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(54) IMAGE FORMING UNIT AND IMAGE FORMING APPARATUS

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Description

Technical Field

[0001] Exemplary aspects of the present disclosure generally relate to an image forming unit and an image forming apparatus, such as a copier, a facsimile machine, a printer, or a multifunction peripheral including a combination thereof.

Related Art

[0002] In image forming apparatuses such as copiers and printers, known is one in which a charging device, a developing device, a cleaning device, and the like are detachably mounted on a support frame for supporting an image bearer in order to facilitate replacement work or maintenance at a time of a breakdown or at an end of a service lifetime.

[0003] For example, JP-2011-197076-A discloses a configuration in which a cleaning module to clean a surface of a photoconductor can be attached to and detached from a unit frame supporting the photoconductor. The cleaning module includes, for example, a cleaning blade to remove toner remaining on the surface of the photoconductor and a leveling blade to level lubricant applied to the surface of the photoconductor, and such components are configured to be detachable as a single unit.

[0004] When such a detachable unit including the cleaning blade and the leveling blade is removed, deposits such as residual toner and a surplus lubricant blocked by a contact member such as the cleaning blade or the leveling blade that is in contact with the photoconductor are present on the photoconductor. Not a little deposit remains on the surface of the photoconductor when the detachable unit is removed, and thus when a new detachable unit is mounted, the deposit may be sandwiched between the contact member (such as the cleaning blade or the leveling blade) and the photoconductor.

[0005] When a deposit is sandwiched between the contact member and the photoconductor, the contact member is not in normal contact with the photoconductor, thus causing a problem that required original functions are not sufficiently achieved.

[0006] An object of this disclosure is to provide an image forming unit and an image forming apparatus that can prevent the photoconductor and the contact member from sandwiching the deposit and does not cause an image failure due to sandwiching of the deposit.

[0007] JP H0695502 A discloses an image forming apparatus including a detachable cleaner toner magazine including a cleaner blade which contacts a photoreceptor. The photoreceptor is rotated in an opposite direction to that of a normal image forming operation when the cleaner toner magazine is attached.

SUMMARY

[0008] The invention is described in the independent claims.

[0009] Accordingly, the image forming unit and the image forming apparatus can prevent the photoconductor and the contact member from sandwiching the deposit and does not cause an image failure due to sandwiching of the deposit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A more complete appreciation of the disclosure and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a schematic view of an image forming apparatus according to an embodiment of the present disclosure;

FIG. 2 is a schematic view of an image forming unit according to an embodiment of the present disclosure;

FIG. 3 is a schematic view of an image forming unit for illustrating a problem of replacing a cleaning unit;

FIG. 4 is a schematic view of the image forming unit for illustrating the problem of replacing the cleaning unit;

FIG. 5 is a schematic view of the image forming unit for illustrating the problem of replacing the cleaning unit;

FIG. 6 is a schematic perspective view of the image forming unit for illustrating the problem of replacing the cleaning unit;

FIG. 7 is a schematic perspective view of the image forming unit for illustrating the problem of replacing the cleaning unit;

FIG. 8 is a schematic view of a position change mechanism according to a first embodiment of the present disclosure;

FIG. 9 is a schematic view for illustrating an operation of the position change mechanism according to the first embodiment;

FIG. 10 is a schematic view for illustrating the operation of the position change mechanism according to the first embodiment;

FIG. 11 is a schematic view for illustrating the operation of the position change mechanism according to the first embodiment;

FIG. 12 is a schematic view for illustrating the operation of the position change mechanism according to the first embodiment;

FIG. 13 is a schematic view for illustrating the operation of the position change mechanism according to the first embodiment;

FIG. 14 is a schematic view for illustrating a prefer-

able an amount of reverse rotation of a photoconductor;

FIG. 15 is a schematic view of a position change mechanism according to a second embodiment of the present disclosure;

FIG. 16 is a schematic view for illustrating an operation of the position change mechanism according to the second embodiment;

FIG. 17 is a schematic view for illustrating the operation of the position change mechanism according to the second embodiment;

FIG. 18 is a schematic view for illustrating the operation of the position change mechanism according to the second embodiment;

FIG. 19 is a schematic view for illustrating the operation of the position change mechanism according to the second embodiment;

FIG. 20 is a schematic view for illustrating the operation of the position change mechanism according to the second embodiment;

FIG. 21 is a schematic perspective view of a position change mechanism according to a third embodiment of the present disclosure;

FIG. 22 is a schematic view for illustrating an operation of the position change mechanism according to the third embodiment;

FIG. 23 is a schematic view for illustrating the operation of the position change mechanism according to the third embodiment;

FIG. 24 is a schematic view for illustrating the operation of the position change mechanism according to the third embodiment;

FIG. 25 is a schematic view for illustrating the operation of the position change mechanism according to the third embodiment;

FIG. 26 is a schematic perspective view of a position change mechanism according to a fourth embodiment of the present disclosure;

FIG. 27 is a schematic view for illustrating an operation of the position change mechanism according to the fourth embodiment;

FIG. 28 is a schematic view for illustrating the operation of the position change mechanism according to the fourth embodiment;

FIG. 29 is a schematic view for illustrating a configuration and an operation of a position change mechanism according to a fifth embodiment of the present disclosure; and

FIG. 30 is a schematic view for illustrating the configuration and the operation of the position change mechanism according to the fifth embodiment.

[0011] The accompanying drawings are intended to depict embodiments of the present disclosure and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted. In addition, identical or similar reference numerals designate identical or similar

components throughout the several views.

DETAILED DESCRIPTION

[0012] In describing embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this patent specification is not intended to be limited to the specific terminology so selected, and it is to be understood that each specific element includes all technical equivalents that have the same function, operate in a similar manner, and achieve a similar result.

[0013] Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views thereof, and particularly to FIG. 1, an image forming apparatus according to embodiments of the present disclosure is described. As used herein, the singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0014] It is to be noted that the suffixes Y, M, C, and K attached to each reference numeral indicate only that components indicated thereby are used for forming yellow, magenta, cyan, and black images, respectively, and hereinafter may be omitted when color discrimination is not necessary.

[0015] With reference to FIG. 1, a description is given below of a configuration and an operation of an image forming apparatus 100 according to an embodiment of the present disclosure. In the description below, elements or components identical or similar in function or shape are given an identical reference character as far as possible to distinguish, and redundant descriptions are omitted.

[0016] FIG. 1 is a schematic view of an image forming apparatus according to an embodiment of the present disclosure.

[0017] The image forming apparatus 100 illustrated in FIG. 1 includes four image forming units 1Y, 1C, 1M, and 1K detachably attached to an apparatus body 150 thereof. The image forming units 1Y, 1M, 1C, and 1K are identical in configuration, except that the image forming units 1Y, 1M, 1C, and 1K accommodate developers of different colors. Specifically, the image forming units 1Y, 1M, 1C, and 1K accommodate developers of yellow (Y), magenta (M), cyan (C), and black (K), respectively, which are used to form a color toner image. More specifically, each of the image forming units 1Y, 1M, 1C, and 1K includes a drum-shaped photoconductor 2 serving as an image bearer, a charger 3 to charge a surface of the photoconductor 2, a developing device 4 to supply toner (developer) to the surface of the photoconductor 2 to form a toner image, a cleaning device 5 to clean the surface of the photoconductor 2, and a lubricant applicator 6 to supply lubricant to the surface of the photoconductor 2.

[0018] The image forming apparatus 100 further includes an exposure device 7 to expose the surface of each photoconductor 2 to form an electrostatic latent im-

age, a sheet feeder 8 to supply a recording sheet serving as a recording medium, a transfer device 9 to transfer the toner image onto the recording sheet, and a fixing device 10 to fix the transferred toner image onto the recording sheet.

[0019] The sheet feeder 8 includes a sheet feeding tray 11 to contain the recording sheets and a sheet feeding roller 12 to transport the recording sheet.

[0020] The transfer device 9 includes an intermediate transfer belt 13 as an intermediate transferor, four primary transfer rollers 14 as primary transferors to transfer the toner image on each photoconductor 2 to the intermediate transfer belt 13, and a secondary transfer roller 15 as a secondary transferor to transfer the toner image on the intermediate transfer belt 13 to the recording sheet. The intermediate transfer belt 13 is an endless belt and stretched around a plurality of rollers. The four primary transfer rollers 14 are disposed in contact with the respective photoconductors 2 via the intermediate transfer belt 13. Accordingly, the intermediate transfer belt 13 contacts the photoconductors 2 to form primary transfer nips. The secondary transfer roller 15 contacts, via the intermediate transfer belt 13, one of the plurality of rollers around which the intermediate transfer belt 13 is stretched. Thus, the secondary transfer nip is formed between the secondary transfer roller 15 and the intermediate transfer belt 13.

[0021] The fixing device 10 includes a fixing roller 16 as a fixing member which is heated by a heater such as a halogen heater to fix the toner image on the recording sheet and a pressure roller 17 as a pressure member pressed against the fixing roller 16. The fixing roller 16 and the pressure roller 17 are in contact with each other, forming a fixing nip therebetween.

[0022] Inside the image forming apparatus 100, a conveyance path 20 is formed through which the recording sheet fed from the sheet feeding tray 11 is transported. A timing roller pair 18 is disposed in the middle of the conveyance path 20 from the sheet feeding roller 12 to the secondary transfer nip (secondary transfer roller 15).

[0023] With continued reference to FIG. 1, a description is now given of an image forming operation of the image forming apparatus 100.

[0024] When a print job starts, the photoconductor 2 rotates counterclockwise in FIG. 1, and the charger 3 uniformly charges the surface of the photoconductor 2 to a high potential. Subsequently, according to either image data of a document scanned by a scanner or print data instructed from a terminal, the exposure device 7 exposes the surface of the photoconductor 2. Thus, the potential of the exposed portion decreases, and an electrostatic latent image is formed. The developing device 4 supplies toner to the electrostatic latent image, thereby developing the electrostatic latent image into the toner image on the photoconductor 2.

[0025] In the transfer device 9, the intermediate transfer belt 13 rotates, and a constant voltage or constant current control voltage having a polarity opposite a po-

larity of toner is applied to each of the primary transfer rollers 14. Accordingly, a transfer electric field is generated at each of the primary transfer nips between the primary transfer rollers 14 and the respective photoconductors 2. The transfer electrical fields generated in the primary transfer nips transfer and superimpose the toner images from the respective photoconductors 2 one on another onto the intermediate transfer belt 13. Thus, a multicolor (full-color) toner image is formed on the intermediate transfer belt 13. After the toner image is transferred to the intermediate transfer belt 13, the surface of the photoconductor 2 is cleaned by the cleaning device 5 and lubricated by the lubricant applicator 6.

[0026] Further, in the sheet feeder 8, the sheet feeding roller 12 starts rotating and the recording sheet is fed out from the sheet feeding tray 11. Then, the timing roller pair 18 stops the recording sheet and forwards the recording sheet to the secondary transfer nip, timed to coincide with the toner image on the intermediate transfer belt 13. The secondary transfer roller 15 is supplied with a transfer voltage having a polarity opposite a polarity of the charged toner contained in the toner image, thereby generating a transfer electric field at the secondary transfer nip. The transfer electrical field generated in the secondary transfer nip transfers the toner image from the intermediate transfer belt 13 onto the recording sheet at a time.

[0027] Then, the recording sheet is transported to the fixing device 10. The recording sheet carrying the toner image passes through the fixing nip between the fixing roller 16 and the pressure roller 17, which apply heat and pressure to the toner image to fix the toner image on the recording sheet. Subsequently, the recording sheet is discharged outside the image forming apparatus 100, and a series of image forming operations are completed.

[0028] It is to be noted that, although the description above concerns multicolor image formation, alternatively, the image forming apparatus 100 can form single-color images, bicolor images, or three-color images using one, two, or three of the four image forming units 1Y, 1C, 1M, and 1K.

[0029] FIG. 2 is a schematic view of the image forming unit 1 according to the present embodiment.

[0030] Since the four image forming units 1Y, 1M, 1C, and 1K have the same configuration except that toner of different color is contained, one image forming unit 1 illustrated in FIG. 2 is taken as an example, and the configuration of the image forming units 1Y, 1M, 1C, and 1K is described below.

[0031] As illustrated in FIG. 2, the charger 3 includes a charging roller 30 as a charging member to charge the surface of the photoconductor 2. The charging roller 30 is in contact with the surface of the photoconductor 2 and is supplied with a predetermined voltage from a power source of the image forming apparatus 100 to uniformly charge the surface of the photoconductor 2.

[0032] The developing device 4 includes a developing roller 40 as a developer bearer to supply toner to the

photoconductor 2. The developing roller 40 carries toner contained in the developing device 4 on a surface thereof and rotates to convey the toner to a contact portion with the photoconductor 2 to supply toner onto the photoconductor 2.

[0033] The cleaning device 5 includes a cleaning blade 50 as a cleaning member to remove toner remaining on the surface of the photoconductor 2. The cleaning blade 50 is a longitudinal member made of a rubber material such as urethane rubber and one of long sides thereof is in contact with the surface of the photoconductor 2 with a predetermined pressure. Further, the cleaning blade 50 is disposed in a counter direction with respect to rotation of the photoconductor 2 so that an end portion of the cleaning blade 50 contacting the photoconductor 2 faces in a direction opposite to a direction of rotation of the photoconductor 2 indicated by arrow J in FIG. 2 (normal rotation direction). As the photoconductor 2 rotates at a time of image formation, substances such as residual toner adhering to the surface of the photoconductor 2 are mechanically scraped off and removed by the cleaning blade 50. It is to be noted that the substances adhering to the photoconductor 2 include paper dust resulting from the recording sheet, discharge products generated on the photoconductor 2 by discharge of the charging roller 30, additives to toner, and the like in addition to the residual toner.

[0034] The lubricant applicator 6 includes a solid lubricant 60, a brush-like lubricant supply roller 61 as a lubricant supplier to supply the lubricant to the surface of the photoconductor 2, and a leveling blade 62 as a lubricant leveling member to thin the lubricant supplied to the surface of the photoconductor 2.

[0035] The solid lubricant 60 includes fatty acid metal salt, fluorine resin, or the like. In particular, fatty acid metal salt is preferable from the viewpoint of greatly reducing friction of the photoconductor 2. Examples of the fatty acid metal salt include fatty acid metal salt of straight chain hydrocarbon such as myristic acid, palmitic acid, stearic acid, and allylic acid. Examples of the metal include lithium, magnesium, calcium, strontium, zinc, cadmium, Aluminum, cerium, tylan, magnesium stearate, aluminum stearate, iron stearate and the like are preferable, and zinc stearate is particularly preferable.

[0036] The lubricant supply roller 61 contacts the surface of the photoconductor 2. As the photoconductor 2 rotates counterclockwise in FIG. 2, the lubricant supply roller 61 rotates in a direction (clockwise in FIG. 2) trailing to rotation of the photoconductor 2 to scrape off the solid lubricant 60 and supply the lubricant to the surface of the photoconductor 2.

[0037] The leveling blade 62 is a longitudinal member made of a rubber material such as urethane rubber and one of long sides thereof is in contact with the surface of the photoconductor 2 with a predetermined pressure. Further, the leveling blade 62 is disposed in the counter direction with respect to rotation of the photoconductor 2 (so that an end portion of the leveling blade 62 contact-

ing the photoconductor 2 faces in a direction opposite to the direction of rotation of the photoconductor 2). As the photoconductor 2 rotates, the lubricant supplied onto the photoconductor 2 by the lubricant supply roller 61 passes through the leveling blade 62, and then, the lubricant is thinned and applied to the photoconductor 2.

[0038] As illustrated in FIG. 2, in the present embodiment, the lubricant applicator 6 is disposed downstream of the cleaning device 5 in the direction of rotation of the photoconductor 2 starting from the primary transfer nip N1. Therefore, after the cleaning blade 50 cleans the surface of the photoconductor 2, the lubricant is supplied to the surface of the photoconductor 2 by the lubricant supply roller 61. As a result, the lubricant is stably and uniformly supplied without being affected by deposits on the photoconductor 2.

[0039] Further, each component constituting the cleaning device 5 and each component constituting the lubricant applicator 6 are held in a common unit casing 201. The common unit casing 201 is attachable to and detachable from a support frame 22 that supports the photoconductor 2, the charger 3, and the developing device 4. In other words, the cleaning unit 200 serving as a detachable unit includes the cleaning device 5 and the lubricant applicator 6 and is attachable to and detachable from the support frame 22 as a single unit. The support frame 22 includes guide portions 24 and 25 having trench shape as illustrated in FIG. 2. The cleaning unit 200 is replaceable by attaching to and detaching from the support frame 22 along the guide portions 24 and 25.

[0040] Next, a problem of replacing the cleaning unit 200 is described below.

[0041] As illustrated in FIG. 3, since residual toner, the lubricant, etc. are blocked by the cleaning blade 50 and the leveling blade 62, when the image forming unit 1 has been used to some extent, a deposit A that is blocked by each contact member such as the cleaning blade 50 or the leveling blade 62 is present on the surface of the photoconductor 2. As illustrated in FIG. 4, the not a little deposit A remains on the surface of the photoconductor 2 even when a cleaning unit 200A is removed. For this reason, when a new cleaning unit 200B is installed as illustrated in FIG. 5, there is a case where the deposit A is sandwiched between the photoconductor 2 and the cleaning blade 50 or the leveling blade 62.

[0042] When the deposit A is sandwiched between the blades (cleaning blade 50 and leveling blade 62) and the photoconductor 2, gaps S are generated between the blades (cleaning blade 50 and leveling blade 62) and the photoconductor 2 at both sides of the deposit A is sandwiched, as illustrated in FIG. 6. Then, when the image forming operation is started in this state, an adhering substance B such as residual toner, the lubricant, or an additive contained in these substances slips through the gaps S between each of the blades (cleaning blade 50 and leveling blade 62) and the photoconductor 2. As a result, as illustrated in FIG. 7, there is a possibility that the adhering substance B that has slipped through the

gaps adheres to the surface of the charging roller 30, causing charging failure, and may generate an image failure.

[0043] As a countermeasure against the problem, for example, when the cleaning unit 200 is removed, a method of wiping the deposit A on the photoconductor 2 with a waste cloth or the like may be considered. However, in this method, it is considered that a surface friction coefficient of the photoconductor 2 may be increased by the wiping operation. In this case, a rotational load of the photoconductor 2 increases, and the cleaning blade 50 and the leveling blade 62 may get curled.

[0044] Another method is considered, in which an operator or user rotates the photoconductor 2 in a reverse direction opposite to the direction of rotation of the photoconductor 2 at the time of image formation in order to move the photoconductor 2 to a position where the deposit is not sandwiched, before the new cleaning unit 200B is mounted. However, in this method, if the operator or the user erroneously rotates the photoconductor 2 in the direction of rotation of the photoconductor 2 at the time of image formation, there is a possibility that the deposit A adheres to the charging roller 30 or the developing roller 40. In addition, there is a risk of forgetting to perform the rotating operation. Furthermore, even if the photoconductor 2 is rotated without any mistake in the direction of rotation, it is difficult to precisely adjust an amount of rotation, and therefore, it is still uncertain whether sandwiching of the deposit can be prevented surely.

[0045] Therefore, the image forming apparatus 100 according to an embodiment of the present disclosure is provided with a position change mechanism 70 so as to change a position in a rotation direction of the photoconductor 2 by rotating the photoconductor 2 in the reverse direction opposite to the direction of rotation of the photoconductor 2 in image formation in order to reliably prevent the sandwiching of the deposit A.

[0046] FIG. 8 is a schematic view of the position change mechanism 70 according to a first embodiment of the present disclosure.

[0047] As illustrated in FIG. 8, the position change mechanism 70 according to the first embodiment includes a moving member 71, an engaging portion 72 provided on the moving member 71, and a coil spring 73 serving as a pressing member to press the moving member 71 in one direction.

[0048] The moving member 71 reciprocates relative to the support frame 22 in straight directions indicated by arrows C1 and C2 in FIG. 8. One end of the moving member 71 is provided with a receiver 71a to contact and receive one end of the coil spring 73, and the engaging portion 72 is provided at the other end of the moving member 71.

[0049] The coil spring 73 is held in a compressed state between the receiver 71a provided on the moving member 71 and a receiver 22a provided on the support frame 22. The moving member 71 is pressed in the direction

indicated by arrow C1 in FIG. 8.

[0050] The engaging portion 72 has a plurality of protrusions 72a to engage with a photoconductor gear 23 (image bearer gear) attached to the photoconductor 2 to rotate the photoconductor gear 23. The engaging portion 72 is rotatable with respect to the moving member 71 in a direction indicated by arrows D1 and D2 in FIG. 8. Thus, the engaging portion 72 is switchable between an erected state illustrated by a solid line and a tilted state illustrated by a chain double-dashed line in FIG. 8. A torsion coil spring 75 serving as an urging member to urge the engaging portion 72 in a direction to set the engaging portion 72 to the erected state (direction indicated by arrow D1 in FIG. 8) is disposed at a fulcrum 74 serving as a rotation center of the engaging portion 72. Further, the engaging portion 72 is provided with a stopper 72b to hold the engaging portion 72 in the erected state against the urging force of the torsion coil spring 75. Accordingly, the engaging portion 72 is normally held in the erected state.

[0051] Next, an operation of the position change mechanism 70 according to the first embodiment is described.

[0052] As illustrated in FIG. 9, when the cleaning unit 200A is attached to the support frame 22, the moving member 71 is pushed to the lower left in FIG. 9 by the cleaning unit 200A. More particularly, a pushing portion 201a provided in the common unit casing 201 of the cleaning unit 200A presses the receiver 71a of the moving member 71 against a pressing force of the coil spring 73, so that the moving member 71 is disposed at the pushed-in position where the moving member 71 has been pushed to the lower left (first position). In this state, the engaging portion 72 is held in the erected state, but the engaging portion 72 is disposed at a position where the engaging portion 72 is not engaged with (or is not in contact with) the photoconductor gear 23. Thus, as the engaging portion 72 is disposed at a position where the engaging portion 72 is not engaged with the photoconductor gear 23, even when the photoconductor gear 23 rotates together with the photoconductor 2 at the time of image formation, neither the engaging portion 72 nor the photoconductor gear 23 is damaged.

[0053] As illustrated in FIG. 10, when the cleaning unit 200A is moved in a direction for removing the cleaning unit 200A from the position in the state illustrated in FIG. 9 (direction indicated by an outlined arrow in FIG. 10), since the pushing portion 201a moves in the direction opposite to the direction in which the pushing portion 201a pushes the moving member 71, the moving member 71 is pressed by the coil spring 73 and is moved to the upper right (direction indicated by arrow C1 in FIG. 10). At that time, the engaging portion 72 comes into contact with the photoconductor gear 23, so as to be turned in the counterclockwise direction (direction indicated by arrow D2 in FIG. 10) to be switched to the tilted state. As a result, the engaging portion 72 becomes unengaged with the photoconductor gear 23. Thus, even when the moving member 71 moves to the upper right, the engaging portion 72 does not engage with the pho-

toconductor gear 23, so that the photoconductor gear 23 does not rotate.

[0054] Thus, the purpose of keeping disengagement of the engaging portion 72 from the photoconductor gear 23 is to prevent the photoconductor 2 from rotating in the direction of rotation of the photoconductor 2 at the time of image formation. That is, if the engaging portion 72 is engaged with the photoconductor gear 23 without being tilted, the photoconductor 2 is rotated in the direction of rotation of the photoconductor 2 at the time of image formation (counterclockwise rotation in FIG. 10) in association with the movement of the moving member 71, and therefore, the deposit A on the photoconductor may adhere to the charging roller 30. Further, when the deposit A moves toward the charging roller 30, even if the photoconductor 2 is reversely rotated afterward, the deposit A only returns to an original position thereof and is not moved to a position where the deposit A is not sandwiched by the cleaning blade 50 or the leveling blade 62. Thus, when the cleaning unit 201A is removed, the photoconductor 2 is not rotated, so as to prevent the deposit A from adhering to the charging roller 30 and to obtain an effect of reverse rotation of the photoconductor 2 to be performed later.

[0055] As illustrated in FIG. 11, when the cleaning unit 200A is removed, the pushing (contact) of the pushing portion 201a to the moving member 71 is cancelled and the moving member 71 is placed in a position (second position) opposite to the above-mentioned pushed-in position (first position). In this state, the engaging portion 72 is turned by the torsion coil spring 75 in the clockwise direction (direction indicated by arrow D1 in FIG. 11), and is returned to the erected state.

[0056] Next, as illustrated in FIG. 12, when a new cleaning unit 200B is attached, the receiver 71a of the moving member 71 is pressed by the pushing portion 201a of the cleaning unit 200B, so that the moving member 71 moves to the lower left (direction indicated by arrow C2 in FIG. 12). At that time, the engaging portion 72 in the erected state engages with the photoconductor gear 23 as the moving member 71 moves. As a result, the photoconductor gear 23 is rotated in the clockwise direction in FIG. 12, and the photoconductor 2 rotates in the reverse direction opposite to the direction of rotation of the photoconductor 2 at the time of image formation.

[0057] Then, as illustrated in FIG. 13, when the cleaning unit 200B has been attached, the moving member 71 is disposed at the pushed-in position (first position), and the engagement of the engaging portion 72 with the photoconductor gear 23 is canceled. As a result, the rotation of the photoconductor 2 is stopped.

[0058] As described above, in the present embodiment, the photoconductor 2 is rotated in the reverse direction opposite to the direction of rotation of the photoconductor 2 at the time of image formation when the cleaning unit 200B is attached so that the position of the deposit A on the photoconductor 2 can be shifted (see FIG. 13). With this configuration, it is possible to prevent

sandwiching of the deposit A by the cleaning blade 50 or the leveling blade 62 so that residual toner and surplus lubricant can be prevented from adhering to the charging roller 30 or the developing roller 40 after slipping through the gaps S between the blades (cleaning blade 50 or leveling blade 62) and the photoconductor 2. In addition, since the cleaning blade 50 and the leveling blade 62 can be placed in normal contact with the photoconductor 2 (without sandwiching of the deposit A), the cleaning blade 50 and the leveling blade 62 can fully exhibit original functions thereof.

[0059] In addition, by rotating the photoconductor 2 in the reverse direction by the position change mechanism 70, the amount of rotation of the photoconductor 2 can be adjusted to constant amount as compared with the case where the operator or the user directly rotates the photoconductor 2 in the reverse direction. For this reason, the amount of rotation is stable and sandwiching of the deposit A can be reliably prevented. In addition, according to the configuration of the position change mechanism 70 according to the present embodiment, since the position change mechanism 70 causes the photoconductor 2 to rotate in the reverse direction in conjunction with a mounting operation of the cleaning unit 200B, the operability is excellent without forgetting to perform a reverse rotation operation.

[0060] It is preferable that the amount of rotation when the photoconductor 2 is rotated is set to a small amount of rotation that can prevent the sandwiching securely. More particularly, in FIG. 14, when the amount of rotation at the time of reverse rotation of the photoconductor 2 is assumed to be α , the amount of rotation α is preferably set to be smaller than a rotation angle θ ranging from a contact position E1 of the leveling blade 62 with the photoconductor 2 up to a contact position E2 of the cleaning blade 50 with the photoconductor 2 in the reverse direction of rotation of the photoconductor 2, indicated by arrow K in FIG. 14. When the photoconductor 2 is rotated in the reverse direction, the deposit A can be moved away from the contact position E1 of the leveling blade 62 and at the same time is not allowed to reach the contact position E2 of the cleaning blade 50 by setting in this manner. That is, the deposit A made at the contact position E1 of the leveling blade 62 can be prevented from being sandwiched at the new position by the cleaning blade 50 after the photoconductor 2 is moved by the reverse rotation. In addition, since the amount of rotation of the photoconductor 2 is also small, the number of protrusions 72a of the engaging portion 72 to engage the photoconductor gear 23 can be reduced, which is advantageous for downsizing.

[0061] In addition, as the present embodiment, the cleaning unit 200 can be replaced while leaving the position change mechanism 70 on the support frame 22 by providing the position change mechanism 70 on the support frame 22. In other words, the replacement cost of consumable items can be reduced by not providing a position change mechanism 70 in the cleaning unit 200,

which is an exchange part.

[0062] Another embodiment different from the above-described embodiment is described below.

[0063] FIG. 15 is a schematic view of a position change mechanism 70 according to a second embodiment of the present disclosure.

[0064] As illustrated in FIG. 15, the position change mechanism 70 according to the second embodiment has the moving member 71, the engaging portion 72, and the coil spring 73, as in the first embodiment. However, in the second embodiment, the engaging portion 72 is not rotatable with respect to the moving member 71, but secured in the erected state. Further, in the second embodiment, the photoconductor gear 23 is coupled to the photoconductor 2 via a one-way clutch 26 as a one-way rotary transmission device, and only the rotary driving force in one direction of the photoconductor gear 23 is transmitted to the photoconductor 2. More particularly, in FIG. 15, the one-way clutch 26 is configured to transmit the rotary driving force to the photoconductor 2 only when the photoconductor gear 23 is rotated in the direction indicated by arrow F1 in FIG. 15, and not to transmit the rotary driving force to the photoconductor 2 when the photoconductor gear 23 is rotated in the direction indicated by arrow F2 in FIG. 15. Other configurations are similar to that of the first embodiment.

[0065] Next, an operation of the position change mechanism 70 according to the second embodiment is described.

[0066] As illustrated in FIG. 16, in a state where the cleaning unit 200A is attached to the support frame 22, the moving member 71 is disposed in the pushed-in position where the moving member 71 is pushed by the cleaning unit 200A (first position) similarly to the case of the above-described first embodiment. In this state, the engaging portion 72 is disposed at a position where the engaging portion 72 does not engage with (or is not in contact with) the photoconductor gear 23.

[0067] When the cleaning unit 200A is moved from the position illustrated in FIG. 16 to the direction for removing the cleaning unit 200A as illustrated in FIG. 17 (direction indicated by an outlined arrow in FIG. 17), the moving member 71 is pressed by the coil spring 73 to be moved to the upper right (direction indicated by arrow C1 in FIG. 17). At that time, the engaging portion 72 is engaged with the photoconductor gear 23 so as to rotate the photoconductor gear 23 in the counterclockwise direction in FIG. 17 (direction indicated by arrow F2 in FIG. 17). However, the rotary driving force of the photoconductor gear 23 is not transmitted from the one-way clutch 26 to the photoconductor 2. For this reason, the photoconductor 2 does not rotate when the cleaning unit 200A is removed.

[0068] Thus, in the second embodiment, the rotation of the photoconductor 2 at the time of removal of the cleaning unit 200A is prevented by using the one-way clutch 26 so that the deposit A adhering to the charging roller 30 due to the rotation of the photoconductor 2 can be prevented and the effect of the reverse rotation of the

photoconductor 2 to be performed later can be obtained as in the first embodiment.

[0069] As illustrated in FIG. 18, when the cleaning unit 200A is removed, the pushing onto (contact with) the moving member 71 caused by the pushing portion 201a is released and the moving member 71 is moved to the position (second position) opposite to the above-mentioned pushed-in position (first position). At that time, the engaging portion 72 is disposed at a position where the engaging portion 72 does not engage with (or is not in contact with) the photoconductor gear 23.

[0070] Next, as illustrated in FIG. 19, when the new cleaning unit 200B is attached, the receiver 71a of the moving member 71 is pressed by the pushing portion 201a of the cleaning unit 200B so that the moving member 71 is moved to the lower left in FIG. 19 (direction indicated by arrow C1 in FIG. 19). As the moving member 71 moves, the engaging portion 72 engages with the photoconductor gear 23. Then, as the moving member 71 further moves, the photoconductor gear 23 is rotated in the clockwise in FIG. 19 (direction indicated by arrow F1 in FIG. 19). The rotary driving force of the photoconductor gear 23 at that time is transmitted from the one-way clutch 26 to the photoconductor 2. As a result, the photoconductor 2 rotates in the reverse direction relative to the direction of rotation of the photoconductor 2 at the time of image formation.

[0071] Then, as illustrated in FIG. 20, when the cleaning unit 200B has been attached, the moving member 71 is placed at the pushed-in position (first position), and the engagement of the engaging portion 72 with the photoconductor gear 23 is canceled. As a result, the rotation of the photoconductor 2 is stopped.

[0072] As described above, similarly to the first embodiment even in the second embodiment, when the cleaning unit is attached, the photoconductor is rotated in the reverse direction relative to the direction of rotation of the photoconductor 2 at the time of image formation so that the position of the deposit A on the photoconductor 2 can be shifted. With this configuration, it is possible to prevent sandwiching of the deposit A by the cleaning blade 50 or leveling blade 62. In addition, since the position change mechanism 70 causes the photoconductor 2 to rotate in the reverse direction in conjunction with the mounting operation of the cleaning unit 200B, the operability is excellent without forgetting to perform the reverse rotation operation. In addition, since the amount of rotation when the photoconductor is rotated can be adjusted to a constant amount, sandwiching the deposit A can be reliably prevented. Also in the present embodiment, it is desirable that the amount of rotation in the reverse rotation operation of the photoconductor 2 is set to the same amount of rotation as described referring to FIG. 14.

[0073] In the present embodiment, although a one-way clutch is used as a countermeasure to prevent the rotation of the photoconductor during removal of the cleaning unit 200A, an electromagnetic clutch can also be used

instead of the one-way clutch 26. However, when an electromagnetic clutch is used, an installation space of a power supply wiring is required, and a mounting structure of the clutch becomes complicated. On the other hand, when a one-way clutch with only a mechanical configuration is used as in the present embodiment, it is possible to save space and simplify the mounting structure, and also to increase a flexibility of design.

[0074] FIG. 21 is a schematic perspective view of a position change mechanism 70 according to a third embodiment of the present disclosure.

[0075] As illustrated in FIG. 21, the position change mechanism 70 according to the third embodiment includes an interfering member 76, a support shaft 77 to support the interfering member 76, a bearing 78 disposed on one end side of the support shaft 77, and a gear 79 disposed on an outer periphery of the bearing 78.

[0076] The interfering member 76 is made of a flat plate-shaped member extending continuously in an axial direction of the photoconductor 2. The support shaft 77 is secured to the end of the interfering member 76 on the photoconductor 2 side and is rotatable with respect to the support frame 22 supporting the photoconductor 2. As the support shaft 77 rotates, the interfering member 76 can turn around the support shaft 77 in a direction indicated by arrow G1 and a direction indicated by arrow G2 in FIG. 21.

[0077] The bearing 78 includes a one-way clutch as a one-way rotary transmission device. An electromagnetic clutch can also be used in place of the one-way clutch. However, in terms of saving space, simplifying the mounting structure of the clutch, and improving the flexibility of design, the one-way clutch is preferably used as in the present embodiment.

[0078] As described above, in the present embodiment, since the gear 79 is coupled to the interfering member 76 via the one-way clutch (bearing 78), as for the rotary driving force when the interfering member 76 is turned, only the rotary driving force directed in one direction is transmitted to the gear 79. More particularly, in FIG. 21, the one-way clutch is configured so as to transmit only the rotary driving force when the interfering member 76 is turned in the direction indicated by arrow G2 in FIG. 21 (rotary driving force when the support shaft 77 rotates in a direction indicated by arrow H2) to the gear 79 and so as not to transmit the rotary driving force when the interfering member 76 is turned in a direction indicated by arrow G1 in FIG. 21 (rotary driving force when the support shaft 77 rotates in the direction indicated by arrow H1) to the gear 79. The gear 79 is engaged with the photoconductor gear 23 provided on the photoconductor 2. Accordingly, when the gear 79 rotates, the photoconductor 2 rotates integrally with the photoconductor gear 23.

[0079] Next, an operation of the position change mechanism 70 according to the third embodiment is described.

[0080] As illustrated in FIG. 22, when the cleaning unit 200A is attached to the support frame 22, the interfering member 76 is disposed at a position where the interfering

member 76 has been turned upward in FIG. 22. The position change mechanism 70 is configured so as not to transmit the rotary driving force of the photoconductor 2 to the interfering member 76 even when the image forming operation is started and the photoconductor 2 is rotated in the state where the interfering member 76 has been turned upward in FIG. 22. Thus, the interfering member 76 is held in a predetermined position.

[0081] As illustrated in FIG. 23, when the cleaning unit 200A is removed from the position illustrated in FIG. 22, the interfering member 76 is turned downward (direction indicated by arrow G1 in FIG. 23) due to its own weight. Simultaneously with the turning of the interfering member 76, the support shaft 77 also rotates in the same direction (direction indicated by arrow H1 in FIG. 23), however, the rotary driving force of the support shaft 77 at that time is not transmitted to the gear 79. Accordingly, the photoconductor 2 does not rotate. As described above, the purpose of not allowing the photoconductor 2 to rotate when the cleaning unit 200A is removed is to prevent the deposit A from adhering to the charging roller 30 due to the rotation of the photoconductor 2, as well as to obtain the effect of the reverse rotation of the photoconductor 2 to be performed later as in the above-mentioned embodiments.

[0082] Thereafter, when a new cleaning unit 200B is to be installed, the operator or the user manually turns the interfering member 76 upward (direction indicated by arrow G2 in FIG. 24) as illustrated in FIG. 24. Thus, by turning the interfering member 76 upward, the interfering member 76 is moved to a retracted position where the interfering member 76 does not interfere with the mounting operation of the cleaning unit 200B (permitting the mounting operation).

[0083] Further, when the interfering member 76 is turned upward, the rotary driving force of the support shaft 77 rotating in the same direction (direction indicated by arrow H2 in FIG. 24) is transmitted to the gear 79 so that the gear 79 rotates counterclockwise in FIG. 24. As a result, the photoconductor gear 23 rotates clockwise in FIG. 24, and the photoconductor 2 rotates in the reverse direction relative to the direction of rotation of the photoconductor 2 at the time of image formation.

[0084] Then, as illustrated in FIG. 25, the new cleaning unit 200B can be mounted by placing the interfering member 76 in the retracted position.

[0085] As described above, also in the third embodiment, the position of the deposit A on the photoconductor A can be shifted by rotating the photoconductor 2 in the reverse direction relative to the direction of rotation of the photoconductor 2 at the time of image formation, and the sandwiching of the deposit A by the cleaning blade 50 or the leveling blade 62 can be prevented.

[0086] In the third embodiment, when the cleaning unit 200A is removed, since the interfering member 76 is placed at the interfering position (position illustrated in FIG. 23) where the interfering member has been turned downward to prevent the mounting operation of the

cleaning unit 200B, it is necessary to turn the interfering member 76 upward to the retracted position (position illustrated in FIG. 25) at the time of mounting a new cleaning unit 200B in order to make the state where the cleaning unit 200B is attachable. Then, the photoconductor 2 is reversely rotated in conjunction with the rotational operation to the retracted position. As described above, according to the configuration of the third embodiment, before the cleaning unit 200B is attached, the interfering member 76 is turned upward without fail to perform the reverse rotation operation of the photoconductor 2 so that a new cleaning unit 200B does not be installed with the performance of the reverse rotational operation forgotten.

[0087] In addition, in the third embodiment, since the amount of reverse rotation of the photoconductor 2 can be adjusted to a constant amount, the amount of reverse rotation is stable and sandwiching of the deposit A can be surely prevented. In the configuration according to the third embodiment, since the number of teeth of the gear 79 is smaller than the number of teeth of the photoconductor gear 23, the force required to rotate the photoconductor 2 in the reverse direction can be reduced to improve the operability of the interfering member. It is desirable that the amount of rotation when the photoconductor is rotated reversely is set to the same amount of rotation as described in FIG. 14 also in this case.

[0088] FIG. 26 is a schematic perspective view of a position change mechanism 70 according to a fourth embodiment of the present disclosure.

[0089] In the fourth embodiment illustrated in FIG. 26, only the configuration of the interfering member 76X differs from the third embodiment illustrated in FIGS. 21 to 25. Other configurations are similar to that of the third embodiment. More specifically, the interfering member 76X in the fourth embodiment includes a flat plate-shaped portion 76a similar to the flat plate-shaped portion in the interfering member 76 in the third embodiment and an extension portion 76b extending from a tip of the flat plate-shaped portion 76a at a predetermined angle to form a bend together with the flat plate-shaped portion 76a. As described above, the interfering member 76X in the fourth embodiment is formed at a size larger than the interfering member 76 in the third embodiment.

[0090] In configurations where the cleaning unit 200A can be mounted and removed, it is necessary to form an opening 22b in the support frame 22 for the mounting and removal of the cleaning unit 200A. The opening 22b is shielded by the cleaning unit 200A when the cleaning unit is installed. However, when the cleaning unit 200A is removed, the opening 22b is left open, and the photoconductor 2 is likely exposed to light L from the opening. If the photoconductor 2 is exposed to light L for a long period of time, the photoconductor 2 deteriorates to affect the image quality. Accordingly, when the cleaning unit 200A is removed, it is preferable to provide a light-shielding device to block the irradiation of light L on the photoconductor 2 through the opening 22b.

[0091] Therefore, in the fourth embodiment, the interfering member 76X is formed to be larger as described above, so that the interfering member 76X can shield the photoconductor 2 from light L in place of the cleaning unit 200A. As illustrated in FIG. 28, when the cleaning unit 200A is removed from the mounting state of the cleaning unit 200A illustrated in FIG. 27, the interfering member 76X is turned downward due to its own weight so as to shield the opening 22b for mounting and removal of the cleaning unit 200A. Thus, light L from the outside is blocked by the interfering member 76X, so that the photoconductor 2 can be prevented from being exposed to light L.

[0092] In this state, since a tip 76c of the interfering member 76X is in contact with the edge of the opening 22b so as not to create a gap between the tip 76c and the edge of the opening 22b, light L can be securely blocked without entering through a gap between the tip 76c of the interfering member 76X and the edge of the opening 22b. In the present embodiment, all of areas shielded by the cleaning unit 200A are shielded by the interfering member 76X.

[0093] Thus, according to the configuration of the fourth embodiment, even when the cleaning unit is removed, light shielding for the photoconductor 2 can be reliably performed, and the deterioration of the photoconductor 2 can be highly prevented. In the fourth embodiment, the operation of rotating the photoconductor 2 in the reverse direction is the same as the operation in the third embodiment, and the description is omitted.

[0094] FIGS. 29 and 30 are schematic views illustrating the configuration and operation of the position change mechanism 70 according to a fifth embodiment of the present disclosure.

[0095] In the fifth embodiment, the arrangement of the cleaning unit 200A is different from the above-described embodiments. In the fifth embodiment, as illustrated in FIG. 29, the position of the interfering member 76Y turned downward is a retracted position permitting the mounting of the cleaning unit, and as illustrated in FIG. 30, the position of the interfering member 76Y turned upward is the interfering position that prevents the mounting of the cleaning unit. That is, the positional relationship of the interfering position and the retracted position is upside down with respect to the above-described embodiments. In such a configuration, the interfering member 76Y is not turned from the retracted position to the interfering position by its own weight as in the above-described embodiments.

[0096] Therefore, in the fifth embodiment, a coil spring 80 is provided as an urging member to urge the interfering member 76Y to turn from the lower retracted position (position illustrated in FIG. 29) to the upper interfering position (position illustrated in FIG. 30). With this configuration, as illustrated in FIG. 30, when the cleaning unit 200A is removed, the interfering member 76Y is pulled upward by the coil spring 80 and is turned around to the interfering position.

[0097] Thus, the interfering member 76Y can be turned around to the interfering position certainly without using its own weight by providing the urging member for the interfering member 76Y, so that the flexibility of configuration of the interfering member 76Y and the arrangement of the cleaning unit 200A is improved. In the fifth embodiment, except for the configuration described above, the configuration is basically the same as the configuration of the third embodiment, and the operation of reversing the photoconductor 2 is also the same as the operation of the third embodiment, and thus, the description is omitted.

[0098] This disclosure has been described above with reference to specific embodiments. It is to be noted that this disclosure is not limited to the details of the embodiments described above. In the above-described embodiments, the cleaning unit 200 that integrally includes the cleaning device 5 and the lubricant applicator 6 is described as an example of the detachable unit that can be attached to or detached from the support frame 22, but the present disclosure is applicable to an image forming apparatus provided with a cleaning device as a single unit to be independently attached and detached from the support frame 22 or a lubricant applicator as a single unit to be attached and detached from the support frame 22.

[0099] The present disclosure is not limited to the case where the charging roller 30 and the developing roller 40 are in contact with the photoconductor 2 and can be applied to a configuration where a charging roller or a developing roller is disposed close to (not in contact with) the photoconductor 2.

[0100] In the above-described embodiment, the lubricant applicator 6 is disposed downstream of the cleaning device 5 in the direction of rotation of the photoconductor 2, but on the contrary, the present disclosure can also be applied to a configuration in which a cleaning device is disposed downstream of a lubricant applicator in the direction of rotation of the photoconductor 2.

[0101] In addition, the present disclosure is also applicable to a configuration including a cleaning device that cleans an intermediate transfer belt as an image bearer carrying a toner image, and a lubricant applicator that supplies lubricant to the intermediate transfer belt. In this case, the drive roller that rotates the intermediate transfer belt is rotated in a direction opposite to a direction of rotation at the time of image formation by using a position change mechanism according to the present disclosure so that deposits can be prevented from being sandwiched by the blades when the cleaning device and the lubricant applicator are mounted.

[0102] The image forming apparatus of the present disclosure is not limited to a printer. The image forming apparatus includes, but is not limited to, a copier, a printer, a facsimile machine, and a multifunction peripheral including a combination thereof.

Claims

1. An image forming unit (1) comprising:

an image bearer (2) to bear a toner image;
a support frame (22) to support the image bearer (2);
a detachable unit (200) to be attached to and detached from the support frame (22), the detachable unit (200) including a contact member (50; 62) to contact the image bearer (2); and
a position change mechanism (70) to change a position in a rotation direction of the image bearer (2) by rotating the image bearer (2) in a reverse direction opposite to a direction of rotation of the image bearer (2) in image formation in conjunction with the attachment of the detachable unit (200) to change the position in the rotation direction of the image bearer (2);
an image bearer gear (23) attached to the image bearer (2);

characterised in that the position change mechanism (70) includes:

a moving member (71) to move between a first position and a second position, the first position at which the moving member (71) is disposed in a state where the detachable unit (200) is attached, the second position at which the moving member (71) is disposed in a state where the detachable unit (200) is detached; and
an engaging portion (72) disposed on the moving member, to engage the image bearer gear (23), and

wherein, when the moving member (71) moves from the second position to the first position in conjunction with the attachment of the detachable unit (200), the engaging portion (72) engages with the image bearer gear (23) to rotate the image bearer gear (23) to rotate the image bearer (2) in the reverse direction.

2. The image forming unit (1) according to claim 1, wherein the engaging portion (72) switches between an erected state to engage with the image bearer gear (23) and a tilted state not to engage with the image bearer gear (23), and
wherein the engaging portion (72) is in the erected state when the moving member (71) moves from the second position to the first position, and the engaging portion (72) switches from the erected state to the tilted state when the moving member (71) moves from the first position to the second position.
3. The image forming unit (1) according to claim 1, further comprising a one-way rotary transmission de-

vice (26) disposed between the image bearer gear (23) and the image bearer (2) to:

couple the image bearer gear (23) and the image bearer (2), and
transmit a rotary driving force of the image bearer gear (23) to the image bearer (2) when the moving member (71) moves from the second position to the first position.

4. An image forming unit (1) comprising:

an image bearer (2) to bear a toner image;
a support frame (22) to support the image bearer (2);
a detachable unit (200) to be attached to and detached from the support frame (22), the detachable unit (200) including a contact member (50; 62) to contact the image bearer (2);
a position change mechanism (70) to change a position in a rotation direction of the image bearer (2) by rotating the image bearer (2) in a reverse direction opposite to a direction of rotation of the image bearer (2) in image formation to change the position in the rotation direction of the image bearer (2) when the image forming unit (1) is operated to enable the attachment of the detachable unit (200);
an image bearer gear (23) attached to the image bearer (2);
characterised in that the position change mechanism (70) includes:

an interfering member (76) to move between an interfering position to prevent the attachment of the detachable unit (200) and a retracted position to permit the attachment of the detachable unit (200); and
a gear (79) to move in conjunction with the interfering member (76) and engage with the image bearer gear (23),

wherein when the interfering member (71) moves from the interfering position to the retracted position, the gear (79) rotates the image bearer gear (23) to rotate the image bearer (2) in the reverse direction.

5. The image forming unit (1) according to claim 4, further comprising a one-way rotary transmission device (78) disposed between the gear (79) and the interfering member (76) to:

couple the gear (79) and the interfering member (76), and
transmit a rotary driving force of the interfering member (76) to the gear (79) when the interfering member (71) moves from the interfering po-

sition to the retracted position.

6. The image forming unit (1) according to claim 4 or 5, wherein, in a state where the interfering member (76) is placed at the interfering position, the interfering member (76) shields an opening (22b) formed in the support frame (22) to attach and detach the detachable unit (200).

7. An image forming apparatus (100) comprising:

an apparatus body (150); and
the image forming unit (1) according to any one of claims 1 to 6 to be attached to and detached from the apparatus body (150) as a single unit.

Patentansprüche

1. Bilderzeugungseinheit (1), umfassend:

einen Bildträger (2), um ein Tonerbild zu tragen;
einen Stützrahmen (22), um den Bildträger (2) zu stützen;
eine abnehmbare Einheit (200), die an dem Stützrahmen (22) angebracht und davon abgenommen werden soll, wobei die abnehmbare Einheit (200) ein Kontaktelement (50; 62) beinhaltet, um den Bildträger (2) zu kontaktieren; und
einen Positionsänderungsmechanismus (70) zum Ändern einer Position in einer Rotationsrichtung des Bildträgers (2) durch Rotieren des Bildträgers (2) in eine einer Rotationsrichtung des Bildträgers (2) entgegengesetzte umgekehrte Richtung bei der Bilderzeugung in Verbindung mit der Anbringung der abnehmbaren Einheit (200), um die Position in der Rotationsrichtung des Bildträgers (2) zu ändern;
ein Bildträger-Zahnrad (23), angebracht an dem Bildträger (2);
dadurch gekennzeichnet, dass der Positionsänderungsmechanismus (70) Folgendes beinhaltet:

ein Bewegungselement (71), um sich zwischen einer ersten Position und einer zweiten Position zu bewegen, wobei an der ersten Position das Bewegungselement (71) in einem Zustand angeordnet ist, in dem die abnehmbare Einheit (200) angebracht ist, wobei an der zweiten Position das Bewegungselement (71) in einem Zustand angeordnet ist, in dem die abnehmbare Einheit (200) abgenommen ist; und
einen Eingriffsabschnitt (72), der am Bewegungselement angeordnet ist, um in das Bildträger-Zahnrad (23) einzugreifen, und

- wobei, wenn sich das Bewegungselement (71) in Verbindung mit der Anbringung der abnehmbaren Einheit (200) von der zweiten Position in die erste Position bewegt, der Eingriffsabschnitt (72) in das Bildträger-Zahnrad (23) eingreift, um das Bildträger-Zahnrad (23) zu rotieren, um den Bildträger (2) in umgekehrter Richtung zu rotieren.
2. Bilderzeugungseinheit (1) nach Anspruch 1, wobei der Eingriffsabschnitt (72) zwischen einem aufgestellten Zustand, um in das Bildträger-Zahnrad (23) einzugreifen, und einem gekippten Zustand, um nicht in das Bildträger-Zahnrad (23) einzugreifen, wechselt und wobei sich der Eingriffsabschnitt (72) im aufgestellten Zustand befindet, wenn sich das Bewegungselement (71) von der zweiten Position in die erste Position bewegt, und der Eingriffsabschnitt (72) vom aufgestellten Zustand in den gekippten Zustand wechselt, wenn sich das Bewegungselement (71) von der ersten Position in die zweite Position bewegt.
3. Bilderzeugungseinheit (1) nach Anspruch 1, ferner umfassend eine Einweg-Drehübertragungsvorrichtung (26), die zwischen dem Bildträger-Zahnrad (23) und dem Bildträger (2) angeordnet ist, um:
- das Bildträger-Zahnrad (23) und den Bildträger (2) zu koppeln und eine Drehantriebskraft des Bildträger-Zahnrad (23) auf den Bildträger (2) zu übertragen, wenn sich das Bewegungselement (71) von der zweiten Position in die erste Position bewegt.
4. Bilderzeugungseinheit (1), umfassend:
- einen Bildträger (2), um ein Tonerbild zu tragen; einen Stützrahmen (22), um den Bildträger (2) zu stützen; eine abnehmbare Einheit (200), die an dem Stützrahmen (22) angebracht und davon abgenommen werden soll, wobei die abnehmbare Einheit (200) ein Kontaktelement (50; 62) beinhaltet, um den Bildträger (2) zu kontaktieren; und einen Positionsänderungsmechanismus (70) zum Ändern einer Position in einer Rotationsrichtung des Bildträgers (2) durch Rotieren des Bildträgers (2) in eine einer Rotationsrichtung des Bildträgers (2) entgegengesetzte umgekehrte Richtung bei der Bilderzeugung, um die Position in der Rotationsrichtung des Bildträgers (2) zu ändern, wenn die Bilderzeugungseinheit (1) betrieben wird, um die Anbringung der abnehmbaren Einheit (200) zu ermöglichen; ein Bildträger-Zahnrad (23), angebracht an dem Bildträger (2);
- dadurch gekennzeichnet, dass** der Positionsänderungsmechanismus (70) Folgendes beinhaltet:
- ein Störelement (76), um sich zwischen einer störenden Position, um die Anbringung der abnehmbaren Einheit (200) zu verhindern, und einer eingefahrenen Position, um die Anbringung der abnehmbaren Einheit (200) zuzulassen, zu bewegen; und ein Zahnrad (79), um sich in Verbindung mit dem Störelement (76) zu bewegen und in das Bildträger-Zahnrad (23) einzugreifen, wobei, wenn sich das Störelement (71) von der störenden Position in die eingefahrene Position bewegt, das Zahnrad (79) das Bildträger-Zahnrad (23) rotiert, um den Bildträger (2) in umgekehrter Richtung zu rotieren.
5. Bilderzeugungseinheit (1) nach Anspruch 4, ferner umfassend eine Einweg-Drehübertragungsvorrichtung (78), die zwischen dem Zahnrad (79) und dem Störelement (76) angeordnet ist, um:
- das Zahnrad (79) und das Störelement (76) zu koppeln und eine Drehantriebskraft des Störelements (76) auf das Zahnrad (79) zu übertragen, wenn sich das Störelement (71) von der störenden Position in die eingefahrene Position bewegt.
6. Bilderzeugungseinheit (1) nach Anspruch 4 oder 5, wobei in einem Zustand, in dem das Störelement (76) an der störenden Position platziert ist, das Störelement (76) eine Öffnung (22b) abschirmt, die im Stützrahmen (22) gebildet ist, um die abnehmbare Einheit (200) anzubringen und abzunehmen.
7. Bilderzeugungsvorrichtung (100), umfassend:
- einen Vorrichtungskörper (150); und die Bilderzeugungseinheit (1) nach einem der Ansprüche 1 bis 6, die als eine einzelne Einheit an dem Vorrichtungskörper (150) angebracht und davon abgenommen werden soll.

Revendications

1. Appareil de formation d'image (1) comprenant :
- un support d'image (2) pour porter une image de toner ;
- un cadre d'appui (22) pour soutenir le support d'image (2) ;
- une unité amovible (200) devant être attachée au cadre d'appui (22) et détachée de celui-ci, l'unité amovible (200) comprenant un élément

de contact (50 ; 62) pour entrer en contact avec le support d'image (2) ; et
 un mécanisme de changement de position (70) pour changer une position dans un sens de rotation du support d'image (2) par la rotation du support d'image (2) dans un sens inverse opposé à un sens de rotation du support d'image (2) dans une formation d'image conjointement avec la fixation de l'unité amovible (200) pour changer la position dans le sens de rotation du support d'image (2) ;
 un pignon de support d'image (23) attaché au support d'image (2) ;
caractérisé en ce que le mécanisme de changement de position (70) comprend :

un élément mobile (71) pour se déplacer entre une première position et une deuxième position, la première position dans laquelle l'élément mobile (71) est disposé dans un état où l'unité amovible (200) est attachée, la deuxième position dans laquelle l'élément mobile (71) est disposé dans un état où l'unité amovible (200) est détachée ; et
 une partie de mise en prise (72) disposée sur l'élément mobile, pour venir en prise avec le pignon de support d'image (23), et

lorsque l'élément mobile (71) se déplace de la deuxième position vers la première position conjointement avec la fixation de l'unité amovible (200), la partie de mise en prise (72) venant en prise avec le pignon de support d'image (23) pour faire tourner le pignon de support d'image (23) pour faire tourner le support d'image (2) dans le sens inverse.

2. Unité de formation d'images (1) selon la revendication 1,
 dans laquelle la partie de mise en prise (72) passe d'un état déployé pour venir en prise avec le pignon de support d'image (23) et un état incliné pour ne pas venir en prise avec le pignon de support d'image (23), et
 la partie de mise en prise (72) se trouvant dans l'état déployé lorsque l'élément mobile (71) se déplace de la deuxième position à la première position, et la partie de mise en prise (72) passant de l'état déployé à l'état incliné lorsque l'élément mobile (71) se déplace de la première position à la deuxième position.
3. Unité de formation d'images (1) selon la revendication 1, comprenant en outre un dispositif de transmission rotatif unidirectionnel (26) disposé entre le pignon de support d'image (23) et le support d'image (2) pour :

coupler le pignon de support d'image (23) et le support d'image (2), et
 transmettre une force d'entraînement rotative du pignon de support d'image (23) au support d'image (2) lorsque l'élément mobile (71) se déplace de la deuxième position à la première position.

4. Appareil de formation d'image (1) comprenant :

un support d'image (2) pour porter une image de toner ;
 un cadre d'appui (22) pour soutenir le support d'image (2) ;
 une unité amovible (200) devant être attachée au cadre d'appui (22) et détachée de celui-ci, l'unité amovible (200) comprenant un élément de contact (50 ; 62) pour entrer en contact avec le support d'image (2) ;
 un mécanisme de changement de position (70) pour changer une position dans un sens de rotation du support d'image (2) par la rotation du support d'image (2) dans un sens inverse opposé à un sens de rotation du support d'image (2) dans une formation d'image pour changer la position dans le sens de rotation du support d'image (2) lorsque l'unité de formation d'image (1) est actionnée pour permettre la fixation de l'unité amovible (200) ;
 un pignon de support d'image (23) attaché au support d'image (2) ;
caractérisé en ce que le mécanisme de changement de position (70) comprend :

un élément interférent (76) pour se déplacer entre une position interférente pour empêcher la fixation de l'unité amovible (200) et une position rétractée pour permettre la fixation de l'unité amovible (200) ; et
 un pignon (79) pour se déplacer conjointement avec l'élément interférent (76) et venir en prise avec le pignon de support d'image (23),

lorsque l'élément interférent (71) se déplace de la position interférente à la position rétractée, le pignon (79) faisant tourner le pignon de support d'image (23) pour faire tourner le support d'image (2) dans le sens inverse.

5. Unité de formation d'images (1) selon la revendication 4, comprenant en outre un dispositif de transmission rotatif unidirectionnel (78) disposé entre le pignon (79) et l'élément interférent (76) pour :

coupler le pignon (79) et l'élément interférent (76), et
 transmettre une force d'entraînement rotative

de l'élément interfèrent (76) au pignon (79) lorsque l'élément interfèrent (71) se déplace de la position interférente à la position rétractée.

6. Unité de formation d'images (1) selon la revendication 4 ou 5, dans laquelle, dans un état où l'élément interfèrent (76) est placé dans la position interférente, l'élément interfèrent (76) protège une ouverture (22b) formée dans le cadre d'appui (22) pour attacher et détacher l'unité amovible (200). 5 10

7. Appareil de formation d'image (100) comprenant :

un corps d'appareil (150) ; et 15
l'unité de formation d'images (1) selon l'une quelconque des revendications 1 à 6 devant être attachée au corps d'appareil (150) et détachée de celui-ci en une seule unité.

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FIG. 1

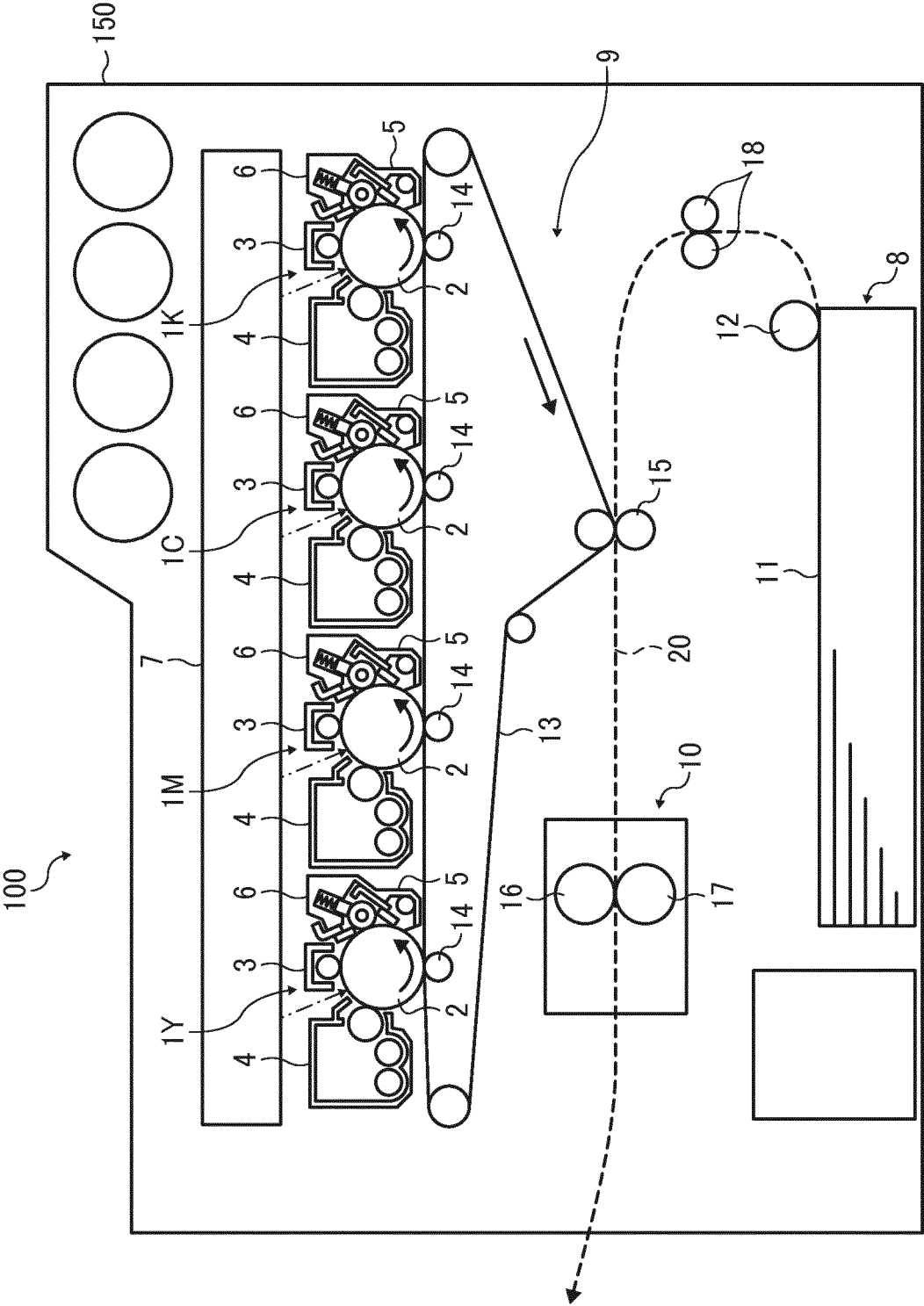


FIG. 2

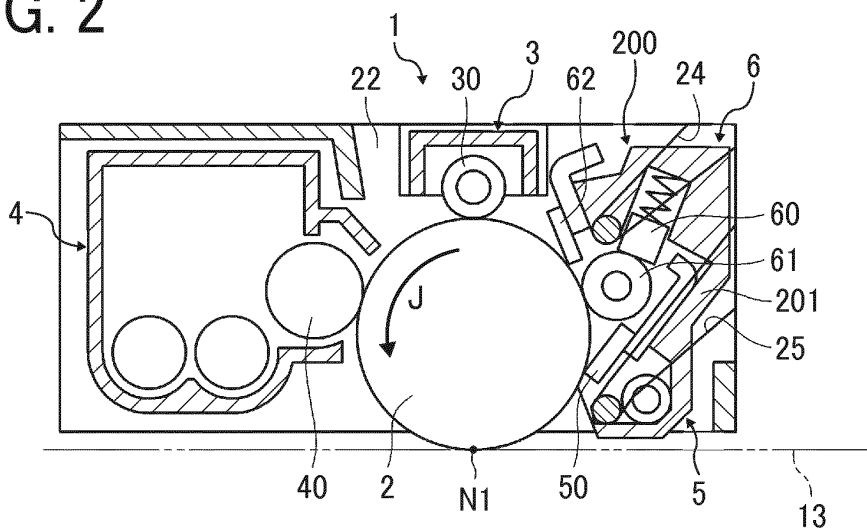


FIG. 3

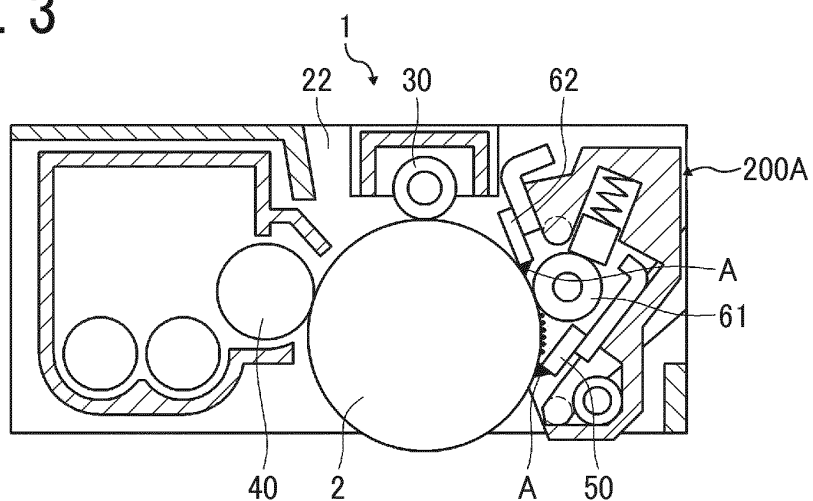


FIG. 4

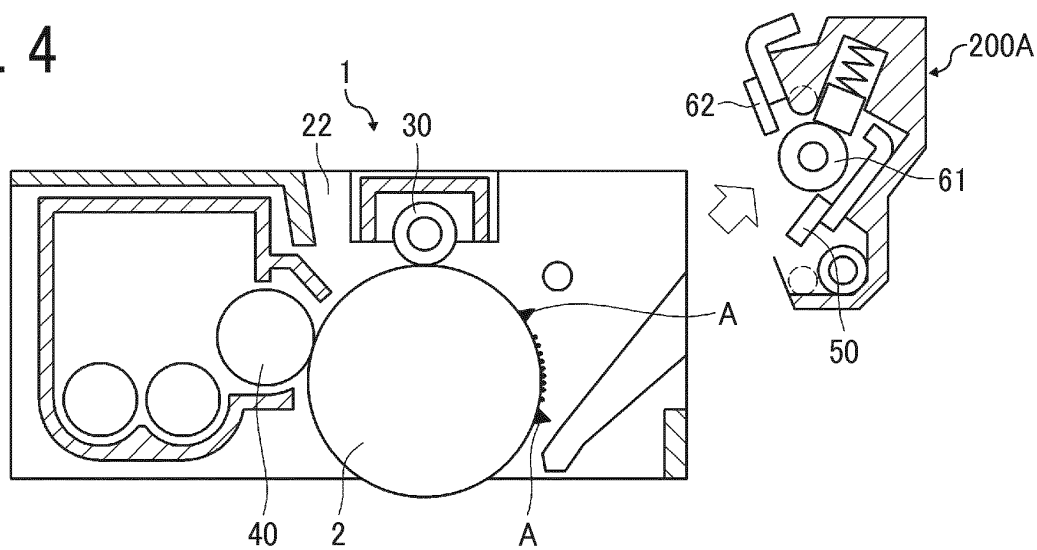


FIG. 5

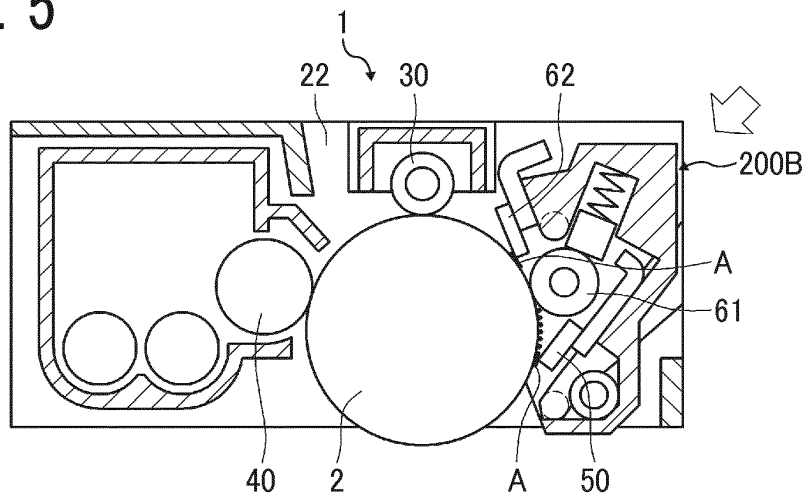


FIG. 6

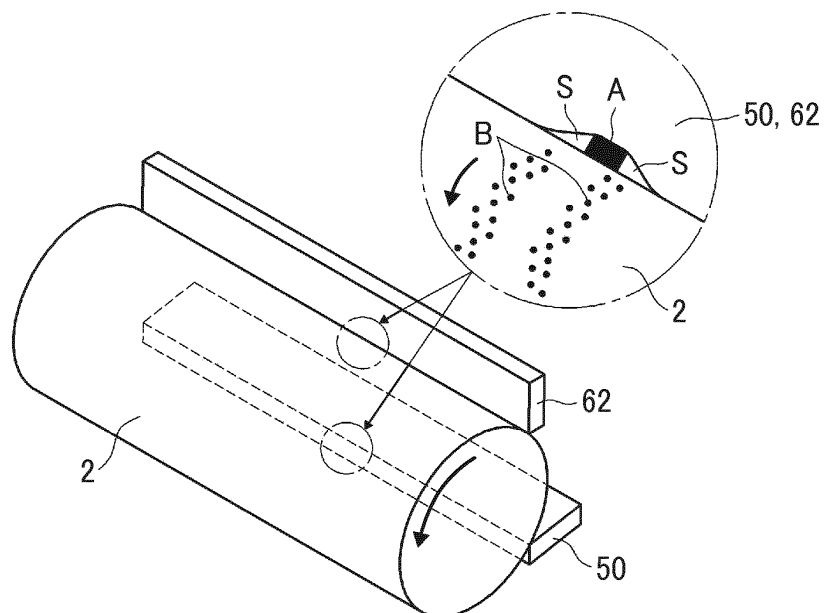


FIG. 7

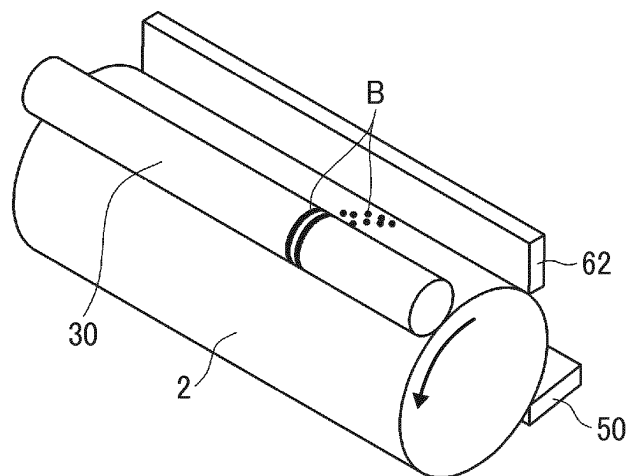


FIG. 8

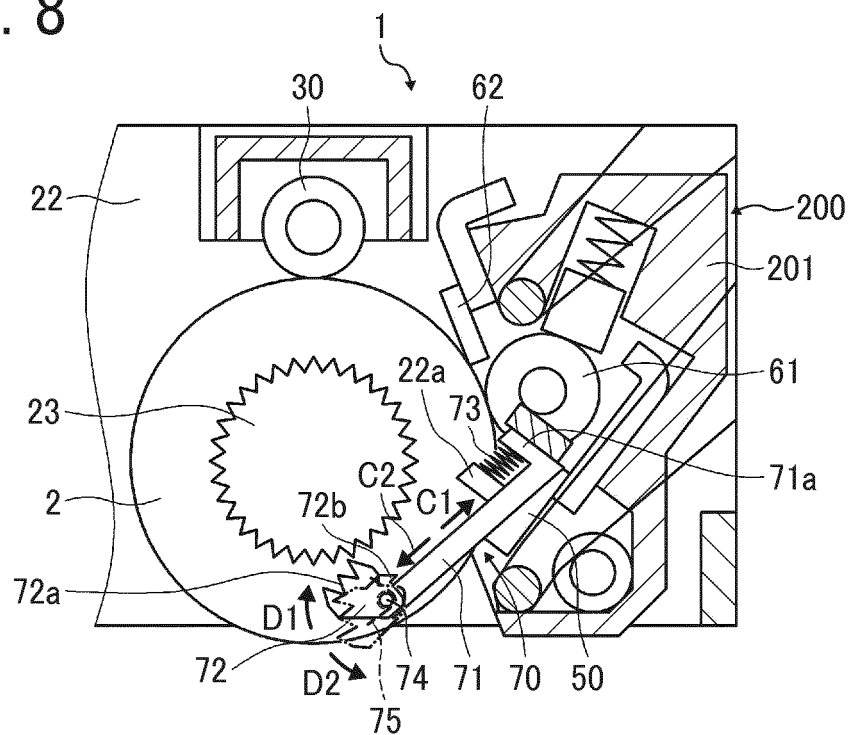


FIG. 9

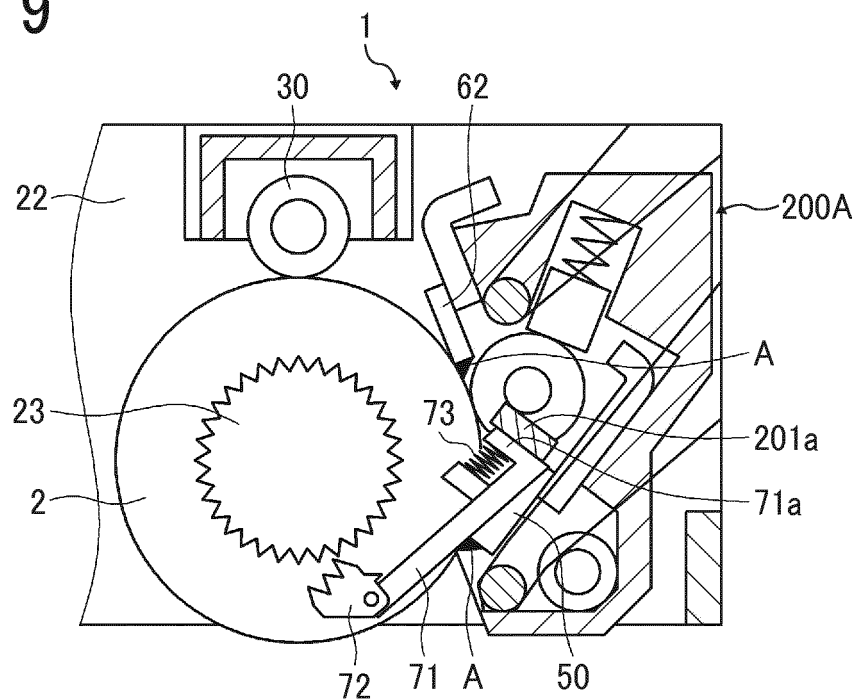


FIG. 10

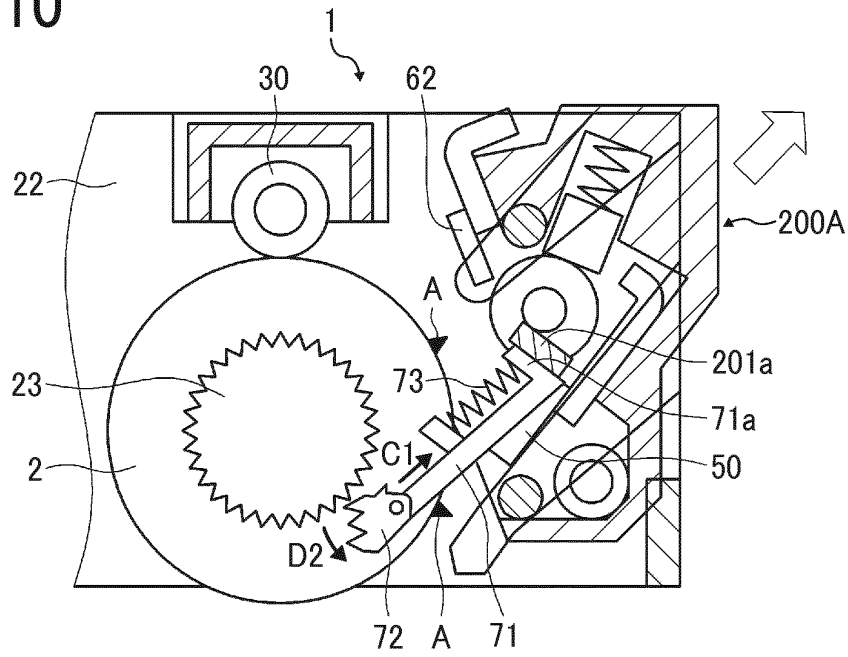


FIG. 11

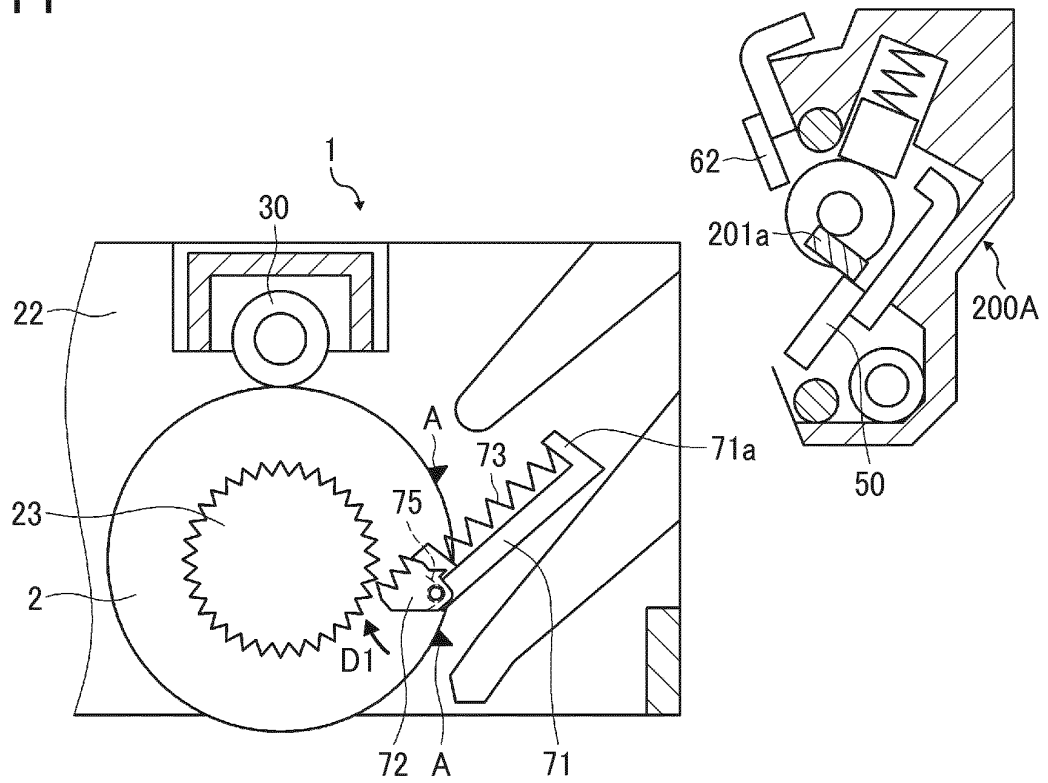


FIG. 12

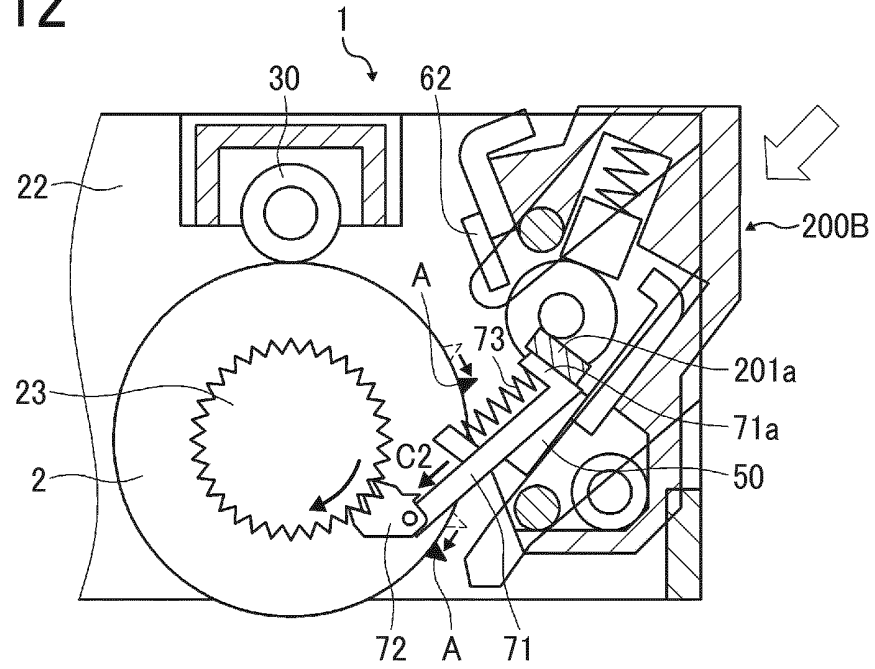


FIG. 13

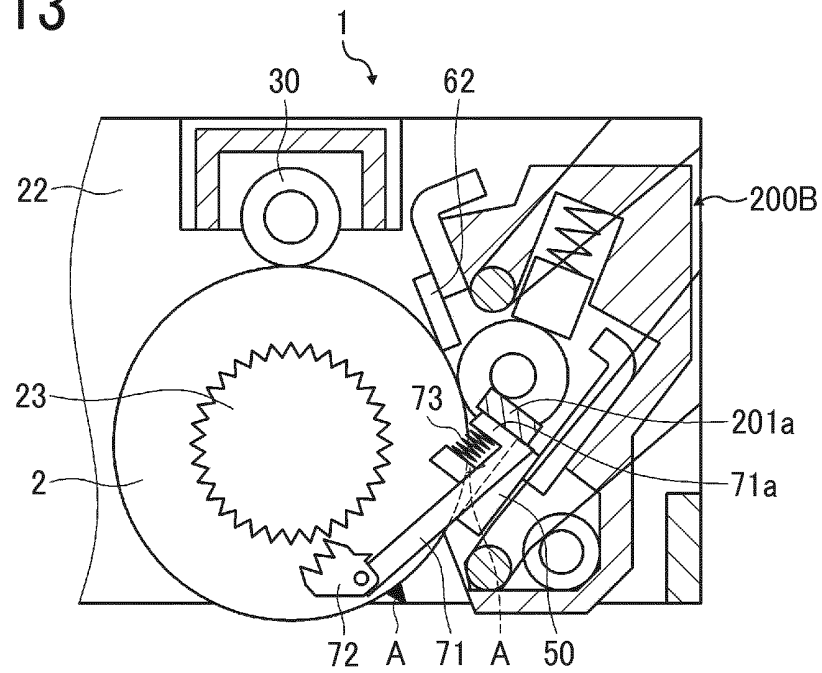


FIG. 14

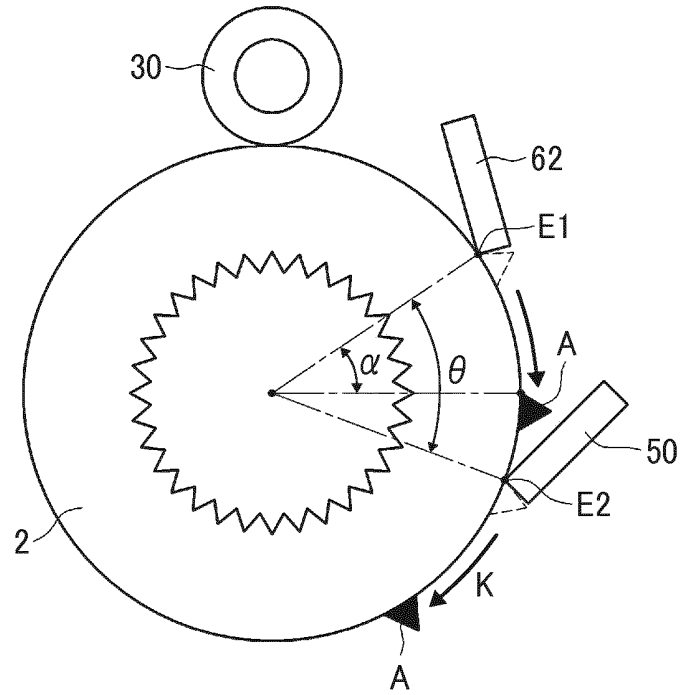


FIG. 15

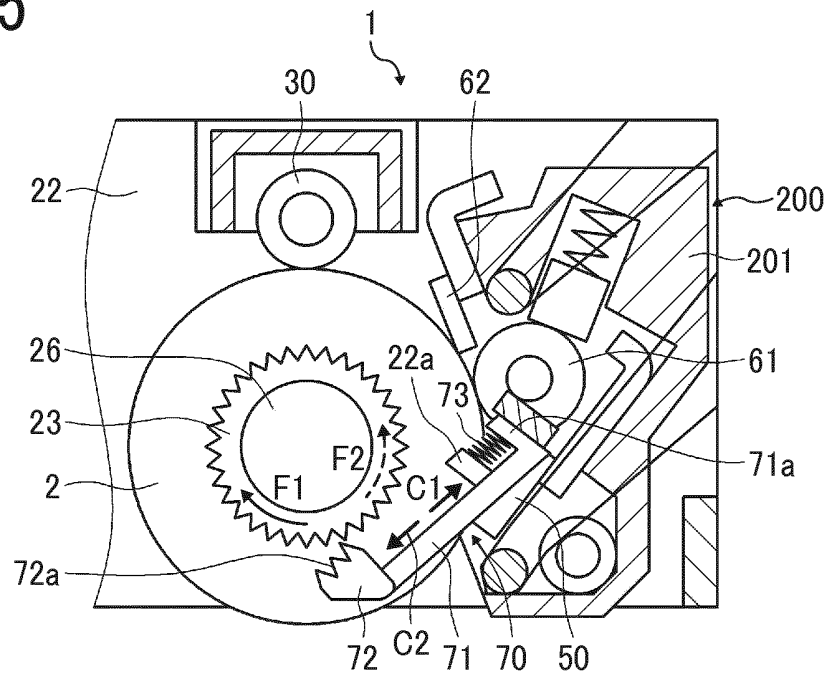


FIG. 16

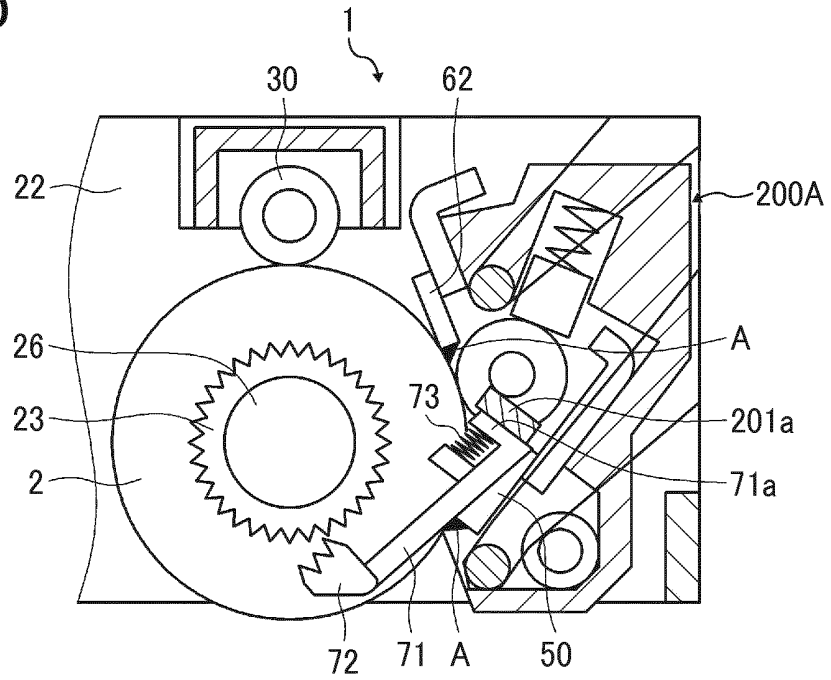


FIG. 17

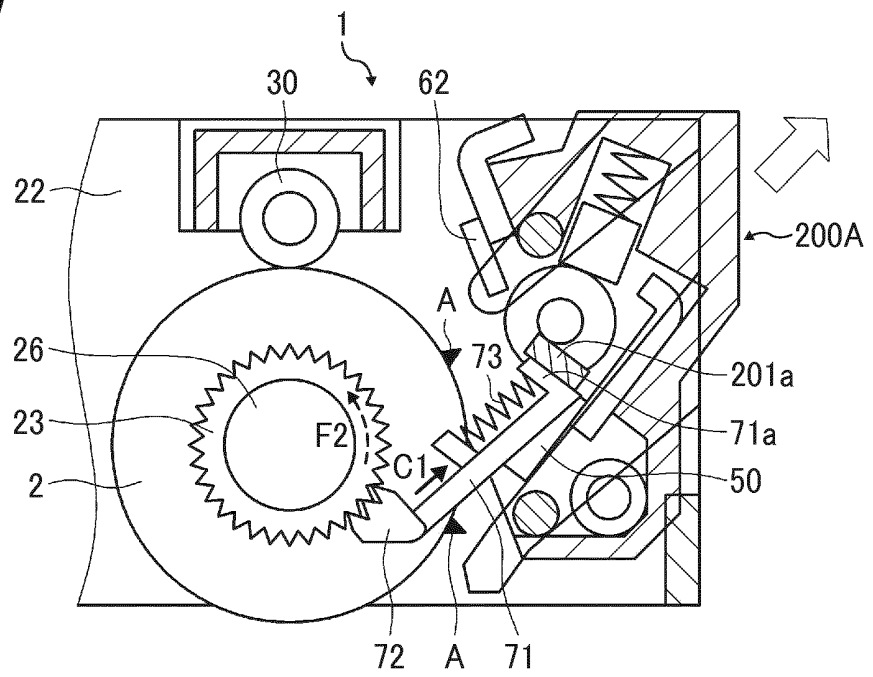


FIG. 18

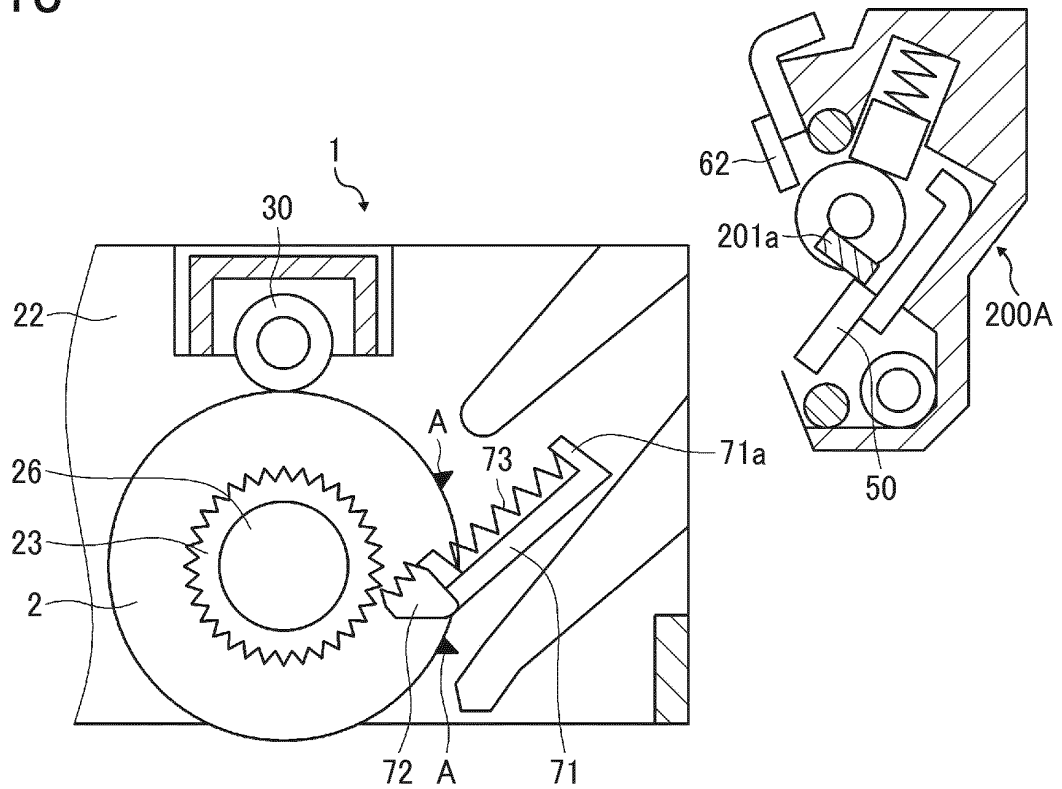


FIG. 19

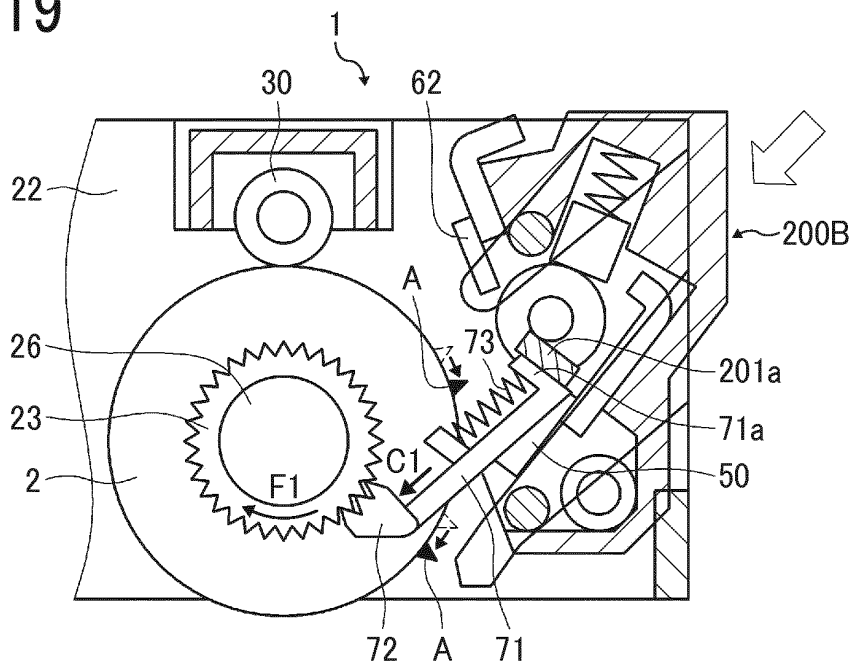


FIG. 20

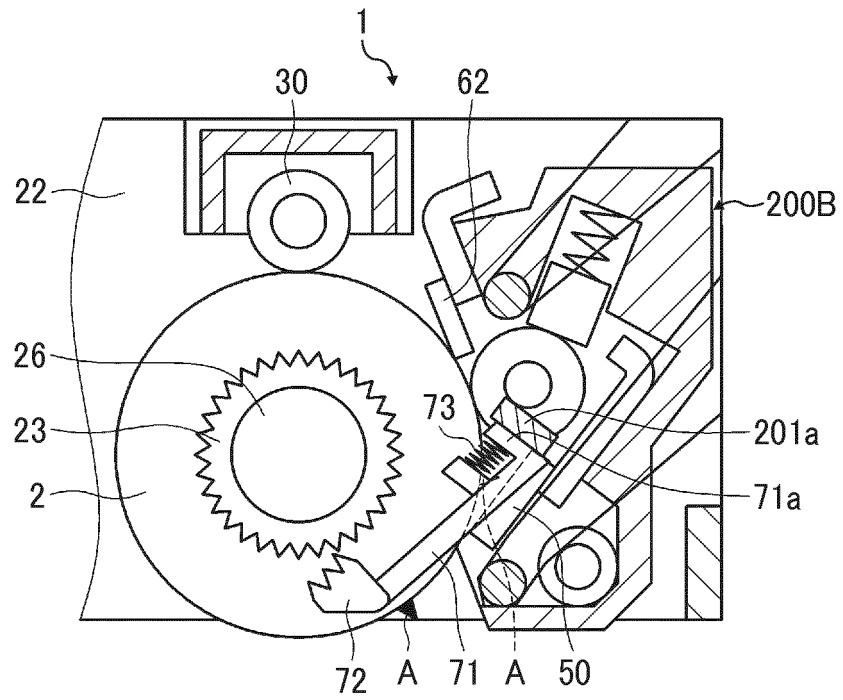


FIG. 21

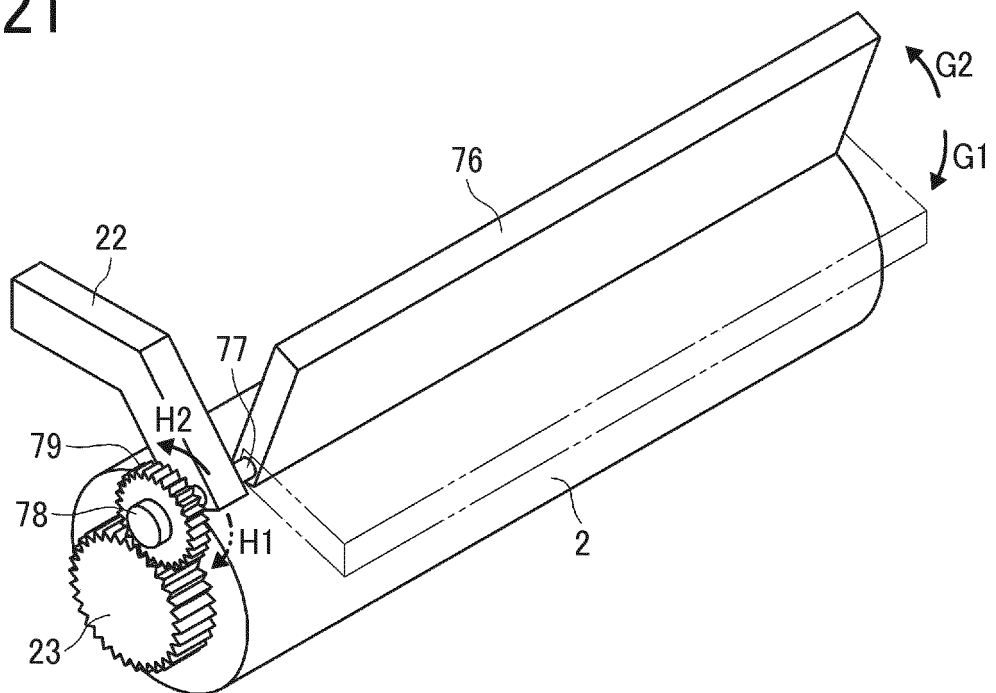


FIG. 22

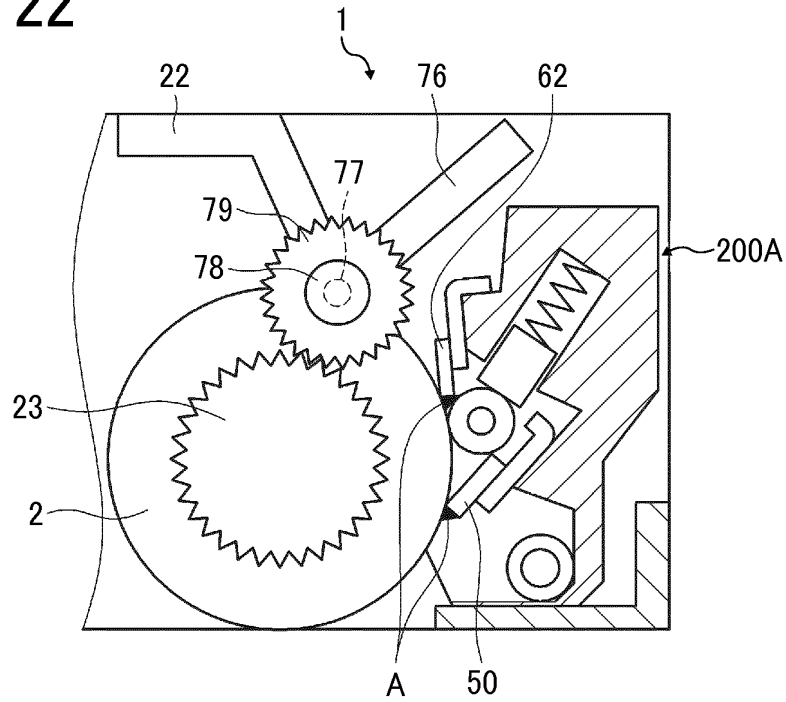


FIG. 23

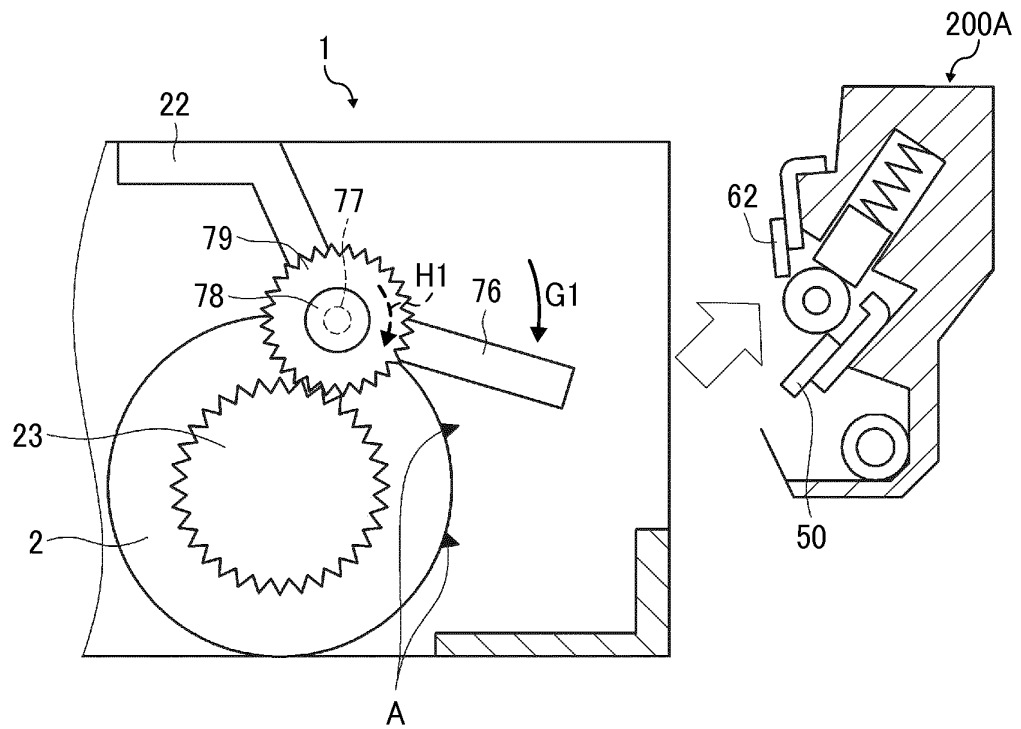


FIG. 24

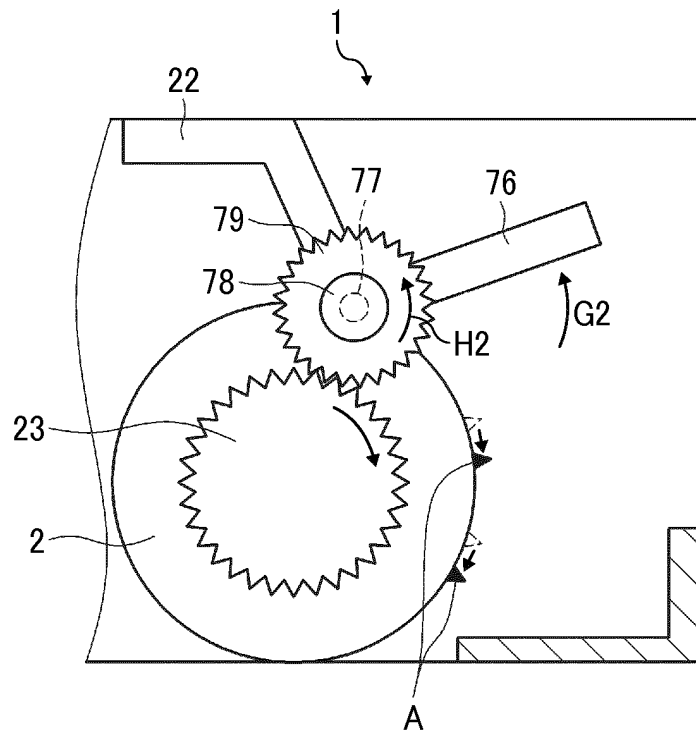


FIG. 25

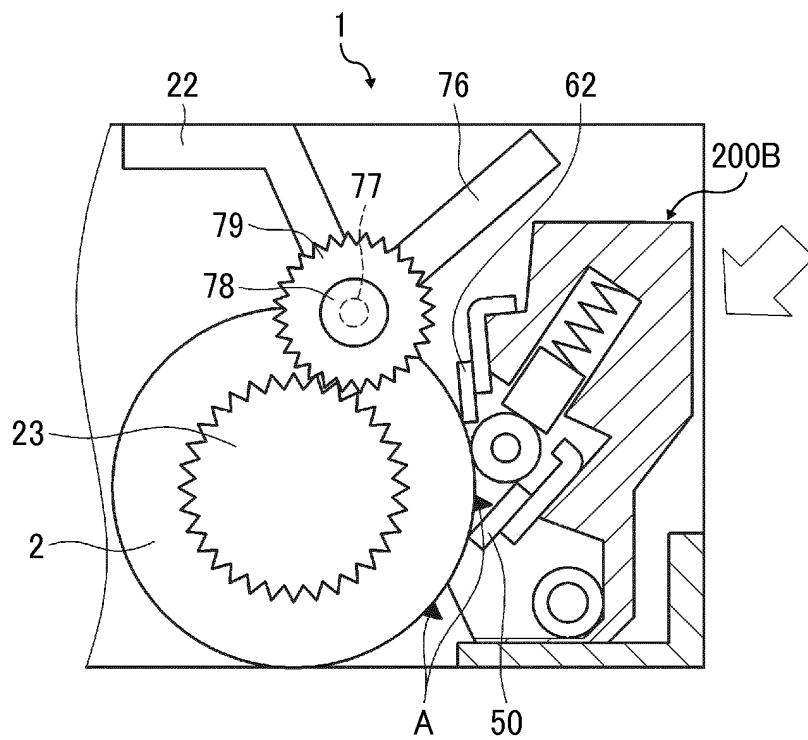


FIG. 26

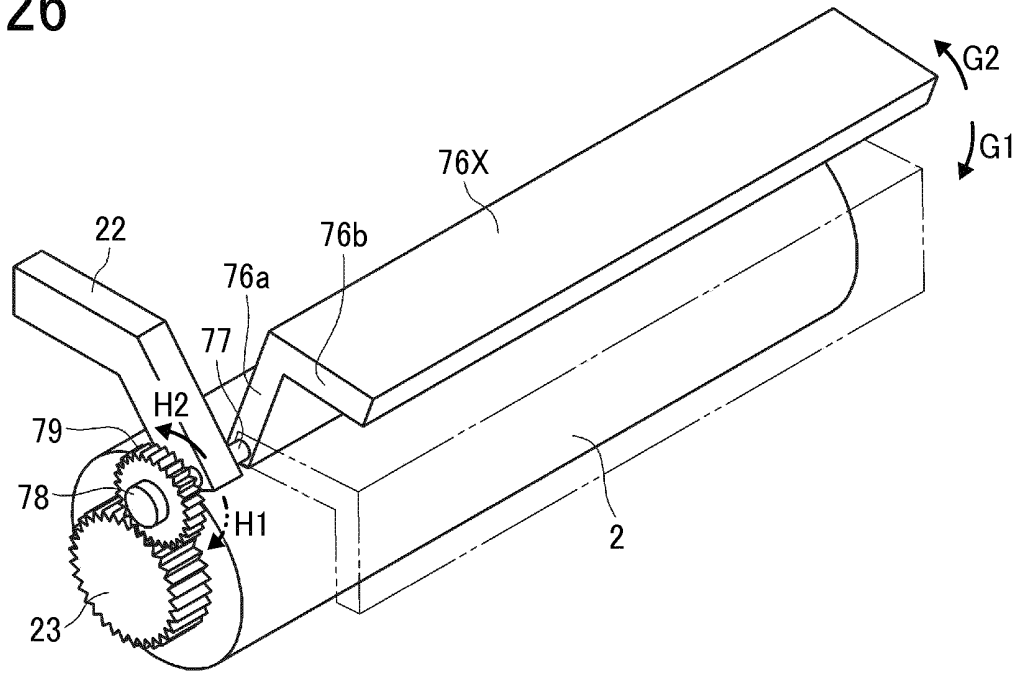


FIG. 27

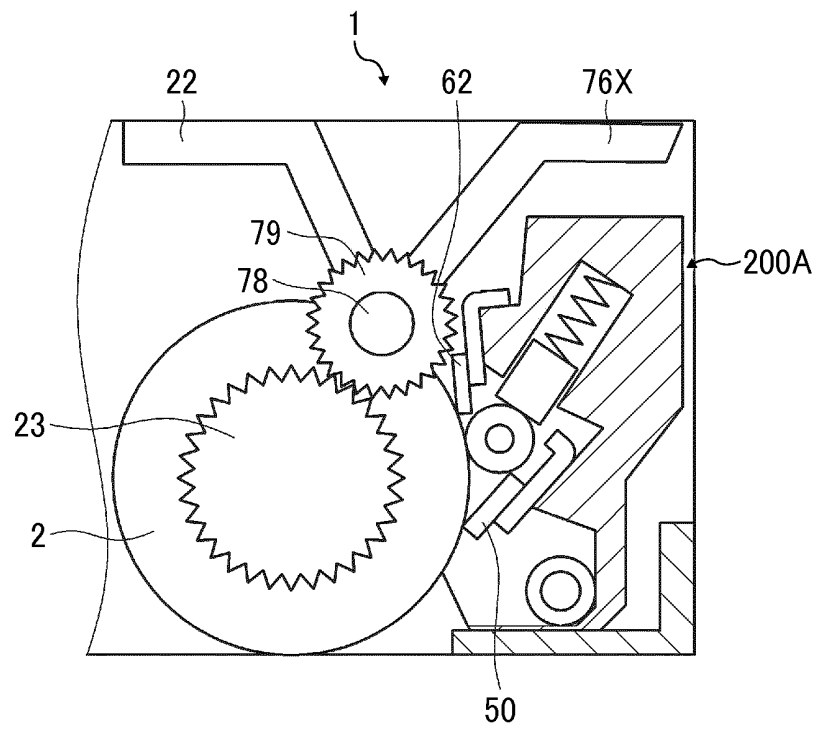


FIG. 28

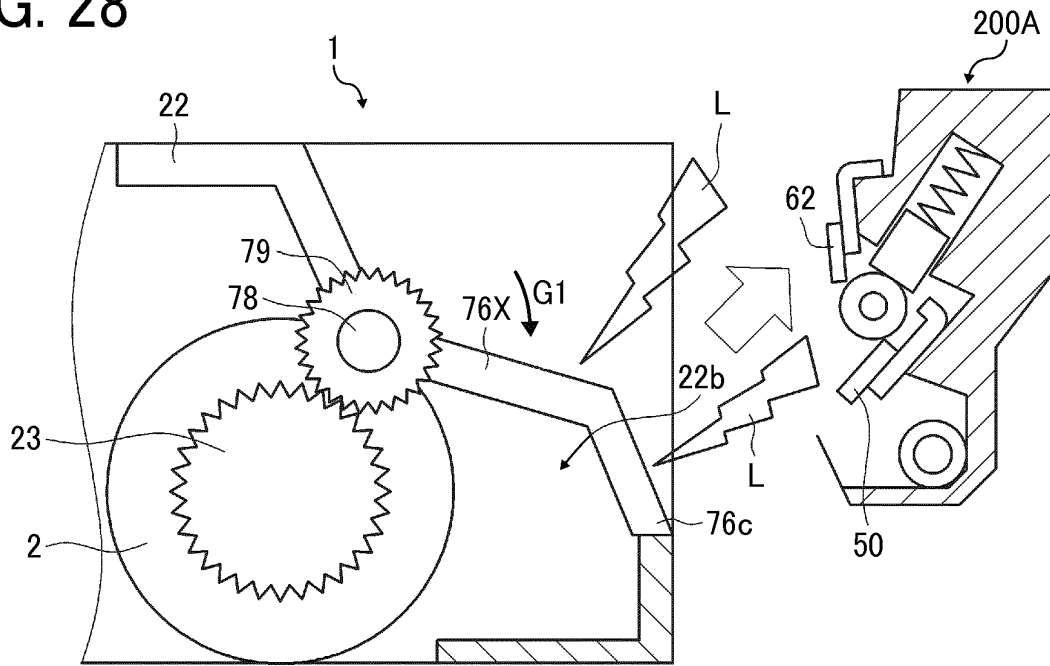


FIG. 29

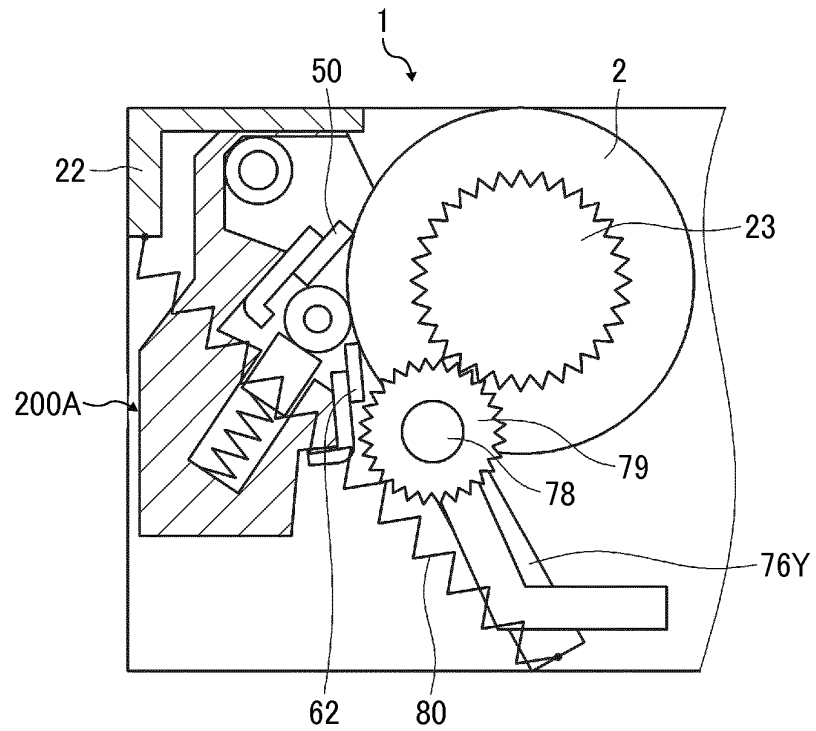
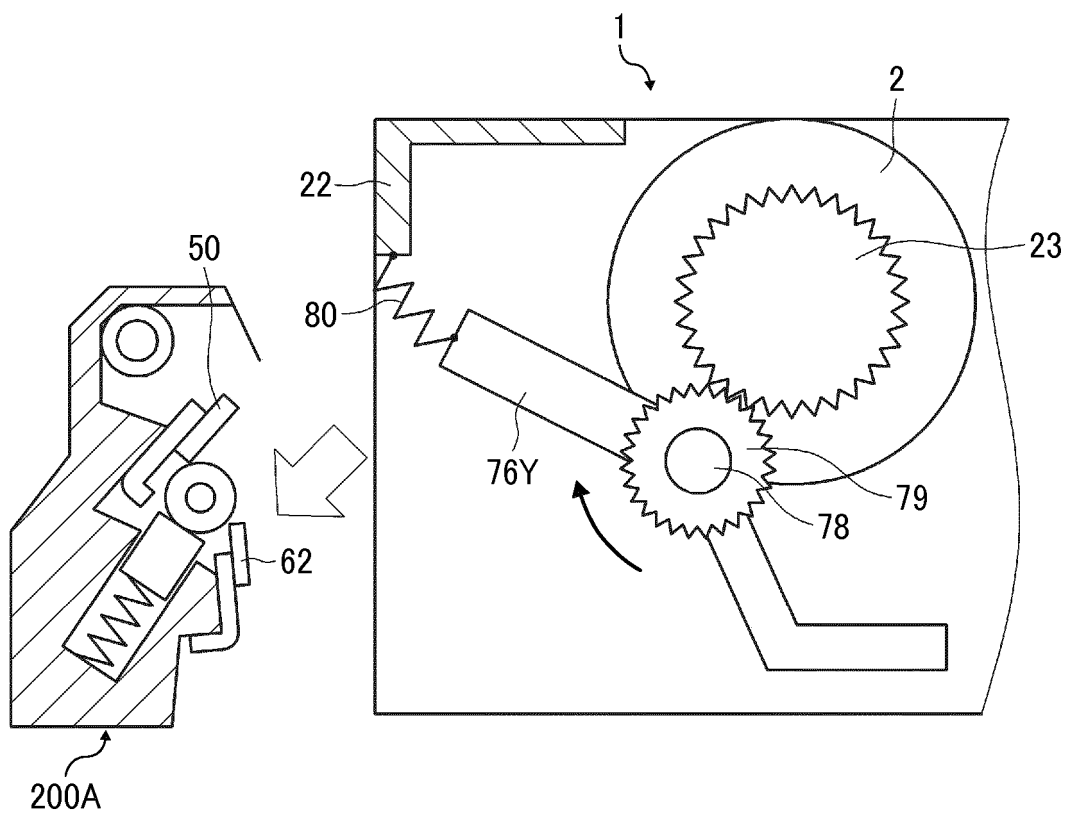


FIG. 30



REFERENCES CITED IN THE DESCRIPTION

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