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CA 2728434 C 2015/11/03

(11)(21) 2 728 434

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2009/06/15
(87) Date publication PCT/PCT Publication Date: 2010/01/14
(45) Date de délivrance/Issue Date: 2015/11/03
(85) Entrée phase nationale/National Entry: 2010/12/13
(86) N° demande PCT/PCT Application No.: JP 2009/061266
(87) N° publication PCT/PCT Publication No.: 2010/004854
(30) Priorités/Priorities: 2008/06/20 (JP2008-161527); 2008/08/11 (JP2008-207291)

(51) Cl.Int./Int.Cl. *G03G 21/18* (2006.01), *G03G 15/00* (2006.01)

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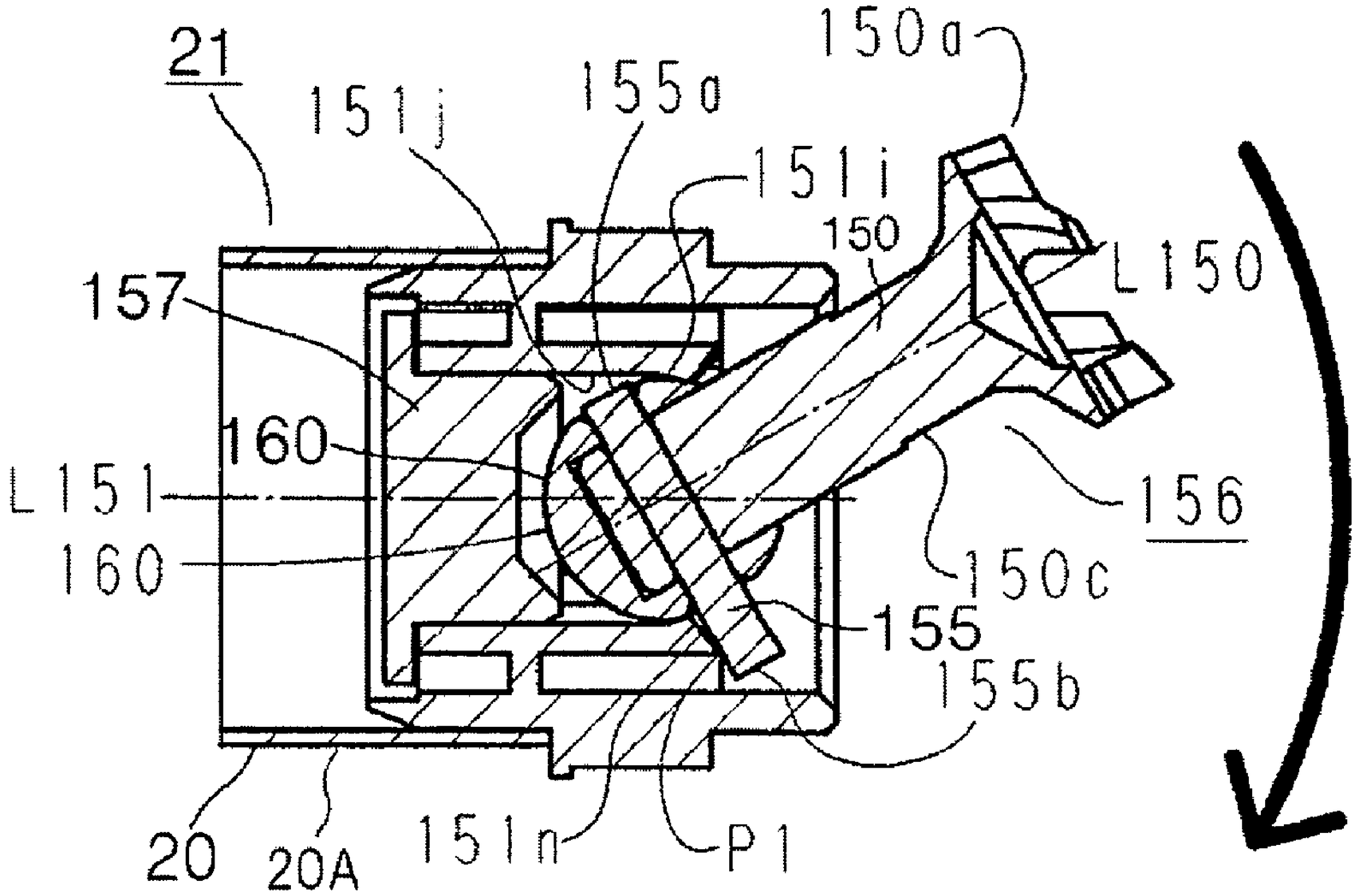
(54) Titre : PROCEDES DE DEMONTAGE ET DE MONTAGE D'UN ORGANE DE COUPLAGE D'UN TAMBOUR ELECTROPHOTOGRAPHIQUE PHOTOSENSIBLE

(54) Title: DISMOUNTING AND MOUNTING METHODS FOR COUPLING AND ELECTROPHOTOGRAPHIC PHOTOSENSITIVE DRUM UNIT



(57) Abrégé/Abstract:
A coupling member dismounting method for dismounting, from a drum flange (21) mounted to an electrophotographic photosensitive drum, a coupling member (150) for receiving a rotating force for rotating the drum, the method including (i) an inclining step of inclining the coupling member relative to a rotational axis of the drum flange, wherein the coupling member includes a rotating force receiving member having and a spherical portion (160) mounted to a rear end portion of the rotating force receiving member by a pin penetration (155); (ii) a pin urging step of pushing the pin (155) from one end to the other end thereof, (iii) a pin riding step of making a part of the pin which is further projected at the end by the pin urging step ride on a second surface; (iv) a coupling member dismounting step of dismounting the coupling member from the drum flange by applying a force to a free end portion of the coupling member toward a fulcrum which is the portion of the pin riding on the second surface.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 January 2010 (14.01.2010)

PCT

(10) International Publication Number
WO 2010/004854 A8

(51) International Patent Classification:
G03G 21/18 (2006.01) *G03G 15/00* (2006.01)

(21) International Application Number:
PCT/JP2009/061266

(22) International Filing Date:
15 June 2009 (15.06.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2008-161527 20 June 2008 (20.06.2008) JP
2008-207291 11 August 2008 (11.08.2008) JP

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) **Title**: DISMOUNTING AND MOUNTING METHODS FOR COUPLING AND ELECTROPHOTOGRAPHIC PHOTOSENSITIVE DRUM UNIT

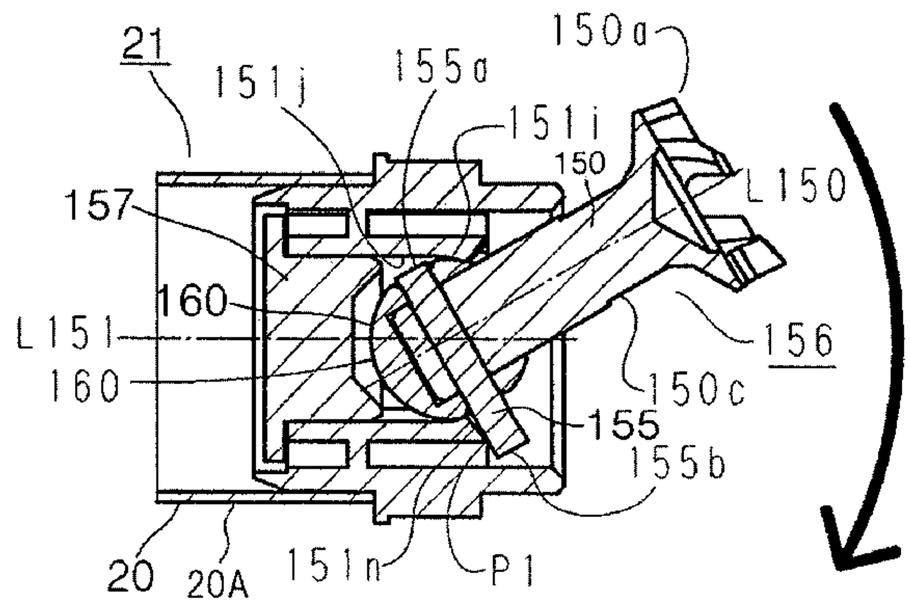


Fig. 29

(57) **Abstract**: A coupling member dismounting method for dismounting, from a drum flange (21) mounted to an electrophotographic photosensitive drum, a coupling member (150) for receiving a rotating force for rotating the drum, the method including (i) an inclining step of inclining the coupling member relative to a rotational axis of the drum flange, wherein the coupling member includes a rotating force receiving member having and a spherical portion (160) mounted to a rear end portion of the rotating force receiving member by a pin penetration (155); (ii) a pin urging step of pushing the pin (155) from one end to the other end thereof, (iii) a pin riding step of making a part of the pin which is further projected at the end by the pin urging step ride on a second surface; (iv) a coupling member dismounting step of dismounting the coupling member from the drum flange by applying a force to a free end portion of the coupling member toward a fulcrum which is the portion of the pin riding on the second surface.

WO 2010/004854 A8

WO 2010/004854 A8

(48) **Date of publication of this corrected version**:
29 December 2010

(15) **Information about Correction**:
see Notice of 29 December 2010

DESCRIPTION

DISMOUNTING AND MOUNTING METHODS FOR COUPLING AND ELECTROPHOTOGRAPHIC PHOTOSENSITIVE DRUM UNIT

[TECHNICAL FIELD]

The present invention relates to a dismounting method for a coupling member, a mounting method for a coupling member, and an electrophotographic photosensitive drum unit used for a process cartridge dismountably mounted to a main assembly of an electrophotographic image forming apparatus. Here, in the present invention, the process cartridge contains as a unit at least one of an electrophotographic photosensitive member drum, developing means as process means actable on the drum, cleaning means, and charging means. And, it is detachably mountable to the electrophotographic image forming apparatus main assembly.

In addition, the electrophotographic image forming apparatus forms an image on a recording material through an electrophotographic type process. As examples of the electrophotographic image forming apparatus, there are an electrophotographic copying machine, an electrophotographic printer (LED printer, a laser beam printer), a facsimile device, a word processor, and so on.

In addition, the main assembly of the electrophotographic image forming apparatus is a portion of the electrophotographic image forming apparatus except the process cartridge.

[BACKGROUND ART]

In a known electrophotographic image forming apparatus in which the electrophotographic image forming process is used the electrophotographic photosensitive member drum, and the process means actable on the electrophotographic photosensitive member drum are integrated into a cartridge as a unit. And, this cartridge is detachably mountable to the main assembly of the electrophotographic image forming apparatus process cartridge type.

According to this process cartridge type the maintenance of the image forming apparatus can be carried out by the user himself or herself without relying on the service person, and therefore, the operativity of the maintenance is remarkably improved.

In addition, in the electrophotographic image forming apparatus, an image is formed on a recording material using a developer. The developer contained in the developer accommodating portion is consumed as the process cartridge having the developing means repeats the image formation.

Simple disassembling, and remanufacturing

methods for making usable again the process cartridge from which the developer has been consumed to such an extent that the image of the quality which can satisfy the user cannot be formed, are desired. And, an example of such a method is disclosed in US Patent 6643482.

The easy assembling method of the process cartridge has been desired.

The present invention further develops the above described prior art.

[DISCLOSURE OF THE INVENTION]

Accordingly, it is a principal object of the present invention to provide an easy dismounting method for a coupling member.

It is another object of the present invention to provide an easy mounting method for a coupling member.

It is a further object of the present invention to provide an electrophotographic photosensitive drum unit, wherein dismounting of the coupling is easy.

It is a further object of the present invention to provide an electrophotographic photosensitive drum unit, wherein mounting of the coupling is easy.

According to an aspect of the present invention, there is provided a coupling member dismounting method for dismounting, from a drum flange mounted to an

electrophotographic photosensitive drum usable with a process cartridge which is detachably mountable to a main assembly of an electrophotographic image forming apparatus, a coupling member for receiving a rotating force for rotating the electrophotographic photosensitive drum from the main assembly of the apparatus in a state in which the process cartridge is mounted to the main assembly of the apparatus, said method comprising (i) an inclining step of inclining the coupling member relative to a rotational axis of the drum flange, wherein the coupling member includes a rotating force receiving member having, at a free end portion, a rotating force receiving portion for receiving the rotating force, a spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration; (ii) a pin urging step of pushing the pin from one end to the other end thereof, wherein said one and the other ends of the pin are projected out of the spherical portion in a state in which the coupling member is inclined by said inclining step; wherein a regulating portion provided along an inside of the drum flange with a gap between the spherical portion and the regulating portion and has a configuration nearer to a spherical surface of the free end portion than a flat plane which is perpendicular to a longitudinal direction of the electrophotographic photosensitive drum and which

passes through a center of the spherical portion, and wherein said regulating portion includes a first surface extending from the regulating portion in a direction away from the coupling member toward the free end portion with respect to the longitudinal direction, and a second surface bent from the first surface extending from the regulating portion in a direction away from the coupling member toward the free end portion with respect to the longitudinal direction, (iii) a pin riding step of making a part of the pin which is further projected at the end by said pin urging step ride on the second surface; and (iv) a coupling member dismounting step of dismounting the coupling member from the drum flange by applying a force to a free end portion of the coupling member toward a fulcrum which is the portion of the pin riding on the second surface.

According to another aspect of the present invention, there is provided a coupling member dismounting method for dismounting, from a drum flange mounted to an electrophotographic photosensitive drum usable with a process cartridge which is detachably mountable to a main assembly of an electrophotographic image forming apparatus, a coupling member for receiving a rotating force for rotating the electrophotographic photosensitive drum from the main assembly of the apparatus in a state in which the

process cartridge is mounted to the main assembly of the apparatus, wherein the coupling member includes a rotating force receiving member having, at a free end portion, a rotating force receiving portion for receiving the rotating force, a resin spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, wherein said; the coupling member is mounted to a drum flange, mounted to one end of the electrophotographic photosensitive drum, by a resin regulating portion which is provided inside the drum flange and which is projected inwardly with respect to a radial direction of the drum flange with a gap between the spherical portion and the regulating portion, said method comprising (i) a gripping step of gripping the rotating force receiving member of the coupling member; (ii) a coupling member dismounting step of dismounting the coupling member, from the resin regulating portion, the resin spherical portion while deforming at least one of the resin regulating portion and the resin spherical portion by applying a force toward the free end portion in a state in which the rotating force receiving member is gripped by said gripping step.

According to a further aspect of the present invention, there is provided a coupling member mounting method for mounting, to a drum flange mounted

to an electrophotographic photosensitive drum usable with a process cartridge which is detachably mountable to a main assembly of an electrophotographic image forming apparatus, a coupling member for receiving a rotating force for rotating the electrophotographic photosensitive drum from the main assembly of the apparatus in a state in which the process cartridge is mounted to the main assembly of the apparatus, wherein the coupling member includes a rotating force receiving member having, at a free end portion, a rotating force receiving portion for receiving the rotating force, a resin spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, wherein said; the coupling member is mounted to a drum flange, mounted to one end of the electrophotographic photosensitive drum, by a resin regulating portion which is provided inside the drum flange and which is projected inwardly with respect to a radial direction of the drum flange with a gap between the spherical portion and the regulating portion, said method comprising a coupling member mounting step of mounting the coupling member, into the resin regulating portion, the resin spherical portion while deforming at least one of the resin regulating portion and the resin spherical portion by pushing it longitudinally inwardly of the electrophotographic photosensitive drum.

According to a further aspect of the present invention, there is provided an electrophotographic photosensitive drum unit to which a coupling member is mountable, wherein said coupling member includes, at a free end portion, a rotating force receiving member for receiving, from an electrophotographic image forming apparatus, a rotating force for rotating an electrophotographic photosensitive drum, a spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, said electrophotographic photosensitive drum unit comprising a cylinder having a photosensitive layer at an outer periphery thereof; and a drum flange provided at one end of said cylinder, said drum flange including, a plurality of resin regulating portions provided inside said drum flange and projected radially inwardly of the drum flange, wherein said regulating portions are effective to regulate movement of said spherical portion in a longitudinal direction of said drum unit when said coupling member is mounted thereto; a recess provided in said regulating portion at a position radially outside of said drum flange, for facilitating deformation of said regulating portion radially outwardly of said drum flange; and a plurality of rotating force receiving portion including a pin for receiving the rotating force, wherein said pin is provided between adjacent ones of

said regulating portions.

These and other objects, features, and advantages of the present invention will become more apparent upon consideration of the following description of the preferred embodiments of the present invention, taken in conjunction with the accompanying drawings.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Figure 1 is a sectional view of a main assembly, and a process cartridge of an image forming apparatus in an embodiment.

Figure 2 is an enlarged cross-sectional view of the process cartridge.

Figure 3 is a perspective view illustrating a frame structure of the process cartridge.

Figure 4 is a perspective view of the main assembly in the state that an openable and closable door is opened.

Figure 5 is a perspective view of a drive shaft of the main assembly.

Figure 6 is a perspective view of a free end portion of a coupling member.

Figure 7 is an illustration showing the state that the coupling member and the drive shaft are connected with each other.

Figure 8 is a sectional view illustrating the

state that the coupling member and the drive shaft are connected with each other.

Figure 9 is a perspective view of a rotational force receiving member which is a component part of the coupling member.

Figure 10 is a perspective view of a spherical portion which is a component part of the coupling member.

Figure 11 is a sectional view of the coupling member.

Figure 12 is a perspective view of the coupling member.

Figure 13 is an illustration of a drum flange.

Figure 14 is a sectional view taken along a line S2-S2 in Figure 13.

Figure 15 is a sectional view which illustrates the process in which the rotational force receiving member is assembled into the drum flange, in the section along a line S1-S1 in Figure 13.

Figure 16 is a sectional view which illustrates the process in which the coupling member is fixed to the drum flange, in the section taken along a line S1-S1 in Figure 13.

Figure 17 is a perspective view of the drum unit, as seen from a driving side.

Figure 18 is a perspective view of the drum unit, as seen from a non-driving side.

Figure 19 is a perspective view illustrating a disassembling process of the photosensitive member unit.

Figure 20 is a perspective view illustrating a disassembling process of the photosensitive member unit.

Figure 21 is a perspective view illustrating a disassembling process of the photosensitive member unit.

Figure 22 is a perspective view illustrating a disassembling process of the photosensitive member unit.

Figure 23 is a sectional view illustrating a method of dismounting the coupling member directly from the drum unit.

Figure 24 is a partial enlarged view of the opening portion in Figure 23.

Figure 25 is a sectional view illustrating a method of dismounting the coupling member directly from the drum unit.

Figure 26 is a sectional view illustrating a method of dismounting the coupling member directly from the drum unit.

Figure 27 is a sectional view illustrating a method of dismounting the coupling member directly from the drum unit.

Figure 28 is a perspective view which

illustrates the state of Figure 27 three-dimensionally.

Figure 29 is a sectional view illustrating a method of dismounting the coupling member directly from the drum unit.

Figure 30 is a sectional view illustrating a method of dismounting the coupling member directly from the drum unit.

Figure 31 is a sectional view illustrating a method of reassembling the drum unit.

Figure 32 is a sectional view illustrating a method of reassembling of the drum unit.

Figure 33 is a perspective view illustrating a disassembling method for the development unit.

Figure 34 is a sectional view illustrating a method for reassembling the drum unit.

[BEST MODE FOR CARRYING OUT THE INVENTION]

Referring to the accompanying drawings, the preferred embodiments of the present invention will be described. The function, material, configuration, positional relations and the like of the elements described hereinbelow is not limiting to the present invention unless otherwise stated. As for the material, configuration and the like of the elements described once apply to the subsequent descriptions unless otherwise stated.

Embodiment:

(General arrangement)

Figure 1 is a sectional view of an image formation main assembly 1 (main assembly), and a process cartridge 2 (cartridge) of an image forming apparatus in an embodiment of the present invention. Figure 2 is an enlarged cross-sectional view of the cartridge 2. Referring to Figures 1 - 2, a general arrangement, and an image formation process of the image forming apparatus in the present embodiment will be described.

This image forming apparatus is a laser beam printer which utilizes electrophotography, wherein a cartridge 2 is detachably mountable to the main assembly 1. When the cartridge 2 is set to the main assembly 1, an exposure device (laser scanner unit) 3 is disposed on the upper portion of the cartridge 2. The lower portion of the cartridge 2 is provided with a sheet tray 4 which contains recording material (sheet material) P which is the object on which an image is formed. The main assembly 1 is provided with a pick-up roller 5a, a feeding roller 5b, a feeding roller pair 5c, a transfer guide 6, a transfer charging roller 7, a feeding guide 8, a fixing device 9, a discharging roller pair 10, a discharging tray 11, and so on along a feeding direction of the sheet material P.

(Image formation process)

The outline of the image formation process will be described. In response to a print start signal, an electrophotographic photosensitive member drum (drum) 20 is rotated at a predetermined peripheral speed (process speed) in a direction of the arrow R1. The a charging roller (charging means, process means) 12 which is supplied with a bias voltage contacts to an outer surface of the drum 20, and the outer surface of by drum 20 is uniformly charged by the charging roller 12.

A laser beam L modulated correspondingly to a serial electrical digital pixel signal of the image information is outputted from the exposure device 3. The laser beam L enters the cartridge 2 through an exposure window 53 of an upper surface of the cartridge 2 to scanningly expose the outer surface of the drum 20 by this, an electrostatic latent image corresponding to the image information is formed on the outer surface of the drum 20. The electrostatic latent image is visualized by a developer T (toner) of a developing device unit 40 into a Toner image.

The charging roller 12 is contacted to the drum 20, and charges the drum 20 electrically. The charging roller 12 is rotated by the drum 20. The developing device unit 40 supplies the toner into the developing

zone of the drum 20 to develop the latent image formed on the drum 20.

The developing device unit 40 feeds the toner T in a toner chamber 45 to a toner feeding chamber 44 by the rotation of a stirring member 43. The developing roller (developing means, process means) 41 which is a developer carrying member containing a magnet roller (stationary magnet) 41a is rotated, and the toner layer triboelectrically charged by the developing blade 42 is formed on the surface of the developing roller 41. The toner is transferred onto the drum 20 in accordance with the latent image, so that the electrostatic latent image is visualized into a toner image. The developing blade 42 applies the triboelectrical charge while regulating the toner amount on the peripheral surface of the developing roller 41.

On the other h, and in accordance with the output timing of the laser beam L, the paper is fed to the sheet material P accommodated in the lower portion of the main assembly 1 from the sheet tray 4 by the pick-up roller 5a, the feeding roller 5b, and feeding roller pair 5c. The sheet material P is timed and fed to a transfer position between the drum 20, and a transfer charging roller 7 via the transfer guide 6. In the transfer position, the toner image is transferred onto the sheet material P sequentially

from the drum 20.

The sheet P onto which the toner image has been transferred is separated from the drum 20, and fed to the fixing device 9 along the feeding guide 8. The sheet material P is passed through a nip formed between a fixing roller 9a, and a pressing roller 9b which constitute the fixing device 9. The pressing and the heat-fixing process are carried out in the nip so that toner image is fixed on the sheet material P. The sheet material P having been subjected to the image fixing process for the toner image is fed to discharging roller pair 10, and is discharged to the discharging tray 11.

On the other h, and the residual toner remaining on the outer surface of the drum 20 is removed by a cleaning blade (cleaning means, process means) 52 after the transferring 20, and the drum is used for the next image formation which starts with the electrical charging operation. The waste toner removed from the drum 20 is stored in the waste toner chamber 52a in the photosensitive member unit 50.

The charging roller 12, the developing roller 41, the cleaning blade 52, and so on are the process means actable on the drum 20, respectively.

(Frame structure of process cartridge)

Figure 3 is a perspective view illustrating

structures of a frame of the cartridge 2.

Referring to Figure 2 and Figure 3, the frame structure of the cartridge 2 will be described.

As shown in Figure 2, the drum 20, the charging roller 12, and the cleaning blade 52 is mounted to the drum frame 51, and constitutes an integral photosensitive member unit 50.

On the other hand, the developing device unit 40 is constituted by the toner chamber 45 which contains the toner, the toner accommodating chamber 40a which forms the toner feeding chamber 44, and the cover 40b.

The toner accommodating chamber 40a and the cover 40b is connected relative to each other by the means such as the welding.

As shown in Figure 3, the cartridge 2 is constituted by connecting the photosensitive member unit 50 and the developing device unit 40 rotatably relative to each other by a connection member 54 of a round pin.

As shown in Figure 3, the free end of an arm portion 55a formed on a side cover 55 provided at each end with respect to the longitudinal direction of the developing device unit 40 (axial direction of the developing roller 41) is provided with a round rotation hole extending in parallel with the developing roller 41 55b.

The drum frame 51 has an engaging hole 51a for receiving the connection member 54 co-axially with the rotation hole 55b when the arm portion 55a is inserted in the predetermined position of the drum frame 51.

The photosensitive member unit 50 and the developing device unit 40 are connected with each other rotatably about the connection member 54 by inserting the connection member 54 through both the rotation hole 55b and the engaging hole 51a.

At this time, a compression coil spring 46 mounted to the base portion of the arm portion 55a abuts to the drum frame 51 to urge the developing device unit 40 downwardly.

By this, the developing roller 41 (Figure 2) is assuredly pressed toward the drum 20.

The spacing members (unshown) are mounted at the opposite ends of the developing roller 41, so that the developing roller 41 is held with predetermined intervals from the drum 20.

(Rotational force transmission method to process cartridge)

Figure 4 is a perspective view of an inside of the main assembly with the door 140 open.

The cartridge 2 is not mounted.

Referring to Figure 4, the rotational force transmission method to the cartridge 2 will be

described.

As shown in Figure 4, a guiding rail 130 for the cartridge mounting and demounting is provided in the main assembly 1, and the cartridge 2 is mounted into the inside of the main assembly 1 along a guiding rail 130.

In this case, a drive shaft 100 of the main assembly side and a coupling member 156 (Figure 3) which is a rotational force transmitting portion of the cartridge 2 connect with each other in interrelation with the mounting operation of the cartridge 2.

By this, the drum 20 receives the rotational force from the main assembly 1 to rotate.

1》 Drive shaft 100:

Figure 5 is a perspective view of the drive shaft 100 of the main assembly side.

The drive shaft 100 is coupled with the drive transmitting means, such as an unshown gear train and the unshown motor provided in the main assembly 1.

The free end portion 100a of the drive shaft 100 has a substantial semispherical shape, and is provided with rotational force transmitting pins as the rotational force applying portion 100b.

2》 Coupling:

In the state where the cartridge 2 is dismountably mounted to the main assembly 1, the

coupling member 156 has the function of receiving a rotational force for rotating the drum 20 from the main assembly 1.

As shown in Figure 11 and Figure 12, this coupling member 156 has a rotational force receiving member 150 which has a rotational force receiving portion 150e (150e1 - 150e4) for receiving the rotational force at the free end portion thereof.

In addition, it has a spherical portion (spherical member) 160 mounted by penetrating the pin 155 through a rear end portion of the rotational force receiving member 150.

Figure 6 is a perspective view of the rotational force receiving member 150.

The material of the rotational force receiving member 150 is resin material of the polyacetal, the polycarbonate, PPS, or the like.

However, in order to enhance the rigidity of the rotational force receiving member 150, glass fibers, carbon fibers, and/or the like may be mixed in the resin material in response to the required torque load.

In the case of mixing such a material, the rigidity of the rotational force receiving member 150 can be enhanced.

The rigidity may further be enhanced by inserting a metal member material in the resin

material, and the whole rotational force receiving member 150 may be made of metal or the like.

The free end of the rotational force receiving member 150 is provided with a plurality of drive receiving projections 150d (150d1 - 150d4).

In addition, the drive receiving projection 150d (150d1 - 150d4) is provided with rotational force receiving portion 150e (150e1 - 150e4) inclined relative to the axis L150 of the rotational force receiving member 150.

In addition, the inside of drive receiving projection 150d1 - 150d4 is provided with a funnel-like funnel 150f.

3》 Connection state between drive shaft 100 and coupling member 156:

Figure 7 is an illustration showing the state that the rotational force receiving member 150 of the coupling member 156 and the drive shaft 100 connects with each other.

Figure 8 is a sectional view illustrating the state that the rotational force receiving member 150 and the drive shaft 100 connect with each other.

Referring to Figure 7 and Figure 8, the connection state between the drive shaft, 100 and the coupling member 156 will be described.

The rotational force transmitting pin 100b of the drive shaft 100 is in engagement with the

rotational force receiving portion 150e (150e1 - 150e4).

Although it is not visible in Figure 7, the rotational force transmitting pin 100b on the back side is also in engagement with the rotational force receiving portion 150e.

In addition, the free end portion 100a of the drive shaft 100 is in contact with the recess 150f of the rotational force receiving member 150.

The rotational force is transmitted from the rotational force transmitting pin 100b to the rotational force receiving portion 150e by the drive shaft 100 rotating.

In addition, by the rotational force receiving portion 150e inclining relative to the axis L150 of the rotational force receiving member 150, the rotational force receiving member 150 and the drive shaft 100 are attracted relative to each other and the free end portion 100a and the recess 150f contact them to each other assuredly, so that the stabilized rotational force transmission is accomplished.

4》 Coupling member 156 and connection part:

Figure 9 is a perspective view illustrating the rotational force receiving member 150, and Figure 10 is a perspective view illustrating the spherical portion 160.

Figure 11 is a sectional view of the coupling

member 156, and Figure 12 is a perspective view of the coupling member 156.

As shown in Figure 9, the end on the side opposite from the rotational force receiving portion 150e of the rotational force receiving member 150 150s is provided with a through-hole 150r.

As shown in Figure 10, the spherical portion 160 connected with the rotational force receiving member 150 has the substantial spherical shape and is provided with the rotational force receiving member 150 and the hole for receiving the pin 155 as will be described hereinafter.

A one-end-closed hole 160a receives the end 150s of the rotational force receiving member 150.

The through-hole 160b receives the pin 155 which will be described hereinafter with the hole 160a.

As shown in Figure 11 and Figure 12, the rotational force receiving member 150 is inserted into the spherical portion 160, and the pin 155 is inserted in the state that the through-hole 150r and the through-hole 160b are aligned with each other.

In this embodiment, the rotational force receiving member 150 and the one-end-closed-hole 160a are engaged with each other with the loose-fit.

The pin 155 and the through-hole 150r are engaged with each other with the loose-fit.

The pin 155 and the through-hole 160b are engaged with each other with the press-fit.

Accordingly, the pin 155 and the spherical portion 160 are connected with each other integrally.

A part provided by the connection between the rotational force receiving member 150 and the spherical portion 160 is the coupling member 156.

When the rotational force is received from the drive shaft 100, the rotational force receiving member 150 rotates about the axis L150, and the through-hole 150r is engaged with the pin 155.

More particularly, the rotational force from the main assembly 1 is converted to the force for rotating the pin 155 about the rotation shaft L150 through the rotational force receiving member 150.

5》 The rotational force transmission to the drum 20 from the coupling member 156:

Figure 13 is an illustration illustrating the drum flange 151, and Figure 14 is a sectional view taken along line S2-S2 in Figure 13.

Figure 15 is a sectional view taken along a line S1-S1 in Figure 13, illustrating the process in which the rotational force receiving member 150 is assembled into the drum flange 151.

Figure 16 shows a sectional view taken along a line S1-S1 in Figure 13, illustrating the process in which the rotational force receiving member 150 is

fixed to the flange 151.

Figure 17 is a perspective view of the electrophotographic photosensitive drum unit (drum unit) 21, as seen from the driving side (rotational force receiving member 150).

Figure 18 is a perspective view of the drum unit 21, as seen from the non-driving side (longitudinally opposite from the rotational force receiving member 150).

Referring to Figure 13 and Figure 14, an example of the drum flange 151 (flange) to which the rotational force receiving member 150 is mounted will be described.

Figure 13 illustrates the flange 151, as seen from the drive shaft 100 side.

An opening 151g (151g1 - 151g4) shown in Figure 13 is a groove which extends in the direction of a rotation shaft of the flange 151.

When the rotational force receiving member 150 is mounted to the flange 151, the pin 155 is received in the either two of openings 51g1 - 151g4.

The clockwisely upstream side of openings 151g1 - 151g4 is provided with the rotational force transmitting surface (rotational force receiving portion) 151h (151h1 - 151h4).

When the rotational force is transmitted to the flange 151 from the pin 155, the pin 155 and the

rotational force transmitting surface 151h contact to each other.

In addition, adjacent to the center axis L151 of the flange 151, a recess (space) 151f is formed.

The recess 151f provides a space surrounded by the cylindrical surface 151j (151j1 - 151j4), a retaining portion 151i (151i1 - 151i4) which is a regulating portion, and the opening 151k (151k1 - 151k4).

The cylindrical surface 151j (151j1 - 151j4) is a substantially cylindrical surface which is co-axial with the axis L151 and which is adjacent to the opening 151g, and has diameter D151a.

The retaining portion 151i (151i1 - 151i4) is a substantially semispherical surface which continues smoothly with the cylindrical surface 151j, and has the radius of SR151.

The opening 151k (151k1 - 151k4) is positioned at the drive shaft side of the retaining portion 151i, and has diameter of D151b.

More particularly, the opening 151k is a first surface of the regulating portion which continues from the retaining portion 151i (regulating portion) and which is extended in the direction away from the coupling member 156 toward the free end of the rotational force receiving member 150 with respect to the longitudinal direction of the drum 20.

In addition, the relation of the spherical portion 160 relative to outside dimension D160 is as follows (Figure 14, Figure 15):

D151b < D160 < D151a = 2xSR151

Although the spherical portion 160 can be inserted with the gap G (Figure 24) into the recess 151f, the movement toward the opening 151k of the axis L151 is prohibited.

The spherical portion 160 (coupling member 156) does not separate from the flange 151 (process cartridge 2) under the normal service condition by this prohibition.

More particularly, the flange 151 is mounted to the end of the drum 20, and the coupling member 156 is mounted to this flange 151.

In order to mount the coupling member 156, the flange 151 is provided with the regulating portion extended along the inside peripheral surface of the flange 151 (retaining portion 151i).

This regulating portion (retaining portion 151i) has the gap G relative to the spherical portion 160, and has a nearer configuration to the configuration of the surface of the spherical portion 160 of the rotational force receiving member 150 than a flat plane which is perpendicular to the longitudinal direction of the drum 20 and which passes through the center of the spherical portion 160.

Referring to Figure 15 and 16, the process of assembling the rotational force receiving member 150 to the flange 151 and fixing will be described.

The end portion 150s is inserted in the direction of an arrow X1 into the flange 151.

Then, the spherical portion 160 is put over the end portion 150s in a direction indicated by an arrow X2.

In addition, the through-holes 160b of the spherical portion 160 and the through-hole 150r of the end portion 150s are aligned with each other, and, thereafter, the pin 155 is inserted thereinto in the direction of an arrow X3.

The pin 155 penetrates the through-holes 160b and the through-hole 150r.

Since the inner diameter of the through-holes 160b is smaller than that of the pin 155, there is a frictional force between the pin 155 and the through-holes 160b.

In this embodiment, the interference therebetween is about 50 micrometers.

By this, the pin 155 is held without deviation during the ordinary use, and the coupling member 156 constituted by the connection between the rotational force receiving member 150 and the spherical portion 160 is provided.

In addition, the coupling member 156 is moved

in a direction X4, and the spherical portion 160 is contacted or approached to the retaining portion 151i.

Then, retaining portion material 157 is inserted in the direction indicated by an arrow X4, and is fixed to the flange 151.

Since a play (gap) remains relative to the spherical portion 160, the coupling member 156 can change the orientation.

Referring to Figure 17 and Figure 18, the structures of the drum unit 21 will be described.

The flange 151 which has the mounted coupling member 156 is fixed to the end side of the drum 20 so that the drive receiving projection 150d is exposed,

In addition, the drum flange 152 of the non-driving side is fixed to the other end side of the drum 20.

The fixing method may be the crimping, the bonding, the welding, and so on.

In the state that the driving side of the drum unit 21 is supported by the bearing member 158 (Figure 3, Figure 19), and the non-driving side thereof is supported by the drum unit supporting pin 159 (Figure 19), the drum unit 21 is supported rotatably by the drum frame 51 (Figure 3).

As has been described hereinbefore, the rotational force from the motor (unshown) of the main assembly 1 rotates the drive shaft 100 through the

drive transmitting means, such as the gear of the main assembly 1 (unshown).

The rotational force is transmitted to the cartridge 2 through the rotational force receiving member 150 of the coupling member 156.

In addition, the rotational force is transmitted from the rotational force receiving member 150 to the flange 151 through the pin 155 to apply the rotational force to the drum 20 integrally fixed to the flange 151.

The outside periphery of the flange 151 is provided with a helical gear molded integrally with the flange 151 151c.

This gear 151c transmits the rotational force received from the drive shaft 100 by the rotational force receiving member 150 to the developing roller 41 (Figure 2).

More particularly, , the outside portion opposed to the retaining portion which is the regulating portion of the flange 151 151i is provided with the helical gear 151c, and the gear transmits the rotational force received from the main assembly 1 by the coupling member 156 to the developing roller 41.

(Remanufacturing method of cartridge)

In the cartridge 2 mounted and used in the main assembly 1 the toner T contained in the toner chamber

45 is consumed in accordance with the repetition of the image formation.

When the toner T is consumed to the degree it becomes impossible to form the image of the quality which satisfies the user of the cartridge 2, it loses the commodity value as the cartridge 2.

In view of this, for example, a means (unshown) for detecting the remainder amount of the toner of the cartridge 2 is provided, and a main assembly control circuit (unshown) compares the detected remaining amount with a predetermined threshold for the cartridge lifetime forenotice and/or the cartridge lifetime warning.

When the detected remaining amount is smaller than the threshold, a display portion (unshown) displays the lifetime forenotice or the lifetime warning of the cartridge 2.

By this, the user is prompted for the preparation for the exchange cartridge 2, and in this manner, the quality of the output images is maintained.

The used-up process cartridge 2 is collected, and the cleaning, the parts replacement, and so on are carried out, and the fresh toner is filled thereinto.

By this, it is remanufactured to reuse.

Here, the remanufacturing method of the used-up cartridge will be described.

Here, the cleaning is carried out by the air

suction, the air-blowing, the wet type cleaning, wiping, and so on, for example.

(i) Unit separating step:

When the connection member 54 which connects the photosensitive member unit 50 and the developing device unit 40 rotatably relative to each other is pulled out, the developing device unit 40 and the photosensitive member unit 50 are separable from each other (Figure 3).

(ii) The disassembling, cleaning, parts replacement, reassembling of the photosensitive member unit 50:

Figs. 19 - 22 are perspective views illustrating processes of disassembling the photosensitive member unit 50.

After separating the photosensitive member unit 50 and the developing device unit 40 from each other, the disassembling, the cleaning, the parts replacement, re-assembly of the photosensitive member unit 50 is carried out.

These operations will be described.

First, referring to Figure 19, the disassembling of a protecting member 101 and an urging spring 102 will be described.

A shaft portion 101a of the protecting member 101 for light shielding and protection of the drum 20

is dismounted with the urging spring 102 from a U-like bearing portion 51d of the drum frame 51.

Referring to Figure 20, the dismounting method of the drum unit 21 will be described.

The drum unit 21 is supported by a bearing member 158 and a drum unit supporting pin 159 provided at the respective ends of the photosensitive member unit 50 (drum frame 51).

When the pin 159 is pulled out, the non-driving side (pin side) of the drum unit 21 is disengaged.

The non-driving side wall 51b of the drum frame 51 is opened longitudinally outwardly, and simultaneously the bearing member 158 integrally fixed on the driving side wall 51c of the drum frame 51 at the driving side is opened longitudinally outwardly.

These directions are indicated by the arrows in Figure 19.

Then, the drum unit 21 is rotated in the direction indicated by an arrow X201 about the driving side of the drum unit 21.

Until the non-driving side drum flange 152 (Figure 18) does not overlap with the non-driving side wall 51b with respect to the axial direction (the direction of an arrow X202) of the drum unit 21, it is rotated, and then, the drum unit 21 is easily pulled out in the direction indicated by the arrow X202.

Referring to Figure 21, the removal of the

waste toner and the dismounting of the charging roller 12 will be described.

When the drum unit 21 is dismounted, an elongated waste toner collection opening 57 is exposed between a cleaning blade 52 and a waste toner leak preventing sheet 56 mounted to the drum frame 51.

By this, the removal of the waste toner stored in the waste toner chamber 52a (Figure 2) of the drum frame 51 can be accomplished using the waste toner collection opening 57.

This removal is carried out by air suction, blowing, wet type cleaning, wiping, for example.

For the dismounting of the charging roller 12, a roller shaft is dismounted in the direction indicated by the arrow from charging roller bearings 13 on the drum frame side which supports the opposite ends of the roller shaft.

In the state that the charging roller 12 is dismounted, when the removal of the waste toner is carried out, the contamination of the charging roller 12 and the damage of the charging roller 12 at the time of the removal are avoided.

The dismounting of the cleaning blade 52 is carried out by dismounting the two screws 58 which fix the cleaning blade 52 to the drum frame 51.

(iii) Dismounting and disassembling of coupling member

156 (1):

In this embodiment, the rotational force receiving member 150 and the pin 155 of the coupling member 156 are made of metal, in order to accomplish high image quality.

Since they are of metals, the durability is excellent and the repetition usage can be performed, and therefore, it is desirable to dismount and reuse them.

In the method for dismounting the coupling member 156, the manufacturing method of the drum unit 21 described above is carried out inversely.

In other words, the drum 20 is dismounted from the drum unit 21 and then retaining portion material 157 (Figure 16) is separated from the flange 151.

Subsequently, the pin 155 is pulled out of the coupling member 156.

By this, the rotational force receiving member 150 and the spherical portion 160 can be separated from each other.

The pin 155 and the rotational force receiving member 150 at least are reused (Unshown).

(iv) Dismounting and disassembling of coupling member 156 (2):

As another method, the coupling member 156 is directly dismounted from the drum unit 21.

In this case, since the operation for separating the drum 20 and the retaining member 157 from each other is unnecessary, working efficiency is excellent.

The method of dismounting the coupling member 156 directly from the drum unit 21 will be described.

Figure 23 is a sectional view illustrating the method of dismounting the coupling member 156 directly from the drum unit 21.

The sectional view is a S2-S2 sectional view of Figure 13.

Figure 24 is a detailed view of the opening 151k portion (surrounded portion) in Figure 23.

Since the flange 151 has the gear 151c, usually, it is made of resin material of a high slidability, such as polyacetal.

Since the spherical portion 160 swings in the recess 151f similarly, it is made of a resin members, such as polyacetal, similarly.

More particularly, the spherical portion 160 and the flange 151 (regulating portion 151 the retaining portion as S 151i) are made of resin material.

As has been described hereinbefore, the outside dimension D160 of the spherical portion 160 is larger than the diameter D151b of the opening 151k, and therefore, usually, at the time of the usage, it does

not separate from the spherical portion 160 (coupling member 156) from the flange 151 (process cartridge 2).

The opening 151k is continuing with the retaining portion 151i, and inclines away from the coupling member 156 (spherical portion 160).

In more detail, in this embodiment, the difference between the outside dimension of the spherical portion 160 D160 and the diameter of the opening 151k D151b is approx. 0.4mm.

However, since the flange 151 and the spherical portion 160 are made of resin material, they relatively easily deform in accordance with the external force.

Therefore, they deform, so that they can pass the spherical portion 160.

Therefore, the coupling member 156 can be pulled out from the flange 151.

First, the member other than the rotational force receiving member 150 of the drum unit 21, i.e., the drum 20 and the flange 151 are held assuredly.

Then, while nipping the driven portion 150a and the connecting portion 150c which have the rotational force receiving portion 150e by a nipping tool 201 such as a pliers or a pincher (cross hatching portion which utilizes connecting portion 150c in Figure 23) (grip step), they are pulled in the direction (direction indicated by the arrow X231) of the axis

L150.

By this, the spherical portion 160 contacts to the retaining portion 151i.

In addition, when drawing force is increased, the outside dimension D160 of the spherical portion 160 reduces, and, the retaining portion 151i, the opening 151k, and taper surface 151n of the flange 151 deforms outwardly in the radial direction from the axis L151 of the flange 151 (direction indicated by the arrow in Figure 24).

The taper surface 151n of the flange 151 extends to the opening 151k, and it inclines away from the coupling member 156 toward the free end side of the coupling member 156 which is in the driven portion side with respect to the axial direction L151.

This taper surface 151n is the portion of the second surface of the regulating portion 151 S.

More particularly, , the taper surface 151n is inclined from the opening which is the first surface of the retaining portion 151i which is the regulating portion 151S 151k, and is extended away from the coupling member 156 toward the free end of the rotational force receiving member 150 with respect to the longitudinal direction of the drum.

In other words, the spherical portion 160, the retaining portion which is the regulating portion 151 S which projects radially inwardly of the flange 151

sets, the opening 151k, and taper surface 151n bend, and at the time of the diameter of the opening 151k D151b and the outside dimension of the spherical portion 160 D160 becoming the same, the coupling member 156 can be taken out from the flange 151 (Dismounting step).

The force required at this time is approx. 9 - 11 kgf (88 - 108 Ns).

In order to utilize the pulling force efficiently, it is preferable to carry out the drawing operation in the state that the axis of the flange 151 L151 and the axis of the rotational force receiving member 150 L150 are aligned with each other (positional relation shown in Figure 23).

The flexibility of the flange regulating portion (retaining portion 151i, opening 151k, taper surface 151n) of 151 depends on the recess 151q1-8 which is in the positions outside in the radial direction of the drum flange 151 as seen from the regulating portion part 151S Figure 13.

In detail, when the recesses 151q are large, it separates easily, and it is hard to separate when it is small.

In this embodiment, the dimensional relation in this embodiment is selected such that in the normal use, the retention function is effective, and at the time of dismounting, it can be dismounted by the above

described force.

With this method, as described above, the coupling member 156 can be directly dismounted from the drum unit 21.

Accordingly, the operation for separating the drum 20 and the retaining member 157 from each other is unnecessary, and therefore the operational efficiency improves.

In addition, since the operation can be performed with an ordinary tool 201 such as a pliers and a pincher, without using a special tool, the operation is easy.

In addition, manual dismounting is practical, even without using the ordinary tool, in the case where a small number of drum units are disassembled.

Thereafter, the pin 155 is drawn out or pushed out of the spherical portion 160. By this, the coupling member 156 is separable into the rotational force receiving member 150, the pin 155 and the spherical portion 160.

Here, the recesses 151q (151q1 - 151q8) are provided in the symmetric positions with respect to the axis 151 L of the flange 151.

More particularly, the recess 151q1 and the recess 151q5, the recess 151q2 and the recess 151q6, the recess 151q3 and the recess 151q7, and the recess 151q4 and the recess 151q8 are provided at the

symmetric positions with respect to the axis 151L, respectively.

By such the disposition, when the coupling member 156 is dismounted from the flange 151, the deformation of the regulating portion arises uniformly with respect to the circumferential direction of the flange 151, and therefore, the deformation of the gear portion 151C can be eased.

This applies also in the case of mounting the coupling member 156 to the flange 151.

The axis 151L is aligned with the axis 20L of the drum 20, and with the axis 20AL of the drum cylinder 20A (Figure 13, Figure 34). Designated by reference character S is the photosensitive layer.

(v) Dismounting, and disassembling (3) of coupling member 156:

Furthermore, another method for dismounting the coupling member 156 directly from the drum unit 21 will be described. Figures 25-27 And Figures 29 and 30 are sectional views illustrating a method for dismounting the coupling member 156 directly from the drum unit 21. Here, they are the sectional views along a plane including the axis L151 of the flange 151, and the axis of the pin 155. Figure 28 is a perspective view for illustrating the state of Figure 27 in three dimensions. The detailed description will be made with

these views.

First, the coupling member 156 is rotated relative to the flange 151 in the direction of the arrow in Figure 25 about the center of the spherical portion 160 (coupling member inclination step). Then, the end surface 155a of the pin 155 is exposed.

Then, the end surface 155a is pushed toward the end surface 155b in the direction of the arrow in Figure 26. More particularly, in the state where the coupling member 156 is inclined through the above described inclination step, the pin 155 of which the one end, and the other end project from the spherical portion 160 is pushed toward the other end from the one end (pin urging step). As has been described hereinbefore, the frictional force is produced between the pin 155, and the spherical portion 160, and therefore, the pin 155 is held, but the pin 155 can be pushed in, without destroying the parts (coupling member 156) by a pressing tool 202 such as a screw driver having a tip. When the end surface 155a is pushed in to the neighborhood the surface of the spherical portion 160, the end surface 155b of the opposite side moves to the state that a clearance is maintained relative to the inner surface 151m of the flange 151.

Then, the coupling member 156 is lightly pulled in the direction of an arrow X271 in Figure 27. By

this, the spherical portion 160 contacts to the retaining portion 151i. Furthermore, the coupling member 156 is rotated in the direction of an arrow X272. By this, the end surface 155b side is exposed.

Then, when the coupling member 156 inclines、the axis L150, and L151 cross with each other, the coupling member 156 is rotated about the axis L151 of the flange 151 in Figure 27 in the direction of the arrow in Figure 28.

Before pushing the end 155a of the pin 155 in, the rotational force transmitting surface 151h (Figure 13), and the pin 155 are in contact to each other, but the pin end 155a is pushed in, and therefore, it can be rotated, without contacting to the rotational force transmitting surface 151h. In addition, the rotation is not restricted in the end 155b by providing the clearance between the pin 155, and the tapered surface 151n.

The coupling member 156 is rotated to the position that the pin end 155b as seen in the longitudinal direction overlaps with the tapered surface 151n of the flange 151 (Figure 29).

As mentioned above, the a part of the pin which is further projected from the other end portion by being pushed through the above described pin urging step rides on the tapered surface 151n which is the second surface of the retaining portion 151i which is

the regulating portion.

Furthermore, while holding the driven portion 150a of the rotational force receiving member 150, a force is applied to the direction of rotating the coupling member 156 in the direction of the arrow in Figure 29.

When the force is applied with such the positional relation, the driven portion 150a is a force application point, the contact points between the pin 155, and the tapered surface 151n is a fulcrum P1, and the contact portion between the spherical portion 160, and the retaining portion 151i is a point of application.

As shown in Figure 29, the connecting portion 150c of the rotational force receiving member 150 is long, and the distance between the fulcrum P1, and the point of application is shorter than the distance between the force application point, and the fulcrum P1, and therefore, the so-called "lever rule" works. By increasing the force, the outside dimension D160 of the spherical portion 160 at the point of application reduces. And, the retaining portion 151i, the opening 151k, and the tapered surface 151n of the flange 151 outwardly deform with respect to the radial direction of the axis L151 of the flange 151 (direction of arrow in Figure 24). By this, the spherical portion 160 (coupling member 156) is dismounted from the flange

151. The force required at this time is approx. 8 - 10kgf (78-98N).

As described above, the force toward the fulcrum is applied at the free end of the coupling member 156 with the fulcrum at the pin part which rides on the tapered surface 151n, so that the coupling member 156 is dismounted from the flange 151 (coupling member dismounting step).

With this method, it is possible to dismount the coupling member 156 directly from the drum unit 21. Accordingly, the operation for separating the drum 20, and the retaining member 157 from each other is unnecessary, and therefore, the operational efficiency is improved. In addition, the operation can be carried out using the ordinary tool 202 such as the screw driver, without using the special tool, and therefore it is excellent in the easiness of the operation. In addition, the force applied until the spherical portion 160 (coupling member 156) separates from the flange 151 (Figure 30), is small by the "leverage".

(vi) Re-assembling method of drum unit 21 (1):

A first method is the same as the assembling method of the drum unit 21 described above substantially. In other words, the rotational force receiving member 150 is inserted into the flange 151, and the spherical portion 160 is covered. Then, the

rotational force receiving member 150, the spherical member 160, and the pin 155 are integrally connected by the pin 155, and the coupling member 15 is assembled to the flange 151 (Figure 15). Furthermore, the retaining member 157 is inserted in the direction of the arrow X4, and it is fixed to the flange 151 (Figure 16). Then, the drum 20, and the flange 151 are connected with each other. Finally, non-driving side drum flange 152 is fixed to the other end portion of the drum 20 (Figure 18).

At this time, the rotational force receiving member 150 disassembled, and taken out is reused, but the spherical portion 160, and the pin 155 may be reused after checking the degrees of the damage, and deformation.

(vii) Re-assembling method of drum unit 21 (2):

Figure 31, and Figure 32 are sectional views illustrating the re-assembling method of the drum unit 21 according to another embodiment. Here, Figures 31, and 32 are a sectional views taken along a line S1-S1 in Figure 13. Figure 34 is a sectional view illustrating a drum unit 21 of the other embodiment.

First, referring to Figure 31, the description will be made. In the assembling method described above, the coupling member 156 is assembled in the flange 151, but in the present embodiment, the coupling member 156

is assembled independently. At this time, the rotational force receiving member 150 disassembled, and taken out is reused, but the spherical portion 160, and the pin 155 may be reused after checking the degrees of the damage, and deformation.

Apart from it, the retaining member 157 is fixed to the flange 151, and then the drum 20 and the flange 151 are connected with each other. Furthermore, non-driving side drum flange 152 is fixed to the other end portion of the drum 20 (Figure 18, Figure 34).

Finally, the coupling member 156 is pushed in in the direction of the arrow in Figure 31, and the spherical portion 160 is contacted to the tapered surface 151n, and when it is further pushed in, the spherical portion 160, and the neighborhood of the tapered surface 151n of the flange 151 which is the regulating portion deforms (arrow in Figure 24) The spherical portion 160 (coupling member 156) can be accommodated in the recess 151f by this deformation (Figure 23).

Here, the easiness of the deformations of the regulating portion 151S (retaining portion 151i, the opening 151k, tapered surface 151n) of the flange 151 depend on the recess 151q (Figure 13, Figure 34) which is in the outside with respect to the radial direction of the drum flange 151, and the easiness is increased with the size of the recess 151q. In this embodiment,

the dimensional relations are such that at the time of the usage, it has the retention function normally, and is easily pushed in. It is not inevitable that the regulating portion 151S has the retaining portion 151i, the opening 151k, and the tapered surface 151n. The regulating portion 151S may have the retaining portion 151i at least.

Therefore, in mounting the coupling member 156 to the flange 151 the spherical portion 160 contacts to the tapered surface 151n, and the center position of the spherical portion 160 is regulated on the axis of the flange 151. By this, the contacted state of the spherical portion 160 relative to the tapered surface 151n is uniform. Accordingly, the regulating portion 151S deforms uniformly, and therefore, the spherical portion 160 can be smoothly mounted to the flange 151.

Therefore, even if the flange 151 and the spherical portion 160 are made of the resin material, as with the present embodiment, the damage can be prevented when they contact.

In this embodiment, the coupling member 156 is made of the metal, and therefore, the strength is high.

However, the center position of the spherical portion 160 is set on the axis 151L. Accordingly, the coupling member 156 can be smoothly mounted to the flange 151.

In the spherical portion 160 at least the

portion contacted to the regulating portion 151S has the spherical configuration when mounting the coupling member 156 smoothly to the flange 151.

The pin 155 can be inserted into the spherical portion 160 and the rotating force receiving portion 150 without inserting the rotational force receiving member 150 into the flange 151, and therefore, the insertion of the pin 155 is easy. In addition, it is not necessary to mount the parts from the retaining member 157 side, and therefore, it can manufacture as a single part by molding the flange 151, and the retaining member 157 integrally (integral-type flange 153), as shown in Figure 32. By this, the simplification of the remanufacturing step, and the cost reduction of the product are accomplished.

(viii) Re-assembling method of photosensitive member unit 50:

The reassembling of the photosensitive member unit 50 after this is carried out through the reverse process as with the case of the disassembling of the photosensitive member unit 50. More particularly, the cleaning blade 52, the charging roller 12, and the drum unit 21 are mounted in the order named order.

In the above-described reassembling, a new article is used at least as for the drum 20.

(ix) Disassembling method, and re-assembling method of developing device unit 40:

Figure 33 is a perspective view illustrating a disassembling method of the development unit 40.

Referring to Figure 33, the description will be made about the disassembling method of the development unit 40.

First, the side covers 55 at the opposite longitudinal ends of the developing device unit 40 are dismounted. The side cover 55 is fixed to the toner accommodating chamber 40a by fastening means such as unshown screws, and therefore, by unfastening them, it can be dismounted from the developing device unit 40.

Then, the developing roller unit 39 is dismounted. The developing roller unit 39 is rotatably supported by the bearing members 47 provided on the opposite ends of the developing roller 41. Each of the upper portion, and the lower portion of the bearing member 47 is provided with two holes 47a, and which are engaged with the shaft 55c of the side cover 55. Accordingly, when the side covers 55 at both end portions are dismounted, the developing roller unit 39 can be easily dismounted from the development unit 40. Furthermore, the developing roller unit 39 is provided at each end of the developing roller 41 with the spacer member 48 for holding a predetermined gap between the developing roller 41, and the drum 20. In

addition, the end of the developing roller 41 is provided with the gear 49 for transmitting the rotational force to the developing roller 41 by engaging with the gear 151c of the flange 151.

Then, the developing blade 42 is dismounted. The developing blade 42 is fixed to the toner accommodating chamber 40a by the screws 59 at the opposite ends thereof together with the cleaning member 38 for effecting a cleaning operation, while contacting to the end surface of the developing roller 41. Therefore, the developing blade 42 can be dismounted by removing the two screws 59.

A toner refilling step will be described. A toner supply opening 37 (Figure 2, Figure 33) communicated with the toner feeding chamber 44, and the toner chamber 45 is exposed, through the above described disassembling step. The toner is filled into the toner chamber 45 through the toner supply opening 37. The toner filling is carried out while holding the developing device unit 40 with the toner supply opening 37 at the upper position, and the toner chamber 45 at the lower position. And, the feeding means such as the funnel is used, and the toner is refilled into the toner supply opening 37.

As described above, after refilling the toner, the developing device unit 40 is assembled. In the case of the reassembling of the developing device unit

40, the operations are carried out through the process opposite from the process of the disassembling step described above. More particularly, after the end of the refilling of the toner, the developing blade 42, the developing roller unit 39, and the side cover 55 are mounted.

(x) Re-assembling method of cartridge 2:

The operations are carried out through the process opposite from the process of the disassembling in the reassembling of the cartridge 2. More particularly, by the connection member 54 (Figure 3), the photosensitive member unit 50, and the developing device unit 40 are connected rotatably with each other. Finally, in the state that the urging spring 102 is mounted to the protecting member 101 (Figure 19), the shaft portion 101a of the protecting member 101 is inserted into the U-shaped bearing portion 51d of the drum frame 51.

The remanufacturing of the process cartridge 2 is completed through the above-described steps.

In the assembling method, the disassembling method, the remanufacturing method of the process cartridge, the steps may simultaneously be carried out by the different operators. In addition, the orders of the steps set forth in the foregoing or in the claims may be properly modified by one skilled in the art.

In addition, the assembly, the disassembling, the remanufacturing of the process cartridge can be carried out by manual operations, automatic operation using automated machines, and combinations of the manual operations, and the automatic operations. In addition, the tools may be used properly.

In addition, in this embodiment, the used process cartridges are collected, and disassembled. And, the parts taken out of the process cartridges by the disassembling are gathered for same parts, respectively. Thereafter, the parts may be re-used, and in some cases, a part of the parts (non-reusable part) may not be used, and a new part may instead be used. In addition, in another type of the present embodiment the used process cartridges are collected, and disassembled. And, a part of parts (non-reusable parts) may not be used, and instead, a reusable part collected from another used cartridge may be reused. Therefore, in the claims, the members, the parts, the portions, and devices with "said or the" covers other members, parts, portion, and devices which have the same function as the very members, parts, portions, and devices.

As has been described hereinbefore, according to the embodiments described above, the process cartridge which is easy in assembling is provided. In addition, the process cartridge which is simple in

disassembling is provided. In addition, the simple remanufacturing method of the process cartridge is accomplished. In addition, a remanufacturing method of making reusable a process cartridge from which the developer has been used to such an extent that the images of a quality satisfactory to the user are not formed, is accomplished. In addition, the developer can be refilled easily into the process cartridge from which the toner has been consumed.

The structures of the process cartridge of the foregoing embodiments are summarized as follows.

(1) The process cartridge 2 detachably mountable to the main assembly 1 of the electrophotographic image forming apparatus comprises the electrophotographic photosensitive member drum 20, and the process means 12, 41, 52 actable on the electrophotographic photosensitive member drum. It includes the coupling member 156 for receiving the rotational force for rotating the electrophotographic photosensitive member drum from the main assembly in the state that the process cartridge is dismountably mounted to the main assembly. This coupling member includes the rotational force receiving member 150 which has the rotational force receiving portion 150e for receiving the rotational force at the free end portion, and the spherical portion 160 mounted by the pin 155 penetration to the rear end portion of the

rotational force receiving member. In addition, it includes the retaining portion 151i which is the regulating portion extended along the inner peripheral surface of the flange 151 in order to mount the coupling member 156 to the drum flange 151 mounted to the end of the electrophotographic photosensitive member drum 20. The configuration of the retaining portion 151i provides the gap G relative to the spherical portion 160, and is nearer to the configuration extended along the surface of the spherical portion 160 of the free end portion than the flat plane which is perpendicular to the longitudinal direction of the drum 20, and which passes through the center of the spherical portion 160.

With this structure 、 the process cartridge which can be easily assembled is accomplished. In addition, the process cartridge which can be easily disassembling is accomplished.

More particularly, the coupling member can be directly dismounted from the electrophotographic photosensitive drum unit 21, and therefore, the operation for separating the electrophotographic photosensitive member drum, and the retaining member from each other is unnecessary, by which the operational efficiency is excellent. In addition, the disassembling is possible by the ordinary tools such as the pliers, and the pincher, without using special

tools.

(2) regulating portions 151S include the first surface (opening) 151k extended away from the coupling member 156 toward the free end portion with respect to the longitudinal direction from the regulating portion 151S.

(3) regulating portions 151S include the second surface (tapered surface) 151n bent from the first surface (opening) 151k, and the second surface (tapered surface) 151n is extended away from the coupling member 156 toward the free end portion with respect to the longitudinal direction.

(4) The outside which faces the retaining portion 151i of the flange 151 are provided with the helical gear 151c, and the helical gear transmits the rotational force received by the coupling member 156 from the main assembly 1 to the developing roller 41.

The (5) the spherical portion 160, and the regulating portion 151S are made of resin material.

In addition, the dismounting methods of the coupling member 156 of the embodiments described above are summarized as follows.

The coupling member 156 is dismounted from the (6) the drum flange 151 mounted to the electrophotographic photosensitive member drum 20 usable with the process cartridge 2 detachably mountable to the main assembly 1 of the

electrophotographic image forming apparatus. In the state in which the process cartridge 2 is dismountably mounted to the main assembly 1 the coupling member 156 receives the rotational force for rotating the electrophotographic photosensitive member drum 20 from the main assembly 1.

The coupling member 156 has the rotational force receiving member 150 which has the rotational force receiving portion 151e for receiving the rotational force, ad the free end portion, and the resin spherical portion 160 mounted by the pin 155 penetration to the rear end portion of the rotational force receiving member. And, the coupling member 156 is mounted to the drum flange 151 by the regulating portion (retaining portion) 151i, and the configuration of the regulating portion (retaining portion) 151i provides the gap G relative to the spherical portion 160, and nearer, than the flat plane which is perpendicular to the longitudinal direction of the electrophotographic photosensitive member drum 20 of flat surface, and is, and which passed through the center of the spherical portion 160, to the configuration extended along the surface of the spherical portion of free end portion.

(i) It has the gripping step of gripping the rotational force receiving member 150 of the coupling member 156 by the tool 201.

(ii) It has the coupling member dismounting step of applying the force to the tool 201 toward the free end portion with respect to the longitudinal direction in the state where the rotational force receiving member 150 is gripped through the gripping step. By this, while elastically deforming the opening 151k of the retaining portion 151i which is the resin regulating portion, the tapered surface 151n, and the resin spherical portion 160, the resin spherical portion 160 is dismounted from the resin material regulating portion (retaining portion 151i) , by which the coupling member 156 is dismounted.

There is provided a method in which the coupling member 156 is mounted to the drum flange which has the resin material regulating portion provided inside of the flange 151 mounted to the end of the photosensitive drum 20 151S (retaining portion 151i, opening 151k, tapered surface 151n). Here, the regulating portion 151S inwardly projects with respect to the radial direction of the flange 151.

The method includes the gripping step of gripping the rotational force receiving member 150 of the coupling member 156. It includes the coupling member mounting step. In the coupling member mounting step, while elastically deforming the at least one side of the resin regulating portion 151S, and the resin spherical portion 160, the spherical portion 160

is pushed into the inside of the regulating portion 151S with respect to the direction of the axis 20L of the photosensitive drum 20, by which the coupling member 156 is mounted to the flange 151.

In addition, the dismounting step of dismounting the coupling member 156 from the flange 151 has the following steps. It has the gripping step of gripping the rotational force receiving member 150 of the coupling member 156. It has the coupling member dismounting step, wherein in the state where the rotational force receiving member 150 is gripped by the gripping step, the spherical portion 160 is dismounted from the regulating portion 151S, while deforming the at least one side of the regulating portion 151S, and the spherical portion 160 by applying the force toward the free end portion, by which, the coupling member 156 is dismounted from the flange 151.

The regulating portions 151S are provided inside of the flange 151 together with the interval along the circumferential direction of the flange 151. Furthermore, the recess 151f is provided inside of the flange 151, and it is provided at the outside of the regulating portion 151S with respect to the radial direction of the flange 151. The outside surface of the flange 151 opposed to the recess 151f is provided with the gear portion 151C. The gear portion 151C is

provided along the outer surface of the flange 151. The gear portion 151C transmits the rotational force received by the coupling member 156 from the main assembly 1 to the developing roller 41.

According to the dismounting method for this coupling member, it is possible to dismount the coupling member directly from the electrophotographic photosensitive drum unit, the operation for separating the electrophotographic photosensitive member drum, and the retaining member is unnecessary. In addition, the operation is possible by an ordinary tool such as the pliers, and the pincher, without using special tools.

(7) There is provided a method, wherein the coupling member 156 is dismounted from the drum flange 151 mounted to the electrophotographic photosensitive member drum 20 usable with the process cartridge 2 detachably mountable to the main assembly 1 of the electrophotographic image forming apparatus. The coupling member 156 receives the rotational force for rotating the electrophotographic photosensitive member drum 20 from the main assembly 1 in the state in which the process cartridge 2 is dismountably mounted to the main assembly 1. The coupling member 156 has the rotational force receiving member which has the rotational force receiving portion for receiving the rotational force at the free end portion, and the

spherical portion mounted at the rear end portion of the rotational force receiving member by the penetration of the pin 155.

(i) It has the inclination step of inclining the coupling member 156 with respect to the rotation axis of the drum flange 151.

(ii) It has the pin urging step of pushing the pin 155 of which the one end, and the other end thereof project from the spherical portion 160 toward the other end from the one end in the state of the coupling member 156 being inclined through the inclination step.

(iii) It has the pin riding step of making a part of the pin which is further projected from the other end portion by being pushed by the pin urging step ride on the second surface (tapered surface) 151n of the regulating portion provided along the inner peripheral surface of the drum flange 151. Here, the retaining portion 151i as the regulating portion provides the gap G relative to the spherical portion 160, and the configuration thereof is nearer, than the flat plane which is perpendicular to the longitudinal direction of the photosensitive drum 20, and, and which passes through the center of the spherical portion 160, to the configuration extended along the surface of the spherical portion of the free end portion. And, the regulating portion 151S is extended

from the retaining portion 151i, , and it has the first surface (opening) 151k extended away from the coupling member 156 toward the free end portion with respect to the longitudinal direction. The second surface (tapered surface) 151n is bent from the first surface (opening) 151k, and is extended away from the coupling member 156 toward the free end portion with respect to the longitudinal direction.

(iv) It has the coupling member dismounting step of applying the force toward a part of the pin which rides, at the free end of the coupling member 156, on the second surface, and dismounting the coupling member 156 from the drum flange 151.

According to the dismounting method for the coupling member of the embodiments described above, the coupling member can be dismounted directly from the electrophotographic photosensitive drum unit. Therefore, the operation for separating the electrophotographic photosensitive member drum and the retaining member is unnecessary, and therefore, the disassembling operational efficiency is excellent. In addition, without using special tools, the operation is possible using an ordinary tool such as pliers, pincher, and so on, and therefore, the operation is easy. By utilizing the leverage, the force required to dismount the coupling member directly is small.

In addition, when the structures of the

electrophotographic photosensitive drum unit 21 of the embodiments described above are summarized as follows.

(8) electrophotographic photosensitive member drum 20 is used in the electrophotographic photosensitive drum unit 21 usable with the process cartridge 2 detachably mountable to the main assembly 1 of the electrophotographic image forming apparatus. It has the coupling member 156 for receiving the rotational force for rotating the photosensitive drum 20 from the main assembly 1, in the state that the process cartridge 2 is dismountably mounted to the main assembly 1. The coupling member 156 has the rotational force receiving member 150 which has the rotational force receiving portion 151e for receiving the rotational force at the free end portion, and the spherical portion 160 mounted by the penetration of the pin 155 at the rear end portion of the rotational force receiving member 150. And, the coupling member 156 is mounted to the flange 151 mounted to the end of the photosensitive drum 20 by the regulating portion 151S (retaining portion 151i). The regulating portion 151S (retaining portion 151i) is provided along the inner peripheral surface of the flange 151 in order to mount the coupling member 156 to the flange 151 mounted to the end of the photosensitive drum 20. In addition, the regulating portion 151S (retaining portion 151i) provides the gap relative to the

spherical portion, and the configuration thereof is nearer, than the flat plane which is perpendicular to the longitudinal direction of the photosensitive drum 20, and, and which passes through the center of the spherical portion 160, to the configuration extended along the surface of the spherical portion 160 of the free end portion 160.

As has been described hereinbefore, the structure of the drum unit 21 is as follows.

First, the coupling member 156 is mountable to the drum unit 21. And, the coupling member 156 has the rotational force receiving member 150 which has the rotational force receiving portion 151e for receiving the rotational force at the free end portion, and the spherical portion 160 mounted by the penetration of the pin 155 at the rear end portion of the rotational force receiving member 150 in order to rotate the drum 20 from the main assembly 1 of the electrophotographic image forming apparatus.

And, the drum unit 21 has the cylinder 20A which is provided with the photosensitive layer S at the peripheral surface, and the drum flange 151 provided at the end of the cylinder 20A. The drum flange 151 has the resin material regulating portion 151S which inwardly projects with respect to the radial direction of the drum flange 151 in the inside of the drum flange 151. The regulating portion 151S

prevents the spherical portion 160 from moving in the longitudinal direction of the drum unit 21, when the coupling member 156 is mounted. And, the regulating portions 151S are provided with the intervals along the circumferential direction in the inside of the flange 151. In addition, the drum flange 151 has the recess 151q (151q1 to 151q8) provided in the regulating portion 151S at the outside with respect to the radial direction of the flange 151, wherein the recess 151q facilitate or permits the regulating portion 151S to outwardly deform with respect to the radial direction of the flange 151. In addition, the flange 151 has a plurality of rotational force transmitting surface (rotational force transmitted portion) 151h (151h1-151h4) which are provided between the regulating portions 151S in order to receive the rotational force from the pin 155.

In addition, the resin material regulating portions 151S are provided at the same positions as the gear portion 151C with respect to the longitudinal direction of the cylinder 20A in the resin flange 151, and they are disposed with the intervals along the circumferential direction of the cylinder 20A. And, in the regulating portion 151S, the free end portion with respect to the longitudinal direction of the cylinder 20A inwardly projects with respect to the radial direction of the flange 151. In addition, the recess

151q (151q1 to 151q8) is provided between the regulating portion 151S, and the inner surface 151t (Figure 13, Figure 34) of the flange 151 with respect to the radial direction. And, the recess 151q facilitates or permits the regulating portion 151S to outwardly deform with respect to the radial direction.

Here, the regulating portion 151S outwardly deforms easily with respect to the radial direction by the provision of the recess 151q. In addition, thereafter, the regulating portion 151S which deformed is restored.

In addition, designated by 151r (Figure 13) is the connecting portion for connecting the regulating portion 151S, and the inner surface 151t (Figure 13, Figure 34) of the flange 151 with each other. The recess 151q is provided between the connecting portions 151r. In other words, the connecting portion 151r, and the recess 151q are provided by turns along the circumferential direction of the flange 151. Therefore, the regulating portion 151S deforms easily.

In addition, the coupling member 156 is mounted to the flange 151. The coupling member 156 receives the rotational force to be transmitted from the main assembly 1 to the flange 1. The coupling member 156 has the rotational force receiving member 150 which has the rotational force receiving portion 150e (150e1 to 150e4) for receiving the rotational force at the

free end portion, and the spherical portion 160 mounted by the penetration of the pin 155 at the rear end portion of the rotational force receiving member 150. In the state that the coupling member 156 is mounted to the flange 151, the pin 155 is movable in the circumferential direction, and the longitudinal direction of the cylinder between the regulating portion 151S, and the regulating portion 151S provided along the circumferential direction of the flange 155. In addition, the coupling member 156 is revolvable relative to the flange 151 in the state in which the spherical portion 160 is movable in the circumferential direction, and is regulated in the movement in the longitudinal direction by the regulating portion 151S. More particularly, the coupling member 156 is mounted revolvably to the flange 151 in the state that the spherical portion 160 is movable within the limits that the pin 155 is regulated in the movement by the regulating portion 151S in the circumferential direction, and it is regulated in the movement by the regulating portion 151S in the longitudinal direction.

According to the drum unit 21 described above, the dismounting of the coupling member 156 is easy.

According to the drum unit 21 described above, the mounting of the coupling member 156 is easy.

According to the structure of the drum unit 21,

it is possible to dismount the coupling member 160 directly from the drum unit 21, and the operation for separating the drum 20, and the retaining member from each other is unnecessary, and therefore, the operational efficiency is excellent. In addition, since the operation is possible by an ordinary tool such as pliers, a pincher, and so on, without using special tools, it is advantageous in the easiness of the operation.

(9) regulating portions 151S (retaining portion 151i) have the first surface (opening) 151k extended away from the coupling member 156 toward the free end portion with respect to the longitudinal direction from the retaining portion 151i as the regulating portion 151S.

(10) regulating portions have the second surface (tapered surface) 151n bent from the first surface (opening) 151k, and it is extended away from the coupling member 156 toward the free end portion with respect to the longitudinal direction.

(11) the outside which faces the retaining portion 151i of the drum flange 151 is provided with the helical gear 151c, and the helical gear transmits the rotational force received by the coupling member 156 from the main assembly 1 to the developing roller 41.

According to the embodiments described above,

an easy dismounting method for the coupling member can be provided.

According to the embodiment described above, an easy mounting method for the coupling member can be provided.

According to the embodiments described above, the electrophotographic photosensitive drum unit from which the coupling member can be easily dismounted, can be provided.

According to the embodiments described above, the electrophotographic photosensitive drum unit to which the coupling member can be easily mounted can be provided.

[INDUSTRIAL APPLICABILITY]

According to the present invention, it is possible to provide an easy dismounting method for a coupling member.

The present invention can also provide an easy mounting method for a coupling member.

The present invention can further provide an electrophotographic photosensitive drum unit, wherein dismounting of the coupling is easy.

The present invention can stillfurther provide an electrophotographic photosensitive drum unit, wherein mounting of the coupling is easy.

While the invention has been described with

reference to the structures disclosed herein, it is not confined to the details set forth and this application is intended to cover such modifications or changes as may come within the purpose of the improvements or the scope of the following claims.

CLAIMS

1. A coupling member dismounting method for dismounting, from a drum flange mounted to an electrophotographic photosensitive drum usable with a process cartridge which is detachably mountable to a main assembly of an electrophotographic image forming apparatus, a coupling member for receiving a rotating force for rotating the electrophotographic photosensitive drum from the main assembly of the apparatus in a state in which the process cartridge is mounted to the main assembly of the apparatus, said method comprising:

(i) an inclining step of inclining the coupling member relative to a rotational axis of the drum flange, wherein the coupling member includes a rotating force receiving member having, at a free end. portion, a rotating force receiving portion for receiving the rotating force, a spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration;

(ii) a pin urging step of pushing the pin from one end to the other end thereof, wherein said one and the other ends of the pin are projected out of the spherical portion in a state in which the coupling member is inclined by said inclining step;

wherein a regulating portion provided along an inside of the drum flange with a gap between the spherical portion and the regulating portion and has a configuration nearer to a spherical surface of the free end portion than a flat plane which is perpendicular to a longitudinal direction of the electrophotographic photosensitive drum and which passes through a center of the spherical portion, and wherein said regulating portion includes a first surface extending from the regulating portion in a direction away from the coupling member toward the free end portion with respect to the longitudinal direction, and a second surface bent from the first surface extending from the regulating portion in a direction away from the coupling member toward the free end portion with respect to the longitudinal direction,

(iii) a pin riding step of making a part of the pin which is further projected at the end by said pin urging step ride on the second surface; and

(iv) a coupling member dismounting step of dismounting the coupling member

from. the drum flange by applying a force to a free end portion of the coupling member toward a fulcrum which is the portion of the pin riding on the second surface.

2. A coupling member dismounting method for dismounting, from a drum flange mounted to an electrophotographic photosensitive drum usable with a process cartridge which is detachably mountable to a main assembly of an electrophotographic image forming apparatus, a coupling member for receiving a rotating force for rotating the electrophotographic photosensitive drum from the main assembly of the apparatus in a state in which the process cartridge is mounted to the main assembly of the apparatus, wherein the coupling member includes a rotating force receiving member having, at a free end portion, a rotating force receiving portion for receiving the rotating force, a resin spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, wherein said the coupling member is mounted to a drum flange, mounted to one end of the electrophotographic photosensitive drum, by a resin regulating portion which is provided inside the drum flange and which is projected inwardly with respect to a radial direction of the drum flange with a gap between the spherical portion and the regulating portion, said method comprising:

(i) a gripping step of gripping the rotating force receiving member of the coupling member; and

(ii) a coupling member dismounting step of dismounting the coupling member from the resin regulating portion, while deforming at least one of the resin regulating portion and the resin spherical portion by applying a force toward the free end portion in a state in which the rotating force receiving member is gripped by said gripping step.

3. A method according to Claim 2, wherein the gap extends in a circumferential direction of the drum flange, and said regulating portion is provided with a recess at a position radially outside of the drum flange.

4. A coupling member mounting method for mounting, to a drum flange mounted to an electrophotographic photosensitive drum usable with a process cartridge which is detachably

mountable to a main assembly of an electrophotographic image forming apparatus, a coupling member for receiving a rotating force for rotating the electrophotographic photosensitive drum from the main assembly of the apparatus in a state in which the process cartridge is mounted to the main assembly of the apparatus, wherein the coupling member includes a rotating force receiving member having, at a free end portion, a rotating force receiving portion for receiving the rotating force, a resin spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, wherein said the coupling member is mounted to a drum flange, mounted to one end of the electrophotographic photosensitive drum, by a resin regulating portion which is provided inside the drum flange and which is projected inwardly with respect to a radial direction of the drum flange with a gap between the spherical portion and the regulating portion, said method comprising:

a coupling member mounting step of mounting the coupling member into the resin regulating portion, while deforming at least one of the resin regulating portion and the resin spherical portion by pushing it longitudinally inwardly of the electrophotographic photosensitive drum.

5. A method according to Claim 4, wherein the gap extends in a circumferential direction of the drum flange, and said regulating portion is provided with a recess at a position radially outside of the drum flange.

6. An electrophotographic photosensitive drum unit to which a coupling member is mountable, wherein said coupling member includes, at a free end portion, a rotating force receiving member for receiving, from an electrophotographic image forming apparatus, a rotating force for rotating an electrophotographic photosensitive drum, a spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, said electrophotographic photosensitive drum unit comprising:

a cylinder having a photosensitive layer at an outer periphery thereof; and

a drum flange provided at one end of said cylinder, said drum flange including,

a plurality of resin regulating portions provided inside said drum flange and projected radially inwardly of the drum flange, wherein said regulating portions

are effective to regulate movement of said spherical portion in a longitudinal direction of said drum unit when said coupling member is mounted thereto;

a recess provided in said regulating portion at a position radially outside of said drum flange, for facilitating deformation of said regulating portion radially outwardly of said drum flange; and

a plurality of rotating force receiving portion including a pin for receiving the rotating force, wherein said pin is provided between adjacent ones of said regulating portions.

7. An electrophotographic photosensitive drum unit for an electrophotographic image forming apparatus, said unit comprising:

a cylinder having a photosensitive layer at an outer periphery thereof; and

a drum flange provided at one end of said cylinder, said drum flange including,

a. plurality of resin regulating portions provided inside said drum flange and projected radially inwardly of the drum flange with a gap between said regulating portions along a circumferential direction of said drum flange;

a recess provided in said regulating portion at a position radially outside of said drum flange, for facilitating deformation of said regulating portion radially outwardly of said drum flange.

8. A drum unit according to Claim 6 or 7, wherein a plurality of such recesses are provided intermittently in the circumferential direction.

9. An electrophotographic photosensitive drum unit for a process cartridge detachably mountable to a main assembly of an electrophotographic image forming apparatus, said electrophotographic photosensitive drum unit comprising: a cylinder having a photosensitive layer at an outer periphery thereof; and

a resin drum flange provided at one end of said cylinder;

a gear portion provided along an outer surface of said drum flange;

a plurality of resin regulating portions provided at the same position as said gear portion with respect to a longitudinal direction of said cylinder with a gap between said regulating portions in. a. circumferential direction inside said drum flange;

a recess provided radially between said regulating portion and an inner surface of said drum flange, for facilitating deformation of said regulating portion radially outwardly of said drum flange.

10. A drum unit according to Claim 9, wherein a coupling member for receiving a rotating force from said main assembly of the apparatus is mounted to said drum flange and includes a rotating force receiving member having a rotating force receiving portion, at a free end portion, for receiving the rotating force, and an spherical portion mounted to a rear end portion of the rotating force receiving member by a pin penetration, and wherein said pin is disposed between said regulating portions arranged along the circumferential. direction and is movable in the circumferential direction and in the longitudinal direction of said cylinder, wherein said spherical portion is mounted revolvably to said drum flange, and said spherical portion is movable in a range regulated by said regulating portion regulating said pin in the circumferential direction and with regulation by said regulating portion in the longitudinal direction.

11. An electrophotographic photosensitive drum unit comprising:

(a) a cylinder having a photosensitive layer at an outer periphery thereof; and

(b) a drum flange provided at one end of said cylinder, said drum flange including a plurality of projections provided inside said drum flange and projected radially inwardly of said drum flange with a space diametrically between said projections, with each of said projections being provided with a recess for easy deformation of said projections.

12. A drum unit accordingly to Claim 11, wherein a part of each projection has an overhang.

13. A drum unit according to Claim 11, wherein another space is formed between said projections along a circumferential direction of said drum flange.

14. A drum unit according to Claim 13, wherein a plurality of such recesses is provided intermittently in the circumferential direction.

15. A drum unit according to Claim 11, wherein said drum flange is made from resin.

16. A drum unit according to Claim 11, further comprising a gear portion provided along an outer surface of said drum flange, wherein the projections are provided at the same position as said gear portion with respect to a longitudinal direction of said cylinder.

17. A coupling member dismounting method for dismounting, from a drum flange mounted to an electrophotographic photosensitive drum, a coupling member for transmitting a rotating force to the drum flange to rotate the electrophotographic photosensitive drum, said method comprising:

(i) an inclining step of inclining the coupling member relative to a rotational axis of the drum flange, wherein the coupling member includes a rear end portion, supported in the drum flange, that has a spherical portion and a pin penetrating the spherical portion, and a free end portion that has a rotating force receiving portion for receiving the rotational force;

(ii) a pin urging step of pushing the pin from one end to the other end thereof, wherein the one end and the other end of the pin project outwardly of the spherical portion in a state in which the coupling member is inclined in said inclining step, wherein the drum flange has a preventing portion for preventing the spherical portion from disengaging from the drum flange and an outer portion provided outside of the preventing portion in a direction of the rotational axis of the flange;

(iii) a pin riding step of causing a portion of the pin, which is further projected at the end by said pin urging step, to ride on the outer portion; and

(iv) a coupling member dismounting step of dismounting the coupling member from the drum flange by applying a force to the free end portion of the coupling member toward a fulcrum, which is the portion of the pin riding on the outer portion.

18. An electrophotographie photosensitive drum unit comprising:

(a) a cylinder having a photosensitive layer at an outer periphery thereof;

(b) a drum flange provided at one end of said cylinder;

(c) a coupling member engaged with said drum flange so that an axis of said coupling member is inclinable with respect to an axis of said drum flange; and

(d) a regulating portion provided in said drum flange so as to prevent said coupling member from disengaging from said drum flange, wherein at least one of said coupling member and said regulating portion is configured to be deformed to permit said coupling member to disengage from said drum flange or to engage with said drum flange.

19. A drum according to claim 18, wherein said drum flange includes a plurality of projections provided inside said drum flange and projected radially inwardly of said drum flange with a space diametrically between said projections, with each of said projections being provided with a recess for easy deformation of said projections.

20. A drum unit according to claim 19, wherein a part of each projection has an overhang.

21. A drum unit according to claim 19, wherein another space is formed between said projections along a circumferential direction of said drum flange.

22. A drum unit according to claim 21, wherein a plurality of such recesses is provided intermittently in the circumferential direction.

23. A drum unit according to claim 18, wherein said drum flange is made from resin.

24. A drum unit according to claim 19, further comprising a gear portion provided along an outer surface of said drum flange, wherein said projections are provided at the same position as said gear portion with respect to a longitudinal direction of said cylinder.

25. An electrophotographic photosensitive drum unit comprising:

(a) a cylinder having a photosensitive layer at an outer periphery thereof; and

(b) a drum flange provided at one end of the cylinder, the drum flange including at least two projections provided inside of the drum flange and projected radially inwardly of the drum flange, with a space diametrically between the at least two projections,

wherein each of the at least two projections projects radially inwardly of the drum flange to a greater extent at a position farther from the cylinder than it does at a position closer to the cylinder, and

wherein each of the at least two projections is provided with a recess to facilitate deformation of the projection.

26. A drum unit according to claim 25, wherein each of the at least two projections extends radially inwardly of the drum to the greatest extent at an outer end of the projection in a longitudinal direction of the cylinder.

27. A drum unit according to claim 25, further comprising a gear portion provided along an outer surface of the drum flange.

28. A drum unit according to claim 27, wherein the at least two projections are provided at substantially the same position as the gear portion with respect to a longitudinal direction of the cylinder.

29. A drum unit according to claim 25, wherein the drum flange includes more than two projections provided inside of the drum flange and projected radially inwardly of the drum flange, and each projection is circumferentially spaced apart from each adjacent projection.

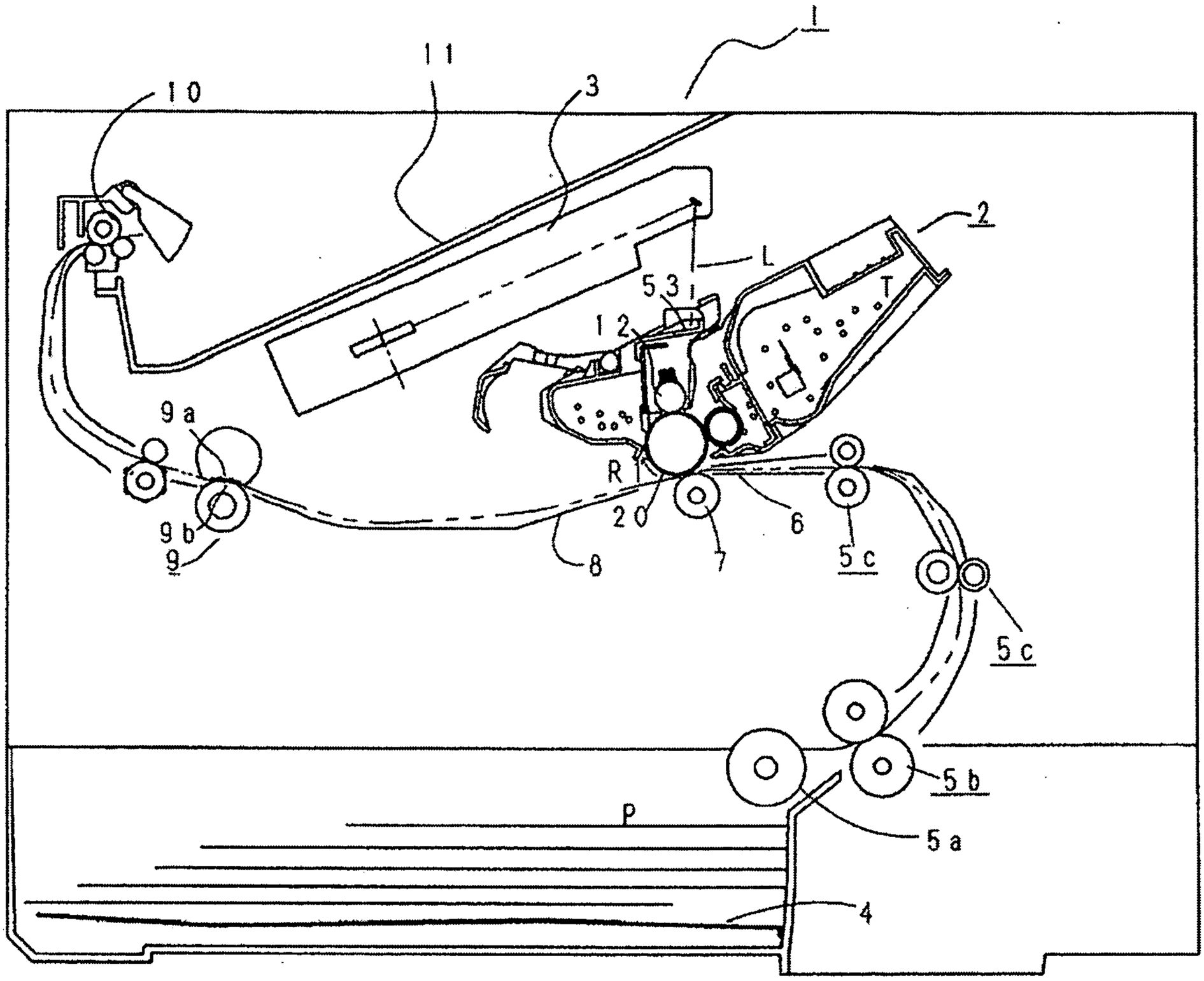
30. A drum unit according to claim 25, further comprising a coupling member engaged with the drum flange so that an axis of the coupling member is inclinable with respect to an axis of the cylinder.

31. A drum unit according to claim 30, wherein the coupling member includes a first end portion engaged with the drum flange, a second end portion, and a connecting portion

connecting the first end portion and the second end portion, and the space diametrically between the at least two projections is narrower than a maximum width of the first end portion.

32. A drum unit according to claim 31, wherein the space diametrically between the at least two projections is wider than a maximum width of the connecting portion.

33. A drum unit according to claim 25, wherein each of the at least two projections is provided with a plurality of recesses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2
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53
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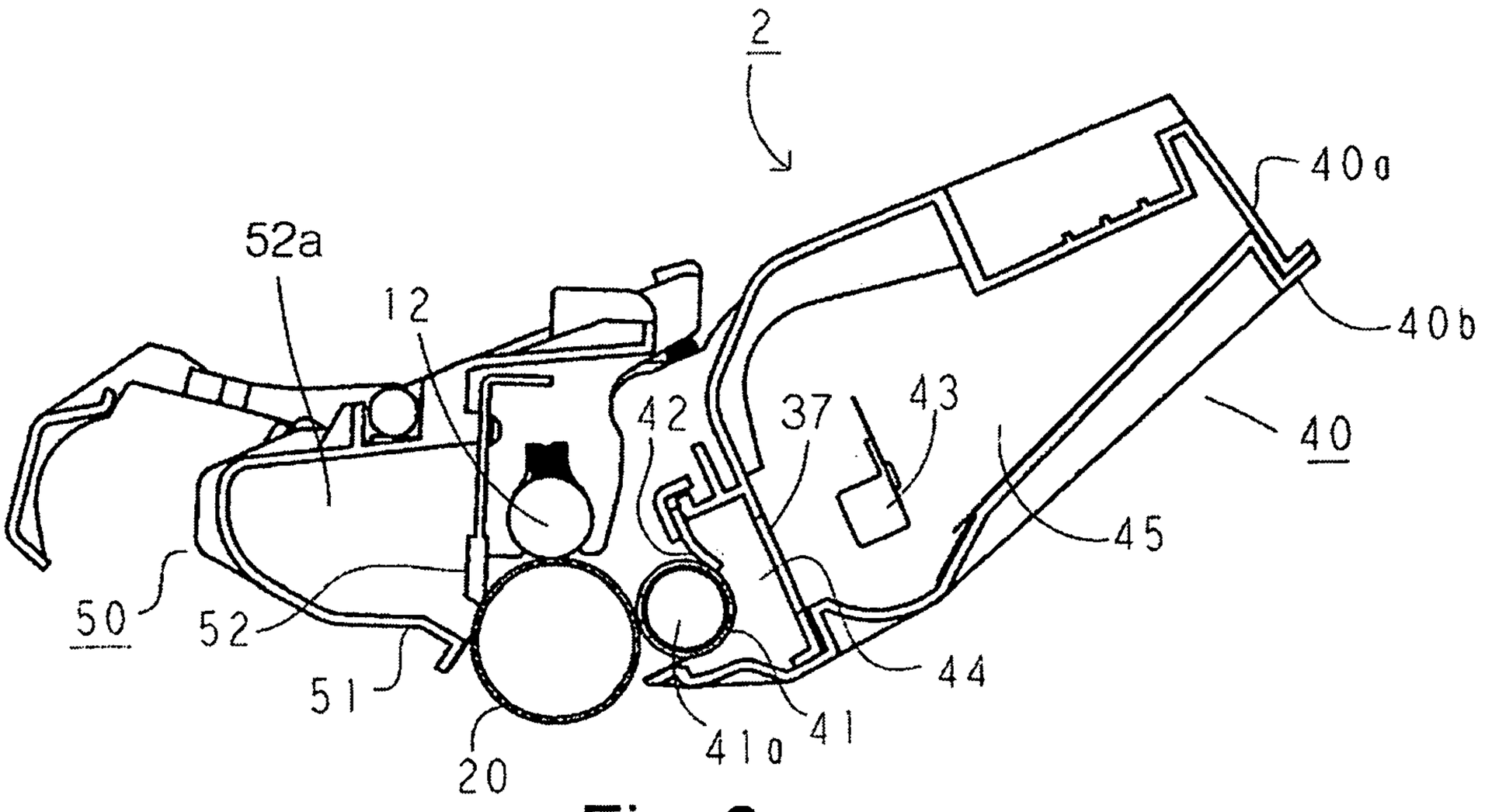
P
4

Fig. 1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20
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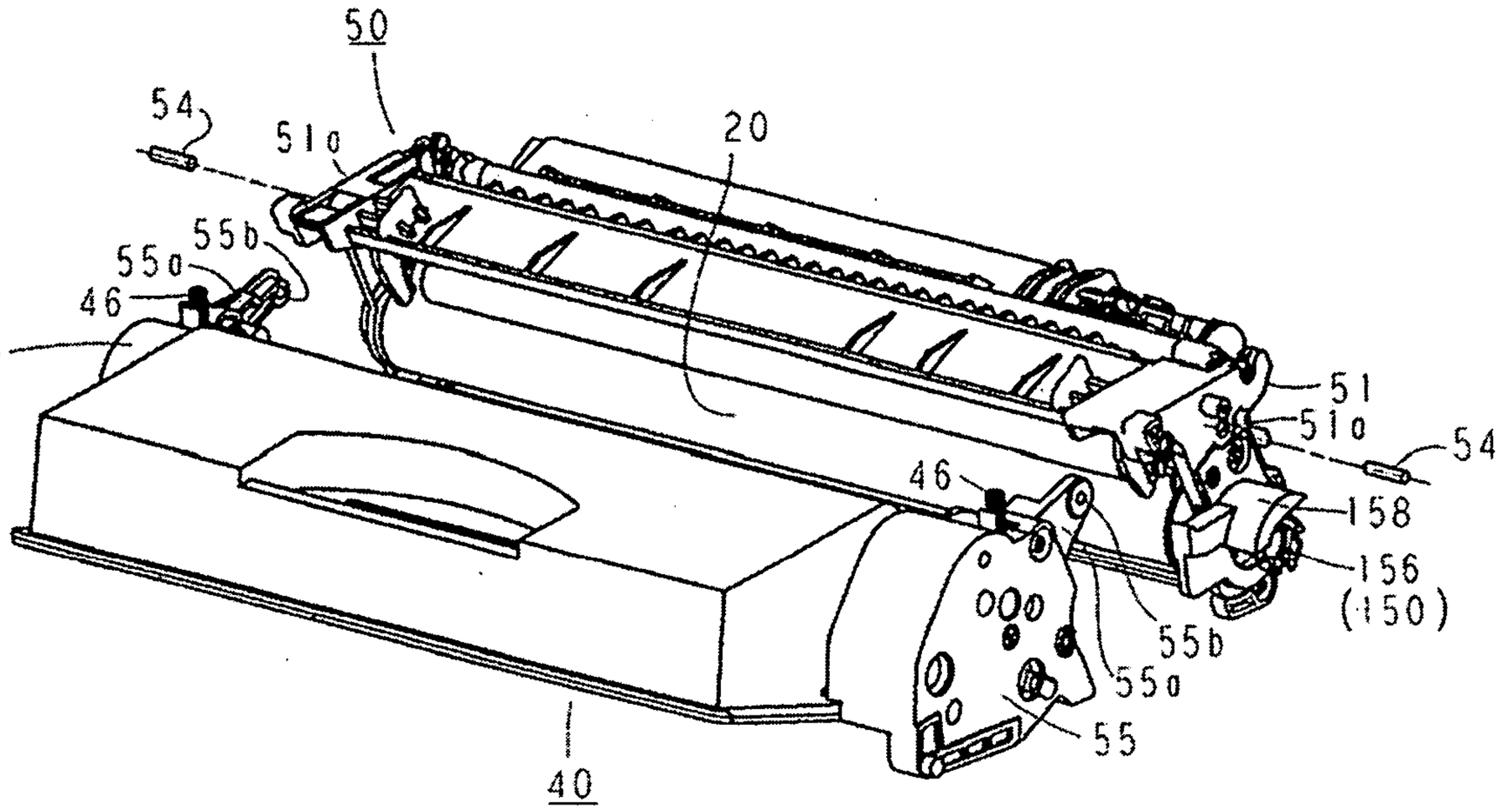
Fig. 2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(150)
55b
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Fig. 3

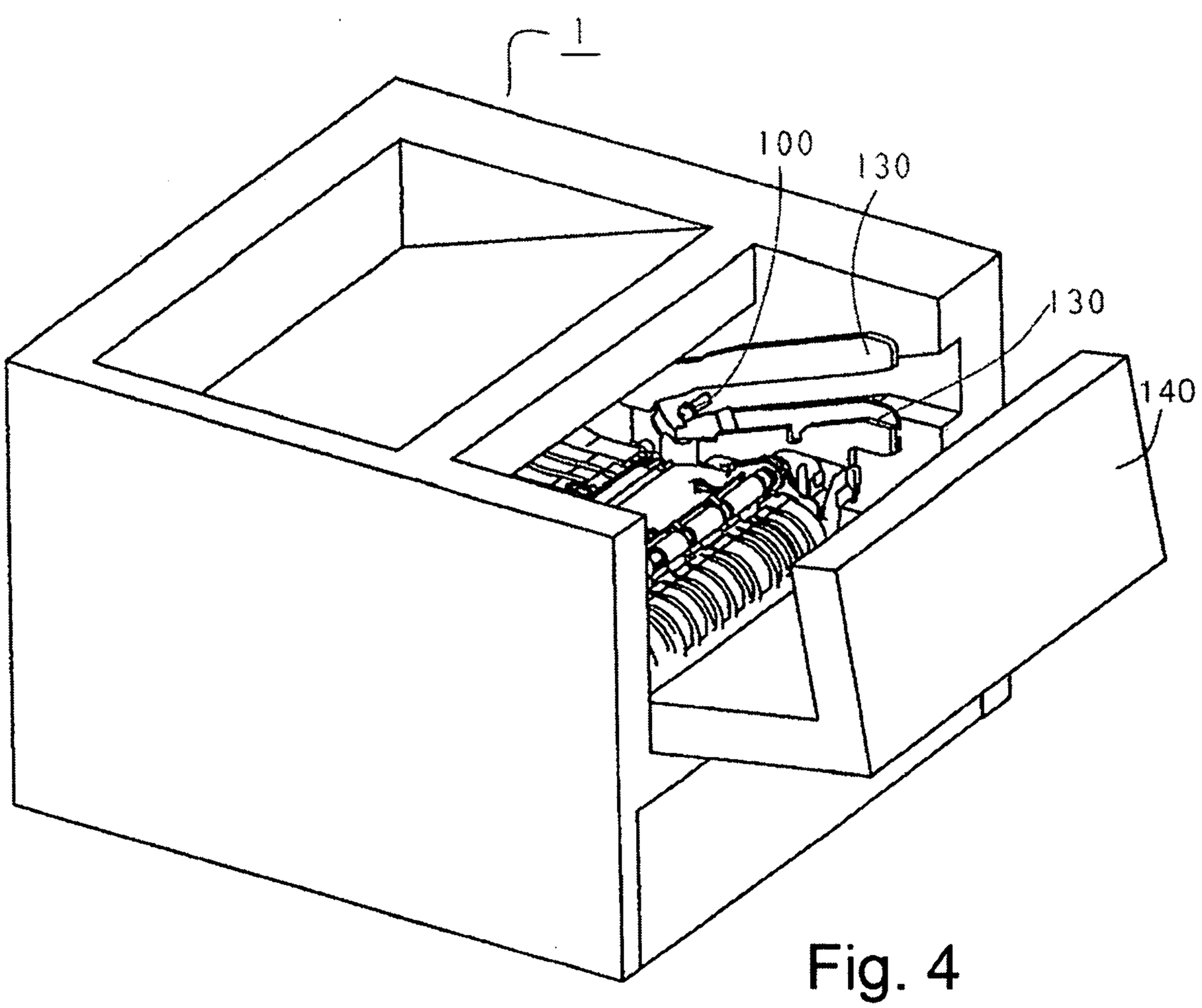

1
100
130
130
140

Fig. 4

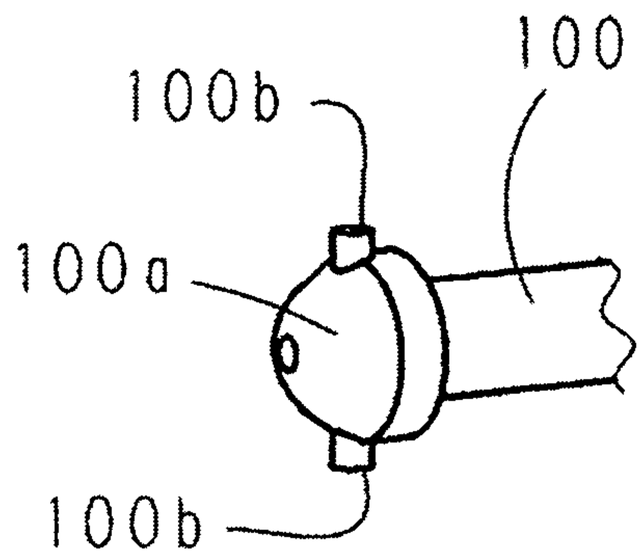


Fig. 5

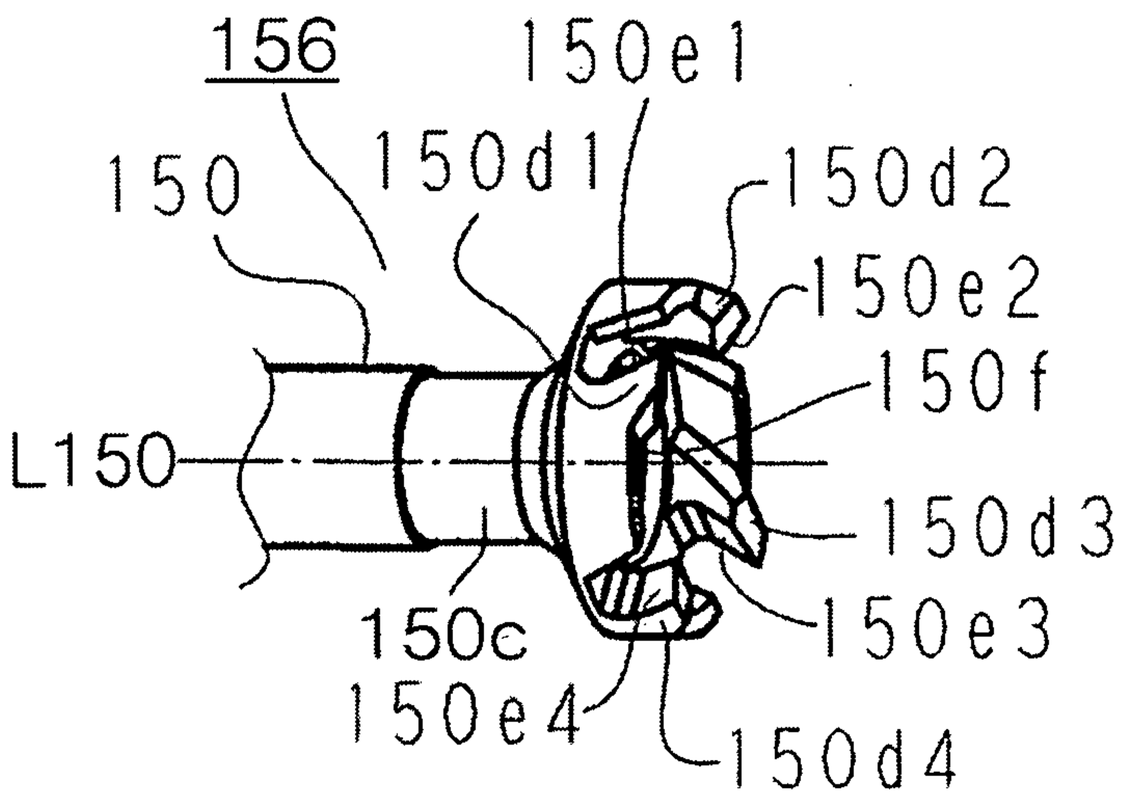


Fig. 6

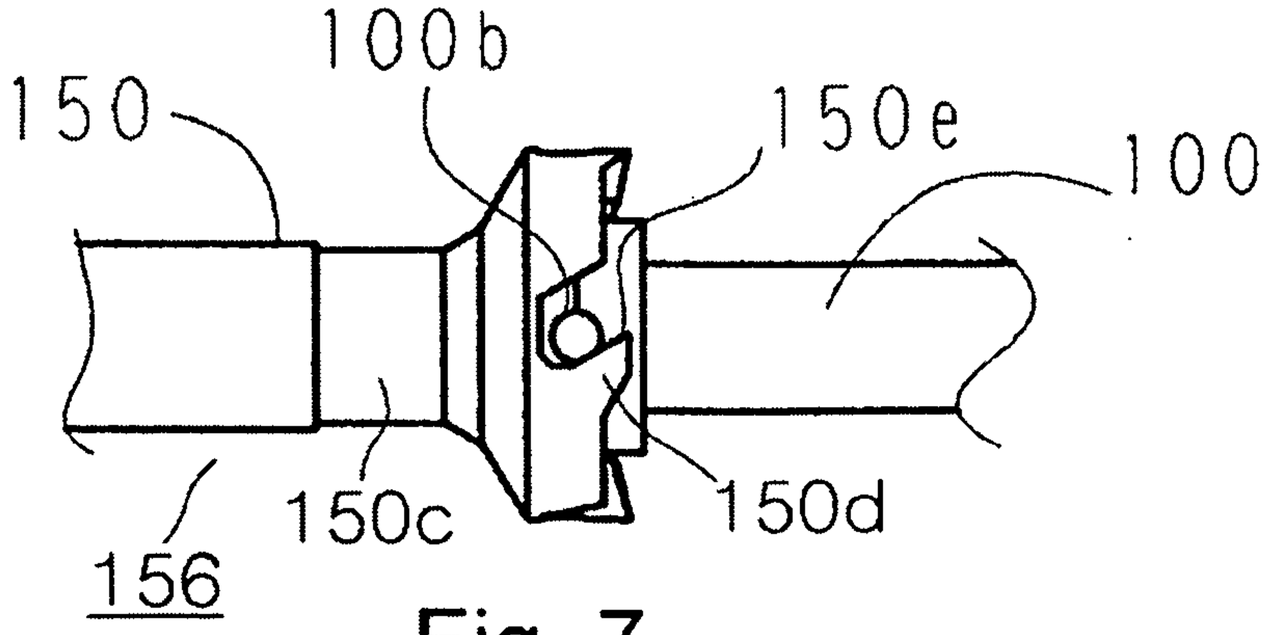


Fig. 7

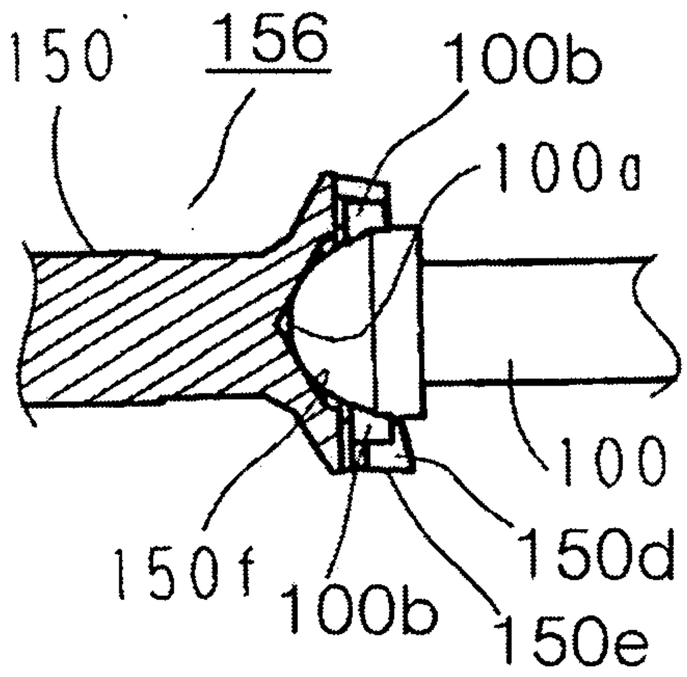


Fig. 8

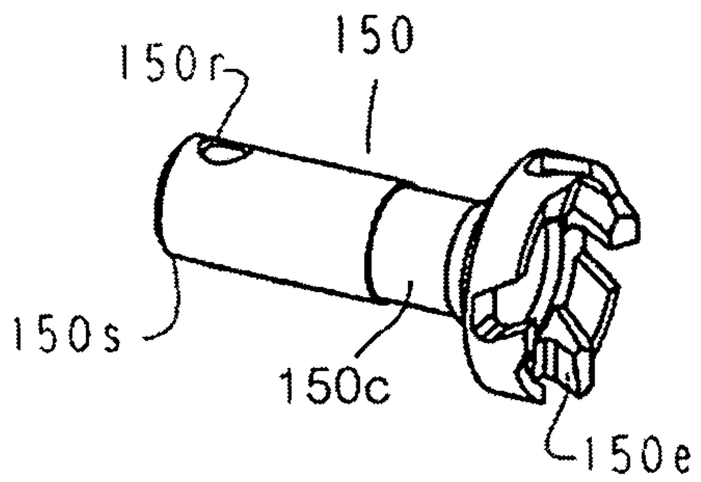


Fig. 9

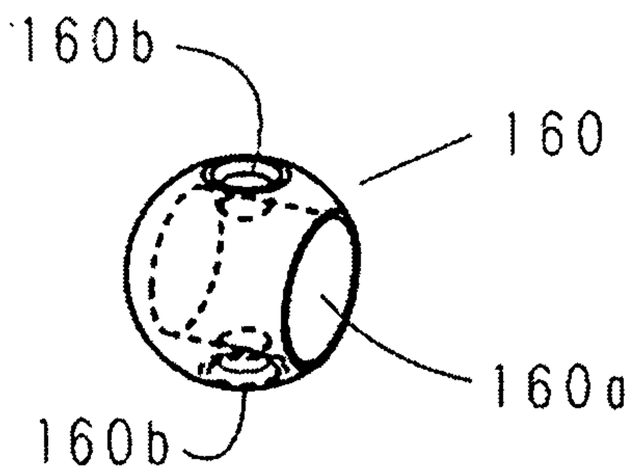


Fig. 10

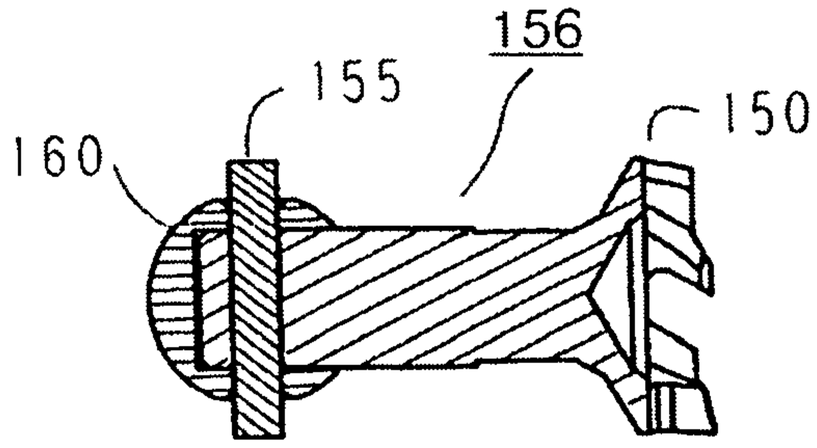


Fig. 11

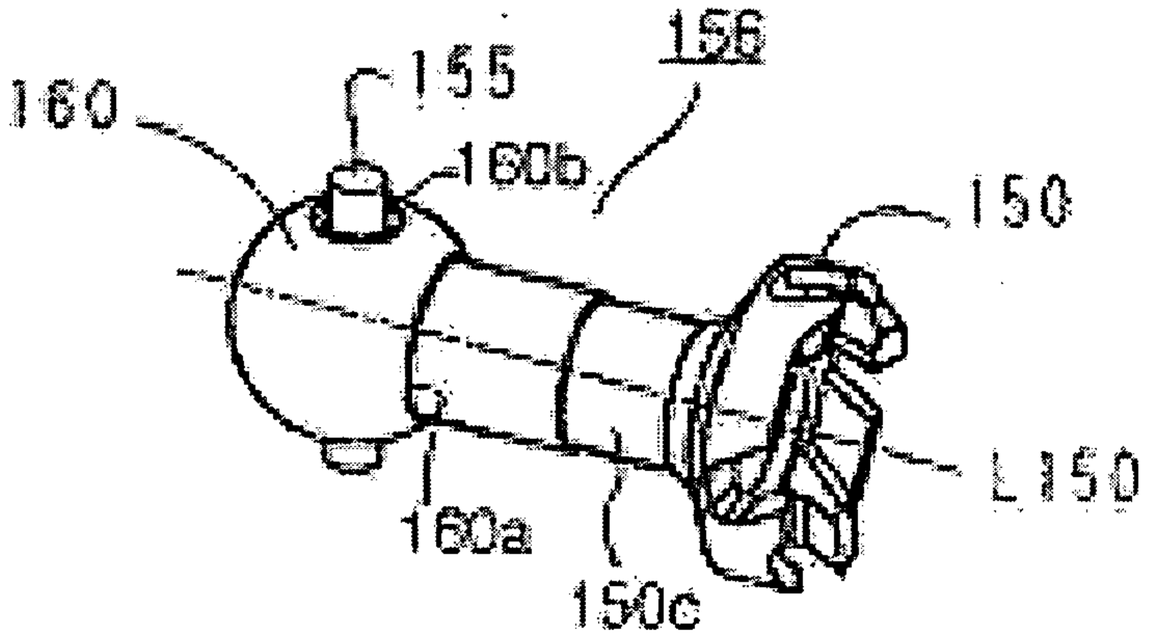

160
155
156
160b
150
L150
160a
150c

Fig. 12

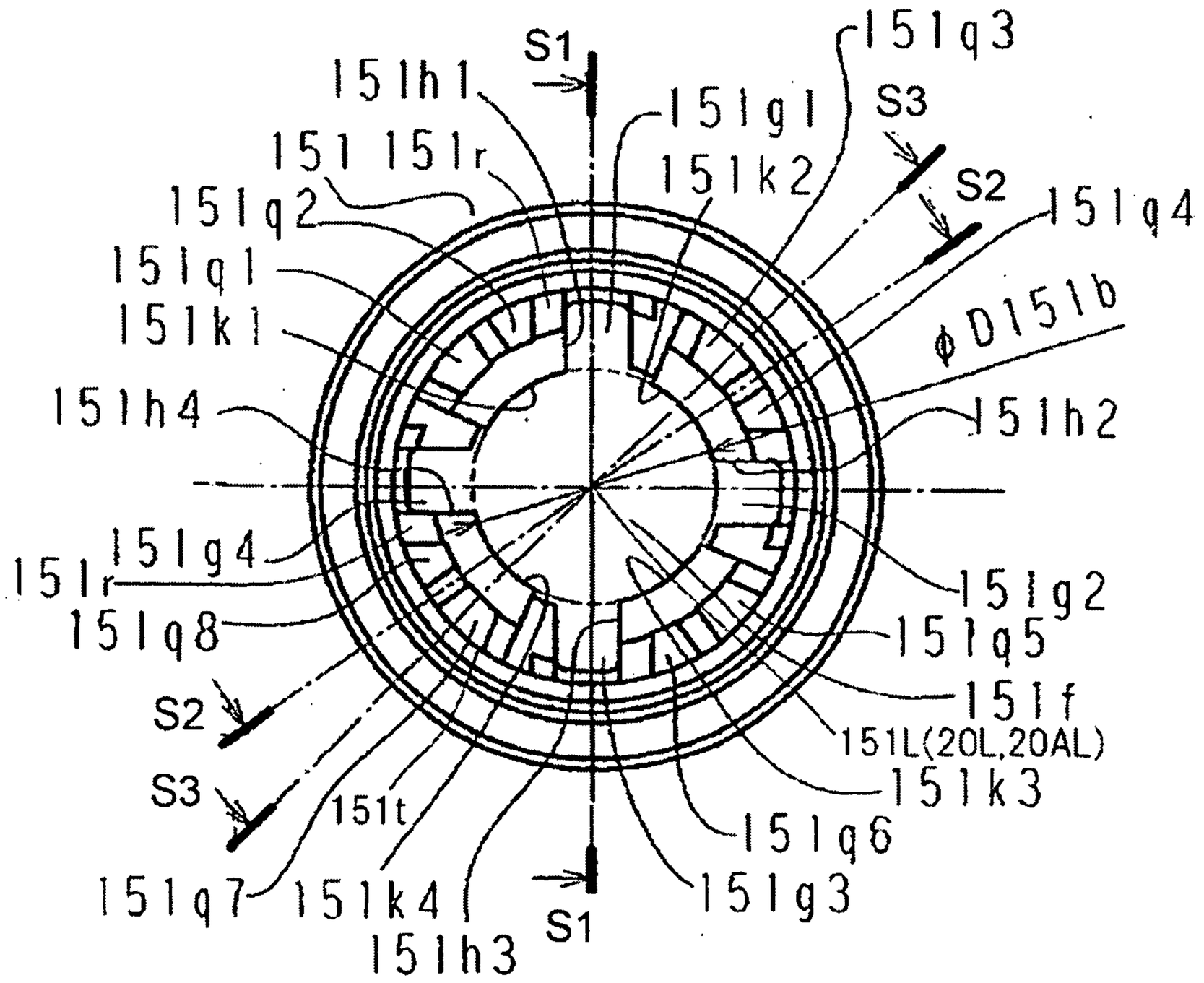

S1
151h1
151 151r
151q2
151q1
151k1
151h4
151g4
151r
151q8
S2
S3
151t
151q7
151k4
151h3
S1
151g3
151q6
151k3
151L(20L,20AL)
151f
151q5
151g2
151h2
φD151b
151q4
S2
S3
151k2
151g1
151q3

Fig. 13

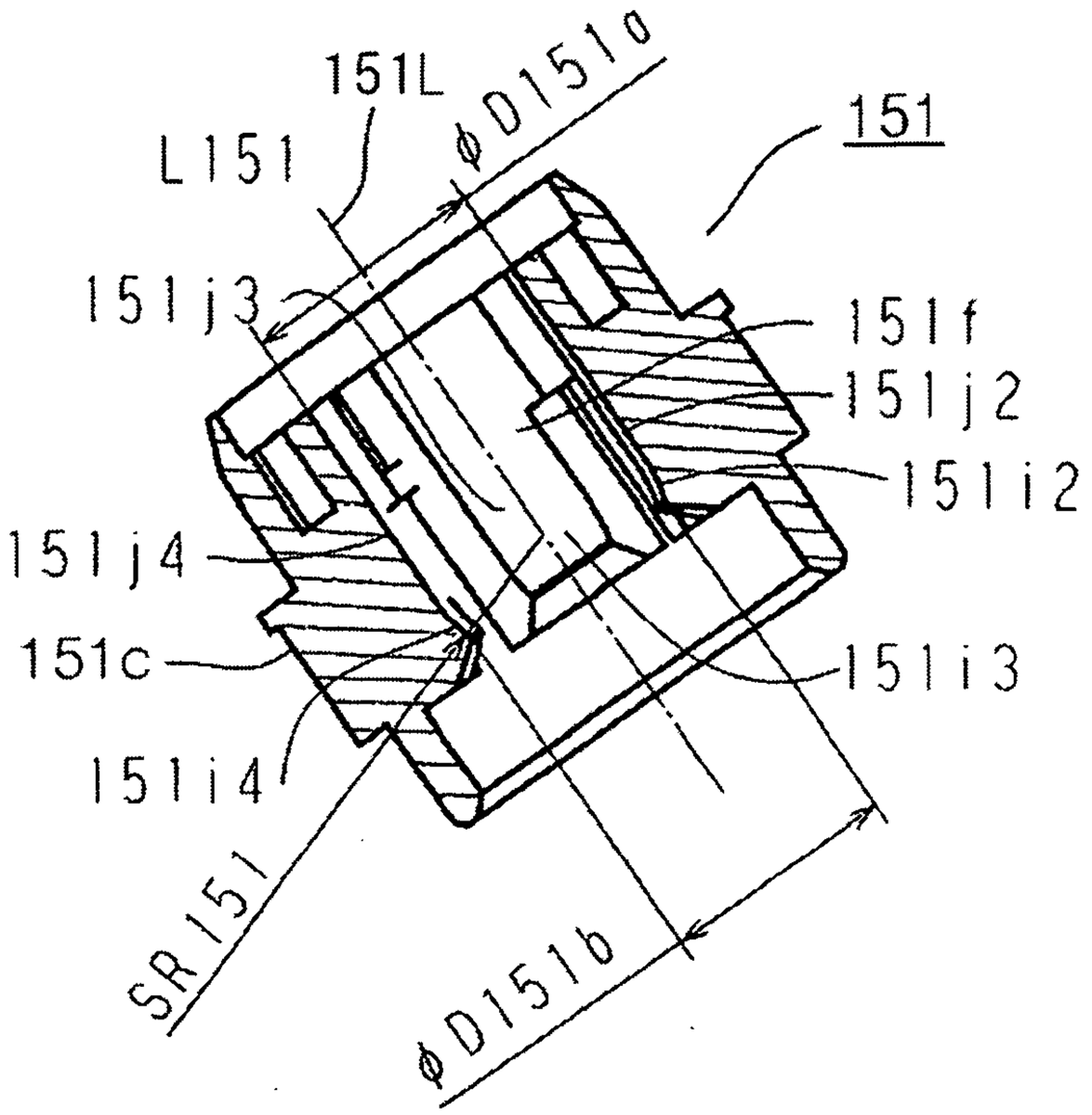

151L
φD151o
L151
151
151j3
151f
151j2
151i2
151j4
151c
151i3
151i4
SR151
φD151b

Fig. 14

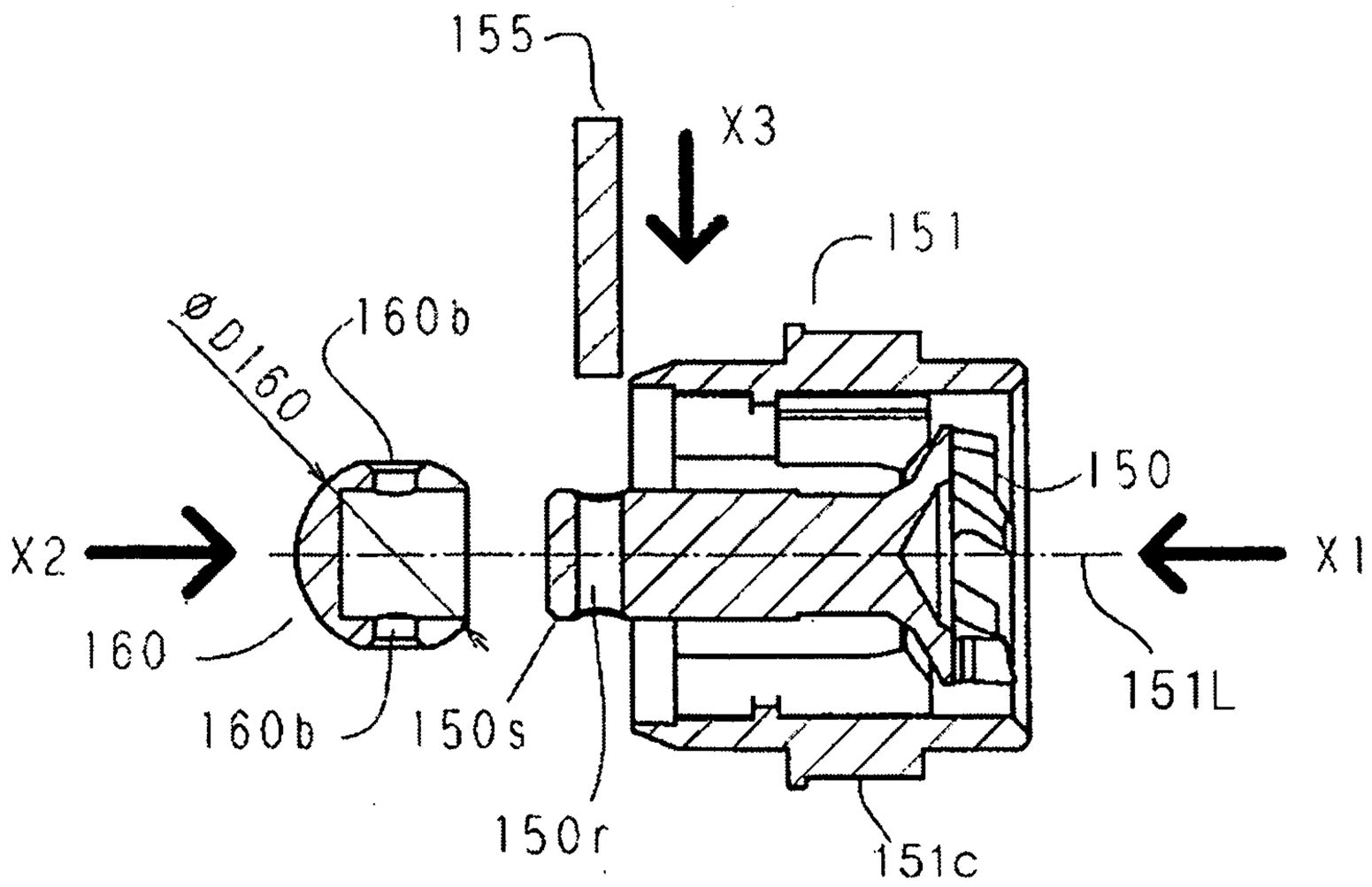

155
X3
151
φD160
160b
150
X2
X1
160
151L
160b
150s
150r
151c

Fig. 15

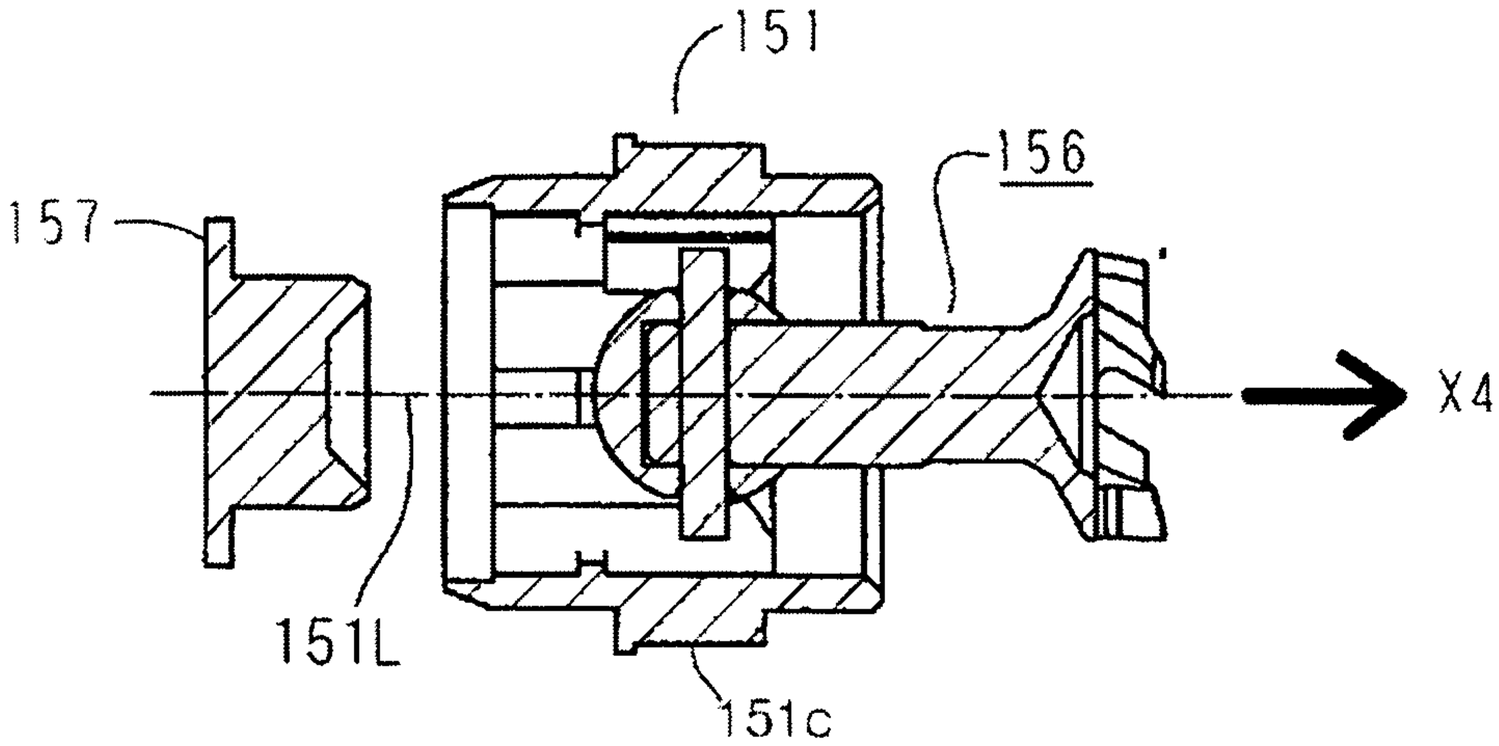


Fig. 16

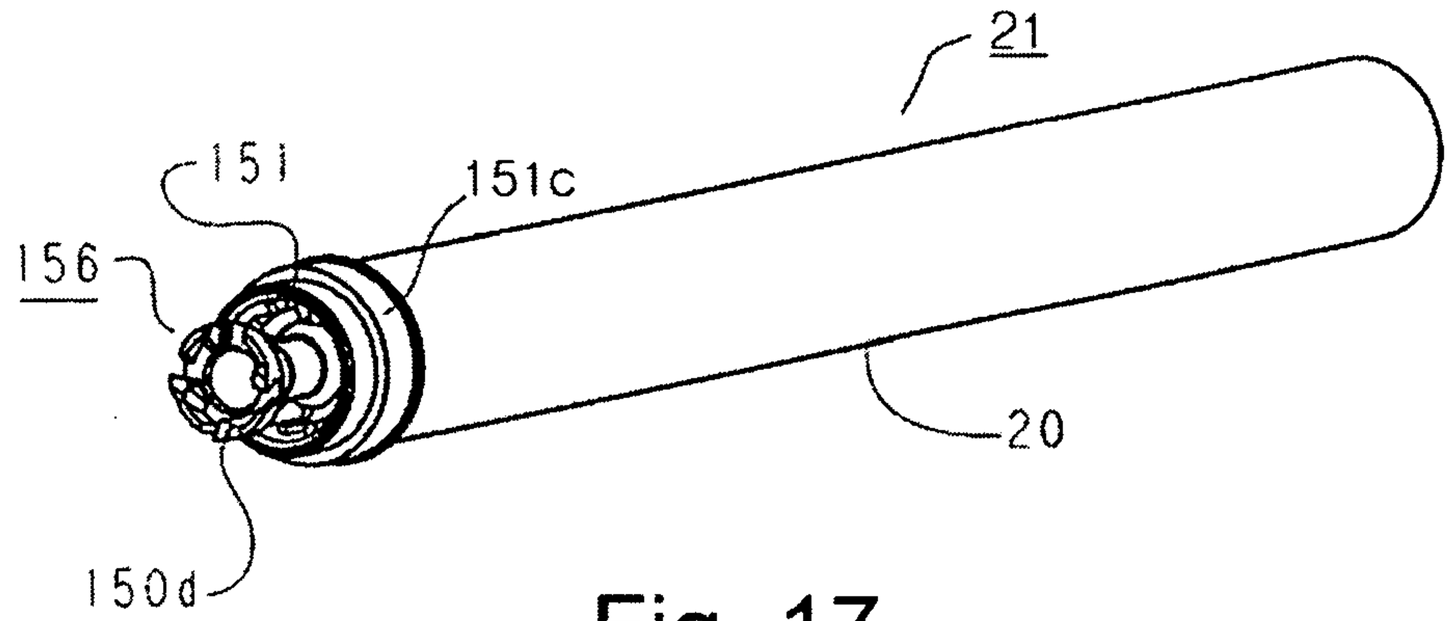


Fig. 17

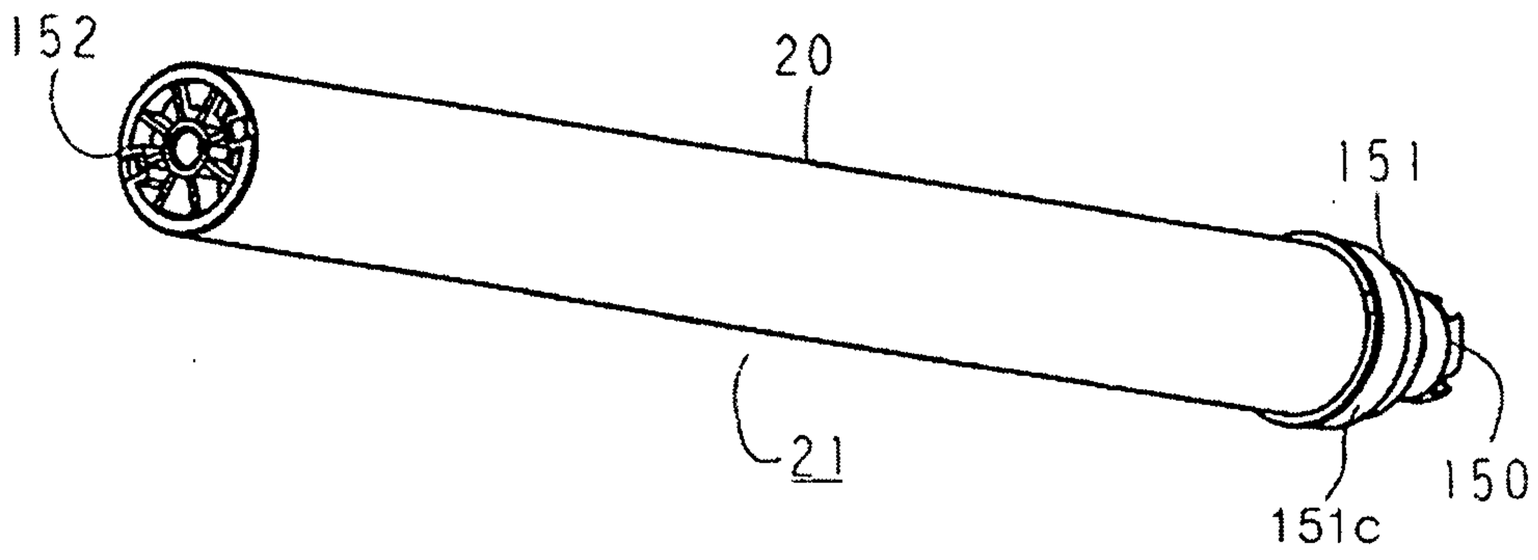


Fig. 18

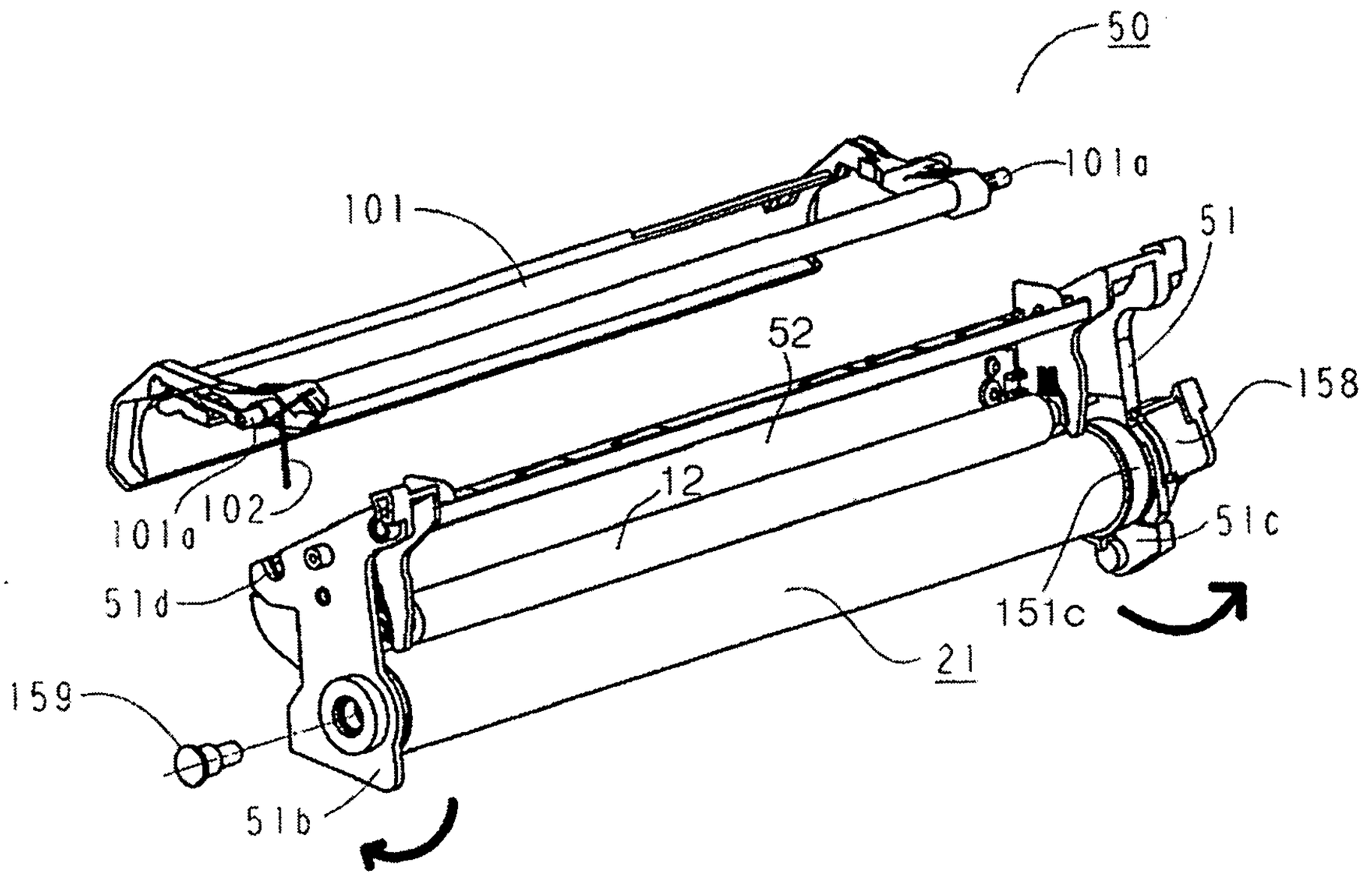

50
101a
101
51
52
158
101a
102
12
51c
51d
151c
21
159
51b

Fig. 19

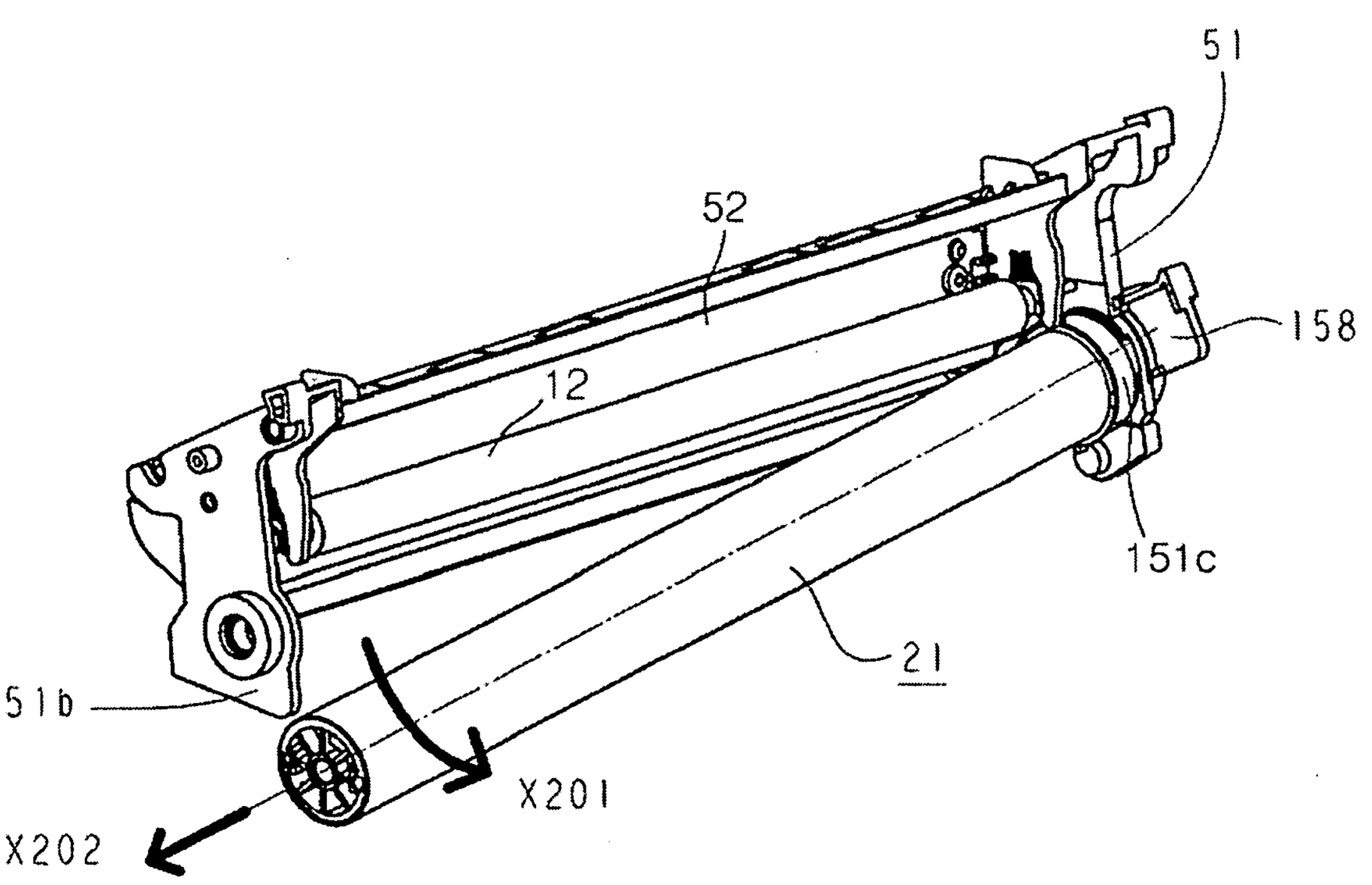

51
52
158
12
151c
21
51b
X201
X202

Fig. 20

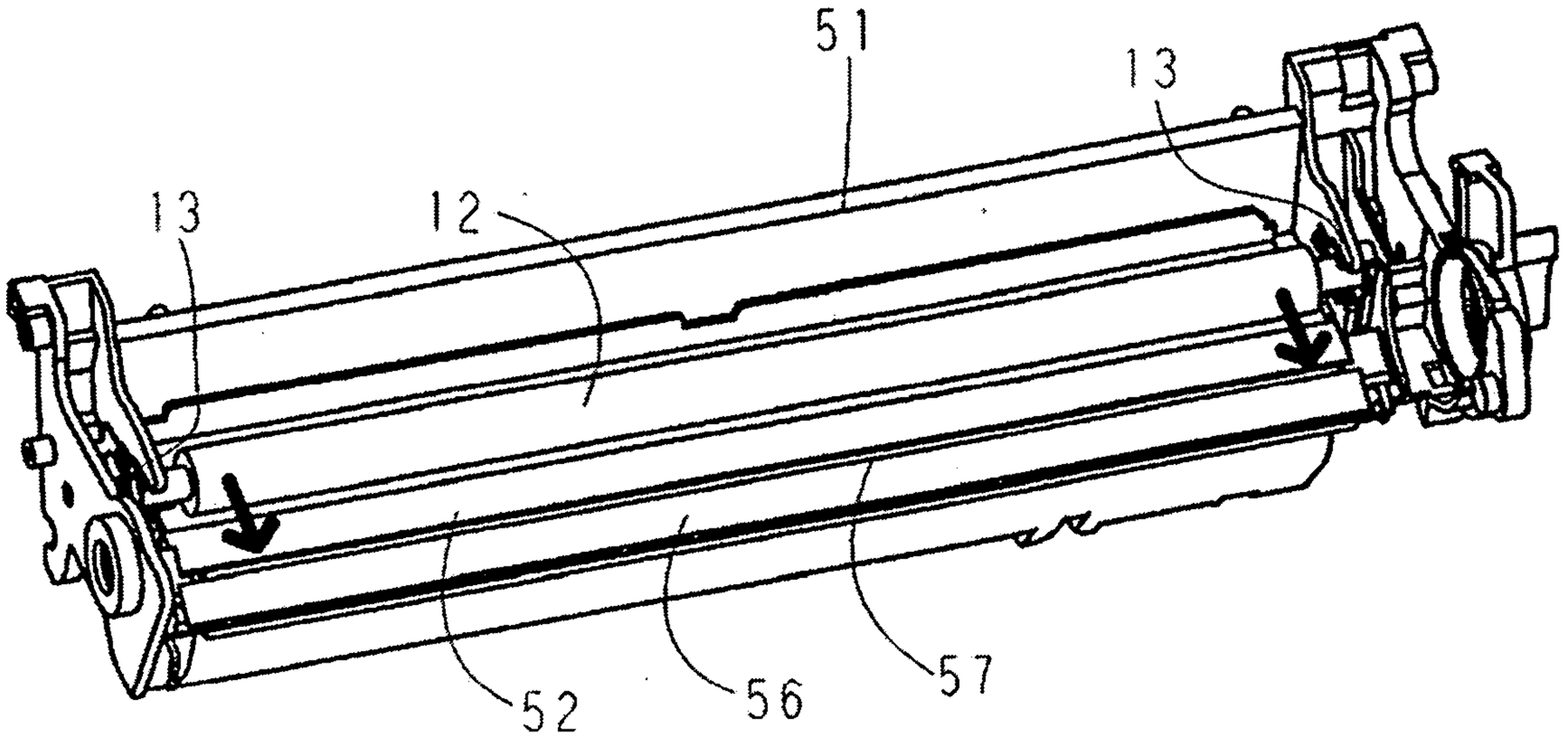


Fig. 21

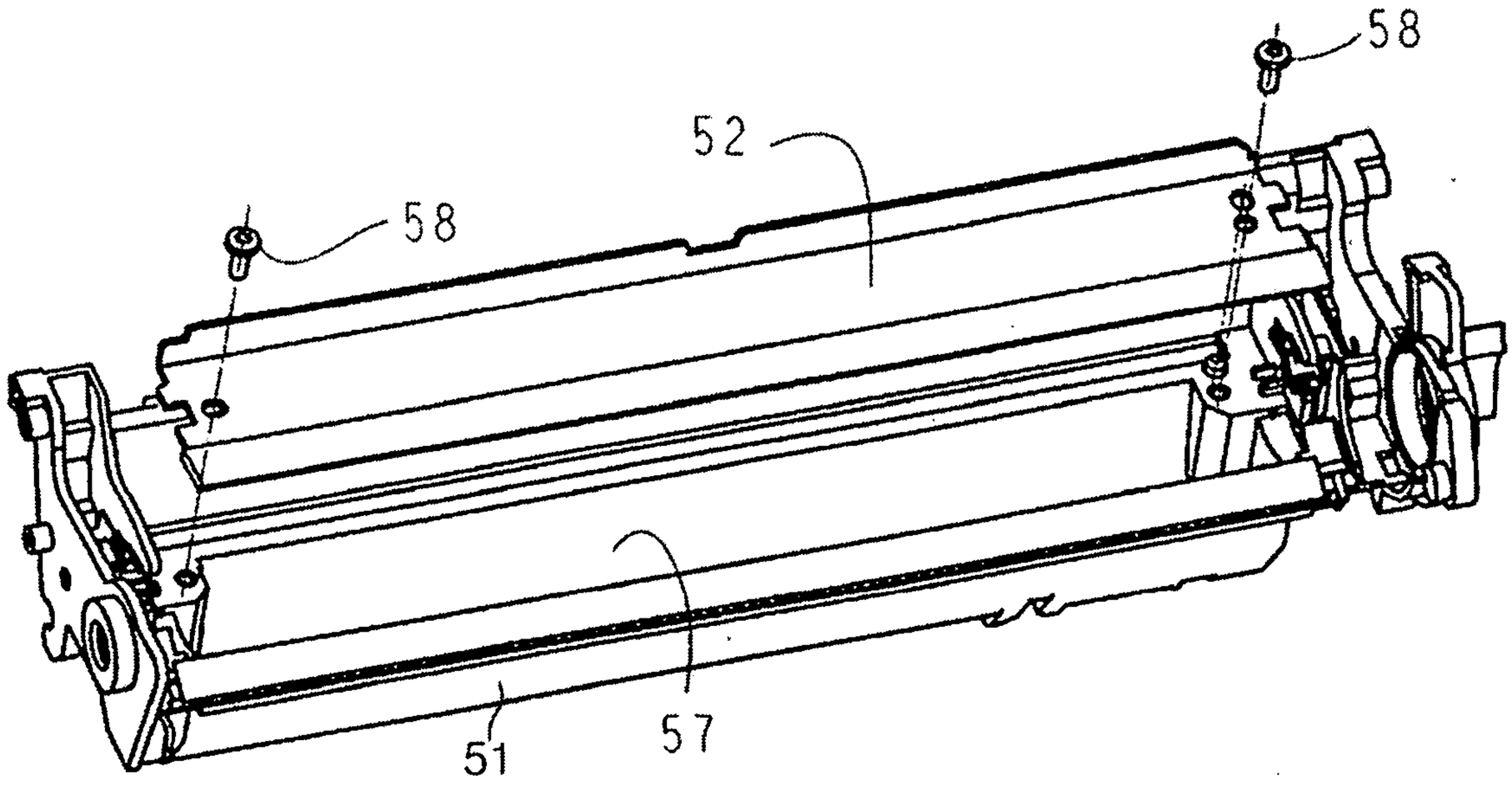


Fig. 22

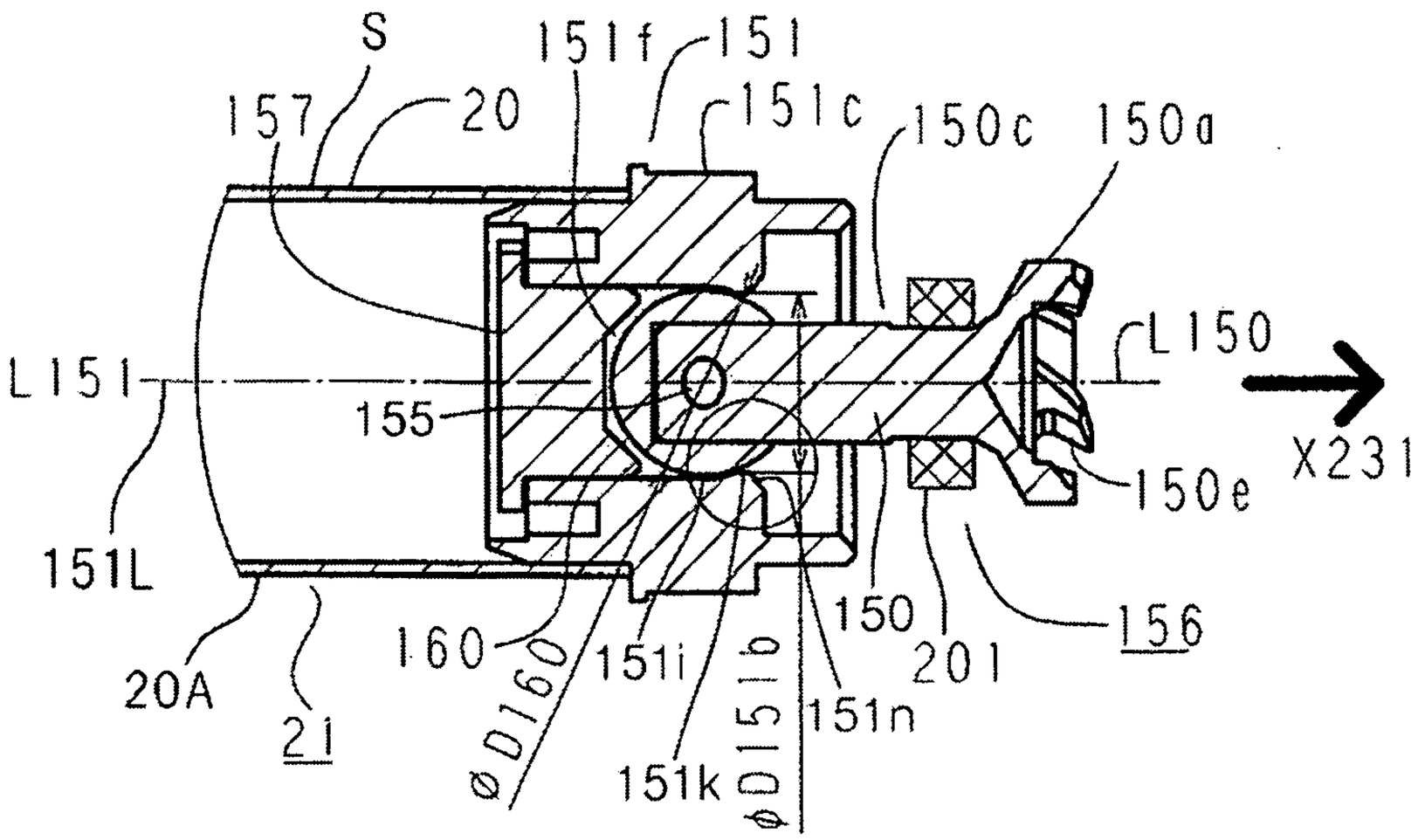

S
151f
151
157
20
151c
150c
150a
L150
L151
155
X231
150e
151L
150
156
160
151i
20A
201
21
ØD160
151n
ØD151b
151k

Fig. 23

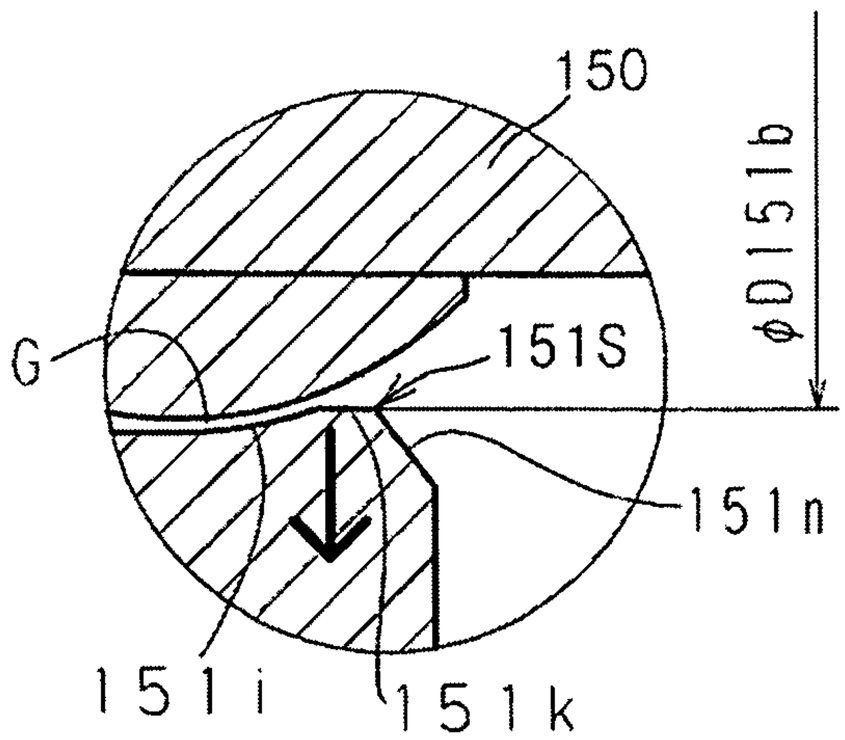

150
ØD151b
G
151S
151n
151i
151k

Fig. 24

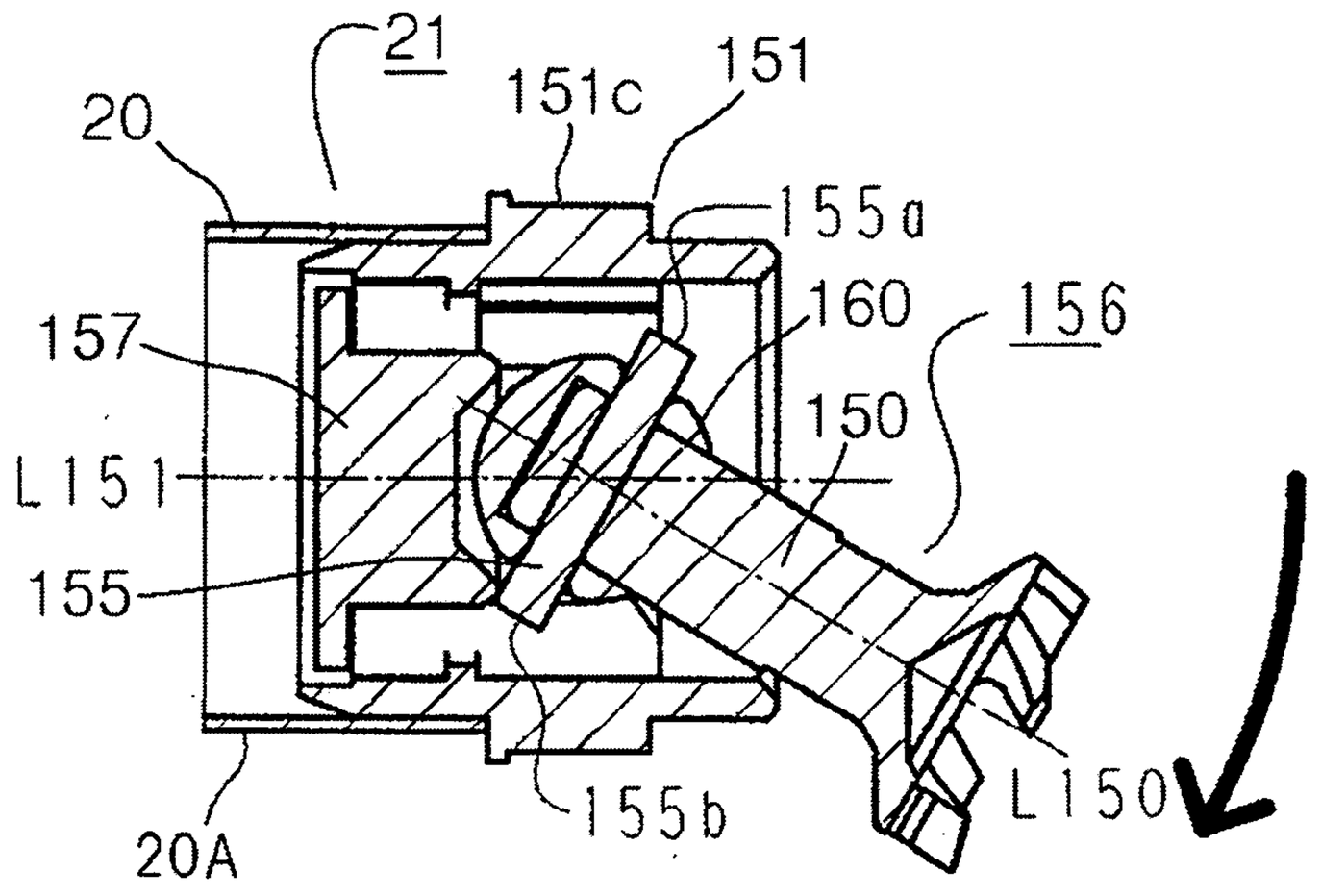

21
151c
151
20
155a
160
156
157
150
L151
155
155b
L150
20A

Fig. 25

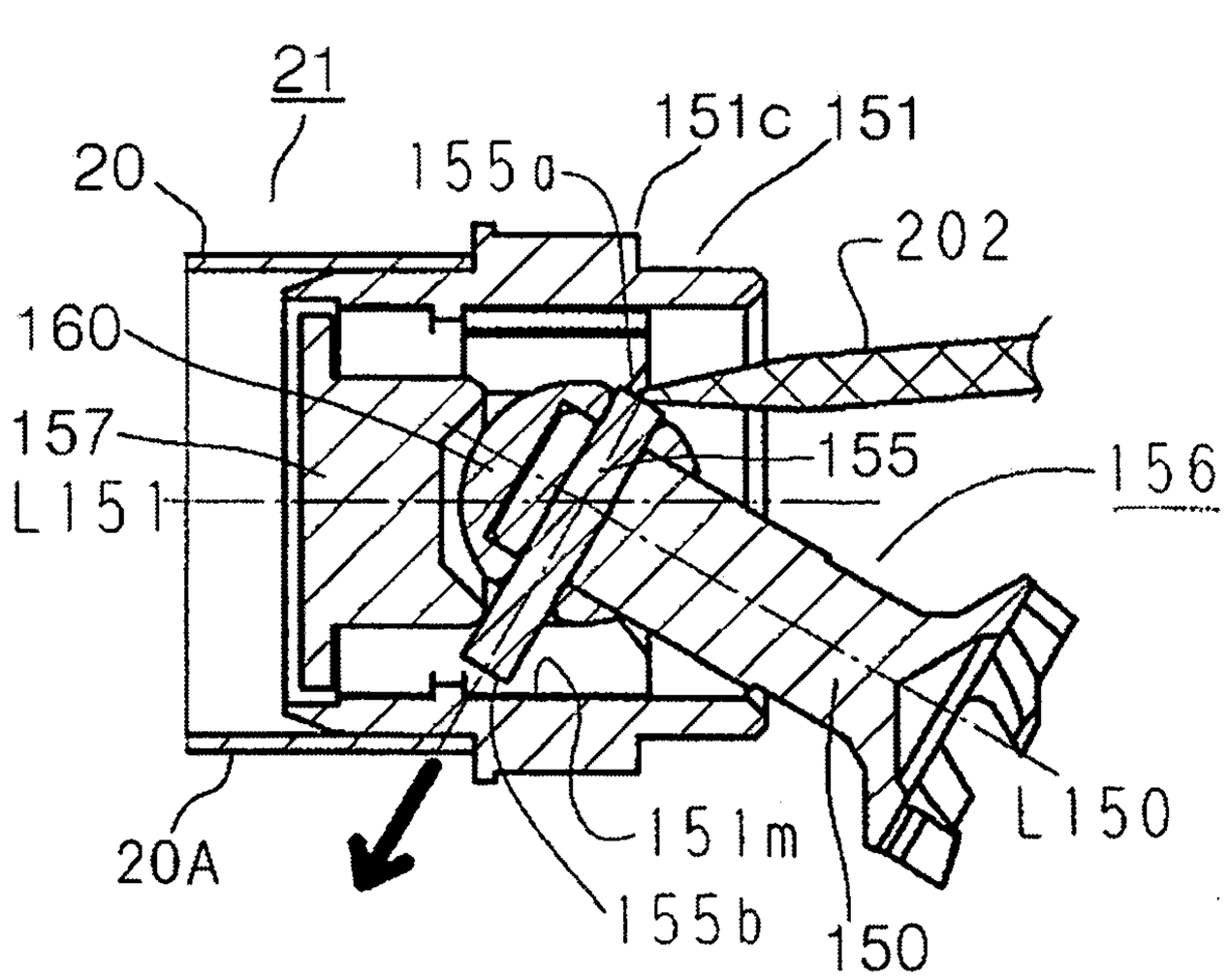

21
20
155a
151c
151
202
160
157
155
156
L151
151m
L150
20A
155b
150

Fig. 26

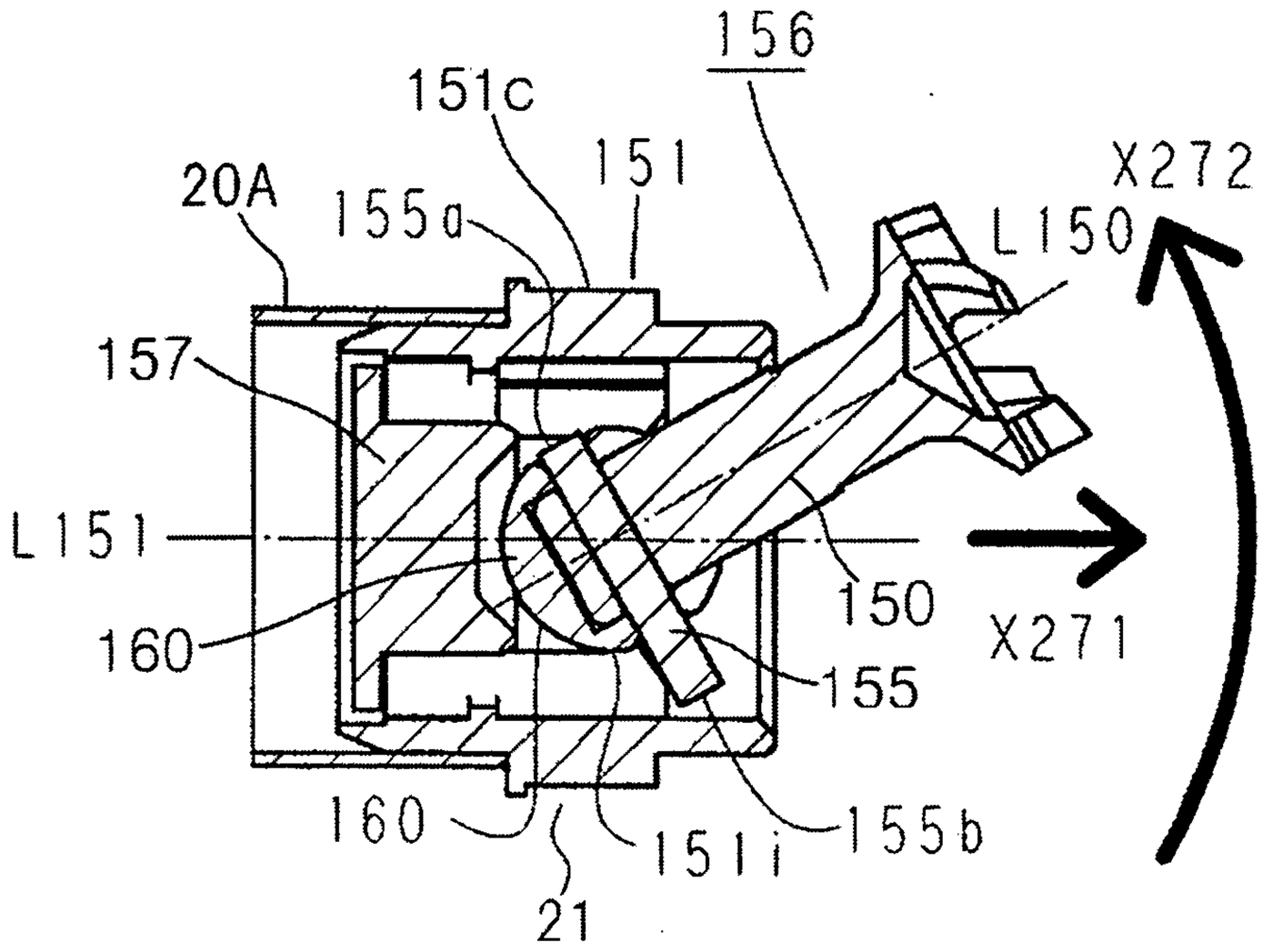

156
151c
151
20A
155a
X272
L150
157
L151
160
150
X271
155
160
151i
155b
21

Fig. 27

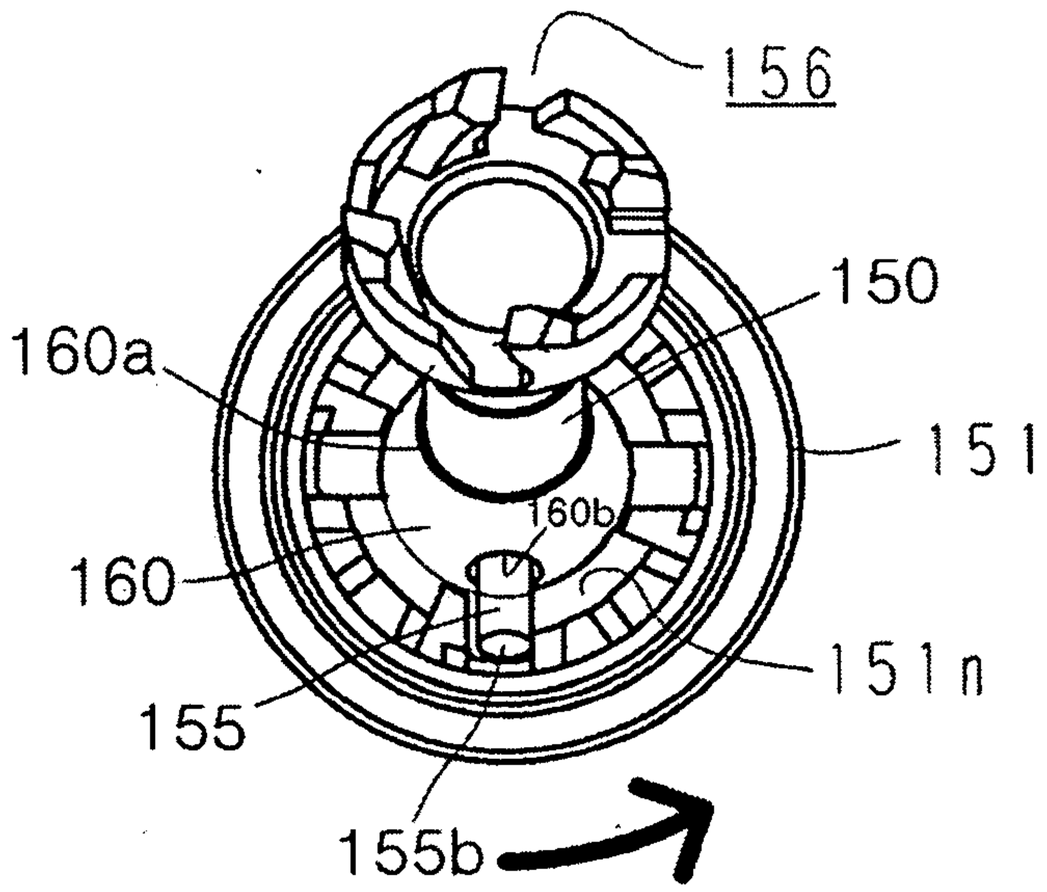

156
150
160a
151
160b
160
151n
155
155b

Fig. 28

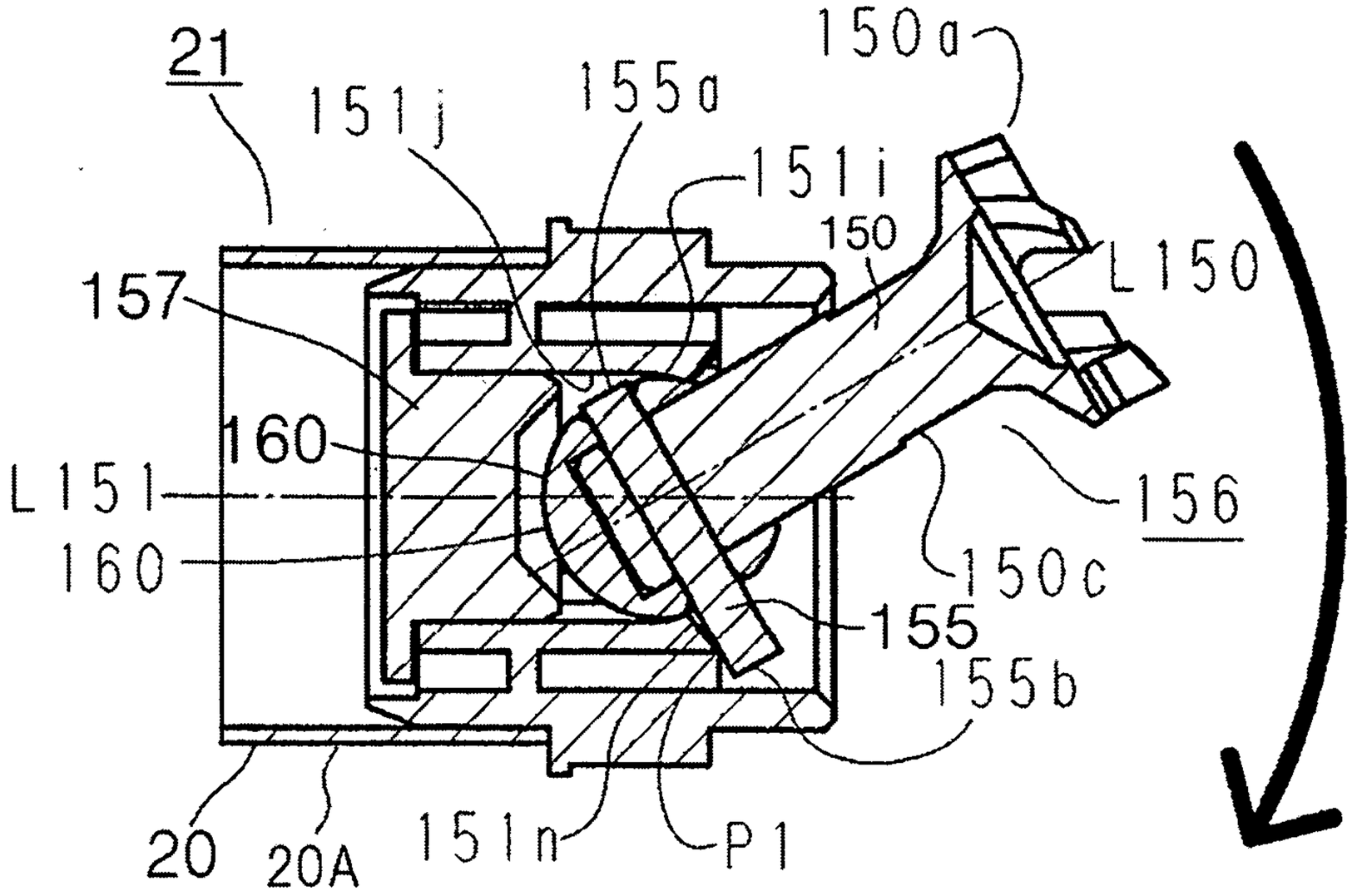

21
151j
155a
150a
151i
150
L150
157
160
L151
160
156
150c
155
155b
20
20A
151n
P1

Fig. 29

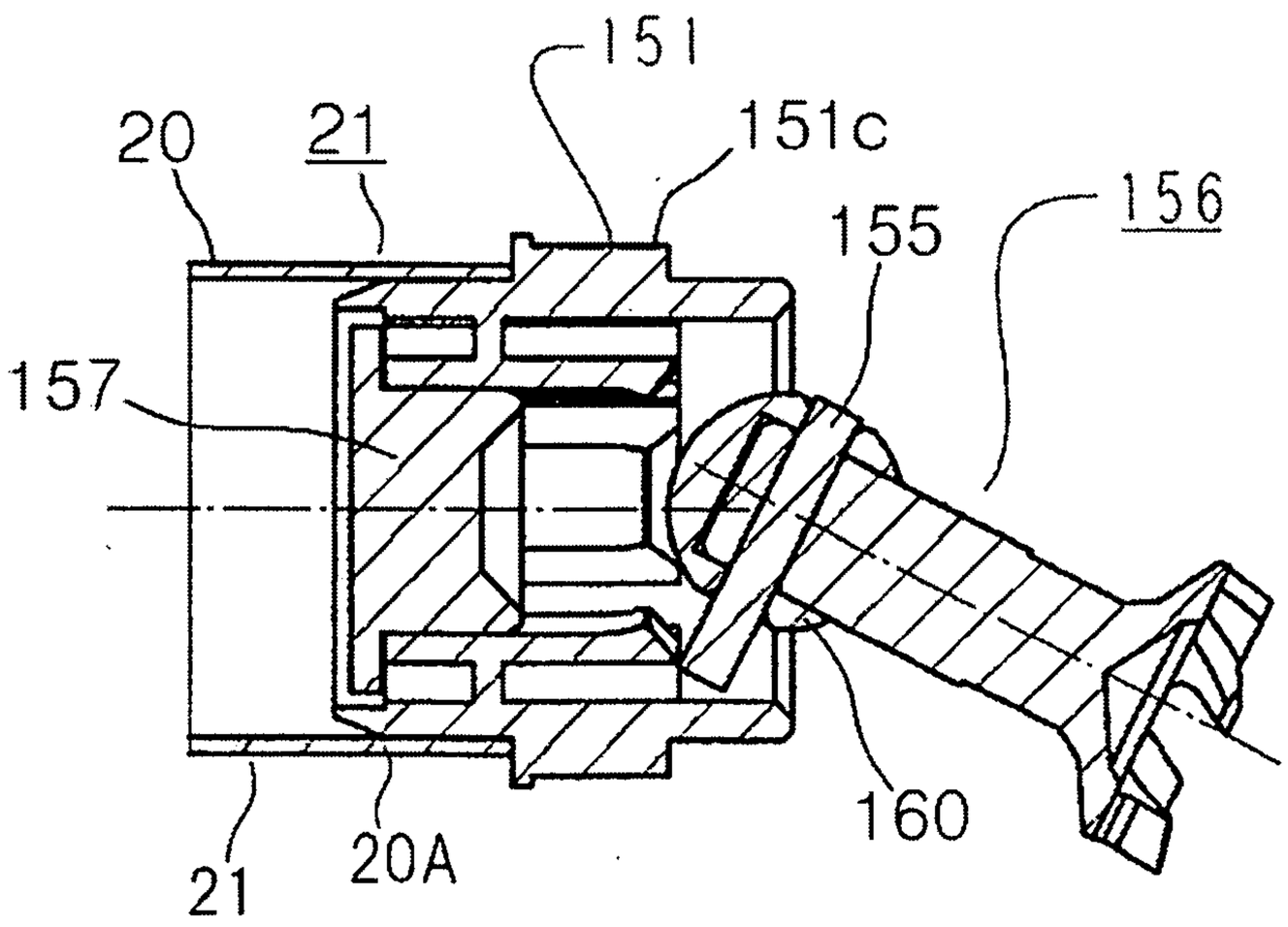

151
20
21
151c
155
156
157
160
21
20A

Fig. 30

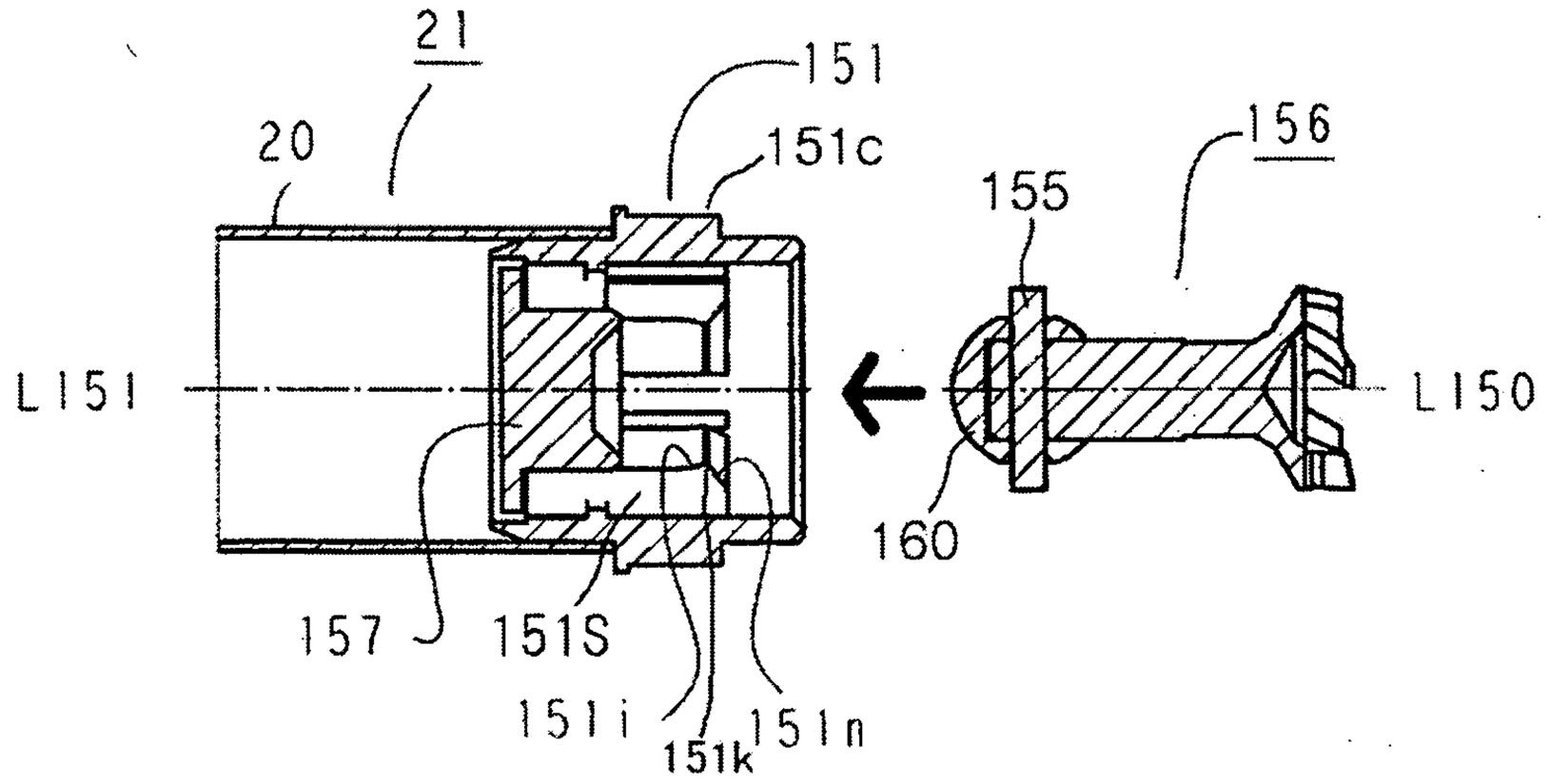

21
151
20
151c
156
155
L151
L150
160
157
151S
151i
151k
151n

Fig. 31

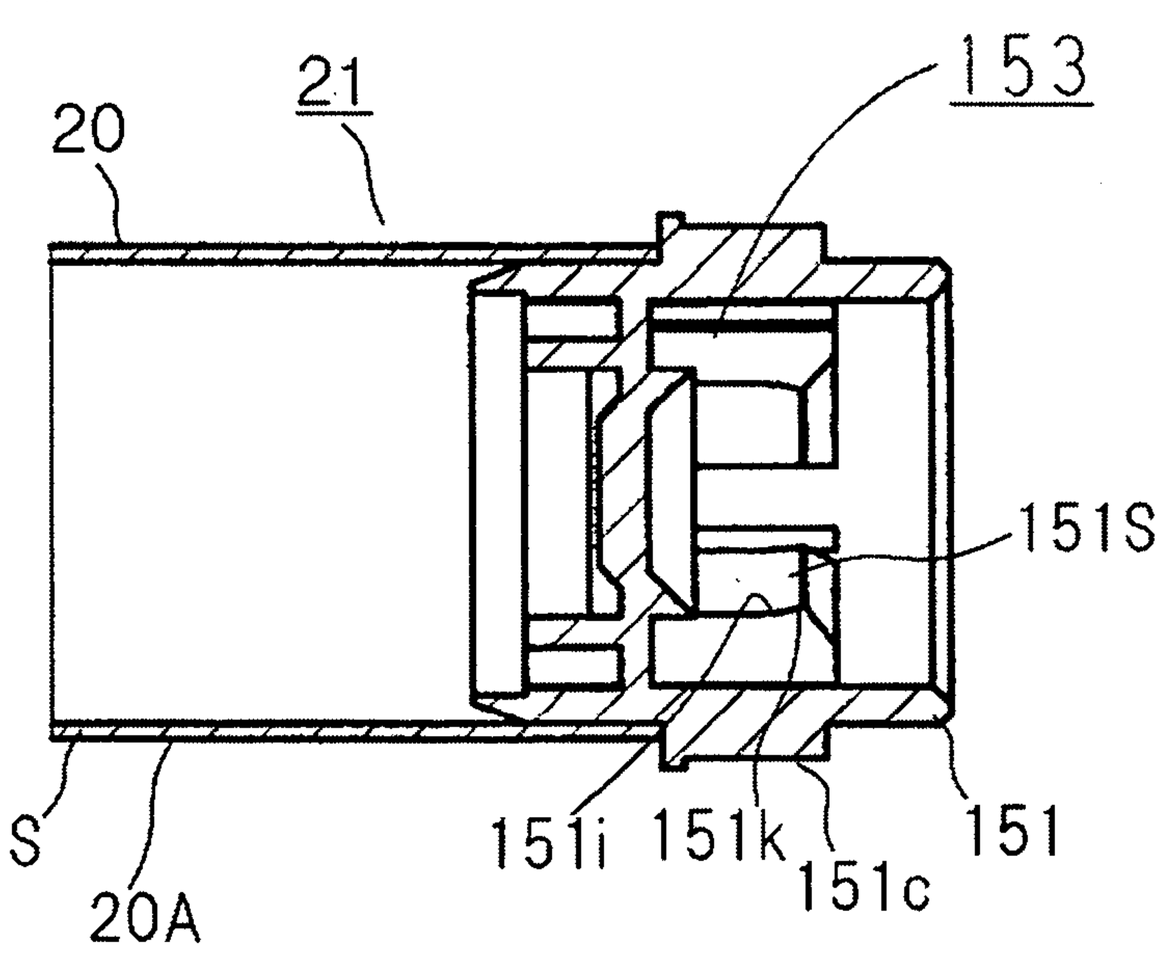

153
21
20
151S
S
20A
151i
151k
151c
151

Fig. 32

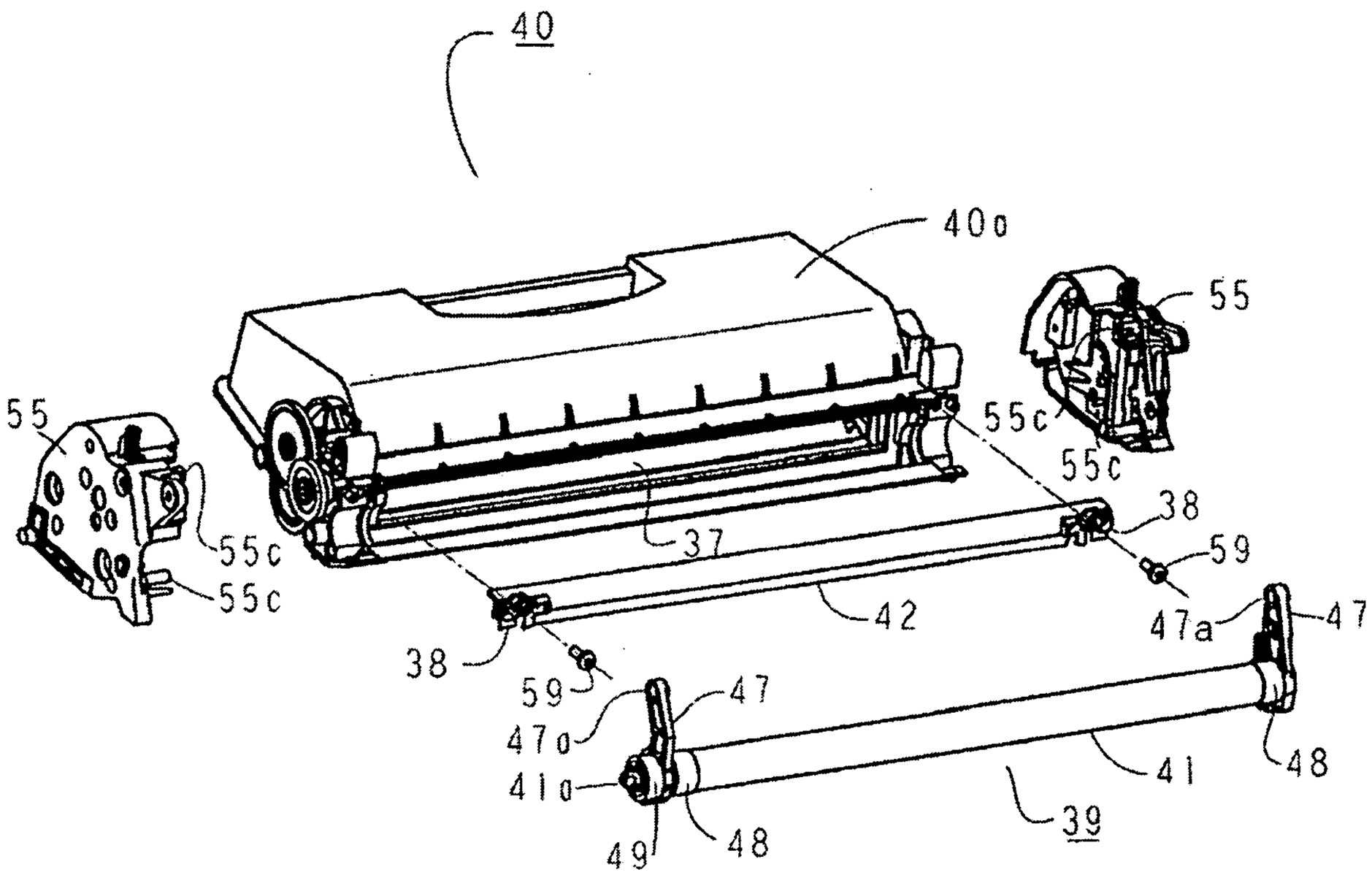

40
40a
55
55
55c
55c
55c
55c
37
38
38
59
59
42
47a
47
47
47a
41a
41
48
48
49
39

Fig. 33

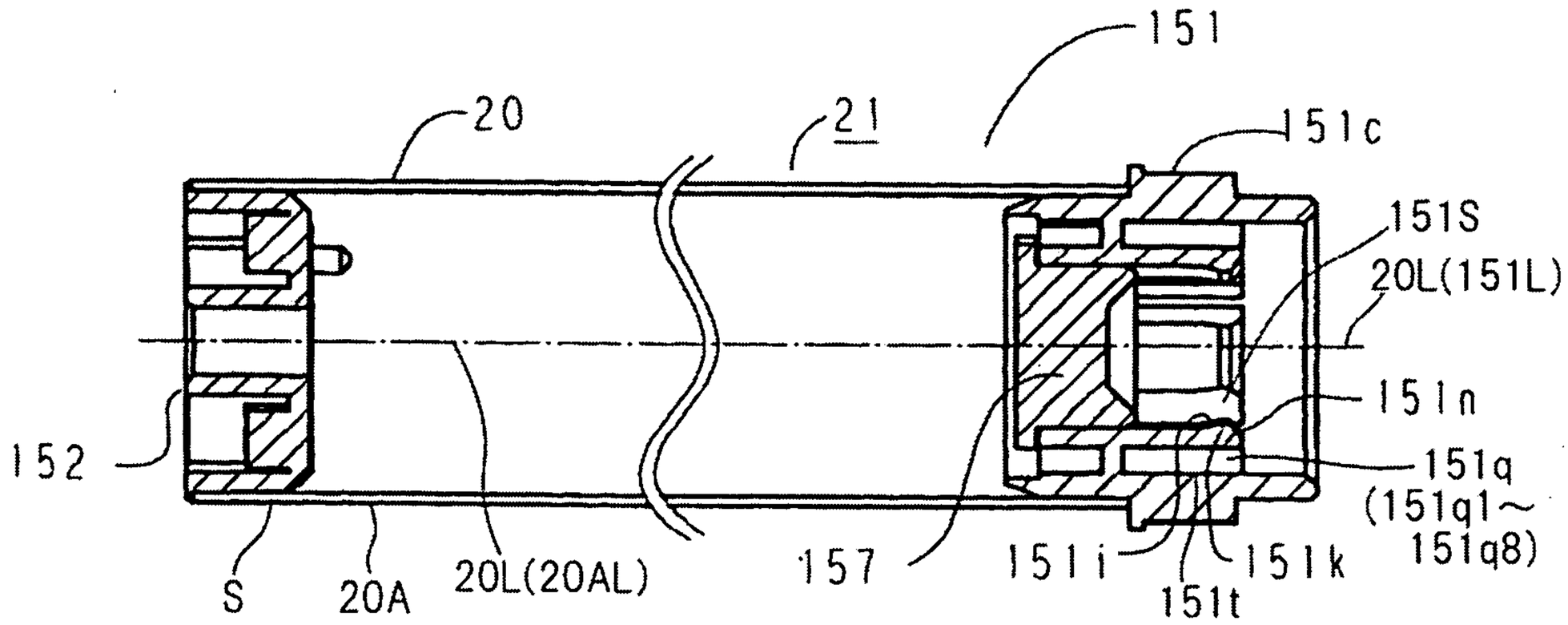
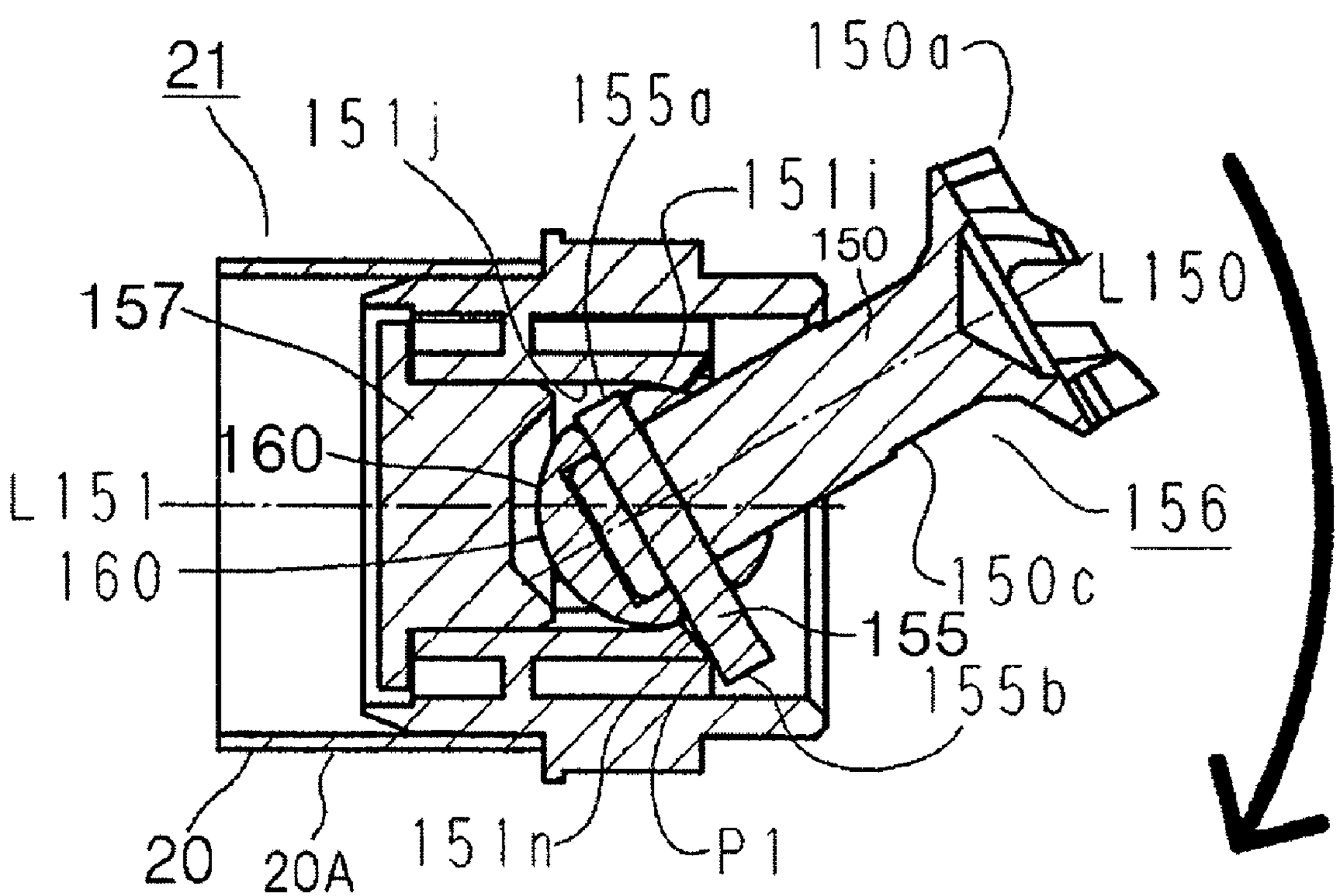

151
20
21
151c
151S
20L(151L)
151n
151q
(151q1～
151q8)
152
157
151i
151k
151t
S
20A
20L(20AL)

Fig. 34


21
151j
155a
150a
151i
150
L150
157
160
L151
160
156
150c
155
155b
20
20A
151n
P1