

DESCRIPTION

[TITLE OF THE INVENTION] DRUM UNIT, CARTRIDGE,
ELECTROPHOTOGRAPHIC IMAGE FORMING APPARATUS AND
5 COUPLING MEMBER

[TECHNICAL FIELD]

[0001] The present invention relates to an electrophotographic image forming
apparatus using an electrophotographic type process, a drum unit, a cartridge, a
10 coupling member, and the like used for the electrophotographic image forming
apparatus.

[BACKGROUND ART]

[0002] In an electrophotographic image forming apparatus, there has been
15 known a structure in which elements such as a photosensitive member drum and
a developing roller as a rotatable member related to image formation are
integrated into a cartridge and can be mounted to and dismounted from an image
forming apparatus main assembly (hereinafter, the apparatus main assembly).
With such a structure, in order to rotate the photosensitive drum in the cartridge, a
20 structure that receives driving force from the apparatus main assembly is
employed in many apparatuses. And, there is known a structure in which a
driving force is transmitted by engaging a coupling member with a driving force
transmitting portion such as a driving pin on the apparatus main assembly side on
the cartridge side.

25 **[0003]** For example, Japanese Unexamined Patent Application Publication No.
2008 - 233867 discloses a cartridge including a coupling member provided at an
end portion of the photosensitive drum so as to be tiltable with respect to the

rotation axis of the photosensitive drum.

[SUMMARY OF THE INVENTION]

[Problems to be Solved by the Invention]

- 5 **[0004]** It is an object of the present invention to develop the above-mentioned conventional technique.

[Means for Solving the Problem]

- [0005]** The representative example structure is a drum unit detachably mountable to a main assembly of an electrophotographic image forming apparatus, the main assembly including a driving shaft provided with a recess, said drum unit comprising (1) a photosensitive drum; and (2) a coupling member provided on said photosensitive drum, said coupling member including, (2 - 1) a driving force receiving portion configured to enter the recess to receive a driving force for rotating said photosensitive drum, and (2 - 2) a supporting portion movably supporting said driving force receiving portion, wherein said supporting portion includes a first extended portion and a second extended portion which extend at least in an axial direction of said photosensitive drum, and said first extended portion and said second extended portion extend in directions different from each other in the axial direction.

20 [Effect of the Invention]

- [0006]** The above-mentioned conventional technique can be further developed.

[BRIEF DESCRIPTION OF THE DRAWINGS]

- [0007]** Figure 1 is a schematic sectional view of an image forming apparatus 100.
- [0008]** Figure 2 is an external perspective view of a drum cartridge 13.
- [0009]** Figure 3 is an external perspective view of a developing cartridge 4.

[0010] Figure 4 is a cross-sectional view taken along an imaginary plane including a rotation center of a photosensitive drum 1 of the drum cartridge 13.

[0011] Figure 5 is an external view of a driving shaft of a main assembly of the apparatus.

5 **[0012]** Figure 6 is a cross-sectional view of a main assembly driving shaft 101 mounted to the image forming apparatus main assembly, taken along a rotational axis center (center of rotation axis).

[0013] Figure 7 is a sectional view of a drum cartridge 13 and the developing cartridge 4.

10 **[0014]** Figure 8 is a cross-sectional view of a coupling 28 and the main assembly driving shaft 101 taken along the rotation axis (rotation axis).

[0015] Figure 9 is a cross-sectional view of the coupling member 28 and the main assembly driving shaft 101 taken along a plane perpendicular to the rotation axis.

15 **[0016]** Figure 10 is a cross-sectional view of the coupling 28 and the main assembly driving shaft 101 taken along the rotation axis.

[0017] Figure 11 is a perspective view of a flange member 70.

[0018] Figure 12 is a view of the flange member 70 as viewed in a direction from a Z1 side to a Z2 side.

20 **[0019]** Figure 13 is a cross-sectional perspective view of the flange member 70.

[0020] Figure 14 is a cross-sectional view of the flange member 70 taken along the rotation axis (the center of the rotation axis).

[0021] Figure 15 is a cross-sectional view of the coupling member 28 and the
25 main assembly driving shaft 101 taken along a plane perpendicular to the rotation axis and passing through a drive transmission surface 73a.

[0022] Figure 16 is a cross-sectional view of the coupling member 28 taken

along the rotation axis (center of rotation axis).

[0023] Figure 17 is a cross-sectional view illustrating a molding die of the flange member 70.

[0024] Figure 18 is a perspective view of an aligning member 33.

5 **[0025]** Figure 19 is a view illustrating a method of assembling the coupling member 28.

[0026] Figure 20 is a perspective view illustrating the mounting of the drum cartridge 13 to the image forming apparatus main assembly 100A.

[0027] Parts (a), (b), (c) and (d) of Figure 21 are cross-sectional views
10 illustrating the mounting operation of the drum cartridge 13 to the image forming apparatus main assembly 100A.

[0028] Parts (a), (b), (c), (d) and (e) of Figure 22 are cross-sectional views illustrating the mounting operation of the coupling member 28 to the main assembly driving shaft 101.

15 **[0029]** Parts (a) and (b) of Figure 23 are sectional views illustrating the operation of mounting the coupling member 28 to the main assembly driving shaft 101 when the main assembly driving shaft 101 rotates from the state where a main assembly drive transmission groove 101a and an engagement portion 73 (drive receiving surface 73a) are out of phase to the state where they are aligned
20 in phase.

[0030] Parts (a), (b), (c), (d) and (e) of Figure 24 are sectional views illustrating a removal operation of the coupling member 28 from the main assembly driving shaft 101.

[0031] Figure 25 is a cross-sectional view of a coupling member 128
25 according to Embodiment 2 taken along the rotation axis (center of rotation axis).

[0032] Figure 26 is a cross-sectional view of the coupling member 128 and the main assembly driving shaft 101 according to Embodiment 2 taken along a plane

perpendicular to the rotation axis at a position passing through the drive receiving surface 73a.

[0033] Part (A) and Part (B) of Figure 27 are a view and a sectional view of a flange member 170 according to Embodiment 2, as viewed from an outside in the Z direction.

[0034] Part (A) and Part (B) of Figure 28 are a view and a side view of the inner cylindrical member 140 according to Embodiment 2 as viewed in a direction from the Z1 side to the Z2 side.

[0035] Parts (a), (b) and (c) of Figure 29 are sectional views showing the assembling procedure of the coupling member 128 according to Embodiment 2.

[0036] Parts (a), (b) and (c) of Figure 30 are illustrations of the assembly procedure of the coupling member 128 according to Embodiment 2 as viewed from the outer side and from the lateral side in the Z direction.

[0037] Figure 31 is a cross-sectional view of the flange member 270 according to Embodiment 3 taken along the rotation axis (center of rotation axis).

[0038] Figure 32 is a cross-sectional view of the coupling member 228 according to Embodiment 3 and the main assembly driving shaft 101 taken along a plane perpendicular to the rotation axis at a position passing through a support portion 74 in a direction.

[0039] Figure 33 is a perspective view of an aligning member 233 according to Embodiment 3.

[0040] Parts (a) and (b) of Figure 34 are views illustrating another embodiment of the coupling member 228 according to Embodiment 3.

[0041] Figure 35 is a cross-sectional view of the coupling member 328 according to Embodiment 4 taken along the rotation axis (center of rotation axis).

[0042] Parts (A) and (B) of Figure 36 are a view and a cross sectional view of a flange member 370 according to Example 4 as viewed from the outside in the Z

direction.

[0043] Figure 37 is a perspective view of an inner cylindrical member 340 according to Embodiment 4.

[0044] Figure 38 is a perspective view of an aligning member 333 according to Embodiment 4.

[0045] Figure 39 is an illustration of the assembling of the coupling member 328 according to Embodiment 4.

[0046] Figure 40 is a cross-sectional view of the coupling member 328 and the main assembly driving shaft 101 according to Embodiment 4 taken along a plane perpendicular to the rotation axis at a position passing through the driving force receiving surface 373a.

[0047] Parts (a) and (b) of Figure 41 are views illustrating another example of the inner cylindrical member 340 according to Embodiment 4.

[0048] Figure 42 is an external view of the main assembly driving shaft 5101 according to Embodiment 5.

[0049] Figure 43 is a cross-sectional view taken along the rotation axis (rotation axis) of the main assembly driving shaft 5101 in a state in which the main assembly driving shaft 5101 according to Embodiment 5 is mounted to the image forming apparatus main assembly.

[0050] Figure 44 is a cross-sectional view of a coupling member 528 according to Embodiment 5 taken along the rotation axis.

[0051] Figure 45 is a cross-sectional view of a cylindrical member 570 according to Embodiment 5 taken along the rotation axis.

[0052] Figure 46 is a cross-sectional view of the coupling member 528 according to Embodiment 5 and the main assembly driving shaft 5101, taken along a plane perpendicular to the rotation axis of the coupling member 528 and passing through the drive receiving surface 573a.

[0053] Figure 47 is a perspective view of an aligning member 533 according to Embodiment 5.

[0054] Figure 48 is a view illustrating the assembling of the coupling member 528 according to Embodiment 5.

5 **[0055]** Figure 49 is a cross-sectional view of a developing cartridge 4 according to Embodiment 5 taken along the axis line of the toner supply roller 20 and the developing roller 17.

[0056] Figure 50 is a perspective view illustrating mounting of the developing cartridge 4 according to Embodiment 5 to the image forming apparatus main
10 assembly 100A.

[0057] Parts (a), (b) and (c) of Figure 51 are cross-sectional views illustrating the mounting operation of the developing cartridge 4 according to Embodiment 5 to the image forming apparatus main assembly 100A.

[0058] Parts (a), (b), (c), (d) and (e) of Figure 52 are cross-sectional views
15 illustrating the operation of mounting the coupling member 528 to the main driving shaft 5101 according to Embodiment 5.

[0059] Figure 53 is a view illustrating another embodiment of the cylindrical member 570 according to Embodiment 5.

[0060] Parts (a), (b) and (c) of Figure 54 are views illustrating the cylindrical
20 member 570 according to Embodiment 5.

[0061] Figure 55 is a view illustrating another example of the coupling member 528 according to Embodiment 5.

[0062] Parts (a), (b) and (c) of Figure 56 are views illustrating another example of the cylindrical member 570 according to Embodiment 5.

25 **[0063]** Figure 57 is a view illustrating another example of the coupling member 528 according to Embodiment 5.

[0064] Figure 58 is a perspective view of an aligning member 633 according

to Embodiment 6.

[0065] Figure 59 is a cross-sectional view of the aligning member 633 according to Embodiment 6 taken along the rotation axis.

[0066] Figure 60 is a cross-sectional view of a coupling member 628 according to Embodiment 6 taken along a plane perpendicular to the rotation axis and passing through the drive receiving surface 673a.

[0067] Figure 61 is a perspective view of a cylindrical member 670 according to Embodiment 6.

[0068] Figure 62 is a cross-sectional view of the coupling member 628 according to Embodiment 6 taken along the rotation axis.

[0069] Figure 63 is a view illustrating the assembling of the coupling member 628 according to Embodiment 6.

[0070] Figure 64 is an illustration showing a modified example of Embodiment 1.

[0071] Figure 65 is an illustration showing a modified example of Embodiment 1.

[DESCRIPTION OF THE EMBODIMENTS]

[0072] In the following, an image forming apparatus, a drum cartridge, and a developing cartridge according to an embodiment of the present invention will be described with reference to the accompanying drawings. Here, the image forming apparatus forms an image on a recording material by using an electrophotographic image forming process, for example. It includes electrophotographic copying machines, electrophotographic printers (for example, LED printers, laser beam printers and so on), electrophotographic facsimile machines, for example. The cartridge is mountable to and dismountable from the main assembly of the image forming apparatus (main assembly of the

apparatus, main assembly of the image forming apparatus, main assembly of the electrophotographic image forming apparatus). In particular, a drum cartridge is a cartridge including a photosensitive drum. A developing cartridge is a cartridge including developing means and the like for developing a latent image formed on the photosensitive member. In this embodiment, each of the drum cartridge and the developing cartridge can be mounted to and dismounted from the image forming apparatus main assembly. In addition, a unit formed by integrating a photosensitive drum and a coupling member is called a drum unit. The drum unit is used for drum cartridges.

10 **[0073]** Here, in the following example, a full-color image forming apparatus in which four drum cartridges and four developing cartridges can be mounted and dismounted is taken. However, the numbers of drum cartridges and developing cartridges to be mounted in the image forming apparatus is not limited to this example. In addition, in the embodiment, a structure using two types of
15 cartridges called a drum cartridge and a developing cartridge is exemplified, but the present invention is not limited to such an example. For example, the present invention is applicable to a process cartridge having integrated functions of drum cartridge and the developing cartridge. Similarly, the constituent elements disclosed in the embodiments are not intended to limit the disclosed
20 material, arrangement, dimensions, other numerical values, and so on, unless otherwise specified. In addition, unless otherwise stated, "above" is based on the upward in the direction of gravity when the image forming apparatus is installed.

25 <Embodiment 1>

[Outline of Electrophotographic Image Forming Apparatus]

[0074] First, referring to Figure 1, an overall structure of an embodiment of an

electrophotographic image forming apparatus (image forming apparatus) according to this embodiment will be described.

[0075] Figure 1 is a schematic sectional view of an image forming apparatus 100 according to this embodiment.

5 **[0076]** As shown in Figure 1, the image forming apparatus 100 comprises, as image forming portions, first, second, third, and fourth image forming portions SY, SM, SC, SC and SK for forming images of colors of yellow (Y), magenta (M), cyan (C), and black (K), respectively. In this embodiment, the first to fourth image forming portions SY, SM, SC, SK are arranged on a line in a
10 substantially horizontal direction.

[0077] Here, in this embodiment, the structures and operations of the drum cartridges 13 (13Y, 13M, 13C, 13K) are substantially the same, and the structures and operations of the developing cartridges 4 (4Y, 4M, 4C, 4K) are substantially the same, except that the colors of the images to be formed are different.

15 Therefore, in the following, Y, M, C, K will be omitted and will be explained as are common for them, unless specific distinction is required.

[0078] In this embodiment, the image forming apparatus 100 has, as image bearing members, four cylinders (hereinafter referred to as photosensitive drums) 1 each including a photosensitive layer, and they are arranged side by side in a
20 direction inclined slightly relative to the vertical direction. A scanner unit (exposure device) 3 is disposed below the drum cartridge 13 in the direction of gravity. In addition, around the photosensitive drum 1, a charging roller 2, and the like as process means (process device, process member) acting on the photosensitive layer are arranged.

25 **[0079]** The charging roller 2 is charging means (charging device, charging member) for uniformly charging the surface of the photosensitive drum 1. And, the scanner unit (exposure device) 3 is an exposure means (exposure device,

exposure member) for forming an electrostatic image (electrostatic latent image) on the photosensitive drum 1 by irradiating a laser beam in accordance with image information. Around the photosensitive drum 1, a developing cartridge 4 and a cleaning blade 6 as cleaning means (cleaning device, cleaning member) is
5 provided.

[0080] An intermediary transfer belt 5 as an intermediary transfer member for transferring the toner image from the photosensitive drum 1 to a recording material (sheet, recording material) 12 is provided facing the four photosensitive drums 1.

10 **[0081]** The developing cartridge 4 of this embodiment uses a contact developing system in which a non-magnetic one-component developer (hereinafter referred to as a toner) is used as a developer and a developing roller 17 as a developer carrying member is in contact with the photosensitive drum 1.

[0082] In the above-described structure, the toner image formed on the
15 photosensitive drum 1 is transferred onto the sheet (paper) 12, and the toner image transferred onto the sheet is fixed. In addition, the drum cartridge 13 is provided with the charging roller 2 for charging the photosensitive drum 1 and the cleaning blade 6 for removing the toner remaining not transferred onto the photosensitive drum 1, as a process means acting on the photosensitive drum 1.

20 The untransferred residual toner remaining on the photosensitive drum 1 not transferred onto the sheet 12 is collected by the cleaning blade 6. In addition, the untransferred residual toner collected by the cleaning blade 6 is accommodated into the removed developer accommodating portion (hereinafter referred to as a waste toner accommodating portion) 14a through the opening 14b
25 (Figure 7). The waste toner container 14a (Figure 7) and the cleaning blade 6 are integrated into a cleaning unit (photosensitive unit, image bearing member unit) 13.

[0083] In addition, the image forming apparatus 100A includes a guide (positioning means) such as a mounting guide and a positioning member (not shown) in the main assembly frame. The developing cartridge 4 and the drum cartridge 13 are guided by these guides and can be mounted to and dismounted
5 from the image forming apparatus main assembly 100A.

[0084] The toners of yellow (Y), magenta (M), cyan (C), and black (K) are accommodated in the developing cartridges 4 for the respective colors.

[0085] The intermediary transfer belt 5 rotates (moves) in the direction of arrow B in Figure 1 in contact with photoconductive drum 1 included in each
10 process cartridge. The intermediary transfer belt 5 is extended around supporting members (driving roller 51, secondary transfer opposing roller 52, driven roller 53). In the inner peripheral side of the intermediary transfer belt 5, four primary transfer rollers 8 as primary transfer means are juxtaposed opposed to the photosensitive drum 1, respectively. In addition, at the position facing the
15 secondary transfer opposed roller 52 on the outer peripheral surface side of the intermediary transfer belt 5, a secondary transfer roller 9 as secondary transfer means is provided.

[0086] During image forming operation, first, the surface of the photosensitive drum 1 is uniformly charged by the charging roller 2. Then, the charged surface
20 of the photosensitive drum 1 is scanned by and exposed to a laser beam corresponding to the image information emitted from a scanner unit 3. By this, an electrostatic latent image corresponding to the image information is formed on the photosensitive drum 1. The electrostatic latent image formed on the photosensitive drum 1 is developed into a toner image (developer image) by the
25 developing roller 17 (Figure 3) of the developing cartridge 4. The toner image formed on the photosensitive drum 1 is transferred (primary transfer) onto the intermediary transfer belt 5 by the function of the primary transfer roller 8.

[0087] For example, in the case of forming full-color images, the above-described process is sequentially performed in the four drum cartridges 13 (13Y, 13M, 13C, 13K) and the developing cartridges 4 (4Y, 4M, 4C, 4K). And, the toner images of the respective colors formed on the photosensitive drums 1 of the drum cartridges 13 are sequentially primarily transferred onto the intermediary transfer belt 5. Thereafter, in synchronization with the movement of the intermediary transfer belt 5, the recording material 12 is fed to the secondary transfer portion. And, the four-color toner images on the intermediary transfer belt 5 are transferred all together onto the recording material 12 fed to the secondary transfer portion, by the intermediary transfer belt 5 and the secondary transfer roller 9.

[0088] The recording material 12 onto which the toner image has been transferred is fed to a fixing device 10 as fixing means. In the fixing device 10, by applying heat and pressure to the recording material 12, the toner image is fixed on the recording material 12. In addition, the primary untransferred residual toner remaining on the photosensitive drum 1 after the primary transferring process is removed by the cleaning blade 6 and collected as waste toner. In addition, the secondary untransferred residual toner remaining on the intermediary transfer belt 5 after the secondary transfer step is removed by the intermediary transfer belt cleaning device 11.

[0089] Here, the image forming apparatus 100 can also form monochromatic or multicolor images using desired single or some (not all) of image forming units.

[Outline of Process Means]

[0090] Referring to Figures 2, 3, 4, and 7, the outline of the drum cartridge 13 and the developing cartridge 4 mountable to the image forming apparatus main assembly 100A of this embodiment will be described.

[0091] Here, the drum cartridge 13Y, the drum cartridge 13M, the drum cartridge 13C and the drum cartridge 13K have the same structures. In addition, the developing cartridge 4Y containing the yellow toner, the developing cartridge 4M containing the magenta toner, the developing cartridge 4C containing the cyan toner and the developing cartridge 4K containing the black toner have the same structures. Therefore, in the explanation below, the drum cartridges 13Y, 13M, 13C, 13K are commonly referred to as a drum cartridge 13, and the developing cartridges 4Y, 4M, 4C, 4K will be commonly referred to as the developing cartridge 4. The components of each cartridge are also generically referred to in the same way.

[0092] Figure 2 is an external perspective view of the drum cartridge 13. Here, as shown in Figure 2, the direction of the rotation axis of the photosensitive drum 1 is Z direction (arrow Z1, arrow Z2), the horizontal direction in Figure 1 is X direction (arrow X1, arrow X2), the vertical direction is Y direction (arrow Y1, arrow Y2).

[0093] The drum cartridge 13 has a cleaning frame 14 as a frame for supporting various elements in the drum cartridge 13. The photosensitive drum 1 is rotatably supported by the cleaning frame 14.

[0094] Here, the photosensitive drum 1 is a rotatable member (image bearing member) constituted to carry an image (toner image, developer image) formed with toner (developer) on its surface.

[0095] Figure 4 is a cross-sectional view of the drum cartridge 13 taken along a plane including the rotation center of the photosensitive drum 1. Here, the side (downstream side in a Z1 direction) at which a coupling member 28 receives the driving force from the image forming apparatus main assembly with respect to the axial direction of the photosensitive drum 1 is called a driving side (rear side) of the drum cartridge 13. On the side opposite the drive side in the axial

direction (downstream side in Z2 direction) is referred to as the non-driving side (front side) of the drum cartridge 13.

[0096] When the drum cartridge 13 is mounted in the apparatus main assembly, the driving side of the drum cartridge 13 is on the downstream side in the cartridge mounting direction, and the non-driving side is on the upstream side in the mounting direction. In other words, in a state in which the drum cartridge 13 is disposed inside the apparatus main assembly, the driving side of the drum cartridge 13 is on the rear side of the printer, and the non-driving side of the drum cartridge 13 is in the front side of the printer.

[0097] Here, the axial direction of the photosensitive drum 1 is a direction parallel to the axis (rotation axis) of the photosensitive drum 1. The axis of the photosensitive drum 1 is an imaginary straight line extending so as to pass through the rotation center of the photosensitive drum 1, and in Figure 4, it is a broken line passing through the center of the photosensitive drum 1. At the end opposite to the coupling member 28 (the end on the non-driving side of the process cartridge), an electrode (electrode portion) contacting the inner surface of the photosensitive drum 1 is provided, and this electrode functions as a ground by contacting the image forming apparatus main assembly.

[0098] A coupling member 28 is mounted to one end of the photosensitive drum 1 and a non-driving side flange member 29 is mounted to the other end of the photosensitive drum 1, thereby forming a photosensitive drum unit (also simply referred to as a drum unit) 30. The photosensitive drum unit 30 obtains the driving force from the main assembly driving shaft 101 provided in the image forming apparatus main assembly 100A by way of the coupling member 28.

[0099] The coupling member 28 is a flange member (driving side flange member) mounted to the driving side end portion of the photosensitive drum 1. The coupling member 28 can be engaged with the main assembly driving shaft

101 as the cartridge 7 is mounted to the apparatus main assembly 100A. The coupling member 28 can be dismounted from the main assembly driving shaft 101 as the cartridge 7 is removed from the apparatus main assembly 100A.

[0100] Here, the photosensitive drum 1, the coupling member 28 and the non-driving side flange member 29 provided in the drum unit 30 are coaxially arranged. These axes of rotation (axes) are the same as the axis of rotation of the drum unit 30. Therefore, the axis and the axial direction of the drum unit 30 are the same as the axes and the axial directions of the photosensitive drum 1, the coupling member 28, and the non-driving side flange member 29.

[0101] As shown in Figure 4, the Z1 side of the coupling member 28 has a cylindrical shape (cylindrical portion 71). The portion, on the Z1 side, of the cylindrical portion 71 is the supported portion 71c. The supported portion 71c is rotatably supported by a drum unit bearing member 39R. That is, the bearing portion 71c is supported by the bearing portion of the drum unit bearing member 39R, by which the photosensitive drum unit 30 is rotatably supported.

[0102] Similarly, the non-driving side flange member 29 provided on the non-driving side of the photosensitive drum unit 30 is rotatably supported by the bearing portion of the drum unit bearing member 39L. The non-driving side flange member 29 has a cylindrical portion (cylindrical portion) projecting from the end portion of the photosensitive drum 1, and an outer peripheral surface 29a of the cylindrical portion is rotatably supported by the drum unit bearing member 39L. The outer peripheral surface 29a is a non-driven side supported portion.

[0103] Here, the drum unit bearing member 39R is disposed on the drive side of the drum cartridge 13, and the drum unit bearing member 39L is disposed on the non-driving side of the drum cartridge 13.

[0104] When the drum cartridge 13 is mounted to the apparatus main

assembly 100A, the drum unit bearing member 39R abuts to a rear side cartridge positioning portion 108 provided in the image forming apparatus main assembly 100A, as shown in Figure 4. In addition, the drum unit bearing member 39L abuts against the front side cartridge positioning portion 110 of the image forming apparatus main assembly 100A. By this, the cartridge 7 is positioned in the image forming apparatus 100A.

[0105] In the Z direction of this example, the position where the drum unit bearing member 39R supports the supported portion 71c is placed at a position close to the position where the drum unit bearing member 39R is positioned at the rear side cartridge positioning portion 108. By doing so, it is possible to suppress inclination of the coupling member 28 when the drum cartridge 13 is mounted in the apparatus main assembly 100A.

[0106] A bearing receiving portion 71c is disposed so that the position where the bearing member 39R supports the supported portion 71c and the position where the bearing member 39R is positioned at the rear side cartridge positioning portion 108 can be brought close to each other. That is, the bearings 71c are arranged on the free end side (the Z1 direction side) of the outer peripheral surface 71a of the cylindrical portion 71 provided on the coupling member 28.

[0107] Similarly, in the Z direction, the position at which the drum unit bearing member 39L rotatably supports the non-driving side flange member 29 is made close to the position at which the drum unit bearing member 39L is positioned at the front side cartridge positioning portion 110. By this, the tilting of the non-driving side flange member 29 is suppressed.

[0108] Drum unit bearing members 39R and 39L are mounted at both sides of the cleaning frame 14, respectively to support the photosensitive drum unit 30. By this, the photosensitive drum unit 30 is rotatably supported by the cleaning frame 14.

[0109] In addition, a charging roller 2 and a cleaning blade 6 are mounted in the cleaning frame 14, and they are arranged so as to be in contact with the surface of the photosensitive drum 1. In addition, the charging roller bearing 15 (15R, 15L) (Figure 7) is mounted in the cleaning frame 14. The charging roller bearing 15 is a bearing for supporting a shaft of the charging roller 2.

[0110] Figure 7 is a sectional view of the drum cartridge 13 and the developing cartridge 4.

[0111] Here, the charging roller bearing 15 (15R, 15L) is mounted so as to be movable in the direction of the arrow C in Figure 7. The rotating shaft 2a of the charging roller 2 is rotatably mounted to the charging roller bearing 15 (15R, 15L). And, the charging roller bearing 15 is urged toward the photosensitive drum 1 by the pressing spring 16 as urging means. By this, the charging roller 2 contacts the photosensitive drum 1 and is rotationally driven by the photosensitive drum 1.

[0112] The cleaning frame 14 is provided with a cleaning blade 6 as a cleaning means for removing the toner remaining on the surface of the photosensitive drum 1. The cleaning blade 6 integrally includes a blade-like rubber (elastic member) 6a which contacts the photosensitive drum 1 to remove toner on the photosensitive drum 1 and a supporting metal plate 6b which supports the blade-like rubber (elastic member) 6a. In this example, the supporting sheet metal 6b is fixed to the cleaning frame 14 with screws.

[0113] As described in the foregoing, the cleaning frame 14 is provided with an opening 14b for collecting the untransferred residual toner recovered by the cleaning blade 6. In the opening 14b, a blowout prevention sheet 26 which is in contact with the photosensitive drum 1 and seals between the photosensitive drum 1 and the opening 14b is provided, thereby preventing leakage of toner upward of the opening 14b.

[0114] Figure 3 is an external perspective view of the developing cartridge 4.

- [0115]** The developing cartridge 4 includes a developing frame 18 for supporting various elements. The developing cartridge 4 is provided with a developing roller 17 as a developer carrying member which contacts the photosensitive drum 1 and rotates in the direction of the arrow D (counterclockwise direction) shown in Figure 7. The developing roller 17 is a rotating member (developing member) for carrying the developer to be supplied to the photosensitive drum 1 on the surface thereof. The latent image on the photosensitive drum 1 is developed with the toner supplied from the developing roller 17 to the photosensitive drum 1.
- [0116]** The developing roller 17 is rotatably supported in the developing frame 18 by the development bearings 19 (19R, 19L) at the respective end portions in the longitudinal direction (rotational axis direction) thereof. Here, the development bearing 19 (19R, 19L) is mounted to each side portion of the developing frame 18.
- [0117]** In addition, as shown in Figure 7, the developing cartridge 4 includes a developer accommodating chamber (hereinafter referred to as a toner accommodating chamber) 18a and a developing chamber 18b in which the developing roller 17 is provided.
- [0118]** In the developing chamber 18b, there are provided a toner supply roller 20 as a developer supply member which contacts the developing roller 17 and rotates in a direction of an arrow E, a developing blade 21 functioning as a developer regulating member for regulating the toner layer of the developing roller 17.
- [0119]** The supply roller (supply member) 20 is also a rotatable member rotating, and on the surface thereof, a developer (toner) is carried, similarly to the developing roller, it is a developer carrying member. The toner carried on the

surface of the supply roller 20 is supplied to the developing roller 17.

[0120] The developing blade 21 is integrally fixed to the fixing member 22 by welding or the like.

[0121] In addition, in the toner accommodating chamber 18a of the
 5 developing frame 18, there is provided a stirring member 23 for stirring the contained toner and for transporting the toner to the toner supply roller 20.

[0122] As described above, by employing a structure in which the elements relating to image formation are integrated in the drum cartridge 13 and the developing cartridge 4 dismountably mountable to the apparatus main assembly
 10 maintenance easiness is improved. In other words, maintenance of the apparatus can be easily carried out by the user dismounting the drum cartridge 13 and the developing cartridge 4 from and to the apparatus main assembly 100A. Therefore, it is possible to provide a device that can easily perform maintenance not by a serviceman but by a user.

[0123] Here, in this example, the drum cartridge 13 and the developing
 15 cartridge 4 are independently mounted to the apparatus main assembly A. However, the drum cartridge 13 and the developing cartridge 4 for forming images of the same color may be constituted as one unit. In this case, the unitized cartridge (process cartridge) is mounted and dismounted relative to the
 20 main assembly of the apparatus.

[Structure of main assembly driving shaft]

[0124] Referring to Figures 5, 6, 8, 9, and 10, the structure of the main assembly driving shaft 101 will be described.

[0125] Figure 5 is an external view of the main assembly driving shaft.

[0126] Figure 6 is a cross-sectional view taken along the rotation axis (rotation
 25 axis) of the main assembly driving shaft 101 mounted to the image forming apparatus main assembly.

[0127] Figure 8 is a cross-sectional view of the coupling 28 and the main assembly driving shaft 101 taken along the rotation axis (rotation axis).

[0128] Figure 9 is a cross-sectional view of the coupling member 28 and the main assembly driving shaft 101 taken along a plane perpendicular to the rotation axis.

[0129] Figure 10 is a cross-sectional view of the coupling 28 and the main assembly driving shaft 101 taken along the rotation axis.

[0130] As shown in Figure 5, the main assembly driving shaft 101 has a gear portion 101e, a shaft portion 101f, a rough guide portion 101g and a supported portion 101d.

[0131] The image forming apparatus main assembly 100A is provided with a motor (not shown) as a drive source. The gear portion 101e receives rotation drive from this motor, by which the main assembly driving shaft 101 rotates. In addition, the main assembly driving shaft 101 is provided with a rotatable projecting shaft portion 101f projecting toward the cartridge side from the gear portion 101e along the rotation axis thereof. And, the rotational driving force received from the motor is transmitted from the coupling member 28 to the photosensitive drum 1 of the drum cartridge 13 by way of the groove-shaped driving transmission groove 101a (recess portion, drive passing portion) provided in the shaft portion 101f. In addition, the shaft portion 101f has a semispherical shape 101c at its free end.

[0132] The main assembly drive transmission groove 101a has a shape such that a portion of an engagement portion 73 which will be described hereinafter can enter. More specifically, it has a main assembly drive transmission surface 101b as a surface which can be contacted by the drive receiving surface (drive receiving portion) 73a of the coupling member 28 to transmit the driving force.

[0133] In addition, as shown in Figure 5, the main assembly drive

transmission surface 101b is not a flat surface, but has a shape twisted around the rotation axis of the main assembly driving shaft 101. The torsional direction is the direction that the downstream side of the main assembly driving shaft 101 in a Z1 direction is in the upstream side in the rotational direction of the main assembly driving shaft 101, relative to the downstream side in the Z2 direction. In this embodiment, the amount of twisting is about 1 ° per 1 mm measured along the rotational axis direction of the cylinder of the engaging portion 73. The reason why the main assembly drive transmission surface 101b is formed to have a twisted shape will be described later.

10 **[0134]** On the surface on the downstream side in the Z2 direction of the main drive transmission groove 101a, a main assembly side removing taper 101i is provided. The main assembly side removing taper 101i is a taper (inclined surface, inclined portion) for helping the engagement portion 73 to be pulled out from the drive transmission groove 101a when dismounting the drum cartridge 13
15 from the apparatus main assembly 100A. Details will be described later.

[0135] Here, it is preferable that when the drive is transmitted from the drive transmission groove 101a to the engagement portion 73, the main assembly drive transmission surface 101b and the drive receiving surface (drive receiving portion) 73a assuredly abut to each other. Therefore, the main assembly drive
20 transmission groove 101a is spaced by a gap (G) from the engaging portion 73 in the rotational axis direction, the circumferential direction, and the radial direction so that the surface other than the main assembly drive transmission surface 101b does not contact with the engaging portion 73 as the driving force receiving portion (Figures 9 and 10).

25 **[0136]** In addition, a main assembly side removing taper 101i as an inclined surface (inclined portion) is provided on the free end side in the axial direction of the main assembly drive transmission groove 101a. In addition, the center 101h

of the semispherical shape 101c is within the range of the main assembly drive transmission groove 101a in the axial direction of the main assembly driving shaft 101 (Figure 8). In other words, when projecting the center 101h and the main assembly drive transmission groove 101a on the axis of the main assembly driving shaft 101, the projection region of the center 101h is inside the projection region of the main assembly drive transmission groove 101a on the axis.

[0137] The rough guide portion 101g is provided between the shaft portion 101f and the gear portion 101e (Figure 6), in the axial direction. The rough guide portion 101g has a tapered shape at the free end on the shaft portion 101f side, and the outer diameter D6 of the rough guide portion 101g is smaller than the inner diameter D2 of the inner peripheral surface 71b of the cylindrical portion 71 of the coupling member 28 which will be described hereinafter, as shown in Figure 8. As shown in Figure 5, the outer diameter D6 of the rough guide portion 101g is larger than the outer diameter D5 of the shaft portion 101f. By this when the cartridge 7 is inserted into the image forming apparatus main assembly 100A, the main assembly driving shaft 101 can be guided so as to follow the coupling member 28, thereby reducing misalignment between the rotation center of the cylindrical portion 71 and the rotation center of the shaft portion 101f. Therefore, the rough guide portion 101g can be referred to as an insertion guide.

[0138] Here, the rough guide portion 101g is dimensioned so as not to come into contact with the inner peripheral surface 71b after the cartridge 7 is mounted in the image forming apparatus main assembly 100A.

[0139] As shown in Figure 6, the supported portion 101d is disposed on the opposite side of the rough guide portion 101g across the gear portion 101e. And, the supported portion 101d is rotatably supported (axially supported) by the bearing member 102 provided in the image forming apparatus main assembly

100A.

[0140] As shown in Figure 6, the main assembly driving shaft 101 is urged toward the drum cartridge 13 by the spring member 103 of the image forming apparatus main assembly 100A. However, the movable amount (play) of the main assembly driving shaft 101 in the Z direction is about 1 mm, which is sufficiently smaller than the width measured in the Z direction of the drive receiving surface 73a which will be described hereinafter.

[0141] As described above, a main assembly drive transmission groove 101a is provided in the main assembly driving shaft 101, and an engaging portion 73 is provided on the coupling member 28 so that the drive is transmitted from the apparatus main assembly 100A to the drum cartridge 13 (drum unit 30).

[0142] As will be described in detail hereinafter, the engaging portion 73 is provided at the free end of a support portion 74 which can be elastically deformed. Therefore, the engaging portion 73 is constituted to be movable radially outward when the drum cartridge 13 is mounted on the apparatus main assembly 100A. By this, along with inserting the drum cartridge 13 into the main assembly 100A of the apparatus, the engagement portion 73 enters the drive transmission groove 101a so that the engagement portion 73 and the main assembly drive transmission groove 101a can engage with each other.

[Structure of Coupling Member]

[0143] Referring to Figures 11 to 19, the structure of a coupling member 28 will be described.

[0144] Figure 11 is a perspective view of a flange member 70.

[0145] Figure 12 is a view of the flange member 70 as viewed from a Z1 side toward a Z2 side.

[0146] Figure 13 is a cross-sectional perspective view of the flange member 70.

[0147] Figure 14 is a cross-sectional view of the flange member 70 taken along a rotation axis (the center of the rotation axis).

[0148] Figure 15 is a cross-sectional view of a coupling member 28 and the main assembly driving shaft 101 taken along a plane perpendicular to the rotation axis so as to pass through a drive transmission surface 73a.

[0149] Figure 16 is a cross-sectional view of the coupling member 28 taken along the rotation axis (center of rotation axis).

[0150] Figure 17 is a cross-sectional view illustrating a molding die of the flange member 70.

[0151] Figure 18 is a perspective view of an aligning member 33.

[0152] Figure 19 is a view illustrating a method of assembling the coupling member 28.

[0153] As shown in Figure 16, the coupling member 28 comprises the flange member 70 and the aligning member 33.

[0154] (Flange Member)

Referring to Figures 4, 9, 11, 12, 13, 14, 15, 17, the structure of the flange member 70 will be described.

[0155] As shown in Figure 13, the flange member 70 includes a mounting portion (fixing portion) 72, a cylindrical portion 71, a flange portion 75, an engagement portion 73, a support portion 74, and a force receiving portion 77.

[0156] The mounting portion 72 is a portion for mounting to the photosensitive drum 1. As shown in Figure 11, the mounting portion 72 includes a press-fitting portion 72d press-fitted to the inner diameter of the cylinder of the photosensitive drum 1, a clamp groove 72e, and a press-fit guide portion 72f provided on the back side (the Z2 direction side) of the press-fitting portion 72d.

[0157] The press-fitting portion 72d as a joining portion is press-fitted into the

photosensitive drum 1, and press-fitted to the photosensitive drum 1, by which the coupling member 28 is fixed to the photosensitive drum 1. More specifically, the cylinder inner diameter of the photosensitive drum 1 and the outer shape of the press-fitting portion 72d are dimensioned so as to be in a press fitting relationship. Here, the above-described relationship is not restrictive in the case of increasing the fastening force by clamping or of fixing the inside diameter portion of the cylinder and the press-fitting portion 72d by adhesion.

5 [0158] As shown in Figures 11 and 12, the clamp groove 72e has a groove shape (a recessed portion) provided on the photosensitive drum 1 side of the press-fitting portion 72d in the Z axis direction. The two clamp grooves 72e are equidistantly arranged around the rotation axis of the coupling member 28.

Here, in the rotation axis direction of the coupling member 28, the clamp groove 72e and the flange portion 75 overlap with each other. In other words, when the clamp groove 72e and the flange portion 75 are projected perpendicularly onto the rotation axis of the coupling member 28, the projection area of the clamp groove 72e and the projection area of the flange portion 75 overlap with each other on the axis.

15 [0159] Here, "X and Y overlap each other in an A direction" means that "when X and Y are projected onto an imaginary line parallel with the direction A, at least a part of the projection area of X and at least a part of the projection area of Y on the imaginary line overlap with each other". By clamping it to a portion of the end of the photosensitive member 1 on the side of the coupling member 28, the photosensitive drum 1 is plastically deformed. By this, a portion of the photosensitive member is inserted into the clamp groove 72e, and the photosensitive drum 1 and the coupling member 28 are firmly fixed with each other. Here, clamping is an operation of plastic-working to join a portion or portions of a plurality of parts. In this embodiment, plastically deforming a

portion of the cylinder (aluminum) of the photosensitive drum 1 is elastically deformed, so that the cylinder of the photosensitive drum 1 is coupled to the coupling member 28. In this embodiment, as an example of a means for firmly fixing the coupling member 28 to the photosensitive drum 1, a structure using the clamp groove 72e is used, but another fixing means such as fixing the cylinder inner diameter portion and the press-fitting portion 72d by adhesion can be used. Therefore, the clamp groove 72e is not essential in the present invention.

[0160] The press-fit guide portion 72f has such a shape that when assembling the coupling member 28 to the photosensitive drum 1, it is easy to assemble the coupling member 28 to the photosensitive drum 1, and the press-fitting of the press-fitting portion 72d into the photosensitive drum 1 is stabilized. More specifically, the outer diameter of the press-fit guide portion 72f is smaller than the outer diameter of the press-fitting portion 72d and the cylinder inner diameter of the photosensitive drum 1, and it is provided with a guide taper 72g on a leading end side in the mounting direction to the photosensitive drum 1. The guide taper 72g is an inclined portion provided on the coupling member 28 in order to facilitate the insertion of the coupling member 28 into the photosensitive drum 1.

[0161] The cylindrical portion 71 has a bearing receiving portion 71c as described above (Figures 4 and 11). The supported portion 71c is rotatably supported by the drum unit bearing member 39R. As shown in Figure 13, the inner diameter D2 of the inner peripheral surface 71b of the cylindrical portion 71 is smaller than the inner diameter D9 of the inner peripheral surface 72m of the mounting portion 72. In addition, as shown in Figures 13 and 14, the inner peripheral surface 71b of the cylindrical portion 71 is provided with a tapered shape at the front end (Z1 direction) free end. This tapered shape is an inclined portion (inclined surface) for guiding the main assembly driving shaft 101 being

inserted into the cylindrical portion 71. The main driving shaft 101 can be guided so as to follow the coupling member 28 so as to reduce the axial misalignment between the rotation center of the cylindrical portion 71 and the rotation center of the shaft portion 101f when the drum cartridge 13 is being
 5 inserted into the image forming apparatus main assembly 100A. In addition, as shown in Figure 8, the inner diameter D2 of the inner peripheral surface 71b is larger than the outer diameter D6 of the shaft portion 101f of the main assembly driving shaft 101. Therefore, after the drum cartridge 13 is mounted on the image forming apparatus main assembly 100A, the inner peripheral surface 71b
 10 does not contact the rough guide portion 101g.

[0162] As shown in Figure 14, the flange portion 75 has a shape projecting outward from the press-fitting portion 72d in the radial direction. The shape thereof is a shape for determining the positions of the photosensitive drum 1 and the coupling member 28 in the Z direction, by the end surface of the
 15 photosensitive drum 1 abutting against the end surface 75b of the flange portion 75, when assembling the coupling member 28 to the photosensitive drum 1.

[0163] As shown in Figure 12, the engaging portion 73 projects at least inward in the radial direction of the coupling member 28 in order to engage with the main assembly driving shaft 101. The engaging portions 73 are arranged at
 20 three positions (120 ° intervals, substantially equally spaced) at equal intervals in the circumferential direction of the coupling member 28. Similarly, three base portions 74 of the support portion are also arranged at equal intervals in the circumferential direction of the flange member 70. In addition, as shown in Figure 12, the engaging portion 73 has a drive receiving surface 73a. The base
 25 74 is provided with a backed-up surface 74i and a contact surface 74h.

[0164] The drive receiving surface 73a is a driving force receiving portion for receiving the driving force from the main assembly driving shaft 101 by

contacting with the driving transmission groove 101a. The flange member 70 is a driving force receiving member for receiving the driving force by way of the drive receiving surface 73a.

[0165] The contact surface 74h provided on the base portion 74 of the support portion is a curved surface where the coupling member 28 abuts against the shaft portion 101f when engaged with the main assembly driving shaft 101, and is a circular arc surface having a shape following the shape, in the circumferential direction (rotational direction), of the coupling member 28. As shown in Figure 9, the radius R1 of the arc defining the inner diameter of the contact surface 74h is substantially the same as the radius R2 of the shaft portion 101f. The backed-up surface 74i contacts with the backup surface 33t of the backup portion 33j of the aligning member 33 which will be described hereinafter, and it is disposed on the downstream side of the drive receiving surface 73a with respect to the rotational direction (shown in Figure 12). In addition, as shown in Figure 15, the angle J formed by the backed-up surface 74i and the drive receiving surface 73a is an acute angle. That is, the drive receiving surface 73a is inclined with respect to the backup surface 33t of the backup portion 33j.

[0166] The drive receiving surface (driving force receiving portion) 73a is movably supported by the supporting portions (73, 74). The supporting portion (73, 74) has a U-shaped snap fit portion.

[0167] A cylindrical member 70 constituting the coupling member 28 has a cylindrical shape (hollow shape). That is, the cylindrical member 70 has a hollow portion (a portion including a cavity inside) of the coupling member 28. The base portion 74 of the support portion (73, 74) includes a base portion 74a which is a fixed end, and the base portion 74a is fixed to the inner surface of the cylinder 70.

[0168] At least a portion of the supporting portion (73, 74) is arranged inside

the cylindrical member 70. In this embodiment, the entire support portion (73, 74) is arranged inside the cylindrical member 70.

[0169] As shown in Figure 13, 14, and the base portion 74 extends from the inner surface of the hollow portion (the cylindrical member 70) of the coupling member 28 with the base portion (fixed end) 74a of the base portion 74 as a starting point. In addition, the base portion 74 is provided with an elastically deformable portion (elastic deformed portion). By this, the base portion 74 movably supports an engaging portion 73 provided at the free end (free end) of the base portion 74.

[0170] More particularly, the base portion 74 includes a base side extending portion (a fixed end side extending portion) 74t, a folded portion (a bent portion, a connecting portion) 74r, and a free end side extending portion (a leading side extending portion) 74s. Backup surface 74i and contact surface 74h are provided on the free end side extending portion 74s.

[0171] The base side extending portion 74t is an extending portion extending from the base portion (fixed end) 74a in the Z2 direction (that is, toward the inside of the drum unit 30 in the axial direction) substantially parallel with the rotation axis of the flange member 70. That is, the base side extending portion 74t extends in the Z2 direction toward the folded portion 74r.

[0172] The base side extending portion 74t is disposed radially outward with respect to the engaging portion 73 and the free end side extending portion 74s.

[0173] The folded portion 74r is continuously formed with the base side extending portion 74t and also continues to the free end side extending portion 74s. That is, the folded portion 74s is a bent portion provided between the root side extending portion 74t and the free end side extending portion 74s. The folded portion 74s is a connecting portion for connecting the free end side extending portion 74s and the root side extending portion 74t. In this

embodiment, the angle at which the folded portion 74r bends is larger than 90 °. More specifically, the angle was about 180 °.

[0174] The folded-back portion 74r and the base side extending portion 74t are elastic portions that can be elastically deformed.

5 **[0175]** The free end side extending portion 74s extends from the folded portion 74r as a starting point in the Z1 direction (that is, the outer side of the drum unit 30 in the axial direction) substantially parallel with the rotation axis of the flange member 70. The free end side extending portion 74s is disposed radially inward with respect to the base side extending portion 74t.

10 **[0176]** By bending the integrally formed base portion 74, the free end extending portion 74s and the base side extending portion 74t are formed. With such a structure, it is possible to simplify the structure of the support portions (73, 74).

[0177] However, it is possible that the connecting portion, the base side
15 extending portion 74t, and the free end side extending portion 74s are formed as separate bodies (separate members), and the base side extending portion 74t and the free end side extending portion 74s are connected to the connecting member.

[0178] The free end side extending portion 74s is also a portion for supporting the drive receiving surface 73a. That is, the free end side extending portion 74s
20 has an engaging portion (projecting portion, protruding portion) 73 on which the drive receiving surface 73a is formed.

[0179] The engaging portion 73 is a projecting portion provided at the free end of the free end side extending portion 74s and projects inward in the radial direction. That is, the direction (axial direction) in which the free end side
25 extending portion 74s extends and the direction (radial direction) in which the engaging portion 73 projects intersect with each other. The engagement portion 73 enters the inside of the main assembly drive transmission groove 101a and

engages with the main assembly drive transmission groove 101a.

[0180] The structure is such that at least parts of the base side extending portion 74t and the free end side extending portion 74s overlaps with each other in the axial direction of the drum unit 30. That is, the structure is such that
5 when the base side extending portion 74t and the free end side extending portion 74s are perpendicularly projected on the axis line of the drum unit 30, the projected areas of them at least partially overlap with each other.

[0181] The drive receiving surface 73a provided in the engaging portion 73 intersects the rotational direction (circumferential direction) of the coupling
10 member 28. In addition, the drive receiving surface 73a is also a surface extending radially inward from the free end side extending portion 74s.

[0182] Here, in this embodiment, the base side extending portion 74t and the free end side extending portion 74s are straight portions extending parallel to the axial direction. However, the present invention is not necessarily limited to
15 such a structure.

[0183] That is, it will suffice for each extending portion (74t, 74s) to extend at least in the axial direction. In other words, a vector extended in a direction in which each extending portion (74t, 74s) extends may have a component in the axial direction. As an example thereof, Figure 64 and Figure 65 show
20 modification examples of this embodiment. As shown in these Figures, the base side extending portion 74t may extend in the Z2 direction with inclination relative to relative to the axial direction. In addition, as shown in Figure 64 and Figure 65, the free end side extending portion 74s may also extend in the Z1 direction with the inclination relative to the axial direction. Even in such a case, the base
25 side extending portion 74t and the free end side extending portion 74s are considered to extend at least in the axial direction. The base side extending portion 74t and the free end side extending portion 74s are regarded as extending

in different directions along the axial direction.

[0184] In addition, as long as the base side extending portion 74t and the free end side extending portion 74s extend at least in the axial direction, they do not have to extend linearly.

5 The free end of the engaging portion 73 (that is, the free end of the free end side extending portion 74s) is disposed closer to the Z1 side than the folded portion 74r. In addition, the root (fixed end) 74a of the base portion 74 is also disposed on the Z1 side of the folded portion 74r.

 The inner side surface of the base side extending portion 74t is
10 arranged to be the same as the diameter of the inner peripheral surface 71b of the cylindrical portion 71 or to project toward the inner diameter side.

[0185] The engaging portion 73 is supported by an elastically deformable base portion 74, it can move radially of the coupling member 28 by deformation of the base portion 74. In other words, the base portion 74 is deformed when subjected
15 to an external force, and a restoring force (elastic force) is produced in a direction returning to a position in the spontaneous state.

[0186] The base side extending portion 74t is deformed so as to be inclined with the root 74a being as a starting point. The folded portion 74r is deformed so as to incline the free end side extending portion 74s. As a result, the
20 engaging portion 73 can be moved in a direction crossing with the direction in which each extending portion (74t, 74s) extends.

[0187] More specifically, when the engaging portion 73 contacts the outer peripheral surface of the main assembly driving shaft 101, it moves radially outwardly along the outer peripheral surface of the main assembly driving shaft
25 101 by elastic deformation of the base 74. Thereafter, when the engaging portion 73 becomes at the same position (same phase) as the main assembly side drive transmission groove 101a provided on the outer peripheral surface of the

main assembly driving shaft 101, the engaging portion 73 moves in a direction in which the elastic deformation of the base portion 74 is freed. Then, the engaging portion 73 moves inward in the radial direction and therefore, a portion of the engagement portion 73 can enter the main assembly drive transmission
 5 groove 101a.

[0188] In addition, the drive receiving surface 73a of the flange member 70 has a shape twisted about the axis of the flange member 70, and in this embodiment, the amount of twisting is the same as that of the main assembly drive transmission surface 101b.
 10 **[0189]** Here, it will suffice if the drive receiving surface 73a has a different phase, in the rotational direction, of two points contacting the driving shaft 101. That is, the drive receiving surface 73a may not necessarily have a twisted shape as long as it has the same function as the twisted surface.

[0190] For example, it will suffice if an outside of the drive receiving surface
 15 73a (z1 direction side) is disposed on the upstream side of the inner side (the Z2 direction side) with respect to the rotational direction of the photosensitive drum 1. In other words, the structure is such that a straight line connecting the cylinder inner end portion and the cylinder outer end portion along the cylinder axial direction of the engaging portion 73 as the driving force receiving portion
 20 intersects the rotation axis of the cylinder. The drive receiving surface 73a is inclined relative to the axis of the coupling member 28.

[0191] As described above, the drive receiving surface 73a has a twisted shape or an inclined shape, and therefore, when the drive receiving surface 73a is driven, the photosensitive drum unit 30 receives such a force that it is pulled in toward
 25 the bearing portion 101d of the main assembly driving shaft 101.

[0192] As shown in Figure 14, the engaging portion 73 is provided with an insertion tapered surface 73d as a mounting force receiving portion on the outer

side (the Z1 direction side) of the photosensitive drum unit 30 in the Z direction. In addition, the engaging portion 73 is provided with a removing tapered surface 73e as a removal force receiving portion on the inner side (the Z2 direction side) of the photosensitive drum unit 30 in the Z direction. By this, the mounting and
 5 dismounting properties of the coupling member 28 relative to the main driving shaft 101 can be improved.

[0193] At the time of mounting, the insertion tapered surface 73d abuts against the semispherical shape 101c, and the engaging portion 73 is moved toward the outside in the radial direction of the driving shaft. In addition, in the
 10 dismounting operation, the removing tapered surface 73e and the main assembly side removing taper 101i are brought into contact with each other, and the engaging portion 73 is moved outward in the radial direction of the main assembly driving shaft 101.

[0194] In addition, as shown in Figure 14, the length L2 of the drive receiving
 15 surface 73 is selected so as to satisfy the relationship of $L1 > L2$, in the Z direction, relative to the distance L1 from the front end surface of the cylindrical portion 71 to the front end surface of the engaging portion 73.

[0195] As shown in Figure 15, the force receiving portion 77 is disposed on the downstream side in the rotational direction of the engaging portion 73, and is
 20 provided with a receiving surface 77a and a rib 77e. The backup portion 33j of the aligning member 33 which will be described hereinafter is sandwiched between the backed-up surface 74i provided on the free end extended portion 74s and the receiving surface 77a. The receiving surface 77a and the drive receiving surface 73 are arranged substantially in parallel with each other. As shown in
 25 Figure 15, the rib 77e is arranged starting from the inner diameter side end of the receiving surface 77a so that it abuts against the inner peripheral surface 72m of the mounting portion 72 substantially perpendicularly to the receiving surface 77a.

[0196] Here, at least parts of the support portions (73, 74) and the drive receiving surface 73a are arranged inside the supported portion 71c in the axial direction of the drum unit 30. Therefore, the support portions (73, 74) and the drive receiving surface 73a can be protected by the supported portion 71c and the bearing member 19R. In particular, in this embodiment, the entirety of the support portions (73, 74) and the drive receiving surface 73a is arranged inside the supported portion 71c in the axial direction of the drum unit 30.

[0197] Furthermore, at least a portion of the supporting portion (73, 74) is placed in the internal space of the photosensitive drum 1. That is, at least a portion of the support portion (73, 74) is located inside the end portion of the photosensitive drum 1 in the axial direction. In other words, when the supporting portion (73, 74) and photosensitive drum 1 are projected perpendicularly to the axis of photosensitive drum 1, at least a part of the projection area of the support portion (73, 74) and the projection area of the photosensitive drum 1 overlap with each other. In addition, at least a part of the supporting portions (73, 74) is also placed inside the photosensitive drum 1 also in the radial direction of the drum unit.

[0198] Similarly, at least a part of the driving force receiving portion (drive receiving surface 73a) is placed inside the photosensitive drum 1. Therefore, when the drive receiving surface 73a and the photosensitive drum 1 are projected perpendicular to the axis of the photosensitive drum 1, at least parts of the projection area of the drive receiving surface 73a and the projection area of the photosensitive drum 1 overlap with each other.

[0199] If at least a part of the supporting portions (73, 74) and at least a part of the drive receiving surface 73a are placed inside the photosensitive drum 1, it is possible to protect the support portions (73, 74) and the drive receiving surface 73a by the photosensitive drum 1.

[0200] In particular, in this embodiment, the entirety of the supporting portions (73, 74) and the whole of the drive receiving surface 73a are placed inside the photosensitive drum 1.

[0201] In addition, by place in the base portion 74a which is the fixed end of the support portion (73, 74), inside the photosensitive drum 1, the following advantageous effects are provided. The base portion 74a is disposed inside the photosensitive drum 1, so that the flange member 70 (the coupling member 28) is covered with the photosensitive drum 1 around the base portion 74a and fixed to the photosensitive drum 1. The photosensitive drum 1 has a high rigidity, and therefore, the portion covered with the photosensitive drum 1 of the flange member 70 is hardly deformed.

[0202] The support portions (73, 74) can be elastically deformed with the base portion 74a as a starting point, but even if the support portion (73, 74) is elastically deformed, it is possible to suppress the influence of the deformation to the outside of the base portion 74a by the photosensitive drum 1.

[0203] If the deformation of the flange member 70 is suppressed, the borne portion 71c of the flange member 70 can be stably supported by the bearing member 39R. In addition, the supporting portion (73, 74) is supported by the portion which is difficult to deform of the flange member 70. As a result, the driving force receiving portion (the drive receiving surface 73a) provided in the supporting portions (73, 74) can receive the driving force from the main assembly driving shaft 101 in a stable manner.

[0204] By providing the drive receiving surface 73a inside the photosensitive drum 1, the main assembly driving shaft 101 can be made longer. The main assembly driving shaft 101 is supported by the main assembly of the device at the fixed end (bearing portion 101d), and is supported by the drum unit at its free end (the shaft portion 101f). Then, the longer the distance between the bearing

portion 101d and the shaft portion 101f, the smaller the inclination of the main assembly driving shaft 101 with respect to the drum unit. That is, when the cartridge 7 is mounted in the apparatus main assembly, it is easy to maintain the main assembly driving shaft 101 and the drum unit parallel.

- 5 **[0205]** By placing the drive receiving surface 73a inside the photosensitive drum 1, the shaft portion 101f can be inserted into the photosensitive drum 1 and the shaft portion 101f can be supported inside the photosensitive drum 1. With this structure, it is easy to assure the length of the main assembly driving shaft 101 (the distance between the supported portion 101d and the shaft portion 101f) while suppressing the increase in size of the apparatus main assembly.

(Manufacturing Method)

[0206] The flange member 70 of this embodiment is manufactured by injection molding (insert molding) using a mold.

- [0207]** Referring to Figure 17, the structure of a mold used for forming the
15 flange member 70 will be described.

[0208] The flange member 70 has a shape in which the flange portion 75 projects outward in the radial direction. In the case of molding such a shape, it is preferable that it is a metal mold as shown in Figure 17.

- [0209]** More specifically, as shown in the drawing, the metal mold has a two-
20 piece structure including a left mold (cylindrical mold 60) and a right mold (mounting portion mold 61). By combining the left and right molds, a space portion (mold cavity, hollow part) having the same shape as the molded portion is defined. The material is poured into this space and solidified in the mold, so that the flange member 70 is formed. The mold has a mold parting portion 62 (a
25 surface for separating the molds, a surface for combining the molds) which is a portion where the right and left molds are fitted in the neighborhood of the space forming the flange portion 75. And, the cylindrical mold 60 has a space for

molding the outer periphery of the cylindrical portion 71. Similarly, the mounting portion side mold 61 has a space for molding the mounting portion 72.

[0210] In the case of forming the flange member 70 using such a metal mold, from the standpoint of mass productivity, it is preferable to use a thermoplastic resin. More specifically, POM, PPS, and other materials are suitable. However, in order to satisfy requirements such as strength, other materials may be appropriately selected. More specifically, a thermosetting resin or a metal material may be used.

[0211] As described in the foregoing, the engaging portion 73 has an insertion taper 73d at one end in the Z direction and a removing taper 73e at the other end. Therefore, it is difficult to place the parting portion 62 of the mold on either one of the end surfaces of the engagement portion 73 in the Z direction. When using a mold for dividing into two bodies, if the parting portion 62 is placed on one of the two end surfaces of the engaging portion 73, it is difficult to remove the molded flange member 70 from the mold. That is, this is because when attempting to part the two molds from the engaging portion 73 after the engaging portion 73 is molded, at least one of the molds cannot move due to interfering with the engaging portion 73.

It is easier to manufacture the mold if the mold parting portion 62 is made as straight as possible. By this, it is possible to manufacture the parting portion 62 with high accuracy. By this, if the mold parting portion 62 is made as straight as possible, the possibility of occurrence of resin leakage or the like can be reduced.

[0212] In order to make the parting portion 62 of the engaging portion 73 straight, it is necessary to place the drive receiving surface 73a at the back side (the Z2 side) of the photosensitive drum unit 30 at least as compared with the insertion taper 73d. Under the circumstances, in this embodiment, the end of the insertion taper 73d and the end of the drive receiving surface 73a are placed at the

same position in the Z direction.

[0213] In addition, when forming the flange member 70 of this embodiment, the mold parting portion 62 is arranged so as to be as follows. That is, the drive receiving surface 73a and the surface of the base portion 74 as seen from the Z2 direction side are formed by the mounting portion side mold 61. In addition, insertion taper 73d, and the surface visible from the Z1 direction side of the base 74 are formed by the cylindrical mold 60. As described in the foregoing, the inner side surface of the base side extending portion 74t is disposed so as to project to the same diameter as the inner peripheral surface 71R of the cylindrical portion 71 or project toward the inner diameter side. By this it is possible to prevent the base side extending portion 74t from interfering with the cylindrical portion side mold 60 and hindering the movement of the cylindrical portion side mold 60.

[0214] In addition, as viewing the flange member 70 in the Z direction (as the flange member 70 is seen along the axial direction), it is necessary to dispose the force receiving portion 77 so as not to overlap the engaging portion 73 and the base portion 74, as shown in Figure 12. That is, as viewing the flange member 70 along the axial direction, it is necessary for the force receiving portion 77 to be disposed spaced apart from the engaging portion 73 and the base portion 74. Considering the thickness of the mold, it is preferable that the force receiving portion 77 is disposed with a gap of about 1 mm from the engaging portion 73 and the base portion 74.

(Aligning member)

[0215] Referring to Figures 10, 15, 16, 18, and 19, the structure of the aligning member (positioning member) 33 will be described.

[0216] In this embodiment, the aligning member 33 has a recess portion (reverse conical shape 33a) narrowed toward the bottom. The inverted conical

shape 33a is a substantially conical recess (recess) and is disposed on the axis of the drum unit 30. In the axial direction of the drum unit 30, it is arranged inside the drive receiving surface 73a. In the following, the detailed shape of the aligning member 33 will be described.

5 **[0217]** As shown in Fig 18, the aligning member 33 has an inverted conical shape portion 33a, a fitting portion 33b, a retaining portion 33c, and a backup portion 33j.

10 **[0218]** As shown in Figure 19, the aligning member 33 is assembled from the Z2 side to the Z1 side of the flange member 70 along the rotation axis, thereby constructing the coupling member 28.

15 **[0219]** As shown in Figure 10, the inverted conical shape 33a is disposed on the inner side (the Z2 direction side) of the photosensitive drum unit 30 than the engaging portion 73. In addition, the flange member 70 and the aligning member 33 are assembled so that the center of the inverted conical shape 33a coincides with the center of the photosensitive drum 1 as viewing the aligning member 33 along the Z direction.

20 **[0220]** The inverted conical shape 33a has a contact portion 33e which abuts on the semispherical shape 101c at the free end of the main assembly driving shaft 101 when the photosensitive drum 1 is rotationally driven. Here, the inverted conical shape 33a has a substantially inverted conical shape (a shape recessed in a substantially conical shape). As shown in Fig 10, the aligning member 33 is mounted to the flange member 70 so that the center 101h of the semispherical shape 101c of the main driving shaft 101 is within the range of the drive receiving surface 73a in the Z direction in the state that the contact portion 33e and the semispherical shape 101c are in contact with each other.

25 **[0221]** The contact portion 33e provided in the inverted conical shape 33a contacts with the semispherical shape 101c of the main assembly driving shaft

101 the drum unit 30 is positioned with respect to the main assembly driving shaft 101.

[0222] That is, the inverted conical shape 33a can determine the position in the axial direction of the drum unit 30 and the position in the radial direction
5 relative to the main driving shaft 101. That is, the inverted conical shape 33a is the radial position determining portion, and it is also the axial direction positioning portion.

[0223] Here, the radial positioning portion and the longitudinal positioning portion need not be conical recess such as a recess having the inverted conical
10 shape 33a. The shape of the radial position determining portion and the longitudinal direction positioning portion may be of any shape as long as it can determine the position of the photosensitive drum unit 30 with respect to the main assembly driving shaft 101 when it contacts the main assembly driving shaft 101. For example, a recess portion (recess portion) having a portion narrowed toward
15 the bottom portion is preferable. As such a shape, it is also possible to use a polygonal cone shape such as a pyramid (square pyramid and so on) which is not a circular cone. However, as long as it is a conical recess portion that is symmetrical with respect to the axis of the coupling member 28 like the inverted conical shape 33a of this embodiment, it is possible to maintain the position of
20 the coupling member 28 (the position of the drum unit 30) with particularly high accuracy.

[0224] Here, it will suffice if the inverted conical shape 33a has an area for contacting the main assembly driving shaft 101, and therefore, the region not touched may have any shape. For example, the bottom of the inverted conical
25 shape 33a which is not in contact with the main driving shaft 101 may not be necessary, it may be bottomless recess of an inverted conical shape 33a.

[0225] The fitting portion 33b is provided for mounting the aligning member

33 to the flange member 70 and as shown in Figure 10, the flange member 70 has a fitting portion 72a at a position corresponding to the fitting portion 33b. In addition, the fitting portion 33b is provided on the inner side (the Z2 direction side) of the photosensitive drum unit 30 than the contact portion 33e.

5 **[0226]** As shown in Figure 18, the retaining portion 33c has a hook shape, thereby preventing the aligning member 33 from dropping off the flange member 70. In addition, as shown in Figure 11, the flange member 70 has a hole shape 72b at a position corresponding to the retaining portion 33c.

[0227] As shown in Figure 15, the backup portion 33j is assembled in a gap
10 between the backed-up surface 74i of the flange member 70 and the receiving surface 77a, and it has a shape which is effective to prevent the engagement portion 73 from tilting toward the upstream side in the rotational direction. Therefore, the thickness of the backup portion 33j is substantially the same as the gap between the backed-up surface 74i and the receiving surface 77a.

15 **[0228]** That is, the backup portion 33j restrains the engagement portion 73 (the drive receiving surface 73a) from moving in the circumferential direction of the flange member 70 by contacting the backed-up surface 74i. The aligning member 33 is a backup member including a backup portion 33j.

[0229] The aligning member 33 is also a positioning member for determining
20 the relative position of the flange member 70 (the drum unit 30) with respect to the main driving shaft 101. The recessed portion (inverted conical shape 33a) provided in the aligning member 33 contacts the free end of the main assembly driving shaft 101 as a positioning portion. By this, the relative position in the axial direction and the relative position in the radial direction of the flange
25 member 70 are both determined with respect to the main assembly driving shaft 101.

[0230] In addition, as viewed in the Z direction, the center of the circle

passing through the ridge line of the engaging portion 73 side of the backup portion 33j is the same as the center of the inverted conical shape 33a, and the diameter of the circle is D8. The diameter D8 is selected so as to be approximately the same as the outer diameter D5 of shaft portion 101f of main assembly driving shaft 101 or so as to satisfy $D8 \geq D5$ in view of dimensional accuracy thereof. In addition, as shown in Figure 16, the backup portion 33j is disposed so as to overlap the drive receiving surface 73a in the Z direction.

[Mounting of Cartridge to Image Forming Apparatus Main Assembly]

10 **[0231]** Referring to Figures 20 and 21, mounting and dismounting of the drum cartridge 13 to and from the image forming apparatus main assembly will be described.

[0232] Figure 20 is a perspective view illustrating the mounting of the drum cartridge 13 to the image forming apparatus main assembly 100A.

15 **[0233]** Figure 21 is a cross-sectional view illustrating the mounting operation of the drum cartridge 13 to the image forming apparatus main assembly 100A.

[0234] The image forming apparatus main assembly 100A of this embodiment employs a structure capable of mounting a cartridge in a substantially horizontal direction. More specifically, the image forming apparatus main assembly 100A includes therein a space in which a cartridge can be mounted. And, there is provided a cartridge door 104 (front door) for inserting the cartridge into the above space on the front side (the side on which the user stands in use) of the image forming apparatus main assembly 100A.

25 **[0235]** As shown in Fig 20, the cartridge door 104 of the image forming apparatus main assembly 100A is openable and closable. As will be seen when the cartridge door 104 is opened, there are provided a lower cartridge guide rail 105 for guiding the drum cartridge 13 is disposed on the bottom surface of the

space and an upper cartridge guide rail 106 is disposed on the upper surface.

The drum cartridge 13 is guided to the mounting position by the upper and lower guide rails (105, 106) provided above and below the aforementioned space. The drum cartridge 13 is inserted into the mounting position substantially along the
 5 axis line of the photosensitive drum unit 30.

[0236] Referring to Figure 21, the operation of mounting and dismounting the cartridge to the image forming apparatus main assembly 100A will be described.

[0237] As shown in part (a) of Figure 21, the drum unit bearing member 39R and the photosensitive drum 1 do not contact the intermediary transfer belt 5 at
 10 the start of insertion of the drum cartridge 13. In other words, the dimensions are selected such that the photosensitive drum 1 and the intermediary transfer belt 5 do not come in contact with each other in the state that the end portion on the far side in the inserting direction of the drum cartridge 13 is supported by the lower cartridge guide rail 105.

[0238] As shown in part (b) of Figure 21, the image forming apparatus main
 15 assembly 100A includes a rear side lower cartridge guide 107 that projects upward with respect to the direction of gravity from the lower cartridge guide rail 105 on the rear side in the inserting direction of the lower cartridge guide rail 105. The rear side lower cartridge guide 107 has a tapered surface 107a on the
 20 upstream side in the inserting direction of the drum cartridge 13. With the insertion, the drum cartridge 13 rides on the tapered surface 107a and is guided to the mounting position.

[0239] Here, the position and shape of the rear side lower cartridge guide 107 are selected so that a portion of the cartridge does not rub against the image
 25 forming area 5A of the intermediary transfer belt 5 when inserting the cartridge into the apparatus main assembly 100A. Here, the image forming area 5A is a region where a toner image to be transferred onto the recording material 12 of the

intermediary transfer belt 5 is carried. In addition, in this embodiment, in the cartridge maintaining the mounting attitude, the unit bearing member 39R provided on the downstream side in the inserting direction of the drum cartridge 13 projects most upward with respect to the direction of gravity. Therefore, arrangement and shape of each element are appropriately selected so that the trace (hereinafter referred to as insertion trace) drawn when the end of the drum unit bearing member 39R, which is the deepest in the inserting direction, is inserted, does not interfere with the image forming area 5A.

[0240] Thereafter, as shown in part (c) of Figure 21, the drum cartridge 13 is inserted further into the back side of the image forming apparatus main assembly 100A from a state in which it rides on the rear side lower cartridge guide 107. And, the drum unit bearing member 39R abuts against the rear cartridge positioning portion 108 provided in the image forming apparatus main assembly 100A. At this time, the drum cartridge 13 (the photosensitive drum unit 30) is in a state of being inclined by about 0.5 to 2 ° with respect to those in the state of completion of mounting in the image forming apparatus main assembly 100A (part (d) of Figure 21). That is, the downstream side of the drum cartridge 13 (photosensitive drum unit 30) is higher than the upstream side in the direction of inserting the drum cartridge 13.

[0241] Part (d) of Figure 21 shows the state of the apparatus main assembly and the cartridge in a state where the cartridge door 104 is closed. The image forming apparatus 100A has a front side lower cartridge guide 109 on the upstream side, in the inserting direction, of the lower cartridge guide rail 105. The structure is such that the front side lower cartridge guide 109 moves up and down in interrelation with the opening and closing of the cartridge door (front door) 104.

[0242] When the user closes the cartridge door 104, the front side lower

cartridge guide 109 is raised. And, the drum unit bearing member 39L and the front side cartridge positioning portion 110 of the image forming apparatus main assembly 100A come into contact with each other, whereby the drum cartridge 13 is positioned relative to the image forming apparatus main assembly 100A.

5 **[0243]** With the above operation, the mounting of the drum cartridge 13 to the image forming apparatus main assembly 100A is completed.

[0244] In addition, removal of the drum cartridge 13 from the image forming apparatus main assembly 100A is in the reverse order of the above-described inserting operation.

10 **[0245]** As described above, oblique mounting structure is employed, and therefore, it is possible to suppress rubbing between the photosensitive drum and the intermediary transfer belt when the drum cartridge 13 is mounted in the apparatus main assembly 100A. Therefore, it is possible to suppress the occurrence of fine scratches on the surface of the photosensitive drum or the
15 surface of the intermediary transfer belt.

[0246] In addition, according to the structure disclosed in this embodiment, the structure of the image forming apparatus main assembly 100A can be simplified compared to the structure in which the entire cartridge is lifted up after mounting the cartridge by horizontally moving the cartridge in the main assembly
20 of the apparatus.

[Engaging Process of Coupling Member to Main Assembly Shaft]

[0247] Referring to Figures 22 and 23, a process of engaging the coupling member 28 and the main assembly driving shaft 101 will be described in detail.

[0248] Figure 22 is a cross-sectional view illustrating the mounting operation
25 of the coupling member 28 to the main assembly driving shaft 101.

[0249] Figure 23 is a sectional view illustrating the mounting operation of the coupling member 28 to the main assembly driving shaft 101, when the main

assembly driving shaft 101 rotates from the state in which the main assembly drive transmission groove 101a and the engagement portion 73 (the drive receiving surface 73a) are out of phase to the state in which they are in phase.

[0250] Part (a) of Figure 22 illustrates a state in which the coupling member 28 starts engaging with the main assembly driving shaft 101. In addition, part (e) of Figure 22 shows a state in which the drum cartridge 13 is mounted to the image forming apparatus main assembly 100A. In particular, part (e) of Figure 23 shows a state in which the front-side lower cartridge guide 109 is raised, and in this state, as the cartridge door 104 closes, the drum cartridge 13 is positioned relative to the image forming apparatus main assembly 100A.

[0251] Here, parts (b) to (d) of Figure 22 illustrate the process of mounting the coupling member 28 and the main assembly driving shaft 101 between part (a) of Figure 22 and part (e) of Figure 22. Here, the main driving shaft 101 is in a lower position in the direction of gravity by a small angle due to its own weight.

[0252] In addition, part (a) of Figure 23 illustrates a state where the phases of the main assembly drive transmission groove 101a and the engagement portion 73 (the drive receiving surface 73a) are not aligned.

[0253] As described using part (b) of Figure 21, the drum cartridge 13 rides on the rear-side lower cartridge guide 107. That is, the drum cartridge 13 becomes in a state of being inclined by about 0.5 to 2 ° while gradually increasing the inclination angle from the state of part (a) of Figure 21 to the state of part (b) of Figure 21. And, the drum cartridge 13 rides on the rear side lower cartridge guide 107.

[0254] Similarly, as shown in part (a) of Figure 22, the coupling member 28 is inserted toward the main assembly driving shaft 101 in a state inclined by about 0.5 to 2 degrees compared to the state (see part (e) of Figure 22) in which the drum cartridge 13 is positioned in place relative to the image forming apparatus

main assembly 100A.

[0255] As shown in Figure 6, the main assembly driving shaft 101 is cantilevered at the supported portion 101d. In addition, the gear portion 101e meshes with a gear (not shown) for transmitting the drive to the gear portion 101e.

5 Part (a) of Figure 22 shows the main assembly driving shaft 101 in a state where it does not contact the coupling member 28. In this state, it tilts by an angle $\theta 1$ with respect to the direction determined by the self weight and the mating direction with respect to the bearings 101d as the rotation center compared to the state in which the drum cartridge 13 is positioned in place with respect to the
10 image forming apparatus main assembly 100A (shown in part (e) of Figure 22).

[0256] As shown in part (b) of Figure 22, the free end of the inner peripheral surface 71b of the cylindrical portion 71 of the coupling member 28 first contacts the rough guide portion 101g of the main assembly driving shaft 101. As shown, the main assembly driving shaft 101 is cantilevered in the supported portion 101d.

15 Therefore, the rough guide portion 101g of the main assembly driving shaft 101 is inserted into the main assembly driving shaft 101 in a state where it follows the inner peripheral surface 71b of the coupling member 28. As described in the foregoing, in the Z direction, the engaging portion 73 is formed so that the distance L1 from the front end surface of the cylindrical portion 71 to the front
20 end surface of the engaging portion 73 and the length L2 of the drive receiving surface 73 satisfy the relationship of $L1 > L2$ (Figure 14). For this reason, the rough guide portion 101g of the main assembly driving shaft 101 follows the inner peripheral surface 71b of the coupling member 28 before the semispherical shape 101c at the free end of the main assembly driving shaft 101 abuts to the
25 engaging portion 73. By this, the main assembly driving shaft 101 is guided with respect to the coupling member 28. By this, the semispherical shape 101c at the free end of the main assembly driving shaft 101 can be prevented from

being damaged by abutting against the unexpected portion of the engaging portion 73 or the base portion 74.

[0257] As shown in part (c) of Figure 22, when the coupling member 28 is further inserted from the part (b) of Figure 22 toward the rear side of the main assembly driving shaft 101, the insertion tapered surface 73d of the engaging portion 73 and the semispherical shape 101c at the free end of the main assembly driving shaft 101 come into contact with each other. Due to the inclined surface of the insertion tapered surface 73d and the spherical shape of the semispherical shape 101c, the main assembly driving shaft 101 is guided to the substantially central portion of the three engagement portions 73.

[0258] Furthermore, when the coupling member 28 is inserted into the main assembly driving shaft 101, the base portion 74 elastically deforms radially outward so that the engaging portion 73 follows the semispherical shape 101c. As a result, as shown in part (a) of Figure 23, the engaging portion 73 moves (retracts) to the outer diameter portion of the shaft portion 101f of the main assembly driving shaft 101. As shown in part (d) of Figure 22, with this movement, the coupling member 28 is mounted to the main assembly driving shaft 101 until the removing tapered surface 73e of the engaging portion 73 reaches the rear side in the Z direction from the main assembly side removing taper 101i of the main assembly driving shaft 101. As described in the foregoing, the base portion 74 has the base side extending portion 74t and the folded portion 74r which can be elastically deformed. When the engaging portion 73 moves radially outward, the base portion 74t and the folded portion 74r of the base portion 74 are elastically deformed, respectively, and therefore, it becomes deformable radially outwardly with a smaller force as compared with a structure in which only the base side extending portion 74t is elastically deformed. Therefore, the mounting force of the drum cartridge 13 to the image forming

apparatus main assembly 100A can be low.

In addition, since the base portion 74 is provided with the folded portion 74r, the base portion 74 can be provided in a limited space in the Z direction.

5 As described above, the mounting force of the drum cartridge 13 to the image forming apparatus main assembly 100A can be suppressed low without increasing the size of the flange member 70 in the Z2 direction.

[0259] Thereafter, as described above, the drum cartridge 13 is lifted so that the drum unit bearing member 39L of the drum cartridge 13 abuts against the
10 front side cartridge positioning portion 110. By lifting the drum cartridge 13, the drum cartridge 13 is positioned relative to the image forming apparatus main assembly 100A (as shown in part (d) of Figure 21). As shown in part (e) of Figure 22, by the operation of the drum cartridge 13, the inclination of the coupling member 28 is eliminated.

15 **[0260]** And, when the main assembly driving shaft 101 rotates, as shown in part (b) of Figure 23, the main assembly drive transmission groove 101a and the engagement portion 73 becomes in phase. By this, at least a part of the elastic deformation of the base portion 74 is eliminated, and a part of the engagement portion 73 enters the main assembly drive transmission groove 101a, and then the
20 coupling member 28 and the main assembly driving shaft 101 are brought into engagement with each other.

[0261] Here, when the phases of the main assembly drive transmission groove 101a and the engagement portion 73 are matched, the elastic deformation of the base portion 74 is canceled at the stage of part (d) of Figure 22, and the state of
25 part (b) of Figure 23 is reached so that the driving force of the main assembly driving shaft 101 can be transmitted to the drum cartridge 13 by way of the coupling member 28.

[0262] As explained above, as the drum cartridge 13 is mounted to the apparatus main assembly 100A, the main assembly drive transmission groove 101a and the engagement portion 73 can be engaged with each other. Therefore, it is unnecessary to move the main assembly driving shaft 101 in order to engage with the coupling member 28. That is, it is unnecessary to provide a mechanism, in the main assembly 100A of the image forming apparatus, for moving the main assembly driving shaft 101 so as to engage with the coupling member 28. In addition, a mechanism for engaging the main assembly driving shaft 101 with the coupling member 28 after mounting the drum cartridge 13 to the image forming apparatus main assembly 100A can be omitted from the apparatus main assembly 100A.

[0263] Here, when the drum cartridge 13 is mounted to the apparatus main assembly 100A, the engaging portion 73 of the coupling member 28 is retracted radially outward by contacting the main assembly driving shaft 101. And, the engagement portion 73 is constituted to engage with a groove (main assembly drive transmission groove 101a) of the main assembly driving shaft 101 by moving inward in the radial direction.

[0264] Here, it is also possible to provide a groove for receiving drive on the coupling member, and to provide a movable portion capable of engaging with the groove by moving in the radial direction on the driving shaft 101 side. However, as compared with the drum cartridge 13, the image forming apparatus main assembly 100A is required to have higher durability. It is preferable to provide a movable portion (engaging portion 73) that moves in the radial direction on the coupling member 28 side of the drum cartridge 13 as in this embodiment, from the stand point of enhancing the durability of the image forming apparatus main assembly 100A.

[Drive of coupling member by main assembly driving shaft]

[0265] Referring to Figure 15, the transmission of the rotational drive from the main driving shaft 101 to the coupling member 28 will be described.

[0266] When the drive receiving surface 73a of the coupling member 28 comes in contact with the main assembly drive transmission surface 101b, the
 5 cleaning blade 26, the charging roller 22, and so on apply a load to the photosensitive drum unit 30. That is, the drive receiving surface 73a rotates integrally with the driving transmission surface 101b while receiving the load (driving force) F1.

[0267] This driving force F1 received by the drive receiving surface 73a can
 10 be divided into a component Fv in a direction perpendicular to the backed-up surface 74i and a component Fh in a direction parallel to the backed-up surface 74i, because the angle J formed by the backed-up surface 74i and the drive receiving surface 73a is an acute angle. As shown in Figure 15, the component in the vertical direction Fv is transmitted to the backed-up surface 74i opposite to
 15 the drive receiving surface 73a of the engaging portion 73. The engaging portion 73 is backed up by the mounting portion 72 by way of the backup portion 33j and the rib 77e, and therefore, the engaging portion 73 substantially does not deform toward the downstream side in the rotational direction.

[0268] Also, when the engaging portion 73 receives the component Fv in the
 20 parallel direction, the contact surface 74h comes into contact with the shaft portion 101f of the main assembly driving shaft 101, and the engaging portion 73 is backed up.

[0269] By the force component Fv parallel to the backed-up surface 74i, the engaging portion 73 (the drive receiving surface 73a) is urged radially inward
 25 toward the inside of the drive transmission groove 101a.

[0270] That is, the backup surface 33t of the backup portion 33j and the backed-up surface 74i are inclined relative to the drive receiving surface 73a.

By this, when the drive receiving surface 73a receives a force from the drive transmission groove 101a of the main assembly driving shaft 101 and the backed-up surface 74i comes into contact with the backup surface 33t, the engaging portion 73 moves radially inward along the backup surface 33t. That is, since
 5 the backup surface 33t and the backed-up surface 74i are inclined with respect to the drive receiving surface 73a, the force urging the engaging portion 73 in the radially inward direction is produced when the backup surface 33t and the backed-up surface 74i contact with each other.

[0271] In the cross-section of Figure 15, a straight line extending along the drive receiving surface 73a and a straight line extending along the backup surface
 10 33t intersects at an outside of the driving force receiving surface 73a in the radial direction of the coupling member.

[0272] Further, in the radial direction of the coupling member 28, the backup surface 33t is inclined so that inner diameter side thereof is on the downstream
 15 side of the outer diameter side in the rotational direction. This also applies to the backed-up surface 74i.

[0273] The driving force receiving surface 73a provided in the engaging portion 73 is an inclined portion inclined relative to the moving direction of the engaging portion 73. The engaging portion 73 is movable so as to retract
 20 outward in the radial direction of the coupling member 28, but the driving force receiving surface 73a is inclined with respect to the direction.

[0274] In other words, in the state that the driving force receiving surface 73a is in contact with the drive transmission groove 101a, the drive receiving surface 73a is inclined so that the drive receiving surface 73a bites into the driving
 25 transmission groove 101a. For these reasons, in a state in which the drive receiving surface 73a is receiving the driving force from the driving transmission groove 101a, it is difficult for the engagement portion 73 to retreat from the drive

transmission groove 101a. The engagement state between the engagement portion 73 and the drive transmission groove 101a is stabilized.

[0275] More particularly, on the drive receiving surface 73a, the inner diameter side (free end side) of the coupling member 28 is provided on the upstream side of the outer diameter side (rear end side) in the rotational direction of the coupling member 28. That is, the drive receiving surface 73a is inclined so as to face outside at least in the radial direction of the coupling member 28. That is, the normal vector extending perpendicularly to the drive receiving surface 73a and facing the drive receiving surface 73a has a component directed outward in the radial direction.

[0276] Therefore, when the coupling member 28 (the photosensitive drum unit 30) rotates, the force received by the drive receiving surface 73a acts in a direction to engage the engaging portion 73 with the main assembly drive transmission groove 101a. That is, the engaging portion 73 is urged inward in the radial direction by the driving force received by the drive receiving surface 73a. By this, the engagement state between the engagement portion 73 and the main assembly drive transmission groove 101a is stabilized and the disengagement between the engagement portion 73 and the main assembly drive transmission groove 101a is suppressed.

[0277] By the above-described structure, the drive receiving surface 73a can be stably brought into contact with the main assembly drive receiving surface 101a and the photosensitive drum unit 30 can be retracted to the side of the main assembly driving shaft 101 to be held by the bearing portion 101d. In addition, even if the load F1 fluctuates, the engaging portion 73 is backed up as described above, and therefore, deformation of the engaging portion is suppressed. Therefore, the rotation amount of the photosensitive drum 1 does not substantially change, and as a result, the quality of the image can be maintained.

[0278] Here, in this embodiment, the backup portion 33i is provided in the aligning member (positioning member) 33. However, the backup portion 33i may be provided on a member different from the aligning member 33.

[0279] That is, the backup portion 33i may be provided in a member different from the positioning portion (reverse conical shape 33a) for positioning the drum unit 30 with respect to the main assembly driving shaft 101.

[Removal of Coupling Member from Main Assembly Drive Shaft]

[0280] Referring to Figure 24, the removal operation of the coupling member 28 from the main driving shaft 101 will be described.

[0281] Figure 24 is a cross-sectional view illustrating the removal operation of the coupling member 28 from the main assembly driving shaft 101.

[0282] As shown in part (a) of Figure 24, when the rotation drive of the main assembly driving shaft 101 is stopped, the drive receiving surface 73a and the main assembly drive transmission surface 101b are in contact with each other.

[0283] In this state, a portion of the engagement portion 73 enters the main assembly drive transmission groove 101a.

[0283] When the cartridge door 104 opens, the front-side lower cartridge guide 109 lowers, and the drum unit bearing member 39L separates from the front side cartridge positioning portion 110 of the image forming apparatus main assembly 100A. At this time, as shown in part (b) of Figure 24, the coupling member 28 and the main assembly driving shaft 101 are inclined by about 0.5 to 2 ° relative to the mounting complete state (Z direction).

[0284] As shown in part (c) of Figure 24, when removing the drum cartridge 13 from the image forming apparatus main assembly 100A, the removing tapered surface 73e of the engaging portion 73 abuts against the main assembly side removing taper 101i. As the removing tapered surface 73e abuts against the main assembly side removing taper 101i, the base portion 74 begins to elastically

deform and moves the engaging portion 73 along the main assembly side removing taper 101i radially outward.

[0285] Furthermore, when the coupling member 28 is removed from the main assembly driving shaft 101, the base portion 74 is further elastically deformed to
 5 move the engaging portion 73 to the outer diameter of the shaft portion 101f of the main assembly driving shaft 101. As shown in part (d) of Figure 24, by moving the engaging portion 73 to the outer diameter of the shaft portion 101f, the coupling member 28 can be removed from the main assembly driving shaft 101.

10 **[0286]** Furthermore, as shown in part (e) of Figure 24, when the coupling member 28 is removed from the main assembly driving shaft 101, the elastic deformation of the base portion 74 is released and the position of the engaging portion 73 also returns to the position which is taken before the elastic deformation.

15 As described in the foregoing, when the coupling member of this embodiment is used, it is possible to suppress the size increase of the flange member 70 in the Z2 direction. And, it is possible to suppress the mounting force of the drum cartridge 13 to the image forming apparatus main assembly 100A, suppress the change in the rotation amount of the photosensitive drum 1,
 20 and maintain the image quality.

In addition, in this embodiment, in the base portion 74n, one folded portion 74r is provided at each position, but it is also possible to use a structure including a plurality of folded portions 74r as long as it can be arranged in the space of the inner peripheral surface 72m of the coupling member 28.

25 **[0287]** For example, it is also possible that the following structures are sequentially arranged from the fixed end of the base portion 74 toward the free end. That is, it comprises (1) an extending portion extending inward in the axial

direction, (2) a folded-back portion, (3) an extending portion extending outward in the axial direction, (4) a folded-back portion, (5) an extension which extends inward. In such a case, the base 74 has three extended portions and has an S-shape. Either in the case of one folded portion or in the case of two or more

5 folded portions, the base portion 74 has at least first extending portions and second extending portions extending in mutually different directions in the axial direction. In this example shown in Figure 13, Figure 14, and so on, one of the root side extending portion 74t and the free end side extending portion 74s

10 extending in mutually different directions corresponds to the first extending portion, and the other corresponds to the second extending portion.

[0288] For example, when the free end side extending portion 74s disposed on the most free end side of the supporting portion is the first extending portion, the base side extending portion 74t connected thereto is the second extending portion. In this case, the first extending portion (74s) extends from the second extending

15 portion (74t) toward the free end of the supporting portion the second extending portion (74t) may be said to extend from the fixed end of the supporting portion toward the first extending portion (74s).

<Embodiment 2>

20 **[0289]** Referring to Figures 25 to 30, Embodiment 2 will be described.

Figure 25 is a cross-sectional view of the coupling member 128 according to this embodiment, taken along the center of the rotation axis (center of rotation axis)

[0290] Figure 26 is a cross-sectional view of the coupling member 128 and the main assembly driving shaft 101 according to this embodiment taken along a

25 direction perpendicular to the rotation axis at a position passing through the drive receiving surface 73a.

[0291] Figure 27 is a view of the flange member 170 according to this

embodiment as viewed from the Z direction, and a cross sectional view thereof.

[0292] Figure 28 is a view of the inner cylindrical member 140 according to this example as viewed from the Z1 side to the Z2 side, and a side view thereof.

[0293] Figure 29 is an explanatory sectional view illustrating a procedure of assembling the coupling member 128 according to this embodiment.

[0294] Figure 30 is a view of the procedure of assembling the coupling member 128 according to this embodiment as viewed from the outer side in the Z direction and from the side.

[0295] When the elements of this embodiment correspond to the elements described in Embodiment 1, the same names are given. The elements, functions and the like which are different from the elements of the embodiment described above will be described in detail with respect to such elements, and the description of the same points as those described above may be omitted in some cases.

[0296] Elements which are substantially equivalent to the elements of the above-described embodiments are denoted by the same reference numerals and characters in addition to the same names, and a detailed description thereof will be omitted.

In Embodiment 1, the coupling member 28 comprises two portions of the flange member 70 and the aligning member 33. In this example, as shown in Figure 25, the coupling member 128 comprises the flange member 170 and the inner cylindrical member 140.

More specifically, as shown in Figure 27, the flange member 170 includes a mounting portion 172, a cylindrical portion 171, a flange portion 175, a force receiving portion 177, a centering portion 133a, and a cylindrical member pressing portion 178. As shown in Figure 28, the inner cylindrical member 140 includes a base portion 174, an engaging portion 173, a fitting portion 140a, a

retaining portion 140b, and a rotation stopper portion 140c.

[0297] The base portion 174 and the engaging portion 173 form a supporting portion for supporting the driving force receiving portion (the drive receiving surface 173a), similarly to the base portion 74 and the engaging portion 73 of Embodiment 1. This support portion (174, 173) is a snap fit portion with a U shape. The inner cylindrical member 140 is a driving force receiving member for receiving the driving force from the apparatus main assembly by the drive receiving surface 173a (Figure 28) provided in the engaging portion 173.

[0298] The flange member 170 is a member to be transmitted (transmitted member) to which the driving force is transmitted from the inner cylindrical member 140.

(Flange Member)

[0299] As described in the foregoing, as shown in Figure 27, the flange member 170 includes a mounting portion 172, a cylindrical portion 171, a flange portion 175, a force receiving portion 177, an inverted conical shape 133a, and a cylindrical member pressing portion 178.

The mounting portion 172 is a portion to be mounted to the photosensitive drum 1, similarly to the mounting portion 72 of Embodiment 1. The mounting portion 172 is adhered to the inner periphery of the photosensitive drum 1 or press-fitted to the inner periphery of the photosensitive drum 1.

The cylindrical portion 171 is provided with a bearing portion equivalent to that of the bearing receiving portion 71c of Embodiment 1, and is rotatably supported by the drum unit bearing member 39R in this portion to be supported.

The flange portion 175 has a shape for determining the positions of the photosensitive drum 1 and the coupling member 128 in the Z direction, similarly to Embodiment 1.

The force receiving portion 177 is in contact with a backed-up surface 174i of an inner cylinder to be described hereinafter and has a shape for preventing the engaging portion 173 from being deformed toward the downstream side in the rotational direction when the coupling member 128 is driven by the main assembly driving shaft 101. Therefore, in the state of the coupling member 128, it is disposed on the downstream side in the rotational direction of the engaging portion 173.

The force receiving portion 177 is provided with a receiving surface 177a which is parallel to the backed-up surface 174i and abuts against the backed-up surface 174i a rib 177e which is perpendicular to the receiving surface 177a and extends from the inner diameter end of the receiving surface to the mounting portion 172. The receiving surface 177a is a backup portion which suppresses the movement of the engaging portion 173 (the drive receiving surface 173a) in the circumferential direction of the coupling member 128. The flange member 170 is a backup member including a backup portion (receiving surface 177a).

[0300] Furthermore, by the receiving surface 177a coming into contact with the backed-up surface 174i, it receives the driving force from the inner cylindrical member 140. That is, the driving force received by the drive receiving surface 173a of the engaging portion 173 from the apparatus main assembly is transmitted from the inner cylindrical member 140 to the cylindrical member 170 by way of the backed-up surface 174i and the receiving surface 177a. The receiving surface 177a is also a transmitted portion for transmitting the driving force from the inner cylindrical member 140.

The inverted conical shape portion 133a has a substantially inverted conical shape as in Embodiment 1. It is provided on the flange member 170 so that the center 101h of the semispherical shape 101c of the main assembly

driving shaft 101 is within the range of the drive receiving surface 173a with the abutting portion 133e and the semispherical shape 101c in contact with each other.

The cylindrical member pressing portion 178 is a gap provided on the back side (Z2 side) of the force receiving portion 177.

5 As shown in Figure 25, the radius R19 of the portion corresponding to the engaging portion 173 in the radial direction of the inner peripheral surface 172m of the mounting portion 172 is larger than the radius R12 of the inner peripheral surface 171b of the cylindrical portion 171.

(Inner Cylinder)

10 **[0301]** As described in the foregoing, the inner cylindrical member 140 is provided with a base portion 174 of the supporting portion, an engaging portion 173 of the supporting portion, a fitting portion 140a, a retaining portion 140b, and a rotation stopper portion 140c (Figure 28).

15 The engaging portion 173 has a drive receiving surface 173a as in Embodiment 1.

The base portion 174 is provided with a base side extending portion 174t, a folded portion 174r, and a free end side extending portion 174s similarly to Embodiment 1. The free end side extending portion 174s is provided with a backed-up surface 174i and a contact surface 174h.

20 **[0302]** In this embodiment, the base side extending portion 174t and the free end side extending portion 174s extend in the direction opposite to the extending direction of the root side extending portion 74t and the free end side extending portion 74s of Embodiment 1.

25 **[0303]** The base side extending portion 174t extends from the base portion 174a in the Z1 direction (outside in the drum unit axial direction) substantially in parallel with the rotation axis of the flange member 170 and is disposed radially outward with respect to the base side extending portion 174s and the engaging

portion 173.

[0304] The folded portion 174r is a bent portion which continuously connects the fixed end side of the base side extending portion 174s and the free end side of the base side extending portion 174t with each other.

5 **[0305]** The base side extending portion 174s is provided with an engaging portion 173 substantially over its entire area. The engaging portion 173 is a projection portion of the base side extending portion 174s, and a drive force receiving portion (drive receiving surface 173a) is provided in the engaging portion 173.

10 **[0306]** In the base portion 174, each of the base side extending portion 174t and the folded portion 174r is elastically deformed. It is possible to deform radially outward with smaller force than in the structure where only the base side extending portion 174t is elastically deformed. This is the same as in Embodiment 1.

15 **[0307]** Both of the free end side of the engaging portion 173 (the free end side of the free end extending portion 174s) and the base portion 174a of the base portion 174 are disposed on the Z2 side of the folded portion 174r.

[0308] The fitting portion 140a is disposed in the rear side of the base portion 174 and the engaging portion 173 and is fitted to the outer peripheral face of the aligning portion 133a, thereby adjusting the center of the flange member 170 and
20 the inner cylindrical member 140 with high accuracy.

[0309] The retaining portion 140b prevents disengagement of the inner cylindrical member 140 from the flange member 170. More specifically, after the inner cylindrical member 140 is incorporated in the flange member 170, it is
25 inserted into the cylindrical member pressing portion 178 to prevent disengagement. As shown in part (a) of Figure 29, the retaining portion 140b is provided with a relief portion 140d in order to avoid interference with the force

receiving portion 177 of the flange member 170 on the upstream side in the rotational direction, in a state (part (b) of Figure 29) in which the flange member 170 is incorporated in the inner cylindrical member 140.

[0310] The rotation stopper portion 140c regulates rotation of the inner cylindrical member 140 in the rotational direction toward upstream side, after the inner cylindrical member 140 is incorporated in the flange member 170, thereby preventing the retaining portion 140b from being disengaged from the cylindrical member pressing portion 178. As shown in part (B) of Figure 28, it has a snap-fit shape.

10 (Assembling of Coupling Member)

[0311] As described in the foregoing, the coupling member 128 has a flange member 170 and an inner cylindrical member 140. Referring to Figure 29, Figure 30, assembling of the coupling member 128 will be described.

[0312] Part (c) of Figure 29 and part (c) of Figure 30 show assembling completion states of the coupling member 128, respectively.

[0313] First, as shown in part (a) of Figure 29 and part (a) of Figure 30, the coupling member 128 is assembled to the flange member 170 such that the inner cylindrical member 140 is oriented in the direction from the Z1 side to the Z2 side. At this time, the inner cylindrical member 140 is assembled with a phase on the upstream side in the rotational direction of the coupling member 128 with respect to the assembled state shown in part (c) of Figure 29 and part (c) of Figure 30. In this phase, the relief portion 140d of the retaining portion 140b is in phase with the force receiving portion 177. For this reason, as shown in part (b) of Figure 29 and part (b) of Figure 30, in the Z direction, the retaining portion 140b is assembled to the same position as the cylindrical member pressing portion 178 which is a gap provided on the back side of the force receiving portion 177. At this time, by fitting the fitting portion 140a of the inner

cylindrical member 140 to the outer periphery of the inverted conical shape 133a of the flange member 170, the center of rotation of the flange member 170 and the inner cylindrical member 140 can be aligned with high precision. In addition, at this time, the rotation stopper portion 140c including the snap fit shape is in a deflected state.

[0314] Thereafter, as shown in part (c) of Figure 29 and part (c) of Figure 30, the inner cylindrical member 140 is rotated to the downstream side in the rotational direction with respect to the flange member 170. With this rotation, the backed-up surface 174i of the engaging portion 173 of the inner cylindrical member 140 can contact the receiving surface 177a of the force receiving portion 177 of the flange member 170. In addition, at this time, the deflection of the rotation stopper 140c including the snap fit shape is released and the mounting of the inner cylindrical member 140 to the flange member 170 is completed.

[0315] That is, the movement in the rotational direction of the inner cylindrical member 140 with respect to the flange member 170 is restricted. That is, the inner cylindrical member 140 can rotate within the range until the backed-up surface 174i comes into contact with the receiving surface 177a on the downstream side in the rotational direction. On the upstream side in the rotational direction, the inner cylindrical member 140 can rotate in a range until the rotation stopper portion 140c comes into contact with the flange member 170.

[Driving of Coupling Member by Main Assembly Driving Shaft]

[0316] Referring to Figure 26, the transmission of rotational drive from the main driving shaft 101 to the coupling member 128 will be described.

[0317] When the drive receiving surface 173a of the coupling member 128 comes in contact with the main assembly drive transmission surface 101b, the drive receiving surface 173a rotates integrally with the driving transmission surface 101b while receiving the load (driving force) F1 as in Example 1.

[0318] When this drive force F_1 is received by the drive receiving surface 173a, the angle J formed by the backed-up surface 174i and the drive receiving surface 173a is an acute angle, and therefore, the driving force F_1 can be divided into a component F_v in the direction perpendicular to the backed-up surface 174i
 5 and a component F_h in the horizontal direction. As shown in Figure 15, the component in the vertical direction F_v is transmitted to the backed-up surface 174i opposite to the drive receiving surface 173a of the engaging portion 173.

When the drive receiving surface 173a of the coupling member 128 comes in contact with the main assembly drive transmission surface 101b, the
 10 drive receiving surface 173a rotates integrally with the driving transmission surface 101b while receiving the load (driving force) F_1 as in Example 1.

[0318] When this drive force F_1 is received by the drive receiving surface 173a, the angle J formed by the backed-up surface 174i and the drive receiving surface 173a is an acute angle, and therefore, the driving force F_1 can be divided
 15 into a component F_v in the direction perpendicular to the backed-up surface 174i and a component F_h in the horizontal direction. As shown in Figure 15, the component in the vertical direction F_v is transmitted to the backed-up surface 174i opposite to the drive receiving surface 173a of the engaging portion 173. The engaging portion 173 is backed up by the mounting portion 172 by way of
 20 the rib 177e, and therefore, the engaging portion 173 does not substantially deform toward the downstream side in the rotational direction. When the engaging portion 173 receives the vertical component F_h , the contact surface 174h comes into contact with the shaft portion 101f of the main assembly driving shaft 101, and the engaging portion 173 is backed up.

[0319] By this, the drive receiving surface 73a can stably abut the main
 25 assembly drive receiving surface 101a so that the photosensitive drum unit 30 can be retracted to the bearing portion 101d side of the main assembly driving shaft

101. In addition, even if the load F1 fluctuates, the engaging portion 73 is backed up as described above, and therefore, it is not substantially deformed, and for this reason, the rotation amount of the photosensitive drum 1 does not substantially change, and the quality of the image can be maintained.

5

<Embodiment 3>

[0320] Referring to Figures 31 to 34, Embodiment 3 will be described.

[0321] Figure 31 is a cross-sectional view of the flange member 270 according to this embodiment taken along the center of the rotation axis (the center of the rotation axis).

10

[0322] Figure 32 is a cross-sectional view of the coupling member 228 and the main assembly driving shaft 101 according to this embodiment cut at a position passing through the base portion 274 in a direction perpendicular to the rotation axis.

15

[0323] Figure 33 is a perspective view of the aligning member 233 according to this example.

[0324] Figure 34 is a view illustrating another embodiment of the coupling member 228 according to this embodiment.

20

[0325] Among the elements of this embodiment, those corresponding to the elements described in the above embodiments are denoted by the same names as the elements of the foregoing embodiments. In regard to those, we will explain in detail the composition and action and so on which are different from the above-mentioned elements, and sometimes omit explanation on the same points as the above-mentioned elements.

25

[0326] Figure 32 is a cross-sectional view of the coupling member 228 and the main assembly driving shaft 101 according to this embodiment taken at a position passing through the base portion 274 along a direction perpendicular to the

rotation axis.

[0323] Figure 33 is a perspective view of the aligning member 233 according to this embodiment.

5 **[0324]** Figure 34 is a view illustrating another embodiment of the coupling member 228 according to this embodiment.

[0325] Among the elements of this embodiment, those corresponding to the elements described in the above embodiments are denoted by the same names as the elements of the foregoing embodiments. In regard to those, the structure and operation and so on which are different from the above-mentioned elements will
10 be described in detail, and the description on the same LM in the as in the foregoing embodiments may be omitted.

[0326] Of the elements of this embodiment, those which are substantially equivalent to those of the above-described embodiments are denoted by the same name and the same reference numeral, and the detailed description thereof will be
15 omitted. In this embodiment, as shown in Figure 31, the base side extending portion 274t is disposed on the downstream side in the rotational direction with respect to the engaging portion 273 and extends from the base portion (fixed end) 274a in the Z2 direction (inside with respect to the axial direction of the drum unit 30). And, the base side extending portion 274t is substantially parallel to
20 the rotation axis of the flange member 270. In addition, the folded-back portion 274r is continuously formed with the base side extending portion 274t and is also continuously connected to the free end side extending portion 274s.

[0327] The free end side extending portion 274s extends in the axial direction from the folded back portion 274r toward the Z1 direction (outside in the axial
25 direction of the drum unit 30).

[0328] An engaging portion (projecting portion) 273 is formed in the free end side extending portion 274s.

[0329] The folded-back portion 274r is disposed on the back side (Z2 side) of the engaging portion 273 in the drum unit 30 with respect to the axial direction.

[0330] Here, in this embodiment, the free end side extending portion 274s and the base side extending portion 274t are arranged at different positions in the circumferential direction (rotational direction) of the drum unit 30. In other words, the free end side extending portion 274s and the base side extending portion 274t are arranged at positions shifted from each other in the circumferential direction (rotational direction). In other words, the free end side extending portion 274s is disposed on the upstream side of the base side extending portion 274t in the rotational direction (Figure 32). This point is different from Embodiment 1.

[0331] Here, a support portion for movably supporting the driving force receiving portion (drive receiving surface 273a) is formed by the base portion 274 and the engaging portion 273 as in Embodiment 1.

[0332] Similarly to Embodiment 1, the aligning member 233 includes an inverted conical shape 233a, a fitting portion 233b, a retaining portion 233c, and a backup portion 233j (Figure 33). As shown in Figure 32, the transmission of the driving force F1 at the time of driving the coupling member 228 by the main assembly driving shaft 101 is also the same as in Embodiment 1 and the engaging portion 273 is backed up by the mounting portion 272 via the backup portion 233j and the rib 277e as in Example 1. Even in this embodiment, the aligning member 233 is a backup member and is a positioning member.

[0333] In addition, when the cartridge 1 is mounted on the image forming apparatus main assembly 100, the engaging portion 273 moves radially outward.

[0334] On that occasion, as with Embodiment 1, the base 1 side extended portion 274t and the folded back portion 274r of the base portion 274 are elastically deformed so that the cartridge 1 can be mounted at a low load. **[0334]** As shown in Figure

32, the transmission of the driving force F1 at the time of driving the coupling member 228 by the main assembly driving shaft 101 is also the same as in Embodiment 1 and the engaging portion 273 is backed up by the mounting portion 272 by way of the backup portion 233j and the rib 277e as in Example 1.

5 Also in this embodiment, the aligning member 233 is a backup member and is a positioning member.

[0333] In addition, when the cartridge 1 is mounted on the image forming apparatus main assembly 100, the engaging portion 273 moves radially outward. On that occasion, as with Embodiment 1, the base 1 side extended portion 274t and the folded back portion 274r of the base portion 274 are elastically deformed
10 so that the cartridge 1 can be mounted at a low load.

[0334] In addition, in this embodiment, for explanation, the base side extending portion 274t is disposed on the downstream side of the engaging portion 273 and the free end side extending portion 274s in the rotational
15 direction. However, the base side extending portion 274t may be disposed on the upstream side of the engaging portion 273 and the free end side extending portion 274s in the rotational direction (part (a) of Figure 34). Or, as shown in part (b) of Figure 34, the base side extending portion 274t may be disposed on both the upstream side and the downstream side of the engaging portion 273 and
20 the free end side extending portion 274s in the rotational direction. At this time, of course, the folded-back portion 274r is also disposed on both sides of the engaging portion 273 and the free end side extending portion 274s in the rotational direction.

[0335] That is, in the structure shown in part (b) of Figure 34, the support
25 portions (273, 274) are provided with two root side extending portions 274t for supporting the free end side extending portion 274s. In other words, the free end side extending portion 274s is connected to the two base side extending

portions 274t by way of the two folded-back portions 274r. Such support portions (273, 274) are M-shaped (part (b) of Figure 34).

<Embodiment 4>

- 5 **[0336]** Referring to Figures 35 to 41, Embodiment 4 will be described.
- [0337]** Figure 35 is a cross-sectional view of the coupling member 328 according to this embodiment taken along the center of the rotation axis (center of rotation axis).
- [0338]** Figure 36 is a view of a flange member 370 according to this
- 10 embodiment as viewed in the Z direction outer side, and a sectional view thereof.
- [0339]** Figure 37 is a perspective view of the inner cylindrical member 340 according to this embodiment.
- [0340]** Figure 38 is a perspective view of the aligning member 333 according to this example.
- 15 **[0341]** Figure 39 is an illustration of the assembly of the coupling member 328 according to this embodiment.
- [0342]** Figure 40 is a cross-sectional view of the coupling member 328 and the main assembly driving shaft 101 according to this embodiment taken along a direction perpendicular to the rotation axis at a position passing through the
- 20 driving force receiving surface 373a.
- [0343]** Figure 41 is a view illustrating another embodiment of the inner cylindrical member 340 according to this embodiment.
- [0344]** Those corresponding to the elements described in the above embodiment are given the same names as those in the above-described
- 25 embodiments. In regard to those, the structure and operation and so on will be described in detail for those different from the above-mentioned elements, and for the elements same as in the foregoing embodiments, the description may be

omitted.

[0345] Of the elements of this embodiment, those substantially equivalent to those of the above-described embodiments are denoted by the same name and the same reference numerals, and the detailed description thereof will be omitted.

5 **[0346]** In this embodiment, especially the points different from Embodiment 3 will be described in detail. Each of the free end side extending portion 374s and the fixed end side extending portion 374t of this embodiment is different in the extending direction from the free end side extending portion 274s and the fixed end side extending portion 274t of Embodiment 3.

10 **[0347]** In Embodiment 3, the coupling member 228 includes the flange member 270 and the aligning member 233, and the flange member 270 includes the engaging portion 273 and the base portion 274. In the base portion 274, the folded-back portion 274r is disposed on the back side (Z2 side) of the engaging portion.

15 **[0348]** By contrast, in this embodiment, as shown in Figure 35, the coupling member 328 comprises the flange member 370, the inner cylindrical member 340, and the aligning member 333. The inner cylindrical member 340 is the driving force receiving member like Embodiment 2, and the aligning member 333 is a backup member as in Embodiment 2 and is a member to be transmitted and also a
20 positioning member.

[0349] More specifically, as shown in Figure 36, the flange member 370 includes a mounting portion 372, a cylindrical portion 371, a flange portion 375, and a force receiving portion 377.

[0350] In addition, as shown in Figure 37, the inner cylindrical member 340
25 includes a base portion 374, an engaging portion 373, and a fitting portion 340a. The base portion 374 includes a base side extending portion 374t and a folded portion 374r as in Embodiment 3.

[0351] In this embodiment, as shown in Figure 37, the base side extending portion 374t is disposed on the downstream side of the engaging portion 373 and the free end side extending portion 374s in the rotational direction. The base side extending portion 374t extends from the base portion 374a in the Z1 direction (outside in the axial direction of the drum unit 30) and is substantially parallel to the rotation axis of the flange member 370. In addition, the folded-back portion 374r is formed continuously with the base side extending portion 374t and is continuously connected to the free end side extending portion 374s.

[0352] The folded portion 374r is disposed closer to the Z1 side than the free end of the free end extended portion 374s (the free end of the engaging portion 373).

[0353] The free end side extending portion 374s extends from the folded portion 374r in the Z2 direction (inside in the axial direction of the drum unit 30) and is substantially parallel to the rotation axis line of the flange member 370.

[0354] An engaging portion 373 is formed in substantially the entire area of the free end side extending portion 374s. The engaging portion 373 is provided with a driving force receiving surface 373a which is a driving force receiving portion.

As shown in Figure 38, the aligning member 333 includes an inverted conical portion 333a, an aligning member fitting portion 333i, a retaining portion 333j, and an inner cylindrical member fitting portion 333k. As shown in Figure 39, the aligning member fitting portion 333i is fitted to the inner peripheral surface 372m (Figure 36) of the mounting portion 372 of the flange member 370. The retaining portion 333j has a snap-fit shape extending in the Z direction, as shown in Figure 38. As shown in Fig 39, the flange member 370 includes a hole shape 372b at a position corresponding to the retaining portion 333j. As shown in Figure 39, the inner cylindrical member fitting portion 333k

is engaged with the fitting portion 340a of the inner cylindrical member 340.

[0355] As shown in Figure 39, the inner cylindrical member 340 and the aligning member 333 are assembled to the flange member 370 from the Z2 side to the Z1 side to form a coupling member 328. As shown in Figure 35, the inner
 5 cylindrical member 340 is sandwiched between the flange member 370 and the aligning member 333 in the assembled state of the coupling 328, thereby regulating the movement in the Z direction. The inner cylindrical member 340 is constituted so as to be rotatably assembled to the flange member 370 until the engaging portion 373 abuts against the force receiving portion 377 on the
 10 upstream side and the downstream side in the rotational direction.

[0356] As shown in Figure 40, when the coupling member 328 is driven by the main assembly driving shaft 101, the backed-up surface 374i of the engaging portion 373 is backed up by the mounting portion 372 via the rib 377e of the force receiving portion 377, as in Embodiment 2. Therefore, the engaging
 15 portion 373 does not substantially deform toward the downstream side in the rotational direction.

[0357] In addition, as in Embodiment 1, in mounting the cartridge 1 to the image forming apparatus main assembly 100, when the engaging portion 373 moves radially outward, the base side extending portion 374t and the folded
 20 portion 374r of the base portion 374 are elastically deformed so that the cartridge 1 can be mounted with a low load.

[0358] In addition, in this embodiment, for explanation, in the inner cylindrical member 340, the base side extending portion 374t is disposed on the downstream side in the rotational direction of the engaging portion 373.
 25 However, as shown in part (a) of Figure 41, the inner cylindrical member 340 may be disposed on the upstream side in the rotational direction, or as shown in part (b) of Figure 41, they may be disposed on both sides in the rotational

direction.

[0359] Here, in Embodiment 4 and Embodiments 1 to 3 described above, the structure of the coupling member for receiving the driving force for driving the photosensitive drum 1 of the drum cartridge 13 has been described.

5 **[0360]** It is also possible to provide the above-described coupling members (28, 128, 228, 328) in the developing cartridge 4. In this case, each of the coupling members (28, 128, 228, 328) receives a driving force for driving elements provided in the developing cartridge 4 such as the developing roller 17, the toner supply roller 18, the stirring member 23 and/or the like. Examples of
10 such a structure will be described in detail in the following Embodiments 5 and 6.

<Embodiment 5>

[0361] Referring to Figures 42 to 57, Embodiment 5 will be described.

[0362] In this embodiment, a coupling member 528 for driving a developing
15 roller 17, a toner supplying roller 18, and a stirring member 23 of the developing cartridge 4 are provided in the developing cartridge 4. In order to transmit the driving force to the coupling member 528, a main assembly driving shaft 5101 is provided in the image forming apparatus main assembly 100A.

[0363] In the above-mentioned Embodiments 1 to 4, the structure of the main
20 assembly of the apparatus and the drive coupling portion (coupling member and main assembly driving shaft 101) of the drum cartridge has been described. In this embodiment and Embodiment 6 will be described hereinafter, these structures are used as the structure of the drive main assembly of the apparatus and the driving connection portion of the developing cartridge (the coupling
25 member 528 and the main assembly driving shaft 5101).

[0364] Therefore, among the elements of this embodiment, those corresponding to the elements described in the above embodiments are denoted

by the same names as in the above-mentioned elements. Structure and the operation and so on which are different from the above-mentioned elements will be described in detail, and the description on the same elements is in the foregoing embodiments may be omitted.

- 5 **[0365]** Of the elements of this embodiment, the same names and the same reference numerals are mounted to the same elements as those of the above-described embodiment and the detailed description will be omitted.

[Structure of Main Assembly Driving Shaft]

- 10 **[0366]** Referring to Figure 42 and Figure 43, the structure of the main assembly driving shaft 5101 will be described.

[0367] Figure 42 is an external view of the main assembly driving shaft 5101.

[0368] Figure 43 is a cross-sectional view of the main assembly driving shaft 5101 mounted to the image forming apparatus main assembly, taken along the rotation axis (rotation axis) thereof.

- 15 **[0369]** As shown in Figure 42, the main assembly driving shaft 5101 includes a gear member 5101e, an intermediate member 5101p, an output member 5101q, and a drive transmission member 5101r.

- [0370]** The image forming apparatus main assembly 100A is provided with a motor (not shown) as a drive source. The gear member 5101e is supplied with
20 rotational driving force from this motor, the driving force is transmitted in the order of the intermediate member 5101p, the output member 5101q and the drive transmission member 5101r so that the main assembly driving shaft 5101 rotates.

- [0371]** In addition, the gear member 5101e, the intermediate member 5101p, and the output member 5101q have a mechanism of an Oldham coupling, and
25 therefore, it can move a certain distance in the X direction and Y direction. Therefore, the drive transmission member 5101r provided through the Oldham coupling on the cartridge side of the main assembly driving shaft 5101 can also

move a certain distance in the X direction and the Y direction. And, the drive transmission member 5101r is provided with a rotatable shaft portion 5101f, and the rotational driving force received from the motor is transmitted to the developing cartridge 4 side by way of the groove-shaped drive transmission groove 5101a (recessed portion, drive passing portion) provided on the shaft portion 5101f. In addition, the shaft portion 5101f has a conical shape 5101c at its free end.

[0372] The main assembly drive transmission groove 5101a has a shape allowing a portion of an engaging portion 573 described later to enter. More specifically, it is provided with a main assembly drive transmission surface 5101b as a surface which contacts the drive receiving surface (drive receiving portion) 573a of the coupling member 528 and transmits the driving force.

[0373] In addition, as shown in Figure 42, the main assembly drive transmission surface 5101b is not a flat surface, but has a shape twisted about the rotation axis of the main assembly driving shaft 5101. The direction of the twisting is such that the Z1 direction side of the main assembly driving shaft 5101 is on the upstream side of the Z2 direction side in the rotational direction of the main assembly driving shaft 5101. In this embodiment, the amount of twist along the rotation axis direction of the cylinder of the engaging portion 573 is about 1 ° per 1 mm. The reason why the main assembly drive transmission surface 5101b is twisted will be described later.

[0374] In addition, on the Z2 direction side surface of the main assembly drive transmission groove 5101a, a main assembly side removing taper 5101i is provided. The main assembly side removing taper 5101i is a taper (inclined surface, inclined portion) for helping the engaging portion 573 to be disengaged from the drive transmission groove 5101a, when removing the developing cartridge 4 from the apparatus main assembly 100A.

[0375] As shown in Figure 43, the bearings 5101d provided in the gear member 5101e are rotatably supported (journaled) by a bearing member 5102 provided in the image forming apparatus main assembly 100A. The output member 5101q is rotatably supported by a coupling holder 5101s. In addition, the drive transmission member 5101r is supported on the output member 5101q so as to be movable in the Z direction and is biased toward the developing cartridge 4 (in the Z2 direction) by the spring member 5103. However, the movable amount (play) of the drive transmission member 5101q in the Z direction is about 1 mm, which is sufficiently smaller than the width of the drive receiving surface 573a, which will be described hereinafter, in the Z direction.

[0376] Furthermore, the coupling holder 5101s is urged substantially in the Y2 direction by the urging spring 5101t, and as will be described hereinafter, when the developer cartridge 4 is mounted, the drive transmission member 5101r is in a position shifted substantially in the Y2 direction with respect to the axis of the gear member 5101e.

[0377] As described above, the drive transmission member 5101r is provided with the main assembly drive transmission groove 5101a, and an engaging portion 573 is provided on the coupling member 528 so that drive is transmitted from the apparatus main assembly 100A to the developing cartridge 4.

[0378] Here, as will be described in detail hereinafter, the engaging portion 573 is provided at the free end of the elastically deformable base portion 574. Therefore, the engaging portion 573 is movable radially outward when the developing cartridge 4 is mounted on the apparatus main assembly 100A. By this, with the insertion of the developing cartridge 4 into the apparatus main assembly 100A, the engaging portion 573 enters the drive transmission groove 5101a so that the engaging portion 573 and the main assembly drive transmission groove 5101a can engage with each other.

[0379] The engaging portion 573 includes a driving force receiving portion for receiving the driving force from the outside of the developing cartridge 4.

Similarly to the above-described embodiments, the base portion 574 and the engaging portion form a supporting portion for movably supporting the driving
5 force receiving portion.

[Structure of Coupling Member]

[0380] Referring to Figure 44, Figure 45, Figure 46, Figure 47, Figure 48, and Figure 49, the coupling member 528 of this embodiment will be described in detail.

10 Figure 44 is a cross-sectional view of the coupling member 528 taken along the rotation axis.

Figure 45 is a cross-sectional view of the cylindrical member 570 taken along the rotation axis.

Figure 46 is a sectional view of the coupling member 528 and the
15 main assembly driving shaft 5101 taken along a direction perpendicular to the rotation axis of the coupling member 528 so as to pass through the drive receiving surface 573a.

Figure 47 is a perspective view of the aligning member 533.

Figure 48 illustrates assembling of the coupling member 528.

20 Figure 49 is a sectional view of the developing cartridge 4 taken along the axis of the toner supply roller 20 and the developing roller 17.

As shown in Figure 44, the coupling member 528 is formed of two members by combining the cylindrical member 570 and the aligning member 533. However, depending on the selection of material, molding method, structure and
25 so on, it is not necessary to be two-piece structure, and it may be constituted by combining three or more members. As in Embodiment 1, the cylindrical member 570 is a driving force receiving member provided with a drive receiving

surface 573a for receiving a driving force from the apparatus main assembly.

As in Embodiment 1, the aligning member 533 is a member to be transmitted to which the driving force is transmitted from the cylindrical member 570. The aligning member 533 is also a backup member provided with a backup portion
 5 for restraining the drive receiving surface 573a from moving in the circumferential direction of the cylindrical member 570.

[0381] As shown in Figure 48, the aligning member 533 is assembled to the cylindrical member 570 in the axial direction (indicated by an arrow) of the cylindrical member 570. Furthermore, by rotating the aligning member 533 in
 10 the counterclockwise direction (shown by the arrow), the retaining portion 533c is engaged with the catching portion 572 so that the aligning member 533 is unitized together with the cylindrical member 570.

(Flange Member)

[0382] As shown in Figure 45, as in Embodiment 1, the cylindrical member
 15 570 includes the engaging portion 573 and the base portion 574. As in Embodiment 1, the engaging portion 573 and the base portion 574 are support portions for movably supporting the driving force receiving portion (drive receiving surface 573a).

[0383] As in Embodiment 1, as shown in Figure 46, the engaging portions 573
 20 are arranged at three positions (120° spacing, substantially equal intervals) at equal intervals in the circumferential direction of the coupling member 528, and they have drive receiving surfaces 573a. The base 574 has a backed-up surface 574i and a contact surface 574h.

[0384] The drive receiving surface 573a is a surface which transmits the
 25 driving force of the main assembly driving shaft 5101 to the coupling member 528 by being in contact with the main assembly drive transmission surface 5101b of the main assembly driving shaft 5101.

The contact surface 574h is a surface abutting against the shaft portion 5101f, and when the coupling member 528 is engaged with the main driving shaft 5101, the radius R51 of the arc forming the inner diameter is substantially the same as the radius R52 of the shaft portion 5101f.

5 **[0385]** The backed-up portion 574i is a surface which contacts with the receiving surface 577a of the force receiving portion 577 of the aligning member 533, which will be described later, and when the coupling member 528 is engaged with the main assembly driving shaft 5101, it is disposed on the downstream side of the drive receiving surface 573a in the rotational direction
10 (Figure 46). As shown in Fig 46, the angle J formed between the backed-up surface 574i and the drive receiving surface 573a is acute.

[0386] Here, it will suffice if the drive receiving surface 573a has different phases in the rotational direction of two points in contact with the drive transmission member 5101r. That is, the drive receiving surface 573a does not
15 necessarily have to have a twisted shape as long as it has the same function as the twisted surface. By forming the drive receiving surface 573a into a twisted shape or an inclined shape, when the drive receiving surface 573a is driven, a force pulling to the outer side (the Z1 direction side) of the developing cartridge 4 is applied to the coupling member 528.

20 **[0387]** Furthermore, as shown in Figure 45, the engaging portion 573 has an insertion tapered surface 573d as a mounting force receiving portion on the outer side (the Z1 direction side) of the developing cartridge 4 in the Z direction. In addition, the engaging portion 573 has a removing tapered surface 573e as a dismounting force receiving portion on the inner side (the Z2 direction side) of
25 the developing cartridge 4 in the Z direction. By this, the mountability and dismountability of the coupling member 4028 to the main driving shaft 5101 can be improved.

[0388] Upon the mounting, the insertion tapered surface 573d and the conical shape 5101c come into contact with each other, and the engaging portion 573 is moved toward the outside in the radial direction of the driving shaft. In addition, the removing taper surface 573e and the main assembly side removing taper

5 5101i are brought into contact with each other, and the engaging portion 573 is moved toward the outside in the radial direction of the main assembly driving shaft 5101.

[0389] As in Embodiment 1, the base portion 574 has a base side extending portion 574t, a folded portion 574r, and a free end side extending portion 574s.

10 As in Embodiment 1, the base side extending portion 574t extends in the Z2 direction (inside in the axial direction of the developing roller) substantially parallel to the rotation axis of the cylindrical member 570 from the base portion 574a. The base side extending portion 574t is disposed radially outwardly of the engaging portion 573 and the free end side extending portion 574s.

15 **[0390]** The folded portion 574r is formed continuously with the root side extending portion 574t, and it is also a portion that continues continuously with the free end extended portion 574s.

[0391] The base side extending portion 574t extends from the folded portion 574r in a direction substantially parallel to the rotation axis of the cylindrical

20 member 570 in the Z1 direction (outside in the axial direction of the developing roller).

[0392] The free end of the engaging portion 573 (the free end of the free end side extending portion 574s) and the base portion 574a of the base portion are disposed closer to the Z1 side than the folded portion 574r.

25 **[0393]** The engaging portion 573 is a projection provided on the free end side extending portion 574s and has a driving force receiving portion (drive receiving surface 573a).

[0394] As in Embodiment 1, the engaging portion 573 can move in the radial direction of the coupling member 528 by the elastic deformation of the base portion 574. In other words, the base portion 574 is deformed by being subjected to an external force, and it produces a restoring force (elastic force) in a direction returning to a position in a spontaneous state.

[0395] As in Embodiment 1, when the coupling member 528 is engaged with the main driving shaft 5101, both the base side extending portion 574t and the folded portion 574r are elastically deformed, whereby the coupling member 528 can be mounted to the main assembly driving shaft 5101 with a low mounting force.

[0396] In addition, the drive receiving surface 573a of the coupling member 528 has a shape twisted about the axis of the coupling member 528, and in this embodiment, the amount of twisting is the same as that of the main assembly drive transmission surface 5101b.

(Aligning Member)

[0397] As shown in Figure 47, the aligning member 533 includes an inverted conical shape 533a, a force receiving portion 577, a retaining portion 533c, and an aligning member drive transmission surface (hereinafter simply referred to as a driving transmission surface).

[0398] The inverted conical shape 533a is a portion for determining the position in the axial direction and the position in the radial direction of the main assembly driving shaft 5101. By contacting the conical shape 5101c of the drive transmission member 5101r in the inverted conical shape of the inverted conical shape 533a, the movement of the drive transmission member 5101r in the axial direction and the radial direction of the main driving shaft 5101 is restricted.

[0399] In the assembled state of the coupling 528, the force receiving surface 577 includes a receiving surface 577a (Figure 46) which is a surface contacting

the backed-up surface 574i provided in the engaging portion 573, and a rib 577e (Figure 46) perpendicular to the receiving surface 577a. Similarly to Embodiment 1, the receiving surface 577a is the backup portion and also the transmitted portion for receiving the driving force from the cylindrical member 570.

[0400] As shown in Figure 48, the drive transmission surface 533m is a surface (driven portion) to which drive is transmitted from the cylindrical member 570 to the aligning member 533. The cylindrical member 570 has a corresponding cylinder drive transmission surface (drive transmission portion) 570m. Three positions thereof (120° spacing, approximately equal intervals) are arranged at equal intervals in the circumferential direction of the aligning member 533 and the cylindrical member 570.

[0401] In addition, the cylinder drive transmission surface 570m and the drive transmission surface 533m are twisted along the axis of the cylindrical member 570 and the aligning member 453, respectively, and the twisting amount is about 2° per 1 mm.

[0402] Regarding this twist amount, the following relationship holds. The cylindrical member 570 receives the force $Fz1$ attracting toward the outer side ($Z1$ direction side) of the developing cartridge 4 at the drive receiving surface 573a. And, the cylindrical member 570 receives a force $Fz2$ attracting inward (toward the $Z2$ direction side) of the developing cartridge 4 at the flange drive transmission surface 570m. In this case, $Fz2 > Fz1$ is always satisfied.

[0403] Therefore, the cylindrical member 570 is assuredly retracted in the $Z2$ direction. Additionally, at least a portion of the engagement portion D in the Z direction between the cylinder drive transmission surface 570m and the drive transmission surface 33m overlaps the receiving surface 573a and the receiving surface 577a of the force receiving portion 577, in the Z direction. By this, it is

possible to suppress the deformation amount of the cylindrical member 570.

[0404] In this embodiment, as shown in Figure 49 a mounting portion 533d (Figure 37) which is a D-shaped hole provided in the aligning member 533 is mounted to the shaft of the toner supply roller 20. And, when the drive is transmitted from the aligning member 533 to the shaft of the toner supply roller 20, the toner supply roller 20 is rotatable. Next, the driving force is transmitted to the toner supply roller gear 598 provided on the side of the axis of the toner supply roller 20 in the Z1 direction. Finally, the drive is transmitted from the toner supply roller gear 598 to the developing roller gear 599 provided on the side of the shaft of the developing roller 17 in the Z1 direction, so that the developing roller 17 can rotate. The ends of the developing roller 17 are rotatably supported by the development bearings 519R and 519L, respectively.

[Mounting of Cartridge to Image Forming Apparatus Main Assembly]

[0405] Referring to Figure 50 and Figure 51, attachment / dismounting of the developing cartridge 4 to / from the image forming apparatus main assembly 100A will be described.

[0406] Figure 50 is a perspective view illustrating the mounting of the developing cartridge 4 to the image forming apparatus main assembly 100A.

[0407] Figure 51 is a cross-sectional view illustrating the mounting operation of the developing cartridge 4 to the image forming apparatus main assembly 100A.

[0408] The image forming apparatus main assembly 100A of this embodiment employs a structure in which the developing cartridge 4 can be mounted in the horizontal direction. More specifically, the image forming apparatus main assembly 100A includes therein a space in which the developing cartridge 4 can be mounted. And, there is provided a cartridge door 5104 (front door) for inserting the developing cartridge 4 into the above-described space in front of the

image forming apparatus main assembly 100A (the direction in which the user stands when used).

[0409] As shown in Figure 50, the cartridge door 5104 of the image forming apparatus main assembly 100A is provided so as to be opened and closed.

5 When the cartridge door 5104 is opened, the lower cartridge guide rail 5105 for guiding the developing cartridge 4 is disposed on the bottom surface of the space, and the upper cartridge guide rail 5106 is disposed on the upper surface. The developing cartridge 4 is guided to the mounting position by the lower guide rails (5105, 5106) provided above and below the space. The developing cartridge 4
10 is inserted into the mounting position substantially along the axis of the developing roller 20.

[0410] In the following, referring to Figure 51, the mounting and dismounting operation of the developing cartridge 4 relative to the image forming apparatus main assembly 100A will be described.

15 **[0411]** As shown in part (a) of Figure 51, the developing cartridge 4 is supported and guided by the lower cartridge guide rail 5105 on the lower side of the end portion on the rear side in the inserting direction. The developing cartridge 4 is guided by the upper cartridge guide rail 5106 (not shown) on the upper side of the end portion on the rear side in the inserting direction. In this
20 state, the developing cartridge 4 is inserted into the apparatus main assembly. At this time, the developing frame 18 and the development bearing 19 (19L, 19R) are dimensioned so as not to contact the intermediary transfer belt 5.

[0412] As shown in part (b) of Figure 51, the developing cartridge 4 is horizontally inserted while being supported by the lower cartridge guide rail 5105
25 until reaching a back side cartridge positioning portion 5108 provided in the image forming apparatus main assembly 100A.

[0413] In addition, when the developing cartridge 4 is mounted, as described

above, the drive transmission member 5101r of the image forming apparatus main assembly 100A is engaged with the coupling member 528 while being urged substantially in the Y2 direction.

[0414] Part (c) of Figure 51 is a view illustrating the state of the image forming apparatus main assembly 100A and the developing cartridge 4 in a state where the cartridge door 5104 is closed. The structure is such that the lower cartridge guide rail 5105 of the image forming apparatus main assembly 100A moves up and down in interrelation with the opening and closing of the cartridge door (front door) 5104.

[0415] When the cartridge door 5104 is closed by the user, the lower cartridge guide rail 5105 is raised. And, both end portions of the developing cartridge 4 contact the cartridge positioning portions (5108, 5110) of the image forming apparatus main assembly 100A, and the developing cartridge 4 is positioned with respect to the image forming apparatus main assembly 100A. In addition, the drive transmission member 5101r of the image forming apparatus main assembly 100A also rises following the developing cartridge 4.

[0416] With the above operation, the mounting of the developing cartridge 4 to the image forming apparatus main assembly 100A is completed.

[0417] In addition, the removal of the developing cartridge 4 from the image forming apparatus main assembly 100A is in the reverse order of the above-described inserting operation.

[Engaging Process of Coupling Member to Main assembly Drive Shaft]

[0418] Subsequently, the engagement process between the coupling member 528 and the main assembly driving shaft 5101 will be described in detail.

[0419] Figure 52 is a cross-sectional view illustrating the mounting operation of the coupling member 528 to the main assembly driving shaft 5101.

[0420] Part (a) of Figure 52 is a view illustrating a state before the coupling

member 528 starts engaging with the drive transmission member 5101r. In addition, part (d) of Figure 52 shows a state in which the developing cartridge 4 is mounted to the image forming apparatus main assembly 100A. In particular, part (d) of Figure 52 shows the state in which as the cartridge door 5104 closes,
 5 the lower cartridge guide rail 105 is raised, and the developing cartridge 4 is positioned with respect to the image forming apparatus main assembly 100A.

[0421] Here, parts (b) and (c) of Figure 52 illustrate the process of mounting the coupling member 528 and the drive transmission member 5101r between the position shown in part (a) of Figure 52 and the position shown in part (d) of
 10 Figure 52. Here, the drive transmission member 5101r is urged substantially in the Y2 direction by the urging spring 5101t, and the axis of the drive transmission member 5101r is urged up to the position shifted substantially in the Y2 direction from the axis of the coupling member 528.

[0422] As described referring to Figure 51, the developing cartridge 4 is
 15 horizontally inserted while being supported by the lower cartridge guide rail 5105 of the image forming apparatus main assembly 100A.

[0423] Part (a) of Figure 52 is a view illustrating a state in which the drive transmission member 5101r does not abut on the coupling member 528. As described in the foregoing, in this state, the axis of the drive transmission member
 20 5101r and the axis of the coupling member 528 are deviated from each other.

[0424] As shown in part (b) of Figure 52, when the coupling member 528 is further inserted from the part (a) of Figure 52 toward the rear side of the drive transmission member 5101r, the insertion tapered surface 573d of the coupling member 528 first contacts the conical shape 5101c of the drive transmission
 25 member 5101r. The insertion tapered surface 573d of the coupling member 528 is guided by the conical shape 5101c of the drive transmission member 5101r, and the axis of the coupling member 528 and the axis of the drive transmission

member 5101r are substantially aligned with each other.

[0425] Part (c) of Figure 52 shows a state in which the coupling member 528 is further inserted from the part (b) of Figure 52 toward the rear side of the drive transmission member 5101r. As the base portion 574 undergoes elastic deformation, the engaging portion 573 deforms radially outwardly of the coupling member 528 so that the insertion tapered portion 573d of the engaging portion 573 deforms so as to match the conical shape 5101c. Furthermore, when the coupling member 528 is inserted in the Z1 direction, the removed tapered surface 573e of the engaging portion 573 of the coupling member 528 is inserted into the drive transmission member 5101r until it comes to the Z direction rear side (Z1 side) from the main assembly side removing taper 5101i of the drive transmission member 5101r. Next, until the positioning portion 533a of the coupling member 528 and the conical shape 5101c of the drive transmission member 5101r are brought into contact with each other, the coupling member 528 is inserted into the drive transmission member 5101r.

[0426] Thereafter, as described above, by raising the developing cartridge 4 by the lower cartridge guide rail 5105, the developing cartridge 4 is positioned relative to the image forming apparatus main assembly 100A (part (c) of Figure 51). In addition, as shown in part (d) of Figure 51, as the developing cartridge 4 rises, the drive transmission member 5101r also moves up. Thereafter, as in Embodiment 1, when the main assembly driving shaft 5101 rotates and the phases of the engaging portion 573 and the drive transmission groove 5101a match, the elastic deformation of the base portion 574 is released, and the engaging portion 573 enters the drive transmission groove 5101a.

[Drive of coupling Member by Main Assembly Driving Shaft]

[0427] Referring to Figure 46, the rotational drive transmission from the main driving shaft 5101 to the coupling member 528 will be described.

[0428] When the drive receiving surface 573a of the coupling 528 abuts against the main assembly drive transmission surface 5101b, the developing blade 21 and the like supply a load by way of the developing roller 17 and the developing roller 17. That is, the drive receiving surface 573a rotates integrally
 5 with the driving transmission surface 101b while receiving the load (driving force) F51.

[0429] When this driving force F51 is received by the drive receiving surface 753a, the angle J formed by the backed-up surface 574i and the drive receiving surface 573a is an acute angle, and therefore, the load can be divided into the
 10 component Fv in the direction perpendicular to the backed-up surface 574i and the component Fh in the horizontal direction. As shown in Figure 46, the component in the vertical direction Fv is transmitted to the backed-up surface 574i opposite to the drive receiving surface 573a of the engaging portion 573. The backed up surface 574i is backed up by the abutment against the force
 15 receiving surface 577a or by the rib 577e in the direction perpendicular to the force receiving surface 577a. By this, even if the load F51 fluctuates, the engaging portion 573 is backed up as described above, and therefore, it is not substantially deformed, and for this reason, the amounts of rotation of the toner supply roller 20 and the developing roller 17 also hardly changes, and as a result,
 20 the quality of the image can be maintained.

[0430] In addition, the removal of the developing cartridge 4 from the image forming apparatus main assembly 100A is executed in the reverse order of the above-described inserting operation.

[0431] In this embodiment, the base side extending portion 574t extends to the
 25 rear side (Z2 direction) substantially in parallel with the rotation axis of the cylindrical member 570. And, the base side extending portion 574t is disposed radially outside the engaging portion 573, and both of the free end side of the

engaging portion 573 and the root 574a of the base portion are disposed on the Z1 side of the folded portion 574r.

[0432] As shown in Figure 53, as another embodiment, both the free end side of the engaging portion 573 and the root 574a of the base portion may be
5 arranged on the Z2 side of the folded portion 574r.

[0433] As shown in part (a) of Figure 54, Figure 55, the base side extending portion 574t may be disposed on the downstream side in the rotational direction with respect to the engaging portion 573 and extend toward the rear side (the Z2 direction) of the base portion 274a. As shown in part (b) of Figure 54, the base
10 side extending portion 574t may be disposed on the upstream side the engaging portion 573 in the rotational direction and extend toward the rear side (the Z2 direction) of the base portion 274a. As shown in part (c) of Figure 54, the base side extending portion 574t may be disposed on both sides of the engaging portion 573 in the rotational direction.

15 [0434] As shown in part (a) of Figure 56 and Figure 57, the base side extending portion 574t may be disposed on the downstream side in the rotational direction beyond the engaging portion 573 and the free end side extending portion 574s and may extend in the Z1 direction from the base portion 574a. As shown in part (b) of Figure 56, the base side extending portion 574t may be
20 disposed on the upstream side in the rotational direction beyond the engaging portion 573 and the free end side extending portion 574s and may extend in the Z1 direction from the base portion 574a. As shown in part (c) of Figure 56, the base side extending portion 574t may be disposed on both sides in the rotational direction relative to the engaging portion 573 and the free end side extending
25 portion 574s.

<Embodiment 6>

[0435] Referring to Figures 58 to 63, Embodiment 6 will be described.

[0436] Figure 58 is a perspective view of the aligning member 633 according to this example.

[0437] Figure 59 is a cross-sectional view of the aligning member 633
5 according to this embodiment cut along the rotation axis.

[0438] Figure 60 is a cross-sectional view of the coupling member 628 according to this embodiment and taken through the drive receiving surface 673a along a direction perpendicular to the rotation axis.

[0439] Figure 61 is a perspective view of the cylindrical member 670
10 according to this embodiment.

[0440] Figure 62 is a cross-sectional view of the coupling member 628 according to this embodiment cut along the rotation axis.

[0441] Figure 63 is a view illustrating assembly of the coupling member 628 according to this embodiment.

[0442] Elements corresponding to the elements disclosed in the above
15 embodiments are given the same names. In addition, the description will be made in detail as to the structure and the operation and so on which are different from the above-described elements, and the description on the same points as described above may be omitted. The same names and the same reference
20 numerals are assigned to substantially the same elements as those described above, and the detailed description is omitted. In this embodiment, especially the points different from Embodiment 5 will be described in detail.

[0443] In Embodiment 5, the coupling member 528 comprises a cylindrical member 570 and the aligning member 533, and the cylindrical member 570
25 includes a cylinder drive transmission surface 570m, a base portion 574, and an engaging portion 573, and the aligning member 533 includes a force receiving portion 577 and a drive transmission surface 533m.

[0444] On the other hand, in this embodiment, a backup portion 670j is provided in the cylindrical member 670, and the aligning member 633 includes a base portion 674, an engaging portion 673, and a force receiving portion 677.

[0445] More specifically, as shown in Figure 58, the aligning member 633 has
 5 a base portion 674, an engaging portion 673, a force receiving portion 677, an inverted conical shape 633a, and a retaining portion 633c.

[0446] As shown in Figure 59, the base portion 674 is provided with a base portion 674a on the Z1 side and includes a base side extending portion 674t extending in the axial direction of the coupling member 628, a free end side
 10 extending portion 674s, a base side extending portion 674t, and a folded portion 674r.

[0447] The engaging portion 673 is provided with a drive receiving surface 673a, similarly to Embodiment 5. That is, the aligning member 633 is a driving force receiving member provided with a driving force receiving portion for
 15 receiving a driving force from the apparatus main assembly.

[0448] Further, the free end extended portion 674s is provided with a backed-up surface 674i and a contact surface 674h.

[0449] The angle j formed by the drive receiving surface 673a and the backed-up surface 674i is an acute angle, as in Embodiment 5.

[0450] As shown in Figure 60, the force receiving portion 677 is disposed on the downstream side in the rotational direction of the engaging portion 673, and includes a receiving surface 677a and a rib 677e. The receiving surface 677a is a surface for sandwiching the backup portion 670j of the cylindrical member 670 which will be described hereinafter in cooperation with the backed-up surface
 20 674i of the base portion 674. The receiving surface 677a and the backed-up surface 674i are substantially parallel. As shown in Fig 60, the rib 677e is disposed substantially perpendicularly to the receiving surface 677a starting from

the inner diameter side end of the receiving surface 677a.

[0451] In addition, the inverted conical shape 633a is a portion for determining the positions of the coupling member 628 and the main assembly driving shaft 5101, as in Embodiment 5.

5 **[0452]** The retaining portion 633c engages with a catch portion 672 provided in the cylindrical member 670 to unitize the aligning member 633 and the cylindrical member 670.

[0453] As shown in Figure 61, the cylindrical member 670 has a backup portion 670j and a catch portion 672. That is, the cylindrical member 670 is a
10 backup member including a backup portion.

[0454] As shown in Figure 60, the backup portion 670j is assembled in a gap between the backed-up surface 674i of the aligning member 633 and the receiving surface 677a and has a shape which prevents the engaging portion 673 from tilting to the upstream side in the rotational direction. Therefore, the
15 thickness of the backup portion 670j is substantially the same as the gap between the backed-up surface 674i and the receiving surface 677a. In addition, as viewed in the Z direction, a circle passing through the ridge line on the side of the engaging portion 673 of the backup portion 670j is arranged so that its center is the same as the inverted conical shape 633a. The diameter D68 of the circle is
20 made approximately the same as the outer diameter D65 of the shaft portion 5101f of the main assembly driving shaft 5101 or is made so that $D68 \geq D65$ is satisfied as the respective dimensional accuracy is taken into consideration. In addition, as shown in Figure 62, the backup portion 670j is disposed so as to overlap the drive receiving surface 673a in the Z direction.

25 **[0455]** By aligning the aligning member 633 with respect to the cylindrical member 670 on the front side from the rear side in the Z direction (from the Z2 side toward the Z1 side), a coupling member 628 is formed (Figure 62). At this

time, as mentioned above, the retaining portion 633c of the aligning member 633 is engaged with the catch portion 672 provided in the cylindrical member 670.

[0456] As shown in Figure 60, when the coupling member 628 is driven by the main assembly driving shaft 5101, the drive receiving surface 673a of the engaging portion 673 receives the driving force F1. In the force components, the force Fv in the direction perpendicular to the backed up surface is backed up by the backed-up surface 674i, the backup portion 670j, the receiving surface 670a, and the rib 670e, and therefore, the engaging portion 673 is prevented from being deformed toward the downstream side in the rotational direction. In addition, with respect to the force Fh in the direction parallel to the backed-up surface 674i, it is possible to prevent the engaging portion 673 from being deformed in the radial direction by the contact surface 674h of the base portion 674 abutting against the shaft portion 5101f of the main assembly driving shaft 5101.

[0457] In addition, in Embodiment 5, an engaging portion 573 is provided on the cylindrical member 570 and placed on the aligning member 533 so as to straddle the inverted conical shape 533a and another portion. Therefore, the cylinder drive transmission surface 570m is provided on the cylindrical member 570, and the drive transmission surface 533m is provided on the aligning member 533. By this, by pulling the cylindrical member 570 toward the aligning member 533 side (Z2 direction side), the position of the engaging portion 573 and the inverted conical shape 533a in the Z direction is stabilized.

[0458] By contrast, in this embodiment, the engaging portion 673 and the inverted conical shape 633a are arranged on the aligning member 633, and therefore, it is not necessary to pull the cylindrical member 670 toward the aligning member 633 side.

[0459] As another embodiment, as in Figure 53 of Embodiment 5, the base

portion 674a of the root side extending portion 674t of the base portion 674 may be provided on the Z2 side and the folded back portion 674r may be provided on the Z1 side of the base side extending portion 674t (not shown). In addition, similarly to the cases shown in Figures 54 and 56, the base side extending portion 674t may be disposed on the rotational direction, the upstream side, the downstream side, and both sides of the engaging portion 673. Here, the structures of the above-described Examples 1 to 6 are summarized as follows. According to the structures described in the present application, the support portion supporting the driving force receiving portion (drive receiving surface) has the first extending portion and the second extending portion extending in mutually different directions, and a certain length of the support portion can be assured even in the middle. That is, the support portion can support the driving force receiving portion movably while keeping the coupling and the cartridge small. Also, with such a structure of the supporting portion, when the cartridge is mounted in the image forming apparatus main assembly, the driving force receiving portion (engaging portion) can be engaged with the main assembly driving shaft provided in the image forming apparatus main assembly.

[INDUSTRIAL APPLICABILITY]

[0460] According to the present invention, there is provided a photosensitive drum unit dismountably mountable to a main assembly of an electrophotographic image forming apparatus.

[CLAIMS]

1. A drum unit comprising:

(1) a photosensitive drum; and

(2) a coupling member operatively connected to the photosensitive drum, the coupling member including (i) a driving force receiving portion configured to receive a driving force for rotating the photosensitive drum, and (ii) a supporting portion movably supporting the driving force receiving portion,

wherein the supporting portion includes a first extended portion and a second extended portion, the first extended portion and the second extending portion extending at least in an axial direction of the photosensitive drum, one of the first extended portion and the second extended portion extending outwardly with respect to the axial direction, and the other of the first extended portion and the second extended portion extending inwardly with respect to the axial direction.

2. A drum unit according to claim 1, wherein the driving force receiving portion is supported by the first extended portion.

3. A drum unit according to claim 1, wherein the first extended portion is provided with a projected portion having the driving force receiving portion.

4. A drum unit according to claim 3, wherein the projected portion projects inwardly in a radial direction of the drum unit.

5. A drum unit according to claim 4, wherein at least a part of the supporting portion is disposed within the photosensitive drum.

6. A drum unit according to claim 3, wherein the projected portion projects in a direction crossing with a direction in which the first extended portion extends.

7. A drum unit according to claim 1, wherein the driving force receiving portion extends in a radial direction of the drum unit.

8. A drum unit according to claim 1, wherein the first extended portion extends toward a free end of the supporting portion, and the second extended portion extends toward the first extended portion.

9. A drum unit according to claim 1, wherein the supporting portion has a fixed end connected to the second extended portion.

10. A drum unit according to claim 1, wherein the coupling member includes a hollow portion, and at least a part of the supporting portion is within the hollow portion.

11. A drum unit according to claim 1, wherein the coupling member includes a hollow portion, and the fixed end of the supporting portion is fixed to an inner surface defining the hollow portion.

12. A drum unit according to claim 1, wherein the first extended portion extends

outwardly with respect to the axial direction, and the second extended portion extends inwardly with respect to the axial direction.

13. A drum unit according to claim 1, wherein the first extended portion extends inwardly with respect to the axial direction, and the second extended portion extends outwardly with respect to the axial direction.

14. A drum unit according to claim 1, wherein the supporting portion supports the driving force receiving portion so as to be movable at least in a radial direction of the drum unit.

15. A drum unit according to claim 1, wherein the supporting portion is elastically deformable.

16. A drum unit according to claim 1, wherein the first extended portion extends in a direction inclined relative to the axial direction.

17. A drum unit according to claim 1, wherein the second extended portion extends in a direction inclined relative to the axial direction.

18. A drum unit according to claim 1, wherein the supporting portion is provided with a connecting portion connecting the first extended portion and the second extended portion with each other.

19. A drum unit according to claim 18, wherein the connecting portion is a bent portion.

20. A drum unit according to claim 1, wherein the first extended portion is disposed inside of the second extended portion in the radial direction of the drum unit.

21. A drum unit according to claim 1, wherein the first extended portion and the second extended portion are offset in a circumferential direction of the drum unit.

22. A drum unit according to claim 21, wherein the first extended portion is disposed upstream of the second extended portion with respect to a rotational moving direction of the drum unit.

23. A drum unit according to claim 21, wherein the first extended portion is disposed downstream of the second extended portion with respect to a rotational moving direction of the drum unit.

24. A drum unit according to claim 1, wherein the supporting portion includes a plurality of such second extended portions.

25. A drum unit according to claim 24, wherein the first extended portion is connected with the plurality of second extended portions.

26. A drum unit according to claim 1, wherein the supporting portion has an M-shape.

27. A drum unit according to claim 1, wherein the coupling member includes a plurality of driving force receiving portions and a plurality of supporting portions.

28. A drum unit according to claim 27, wherein the driving force receiving portions are

disposed equidistantly in a circumferential direction of the drum unit.

29. A drum unit according to claim 27, wherein the coupling member includes three driving force receiving portions and three supporting portions.

30. A drum unit according to claim 1, wherein the coupling member includes (i) a driving force receiving member provided with the supporting portion and the driving force receiving portion, and (ii) a force receiving member for receiving the driving force from the driving force receiving member.

31. A drum unit according to claim 30, wherein the force receiving member includes a receiving portion for receiving the driving force by contacting the supporting portion.

32. A drum unit according to claim 30, wherein the force receiving member is configured to urge the driving force receiving portion at least radially inward of the coupling member.

33. A drum unit according to claim 30, wherein the force receiving member is fixed to the photosensitive drum.

34. A drum unit according to claim 1, wherein the coupling member includes a back-up portion for restricting movement of the driving force receiving portion in a circumferential direction of the coupling member.

35. A drum unit according to claim 34, wherein the back-up portion is configured to restrict-movement of the driving force receiving portion by contacting the supporting portion.

36. A drum unit according to claim 34, wherein the back-up portion is configured to urge the driving force receiving portion at least inwardly of the coupling member.

37. A drum unit according to claim 1, wherein at least a part of the driving force receiving portion is disposed within the photosensitive drum.

38. A drum unit according to claim 1, wherein the driving force receiving portion includes an inclined portion that is inclined relative to a moving direction of the driving force receiving portion.

39. A drum unit according to claim 38, wherein the inclined portion is inclined so as to face outward at least in a radial direction of the drum unit.

40. A drum unit according to claim 38, wherein the inclined portion of the driving force receiving portion is inclined such that the driving force receiving portion is urged radially inward of the drum unit by the driving force.

41. A drum unit according to claim 1, wherein the coupling member is provided with a recess disposed inside of the driving force receiving portion in an axial direction of the drum unit, and the recess reduces in size toward an inside in the axial direction of the drum unit.

42. A drum unit according to claim 1, wherein the supporting portion is a snap fit

portion.

43. A drum unit according to claim 1, wherein the driving force receiving portion is more upstream, in a rotational direction of said coupling member, as going outside in an axial direction of the drum unit.

44. A cartridge comprising a drum unit according to claim 1, and a frame rotatably supporting the drum unit.

45. A cartridge comprising:

(1) a rotatable member rotatable with developer carried on a surface thereof; and

(2) a coupling member including (i) a driving force receiving portion configured to receive a driving force for rotating the rotatable member, and (ii) a supporting portion movably supporting the driving force receiving portion,

wherein the supporting portion includes a first extended portion and a second extended portion the first extended portion and the second extended portion extending at least in an axial direction of the rotatable member, one of the first extended portion and the second extended portion extending outwardly with respect to the axial direction, and the other of the first extended portion and the second extended portion extending inwardly with respect to the axial direction.

46. A cartridge according to claim 45, wherein the driving force receiving portion is supported by the first extended portion.

47. A cartridge according to claim 45, wherein the first extended portion is provided with a projected portion having the driving force receiving portion.

48. A cartridge according to claim 47, wherein the projected portion projects inwardly in a radial direction of the coupling member.

49. A cartridge according to claim 47, wherein the projected portion projects in a direction crossing a direction in which the first extended portion extends.

50. A cartridge according to claim 45, wherein the driving force receiving portion extends in a radial direction of the coupling member.

51. A cartridge according to claim 45, wherein the first extended portion extends toward a free end of the supporting portion, and the second extended portion extends toward the first extended portion.

52. A cartridge according to claim 45, wherein the supporting portion has a fixed end connected to the second extended portion.

53. A cartridge according to claim 52, wherein the coupling member includes a hollow portion, and the fixed end of the supporting portion is fixed to an inner surface defining the hollow portion.

54. A cartridge according to claim 45, wherein the first extended portion extends

outwardly with respect to the axial direction, and the second extended portion extends inwardly with respect to the axial direction.

55. A cartridge according to claim 45, wherein the first extended portion extends inwardly with respect to the axial direction, and the second extended portion extends outwardly with respect to the axial direction.

56. A cartridge according to claim 45, wherein the supporting portion supports the driving force receiving portion so as to be movable at least in a radial direction of the coupling member.

57. A cartridge according to claim 45, wherein the supporting portion is elastically deformable.

58. A cartridge according to claim 45, wherein the first extended portion extends in a direction inclined relative to the axial direction.

59. A cartridge according to claim 45, wherein the second extended portion extends in a direction inclined relative to the axial direction.

60. A cartridge according to claim 45, wherein the supporting portion is provided with a connecting portion connecting the first extended portion and the second extended portion to each other.

61. A cartridge according to claim 60, wherein the connecting portion is a bent portion.

62. A cartridge according to claim 45, wherein the first extended portion is disposed inside of the second extended portion in a radial direction of the coupling member.

63. A cartridge according to claim 45, wherein the first extended portion and the second extended portion are offset in a circumferential direction of the coupling member.

64. A cartridge according to claim 63, wherein the first extended portion is disposed upstream of the second extended portion with respect to a rotational moving direction of the coupling member.

65. A cartridge according to claim 63, wherein the first extended portion is disposed downstream of the second extended portion with respect to a rotational moving direction of the coupling member.

66. A cartridge according to claim 45, wherein said supporting portion includes a plurality of such second extended portions.

67. A cartridge according to claim 66, wherein the first extended portion is connected to the plurality of second extended portions.

68. A cartridge according to claim 45, wherein the supporting portion has an M-shape.

69. A cartridge according to claim 45, wherein the coupling member includes a plurality of driving force receiving portions and a plurality of supporting portions.

70. A cartridge according to claim 69, wherein the driving force receiving portions are disposed equidistantly in a circumferential direction of the coupling member.

71. A cartridge according to claim 69, wherein the coupling member includes three driving force receiving portions and three supporting portions.

72. A cartridge according to claim 45, wherein the coupling member includes (i) a driving force receiving member provided the supporting portion and the driving force receiving portion, and (ii) a force receiving member for receiving the driving force from the driving force receiving member.

73. A cartridge according to claim 72, wherein the force receiving member includes a receiving portion for receiving the driving force by contacting the supporting portion.

74. A cartridge according to claim 72, wherein the force receiving member is configured to urge the driving force receiving portion at least radially-inward of the coupling member.

75. A cartridge according to claim 72, wherein the force receiving member is fixed to the rotatable member.

76. A cartridge according to claim 45, wherein the coupling member includes a back-up portion for restricting movement of the driving force receiving portion in a circumferential direction of the coupling member.

77. A cartridge according to claim 76 wherein the back-up portion is configured to restrict movement of the driving force receiving portion by contacting the supporting portion.

78. A cartridge according to claim 76, wherein the force receiving member is configured to urge the driving force receiving portion at least radially-inward of the coupling member.

79. A cartridge according to claim 45, wherein at least a part of the supporting portion is disposed within the rotatable member.

80. A cartridge according to claim 45, wherein at least a part of the driving force receiving portion is disposed within the rotatable member.

81. A cartridge according to claim 45, wherein the coupling member includes a hollow portion, and at least a part of the supporting portion is within the hollow portion.

82. A cartridge according to claim 45, wherein the driving force receiving portion includes an inclined portion that is inclined relative to a moving direction of the driving force receiving portion.

83. A cartridge according to claim 82, wherein the inclined portion is inclined so as to face outwardly in a radial direction of the coupling member.

84. A cartridge according to claim 82, wherein the inclined portion of the driving force receiving portion is inclined such that the driving force receiving portion is urged radially inward of the coupling member by the driving force.

85. A cartridge according to claim 45, wherein the coupling member is provided with a recess disposed inside of the driving force receiving portion in the axial direction of the rotatable member, and the recess reduces its size toward an inside in the axial direction.

86. A cartridge according to claim 45, wherein the supporting portion is a snap fit portion.

87. A cartridge according to claim 45, wherein the driving force receiving portion is more upstream in a rotational direction of said coupling member, as going outside in the axial direction of the rotatable member.

88. A cartridge according to claim 45, wherein the rotatable member is a photosensitive drum.

89. A cartridge according to claim 45, wherein the rotatable member is a developing roller.

90. A cartridge according to claim 89, further comprising a supplying roller for supplying the developer to the developing roller.

91. A cartridge according to claim 90, wherein the supplying roller is configured to be rotated by the driving force received by the driving force receiving portion.

92. A cartridge according to claim 90, wherein the supplying roller is configured to transmit the driving force from the coupling member to the developing roller.

93. A cartridge according to claim 45, wherein the rotatable member is a supplying roller for supplying the developer to a developing roller.

94. A cartridge according to claim 45, wherein the rotatable member includes a shaft, and the coupling member is mounted to the shaft.

95. An electrophotographic image forming apparatus comprising a cartridge according to claim 45, and an electrophotographic image forming apparatus main assembly to which the cartridge is mountable.

96. A coupling member engageable with a driving shaft provided in a main assembly of an electrophotographic image forming apparatus, the coupling member comprising:

a driving force receiving portion configured to receive a driving force for rotating a rotatable member having a surface for carrying developer; and

a supporting portion movably supporting the driving force receiving portion,

wherein the supporting portion includes a first extended portion and a second extended portion, the first extended portion and the second extended portion extending at least in an axial direction of the rotatable member, one of the first extended portion and the second extended portion extending outwardly with respect to the axial direction and the other of the first extended portion and the second extended portion extending inwardly with respect to the axial direction.

97. A cartridge according to Claim 90, wherein the supplying roller is configured to transmit the driving force from the coupling member to the developing roller.