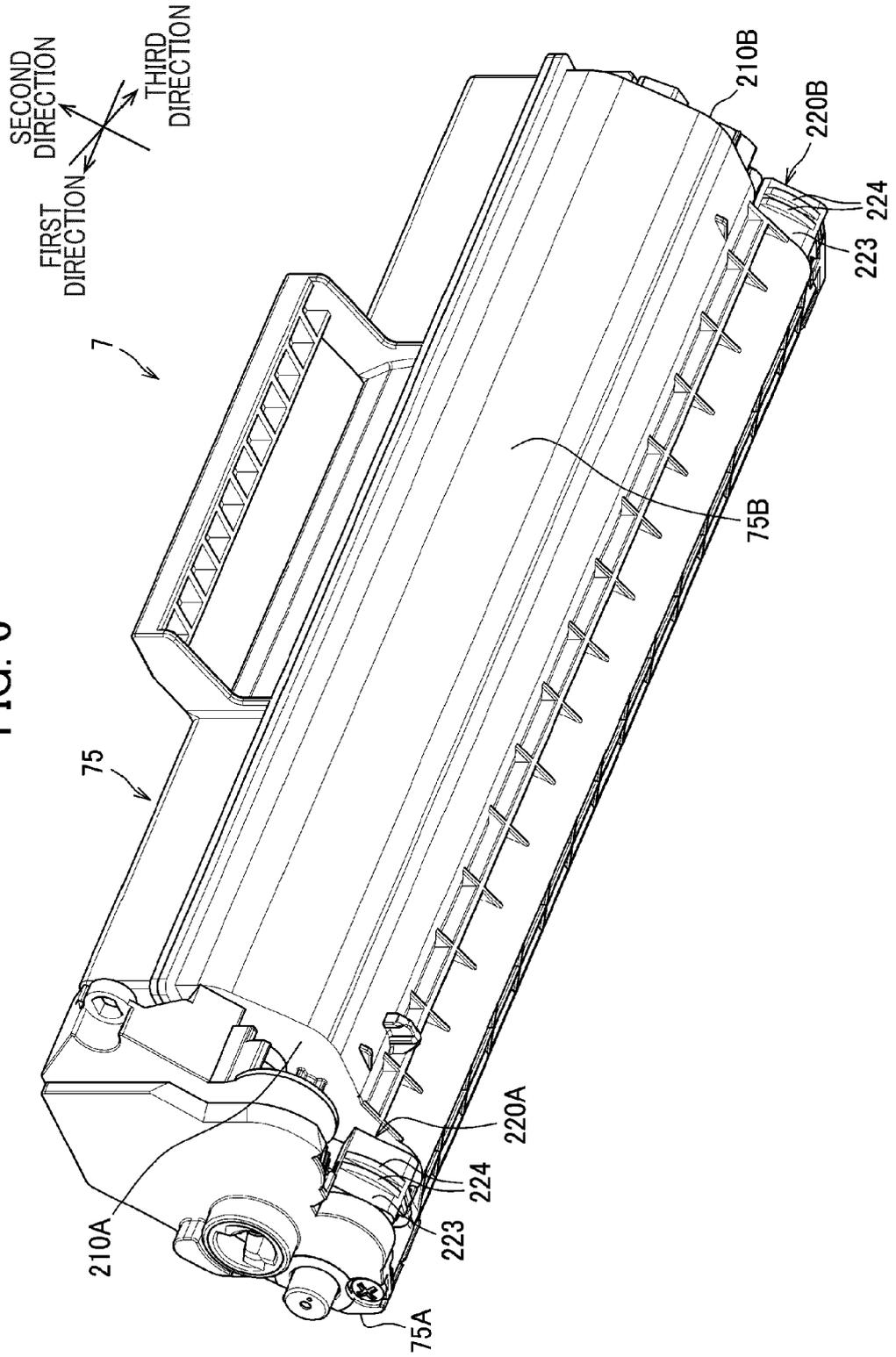


FIG. 7

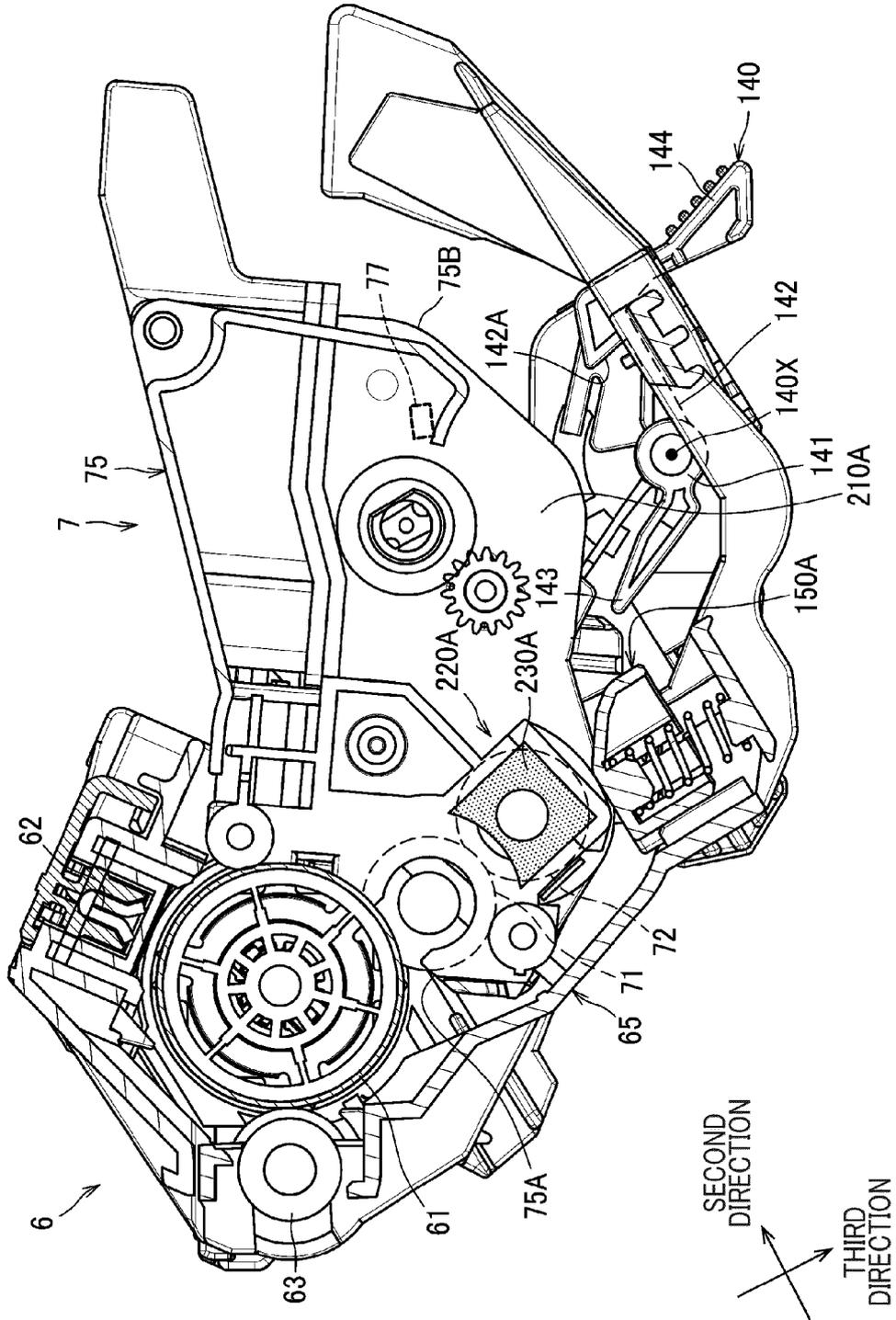


FIG. 8

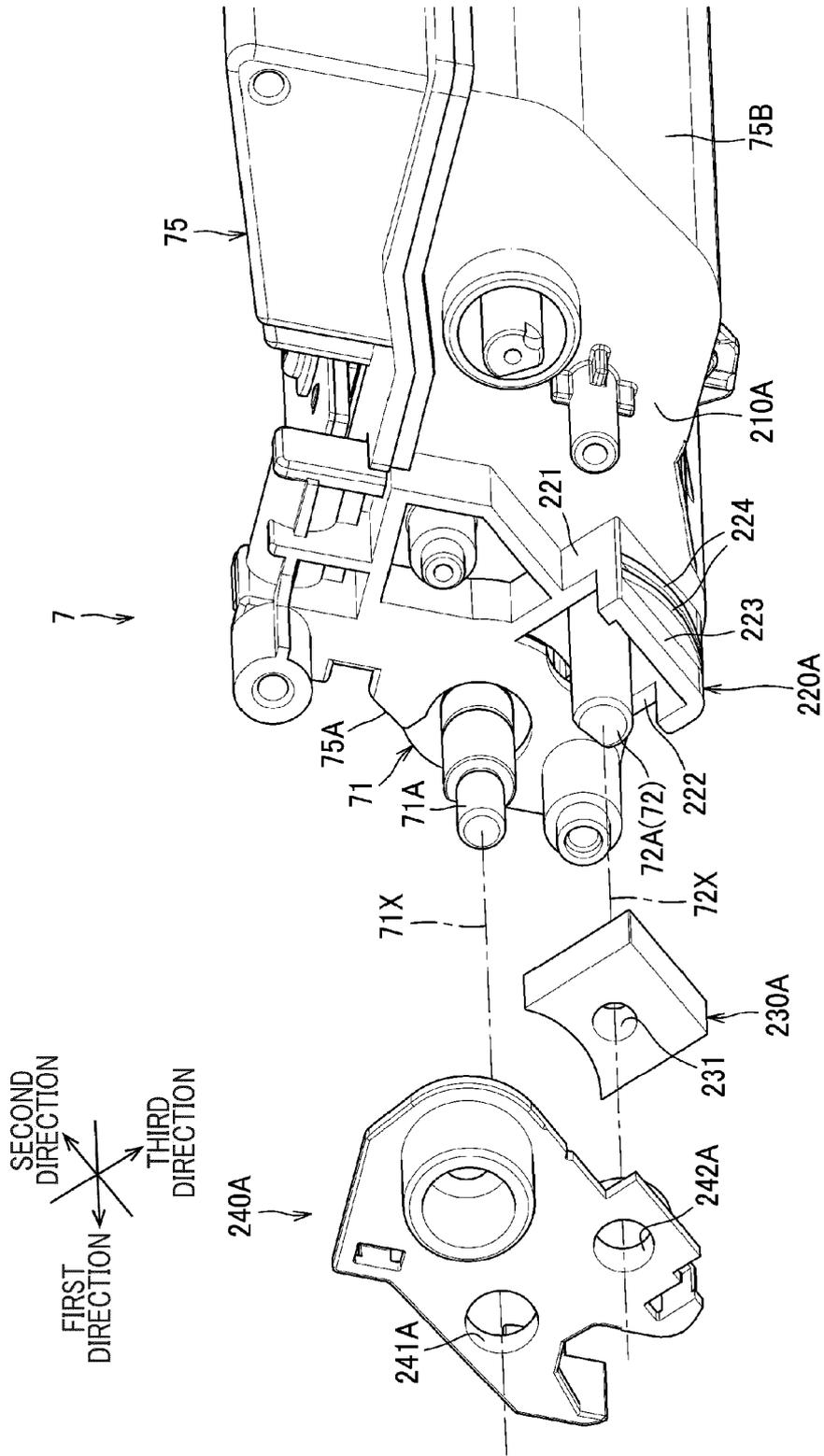
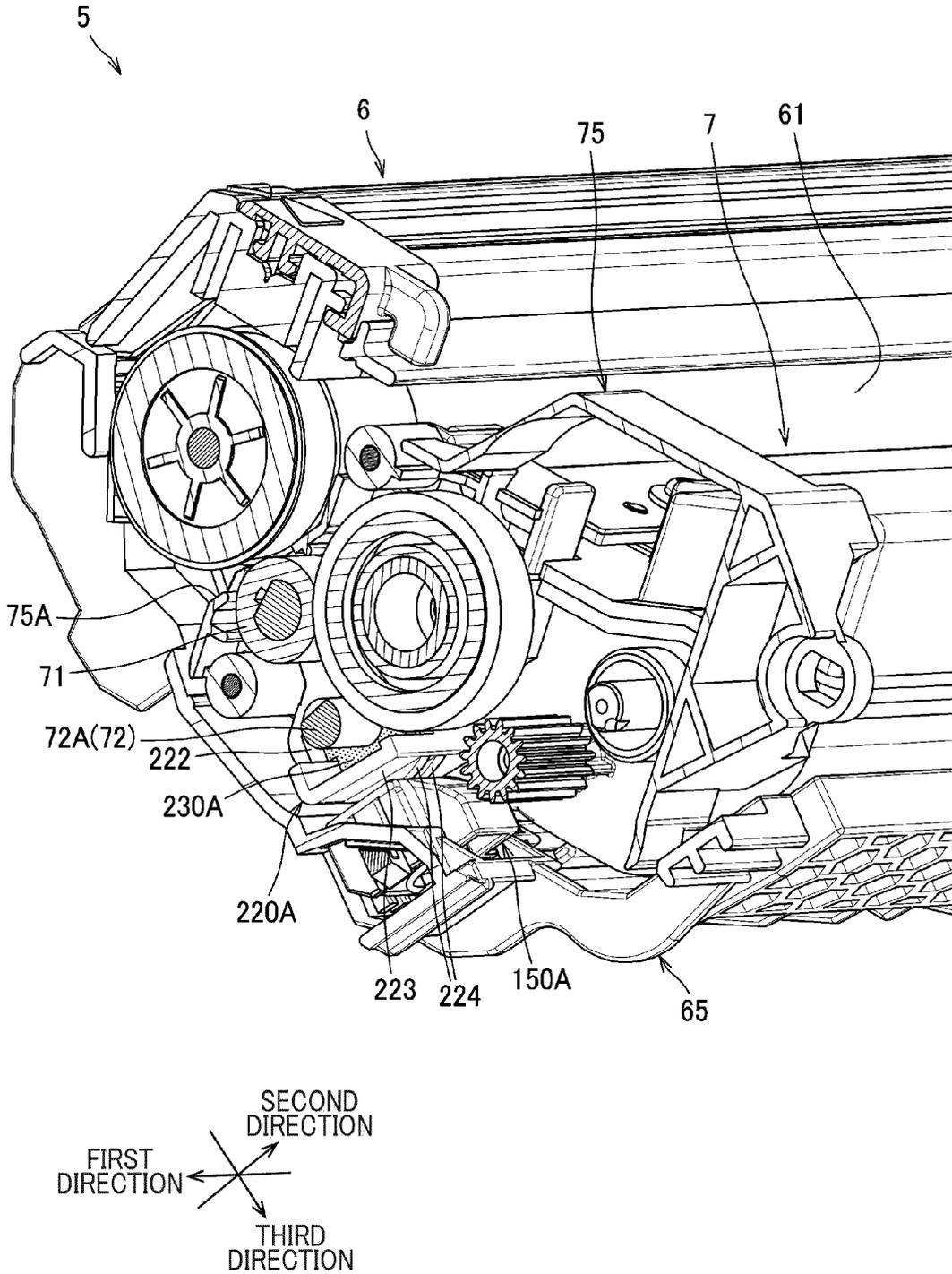
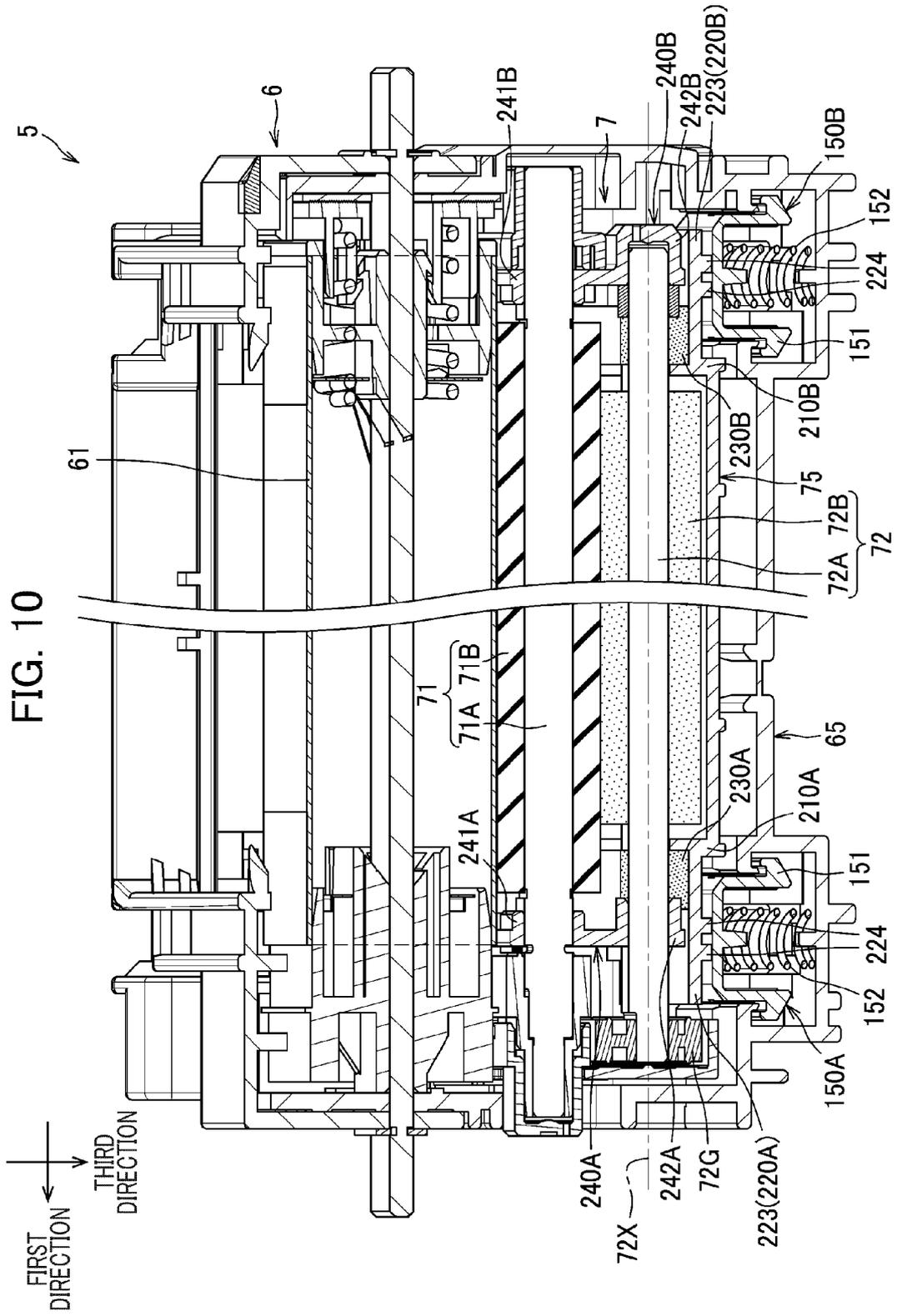


FIG. 9







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Application Number  
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Place of search <b>Munich</b>		Date of completion of the search <b>4 March 2025</b>	Examiner <b>Urbaniec, Tomasz</b>
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
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