

Claims

- [Claim 1] (Amended) A drum cylinder unit used in an electrophotographic image forming apparatus which includes a photoconductive drum and a flange member, wherein
- the flange member comprises a fixing portion fixed to an end of the photoconductive drum, a cylindrical portion which forms a hollow portion therein, a groove portion provided at an edge of the cylindrical portion, and a gear portion,
 - the groove portion and the hollow portion open to an outside in an axial direction of the photoconductive drum,
 - the groove portion includes a first part having a first width $Z1$, and a second part having a second width $Z2$, where $Z1 > Z2$, the second part being disposed on an outer side than the first part in the axial direction of the photoconductive drum, and
 - the flange member is capable to elastically deform to expand the second width $Z2$ to a third width $Z3$, where $Z3 > Z2$.
- [Claim 2] (Amended) The drum cylinder unit according to claim 1, wherein
- the groove portion has a narrowed portion, and
 - the narrowed portion is provided with the second portion.
- [Claim 3] The drum cylinder unit according to claim 2, wherein
- the drum cylinder unit includes a lid member attached to the flange member from the inside in the axial direction, and
 - the narrowed portion is formed by a projection provided in the lid member.
- [Claim 4] The drum cylinder unit according to any one of claims 1 to 3, wherein
- the groove portion includes a first portion extending in the axial direction and a second portion extending in a circumferential direction of the cylindrical portion.
- [Claim 5] The drum cylinder unit according to any one of claims 1 to 4, wherein
- the groove portion includes an opening which opens to the outside in the axial direction, and a thermally deformable protruding portion formed on the opening side.
- [Claim 6] The drum cylinder unit according to any one of claims 1 to 5, wherein
- the flange member further includes a second cylindrical portion provided outside of the cylindrical portion in a radial direction of the photoconductive drum, and a second groove portion provided between the cylindrical portion and the second cylindrical portion, and
 - the cylindrical portion, the second cylindrical portion, and the second groove portion overlap in the axial direction of the photoconductive drum.

- [Claim 7] The drum cylinder unit according to claim 6, wherein the second cylindrical portion includes a gear portion.
- [Claim 8] The drum cylinder unit according to any one of claims 1 to 7, wherein at least two groove portions are provided.
- [Claim 9] The drum cylinder unit according to claim 8, wherein the two groove portions are disposed symmetrically about an axis of the photoconductive drum.
- [Claim 10] A drum cylinder unit used in an electrophotographic image forming apparatus which includes a photoconductive drum and a flange member, wherein
the flange member comprises a fixing portion fixed to an end of the photoconductive drum, a cylindrical portion which includes a hollow portion therein, and a through hole portion which penetrates an edge of the cylindrical portion and communicates with the hollow portion, and the hollow portion opens to an outside in an axial direction of the photoconductive drum, and includes a bottom portion.
- [Claim 11] The drum cylinder unit according to claim 10, wherein at least two through holes are provided.
- [Claim 12] The drum cylinder unit according to claim 11, wherein the two through holes are disposed symmetrically about an axis of the photoconductive drum.
- [Claim 13] The drum cylinder unit according to any one of claims 1 to 12, wherein the cylindrical portion further includes an overhung portion projecting toward the hollow portion.
- [Claim 14] (Amended) A method for attaching a coupling member including a through hole portion to a drum cylinder unit including a photoconductive drum and a flange member, in which the flange member includes a fixing portion fixed to an end of the photoconductive drum, a cylindrical portion which forms a hollow portion therein, and a groove portion provided at an edge of the cylindrical portion, the groove portion and the hollow portion opening to an outside of an axial direction of the photoconductive drum, the method comprising:
- (1) inserting, in the through hole portion, a pin which transmits rotational force of the coupling member to the drum cylinder unit,
 - (2) inserting, in the groove portion, an end of the pin inserted in the through hole portion, and inserting the coupling member in the hollow portion, and
 - (3) connecting the coupling member with the flange member so that an inclination angle of the coupling member is variable,
- wherein
the groove portion has a narrowed portion,
the pin is made to pass through the narrowed portion, and

before the pin passes through the narrowed portion, a width Z2 of the narrowed portion is smaller than a width Z3 of the pin.

[Claim 15] (Deleted)

[Claim 16] A method for attaching the coupling member according to claim 14, wherein,

after the pin is inserted in the groove portion, a thermally deformable portion provided at an opening side of the groove portion is thermally deformed to prevent removal of the pin from the groove portion.

[Claim 17] (Amended) A method for attaching the coupling member according to claim 14, wherein

after the pin is inserted in the groove portion, a regulating member which prevents removal of the pin from the groove portion is inserted in the opening of the groove portion.

[Claim 18] (Amended) A method for attaching a coupling member including a through hole portion to a drum cylinder unit including a photoconductive drum and a flange member, in which the flange member includes a fixing portion fixed to an end of the photoconductive drum, and a bottom portion facing the axial direction outside of the photoconductive drum, the method comprising:

(1) inserting, in the through hole portion, a pin which transmits rotational force of the coupling member to the drum cylinder unit;

(2) disposing an end of the pin inserted in the through hole portion between the groove portion and the bottom portion by fixing a fixing member including a groove portion to the flange member from an outside in the axial direction of the photoconductive drum so that the coupling member connects to the flange member allowing an inclination angle of the coupling member to be variable.

[Claim 19] A method for attaching a coupling member including a first through hole portion to a drum cylinder unit including a photoconductive drum and a flange member, in which the flange member includes a fixing portion fixed to an end of the photoconductive drum, and a cylindrical portion which includes a hollow portion therein, and a second through hole portion which penetrates an edge of the cylindrical portion and communicates with the hollow portion, the hollow portion opens to an outside of an axial direction of the photoconductive drum, the method comprising:

(1) inserting the coupling member in the hollow portion;

(2) inserting, in the first through hole portion and the second through hole portion, a pin which transmits rotational force of the coupling member to the drum cylinder unit; and

(3) connecting the coupling member to the flange member so that an inclination angle of the coupling member is variable.

- [Claim 20] (Amended) A drum unit used in an electrophotographic image forming apparatus, comprising:
- a photoconductive drum;
 - a flange member;
 - a coupling member including a through hole portion; and
 - a pin configured to transmit rotational force of the coupling member to the flange member, wherein
 - the flange member includes a fixing portion fixed to an end of the photoconductive drum, a cylindrical portion which forms a hollow portion therein, and a groove portion provided at an edge of the cylindrical portion,
 - the pin is inserted in the through hole portion,
 - the hollow portion opens to an outside of an axial direction of the photoconductive drum, and the coupling member is inserted in the hollow portion,
 - the groove portion opens to the outside of the axial direction, and an end of the pin is inserted in the groove portion,
 - the coupling member is connected to the flange member so that an inclination angle of the coupling member is variable,
 - the groove portion includes a first part having a first width $Z1$, and a second part having a second width $Z2$, where $Z1 > Z2$, the second part being disposed on an outer side than the first part in the axial direction of the photoconductive drum, and
 - the flange member is capable to elastically deform to expand the second width $Z2$ to a third width $Z3$, where $Z3 > Z2$.
- [Claim 21] (Amended) The drum unit according to claim 20, wherein
- the groove portion includes a narrowed portion, and movement of the pin is prevented by the narrowed portion, and
 - the narrowed portion is provided with the second portion.
- [Claim 22] The drum unit according to claim 21, wherein
- the drum unit includes a lid member attached to the flange member from the inside in the axial direction, and
 - the narrowed portion is formed by a projection provided in the lid member.
- [Claim 23] The drum unit according to any one of claims 20 to 22, further comprising a regulating member inserted in an opening of the groove portion, the regulating member preventing removal of the pin from the groove portion.
- [Claim 24] A drum unit used in an electrophotographic image forming apparatus, comprising:
- a photoconductive drum;
 - a flange member;

a coupling member including a through hole portion; and
 a pin configured to transmit rotational force of the coupling member to the flange member, wherein

the flange member includes a fixing portion fixed to an end of the photoconductive drum, a cylindrical portion which forms a hollow portion therein, and a groove portion provided at an edge of the cylindrical portion,

the hollow portion opens to an outside of an axial direction of the photoconductive drum, and the coupling member is inserted in the hollow portion,

the pin is inserted in the through hole portion,

an end of the pin is inserted in the groove portion,

the groove portion includes a thermally deformable portion configured to thermally deform to prevent movement of the pin in the axial direction outside, and

the coupling member is connected to the flange member so that an inclination angle of the coupling member is variable.

[Claim 25] The drum unit according to any one of claims 21 to 24, wherein

the groove portion includes a first portion extending in the axial direction and a second portion extending in a circumferential direction of the cylindrical portion.

[Claim 26] The drum unit according to any one of claims 21 to 25, wherein

the flange member further includes a second cylindrical portion provided outside of the cylindrical portion in a radial direction of the photoconductive drum, and a second groove portion provided between the cylindrical portion and the second cylindrical portion, and

the cylindrical portion, the second cylindrical portion, and the second groove portion overlap in the axial direction of the photoconductive drum.

[Claim 27] The drum unit according to claim 26, wherein

the second cylindrical portion has a gear portion.

[Claim 28] The drum unit according to any one of claims 21 to 27, wherein

at least two groove portions are provided.

[Claim 29] The drum unit according to claim 28, wherein

the two groove portions are disposed symmetrically about an axis of the photoconductive drum.

[Claim 30] A drum unit used in an electrophotographic image forming apparatus, comprising:

a photoconductive drum;

a flange member;

a coupling member including a first through hole portion; and

a pin configured to transmit rotational force of the coupling member to

the flange member, wherein

the flange member includes a cylindrical portion which includes a hollow portion therein, and a second through hole portion which penetrates an edge of the cylindrical portion and communicates with the hollow portion, the pin is inserted in the first through hole portion and the second through hole portion, and

the coupling member is connected to the flange member so that an inclination angle of the coupling member is variable.

[Claim 31] The drum unit according to claim 30, wherein

at least two second through holes are provided.

[Claim 32] The drum unit according to claim 31, wherein

the two second through holes are disposed symmetrically about an axis of the photoconductive drum.

[Claim 33] The drum unit according to any one of claims 21 to 32, wherein

the cylindrical portion further includes an overhung portion projecting toward the hollow portion.

[Claim 34] (Amended) A drum unit used in an electrophotographic image forming apparatus, comprising:

a photoconductive drum;

a flange member;

a coupling member including a through hole portion;

a pin configured to transmit rotational force of the coupling member to the flange member; and

a fixing member including a groove portion and fixed to the flange member from an outside in the axial direction of the photoconductive drum, wherein

the flange member includes a fixing portion fixed to an end of the photoconductive drum, and a bottom portion facing the axial direction outside of the photoconductive drum,

the pin is inserted in the through hole portion,

an end of the pin is disposed between the groove portion and the bottom portion, and

the coupling member is connected to the flange member so that an inclination angle of the coupling member is variable.

[Claim 35] The drum unit according to claim 34, wherein

at least two groove portions are provided.

[Claim 36] The drum unit according to claim 35, wherein

the two groove portions are disposed symmetrically about an axis of the photoconductive drum.

7 June 2016

VIA FACSIMILE/CONFIRMATION VIA DHL

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Amendment of the claims under Article 19(1)

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Agent's File reference: 10154420WO01

Dear Sirs:

The Applicant who received the International Search Report and the Written Opinion of the International Authority relating to the above-identified International Application transmitted on 12 April 2016 hereby files Amendment under Article 19(1) as in the attached sheets.

We hereby would like to amend Claims 1, 2, 14, 17, 18, 20, 21 and 34, and delete Claim 15 in response to the Written Opinion of the International Authority.

* Support of the amendments

Claim 1 is amended as "...a gear portion, the groove portion ...the photoconductive drum, the groove portion includes ... where $Z3 > Z2$." based on paragraphs [0081]-[0082] and [0089] of the original specification and Fig. 9 of the subject application.

Claims 2 and 21 are amended as "...portion, and the narrowed portion is provided with the second portion." based on paragraphs [0081]-[0082] and [0089] of the original specification and Fig. 9 of the subject application.

Claim 14 is amended as "...is variable, wherein the groove portion has ... a width $Z3$ of the pin." based on paragraphs [0081]-[0082] and [0089] of the original specification and Fig. 9 of the subject application.

Claim 17 is amended as "...to claim 14, wherein after..." for grammatical correction.

Claim 18 is amended as "...the flange member from an outside in the axial direction of the photoconductive drum so that the coupling member connects to the flange member allowing an inclination angle of the coupling member to be variable." based on paragraph [0128] of the original specification and Fig. 19 of the subject application.

Claim 20 is amended as "...the groove portion, the coupling member ...is variable, the groove portion includes ... where $Z3 > Z2$." based on paragraphs [0081]-[0082] and [0089] of the original specification and Fig. 9 of the subject application.

Claim 34 is amended as "...the flange member from an outside in the axial direction of the photoconductive drum, wherein..." based on paragraph [0128] of the original specification and Fig. 19 of the subject application.

Very truly yours,



Takuma ABE
Patent Attorney

TA/yh

Attachment:

Amendment under Article 19(1) 6 sheets (Substitutive pages 27-32)

FIG. 1

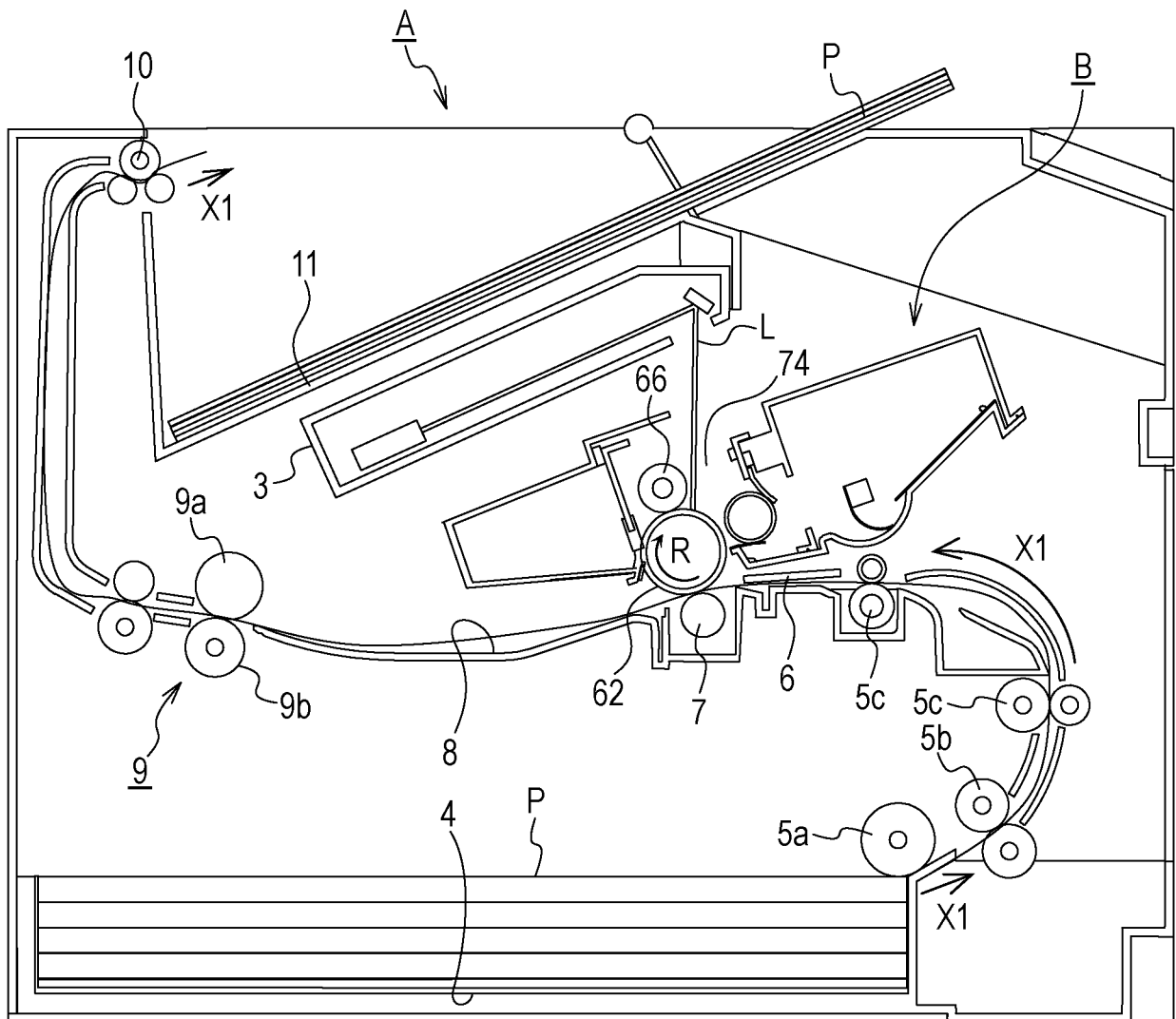


FIG. 2

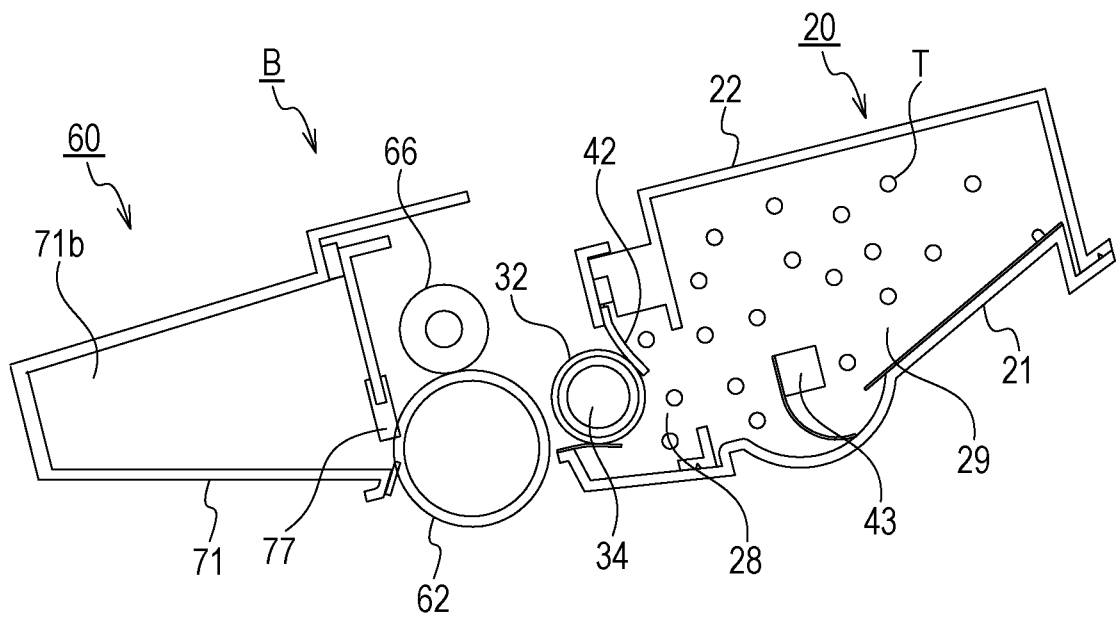


FIG. 3

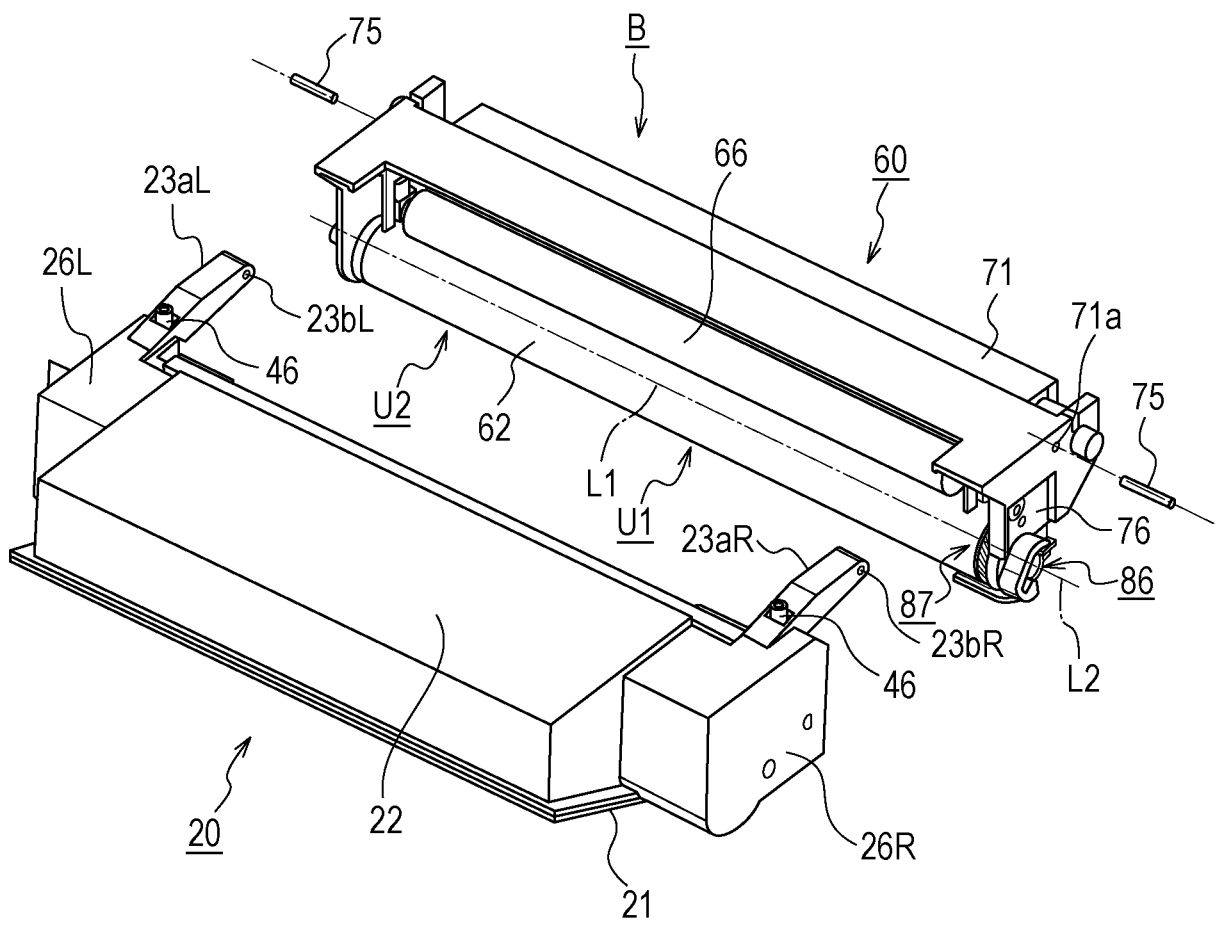


FIG. 4A

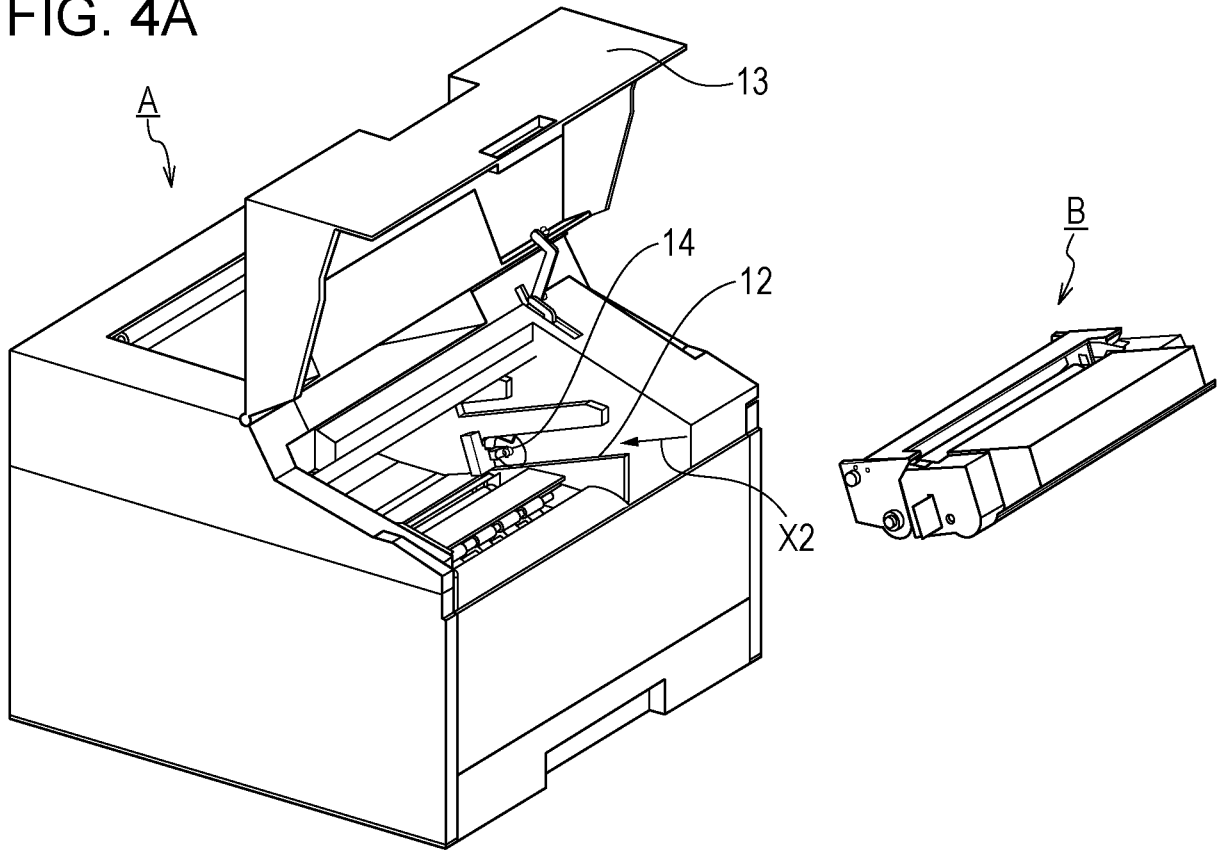


FIG. 4B

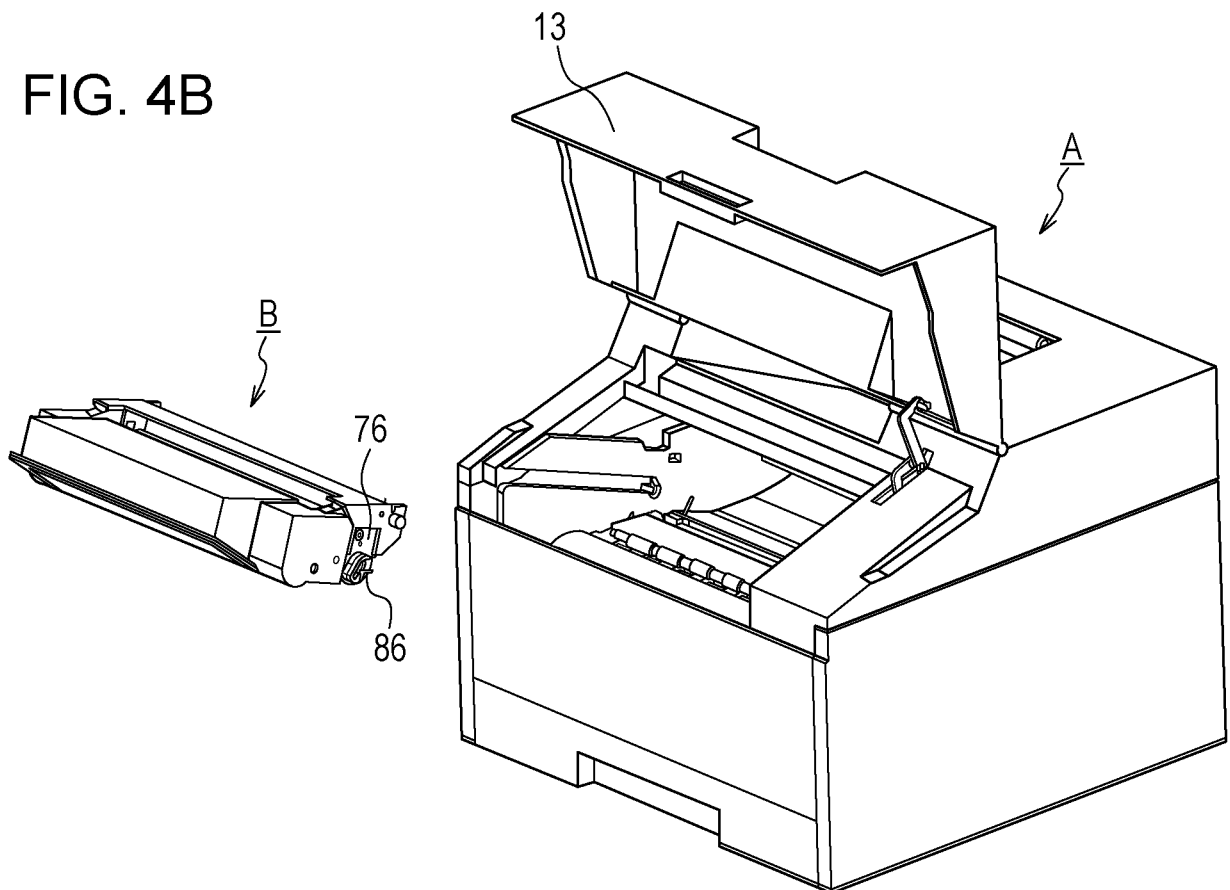


FIG. 5A1

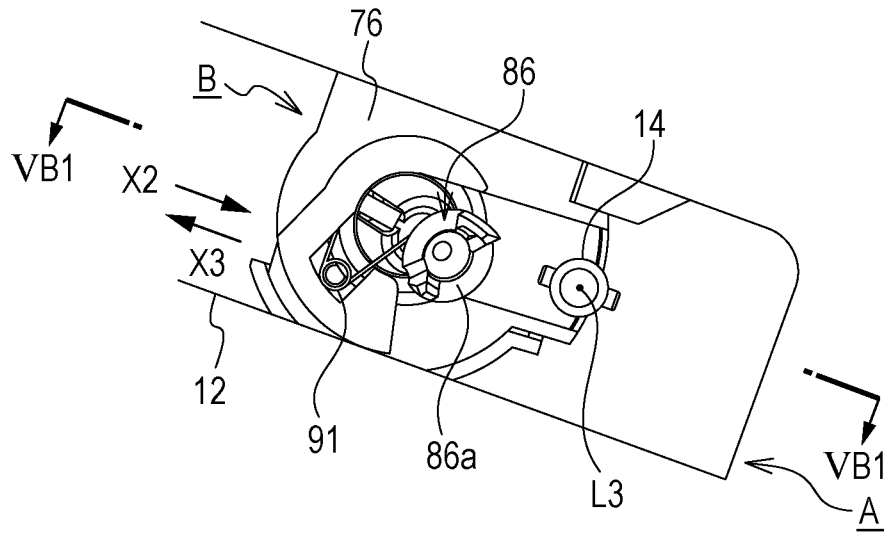


FIG. 5B1

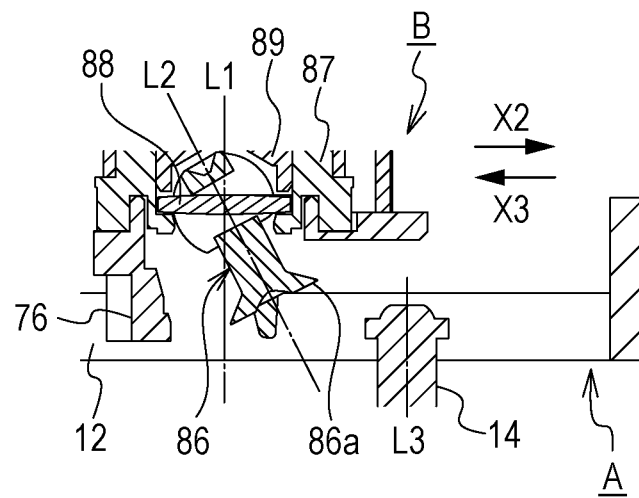


FIG. 5A2

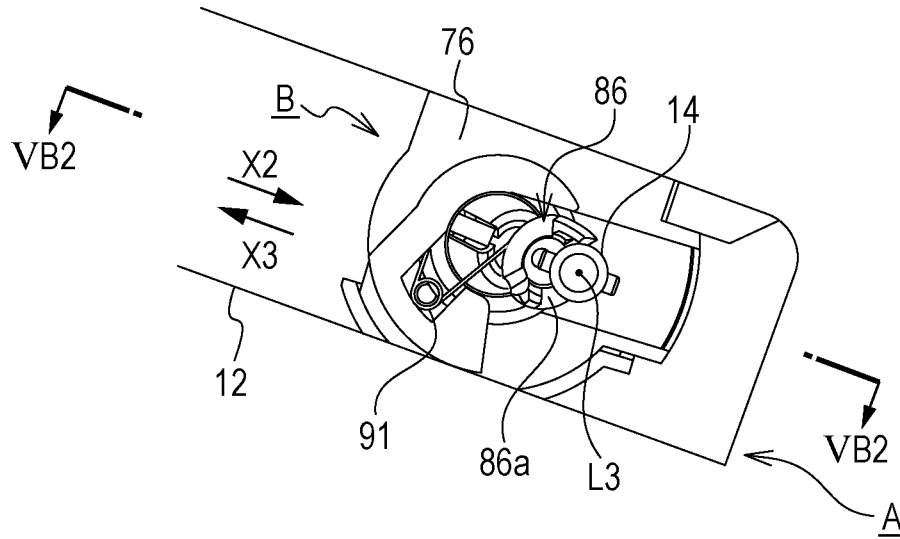


FIG. 5B2

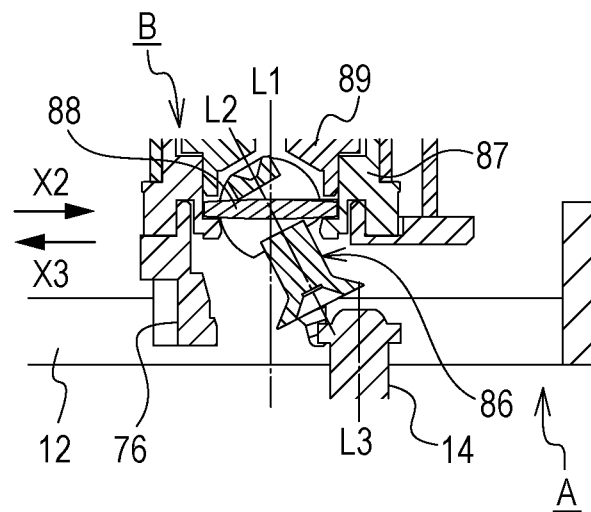


FIG. 5A3

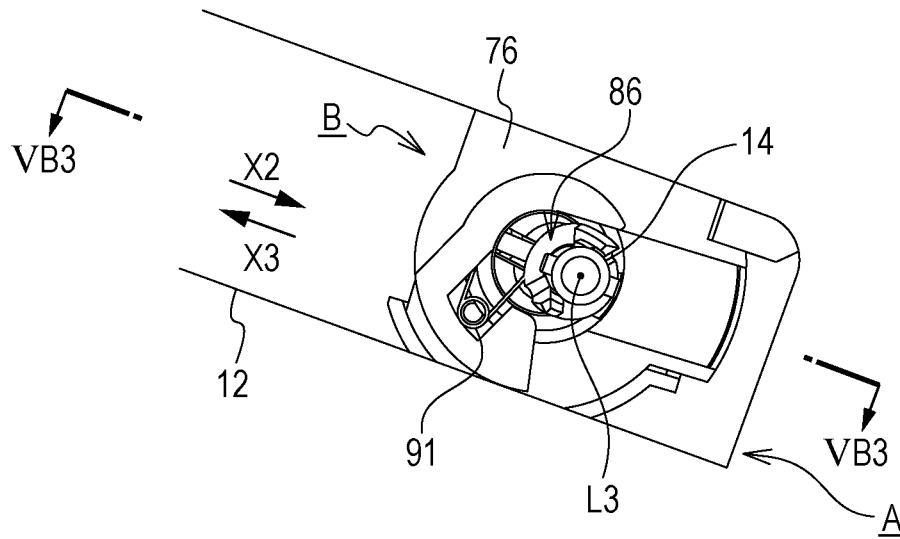


FIG. 5B3

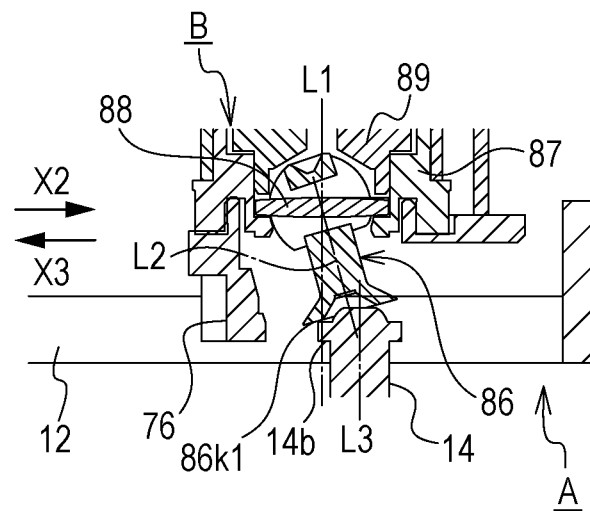


FIG. 5A4

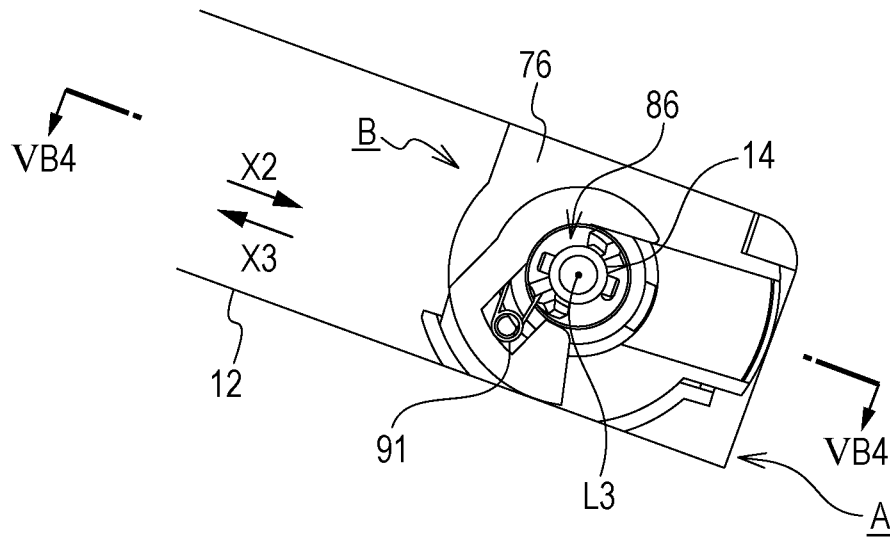


FIG. 5B4

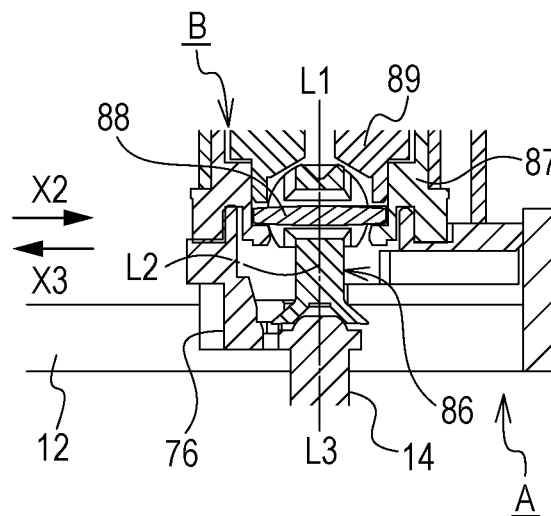


FIG. 6A

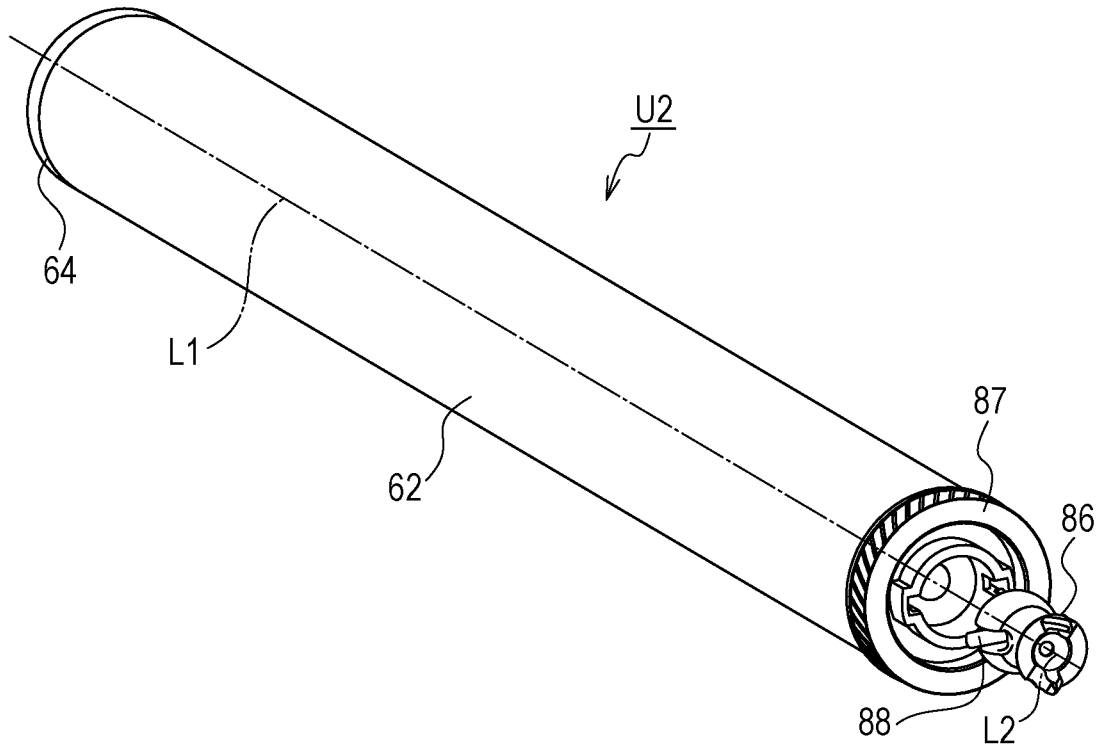
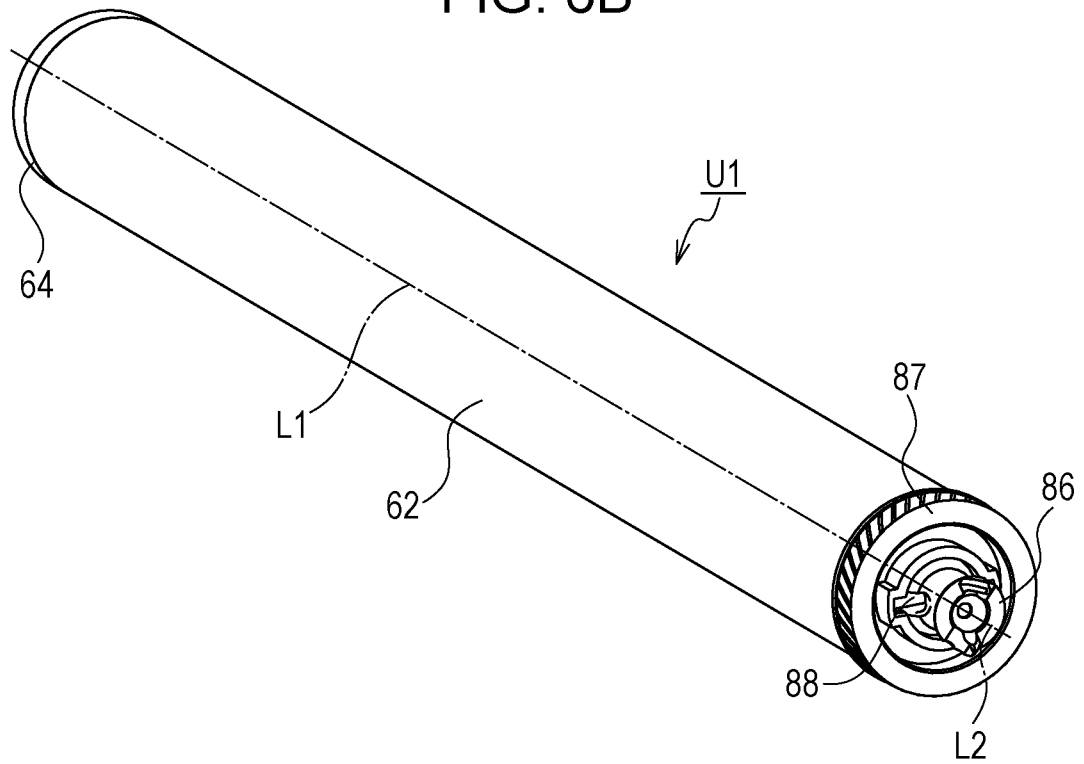


FIG. 6B



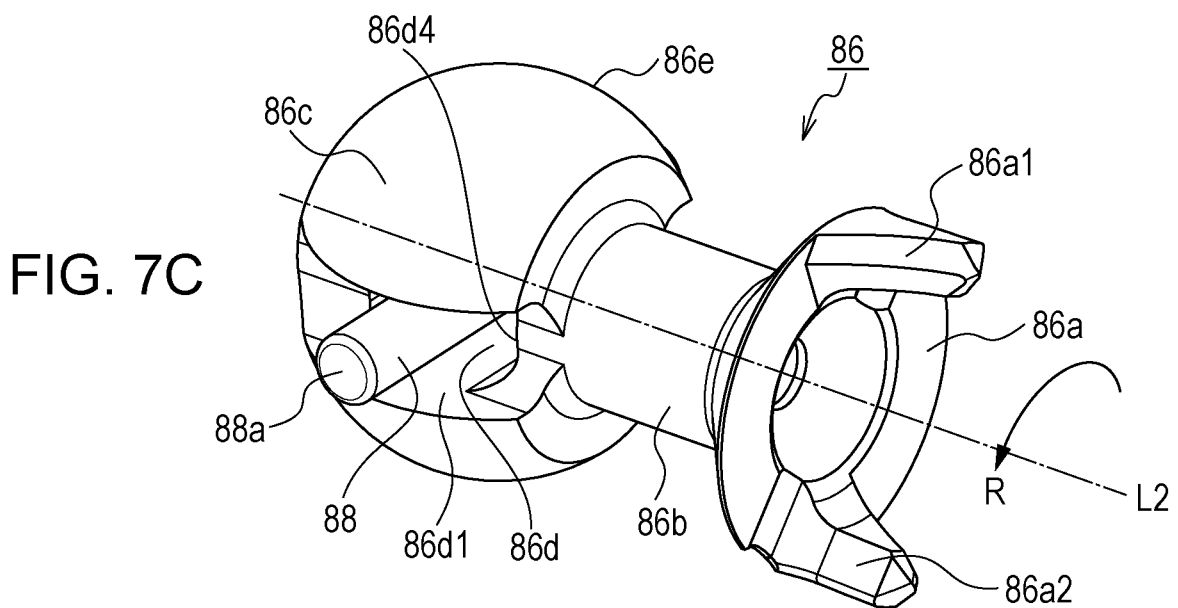
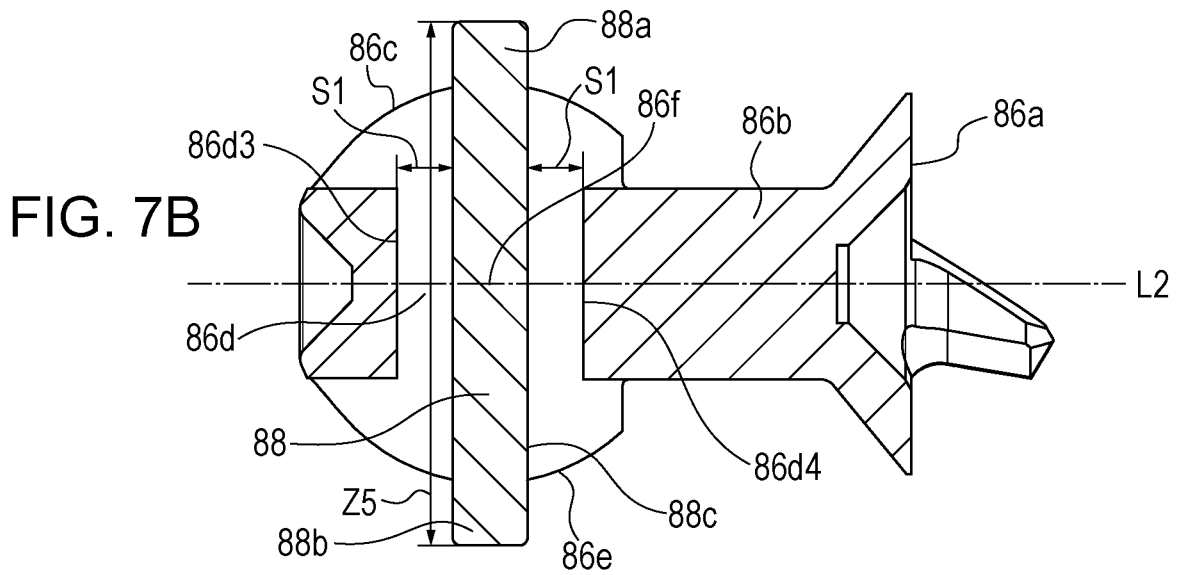
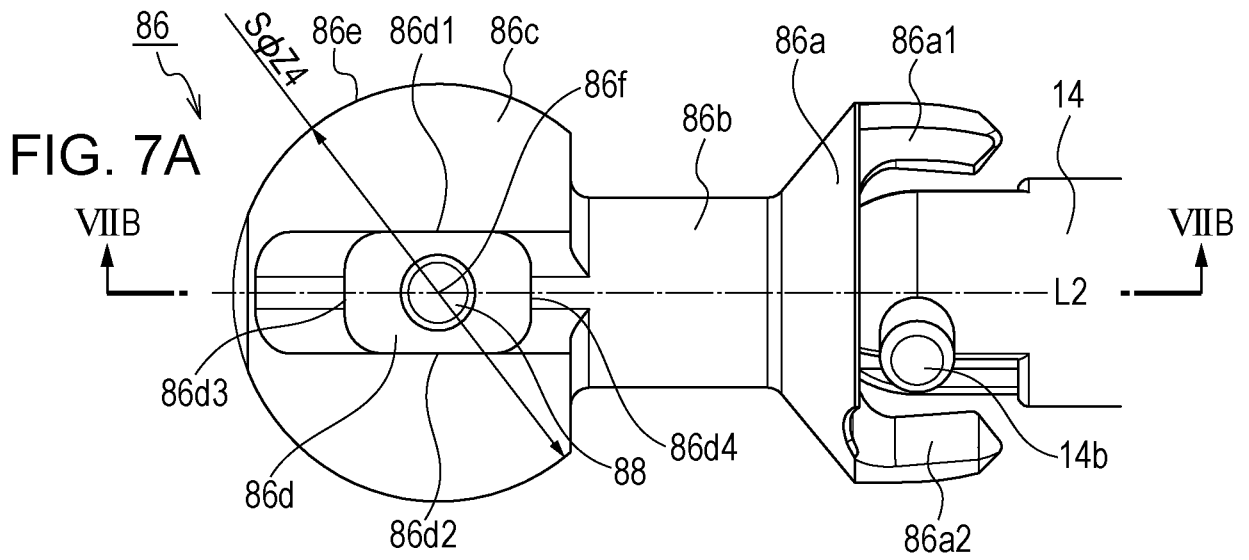


FIG. 8A

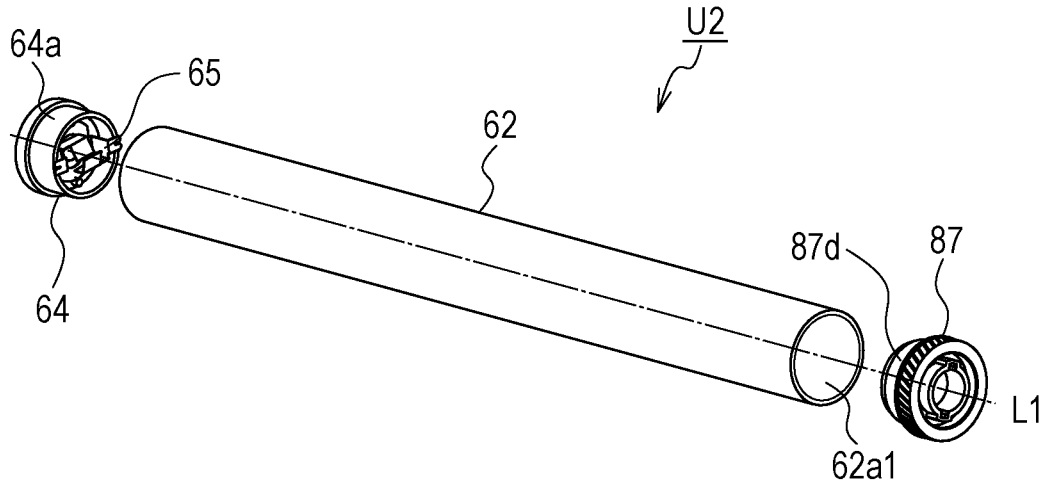


FIG. 8B

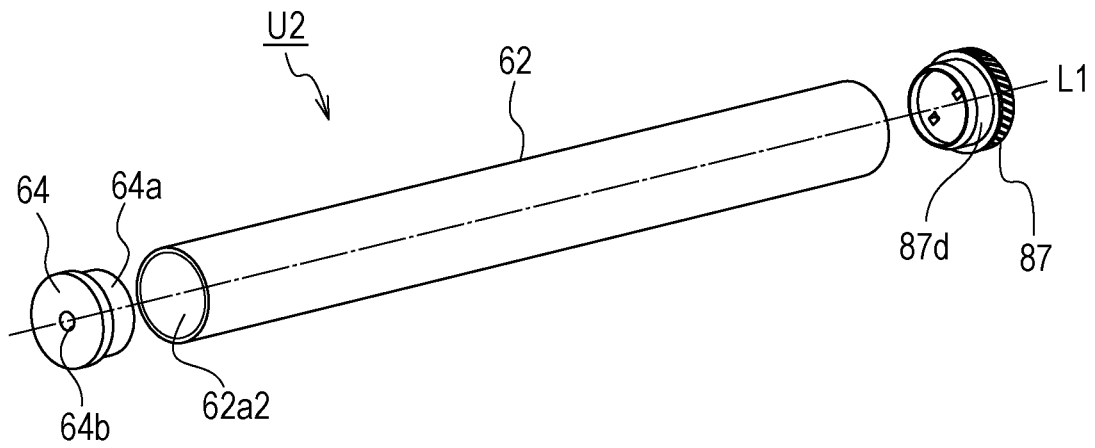


FIG. 8C

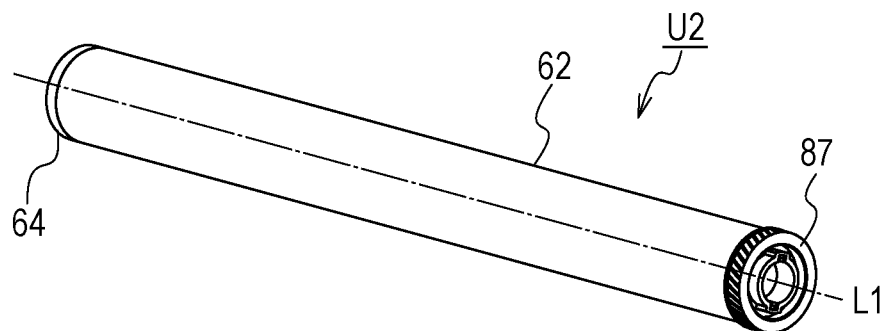


FIG. 9A

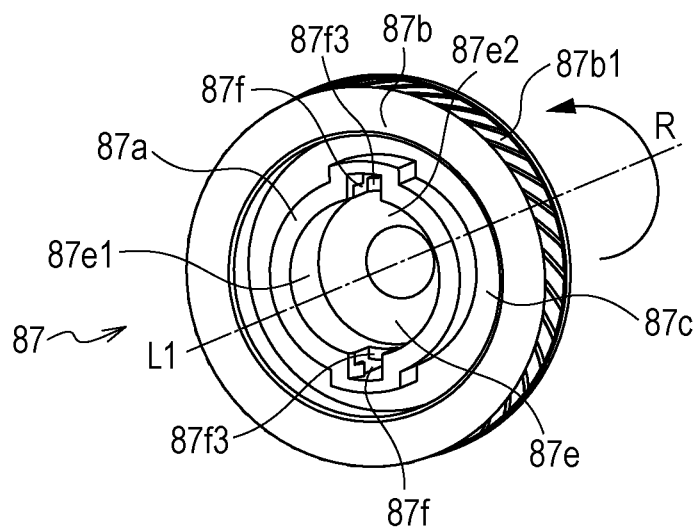
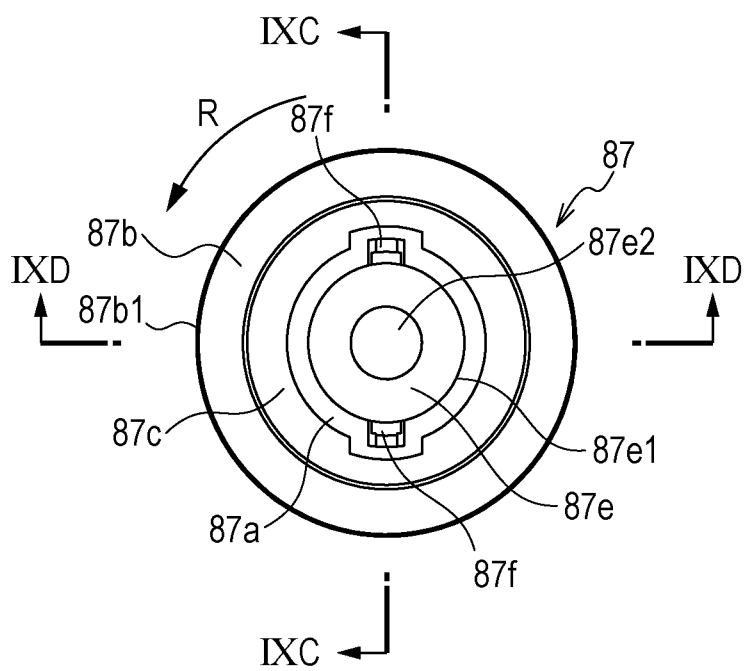


FIG. 9B





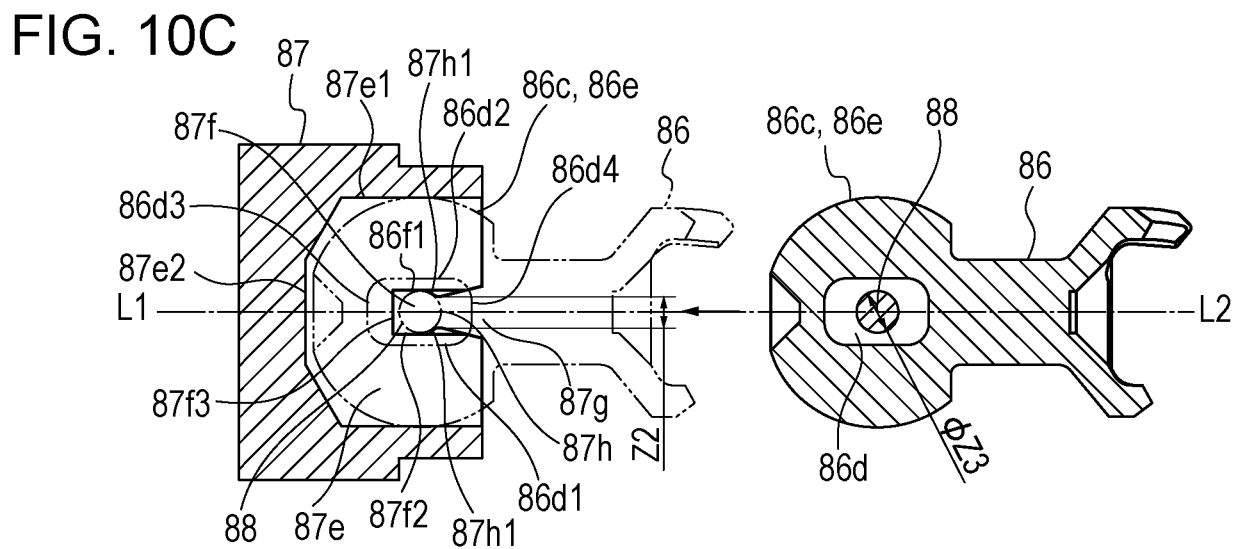
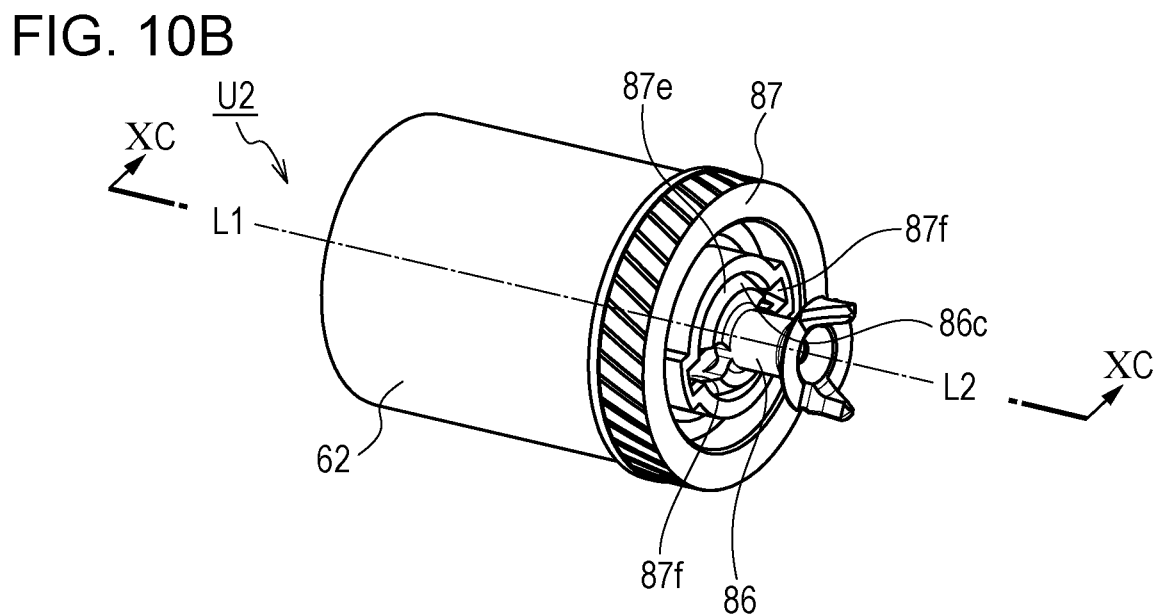
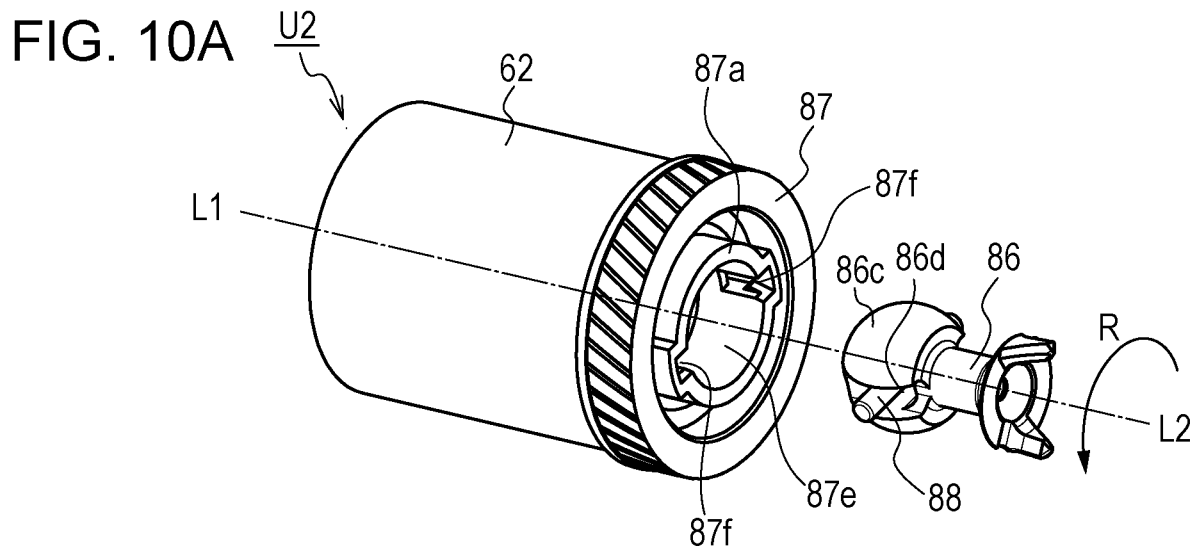


FIG. 11A

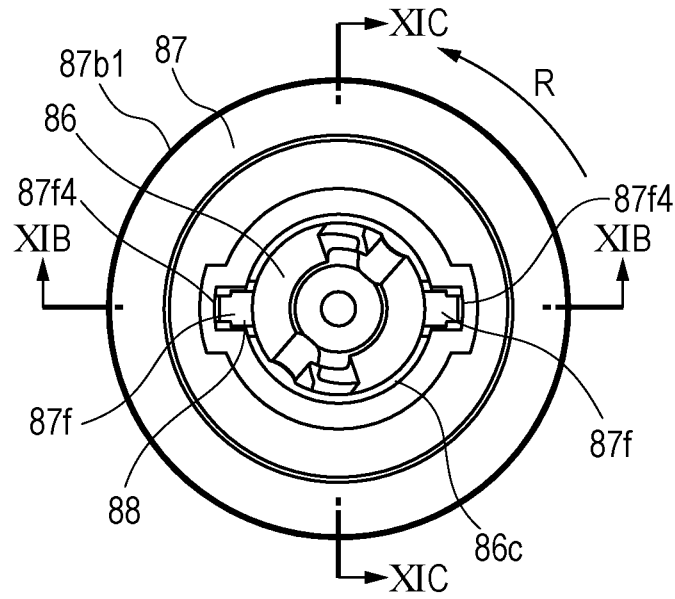


FIG. 11B

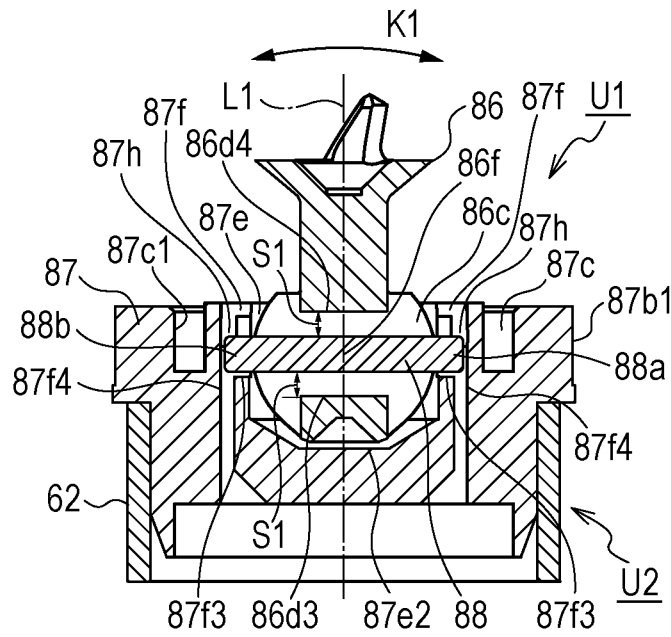


FIG. 11C

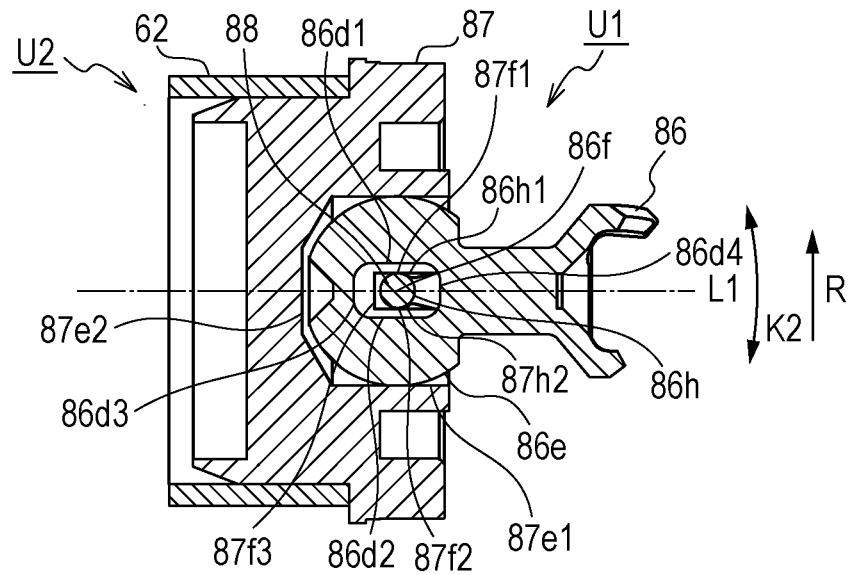
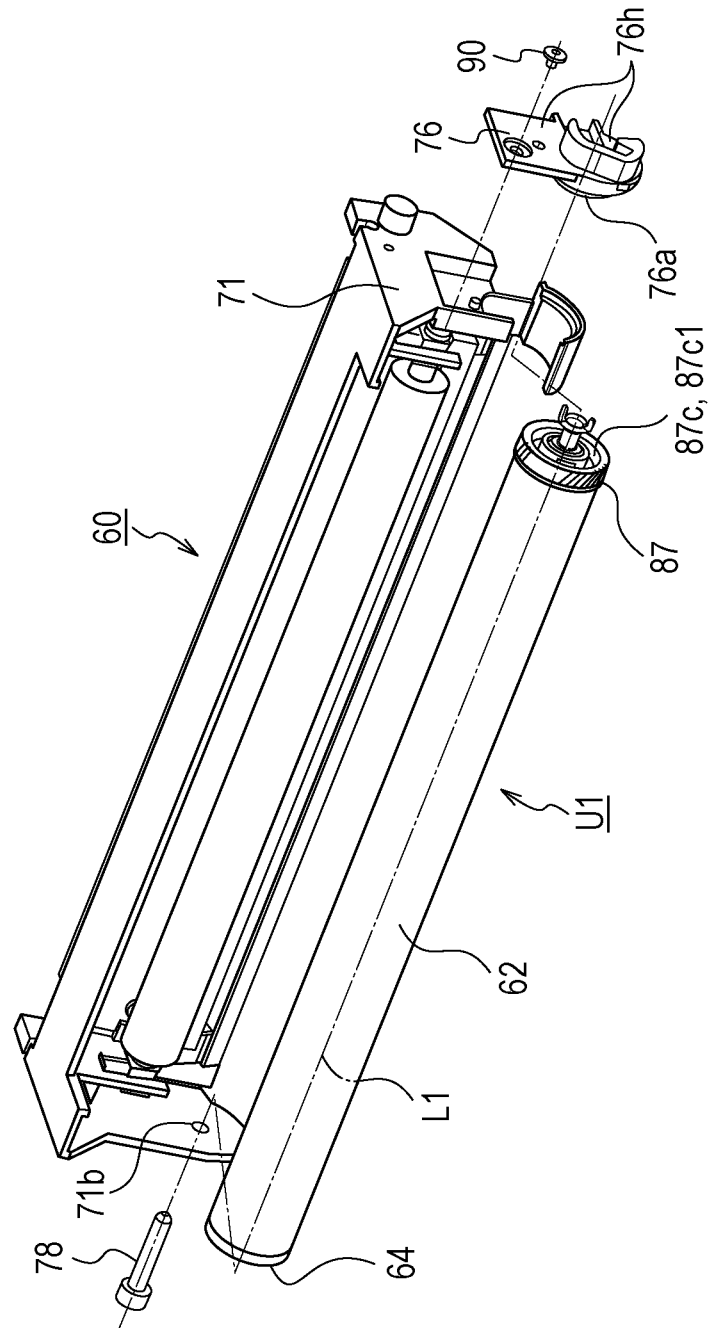


FIG. 12



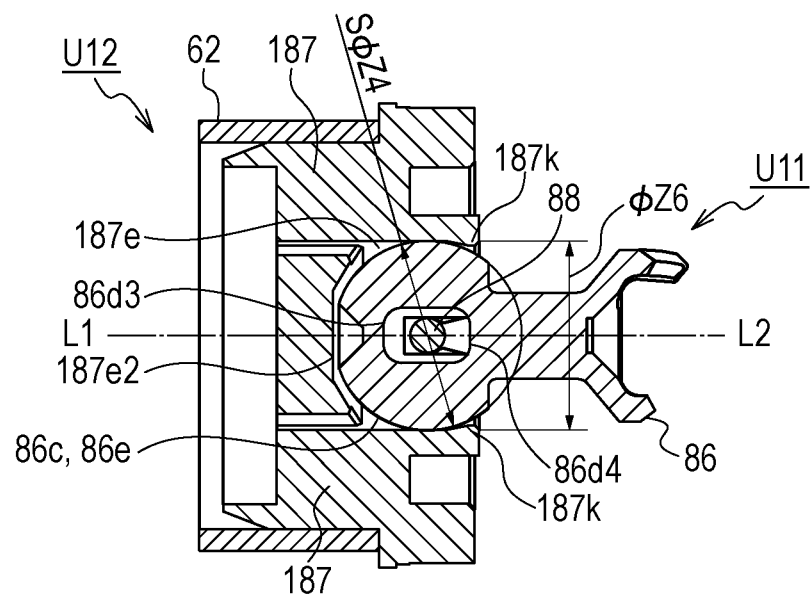
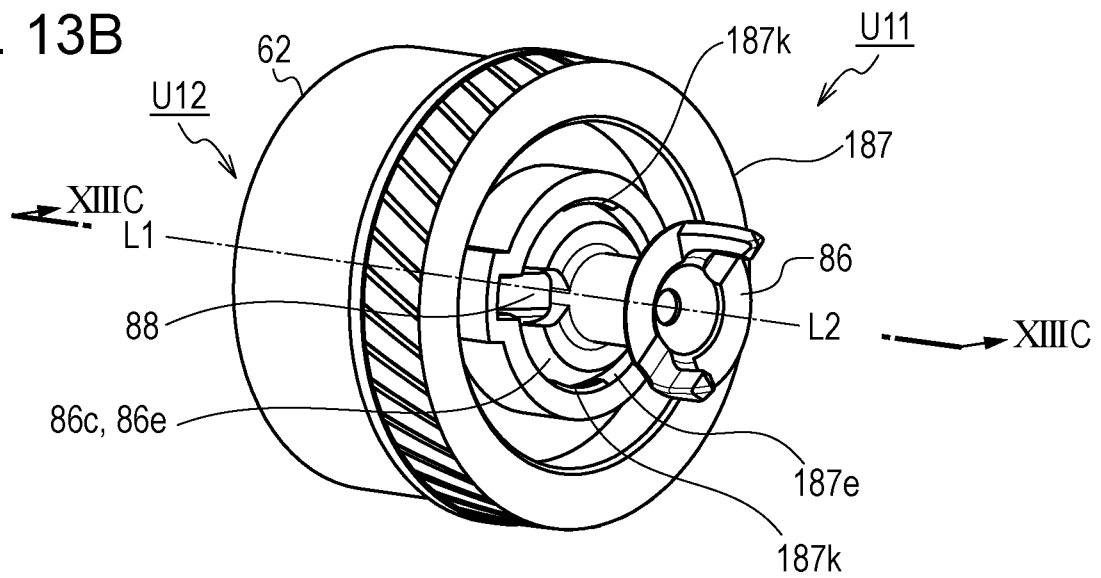
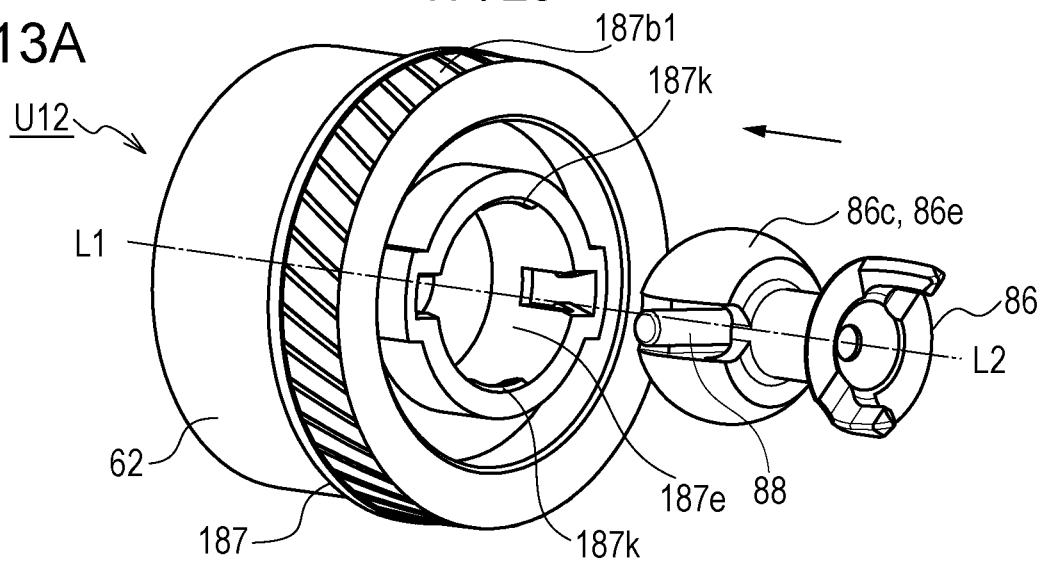


FIG. 14A

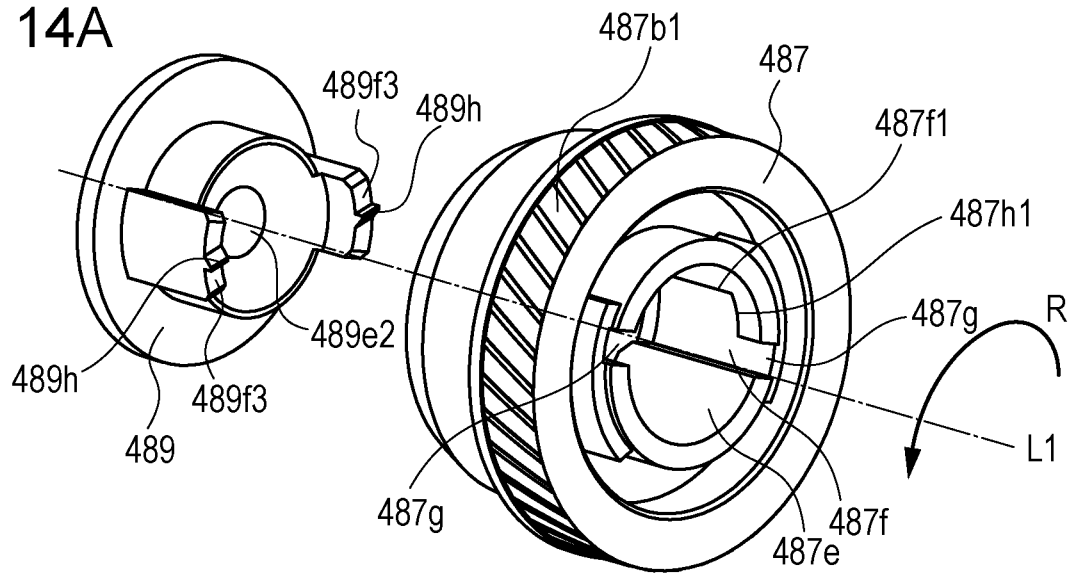


FIG. 14B

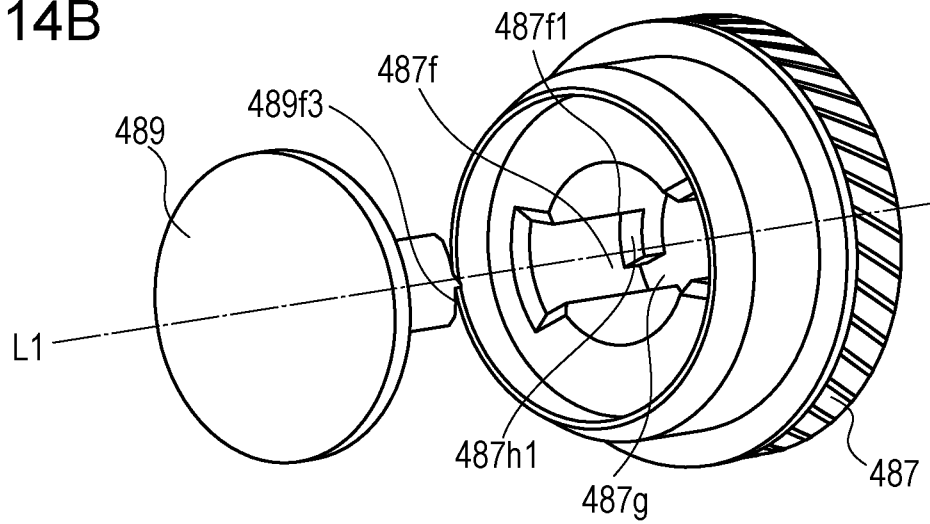


FIG. 14C

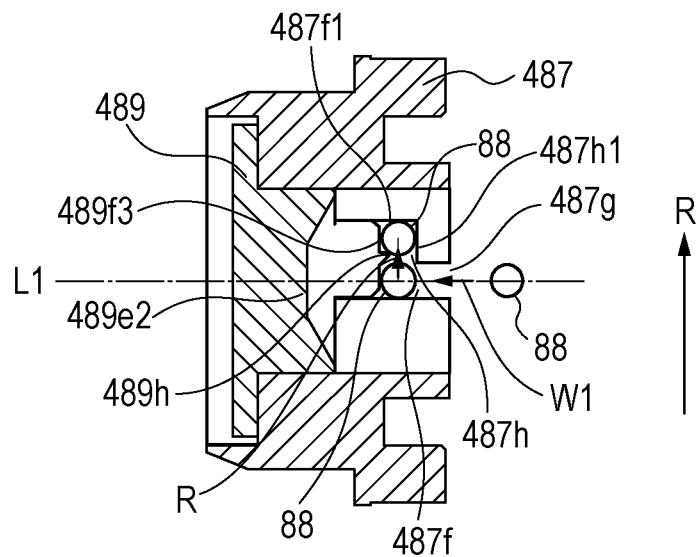


FIG. 15A

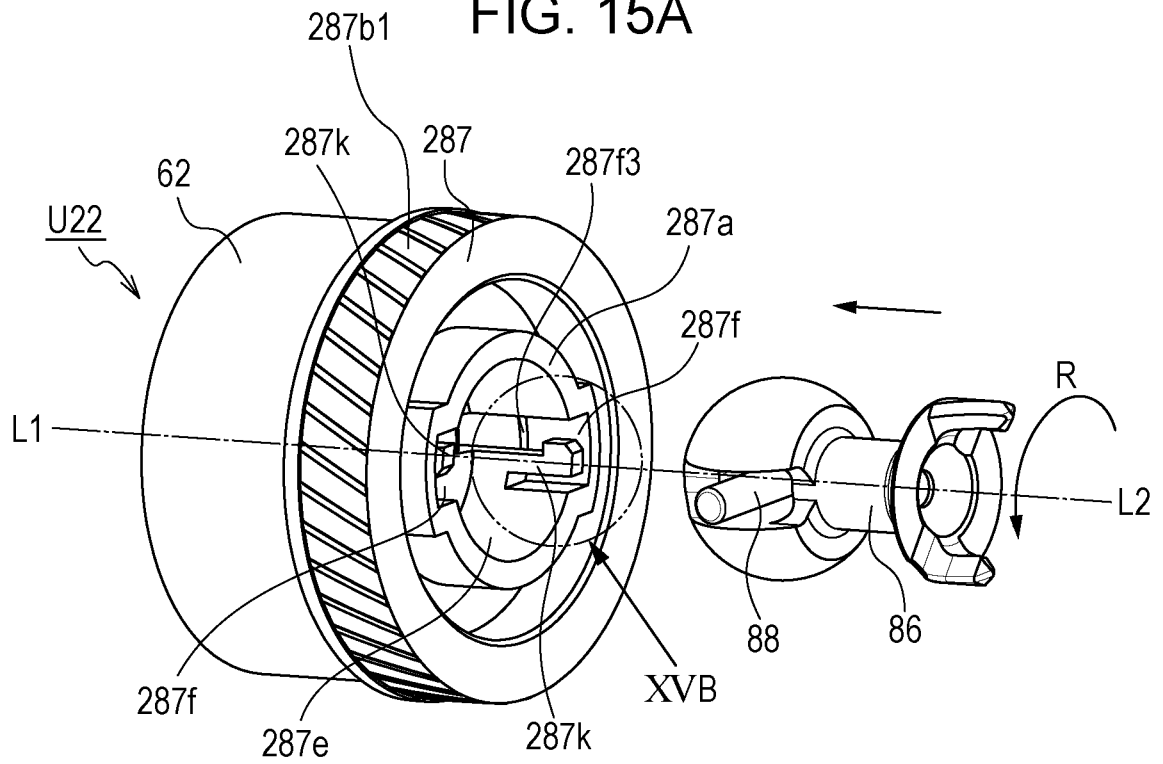


FIG. 15B

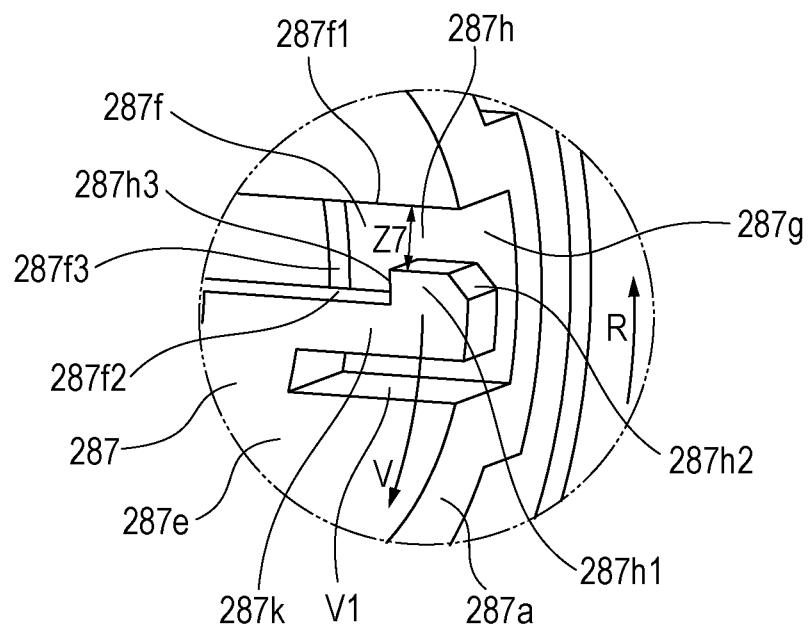


FIG. 16A

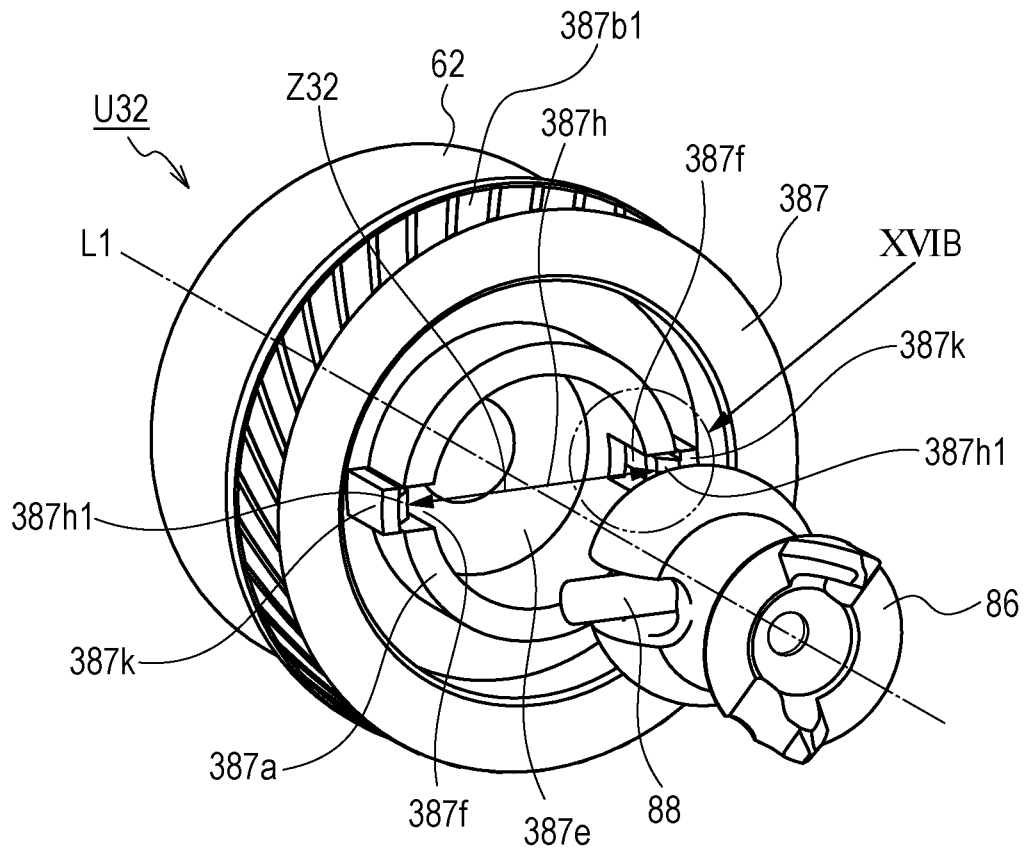


FIG. 16B

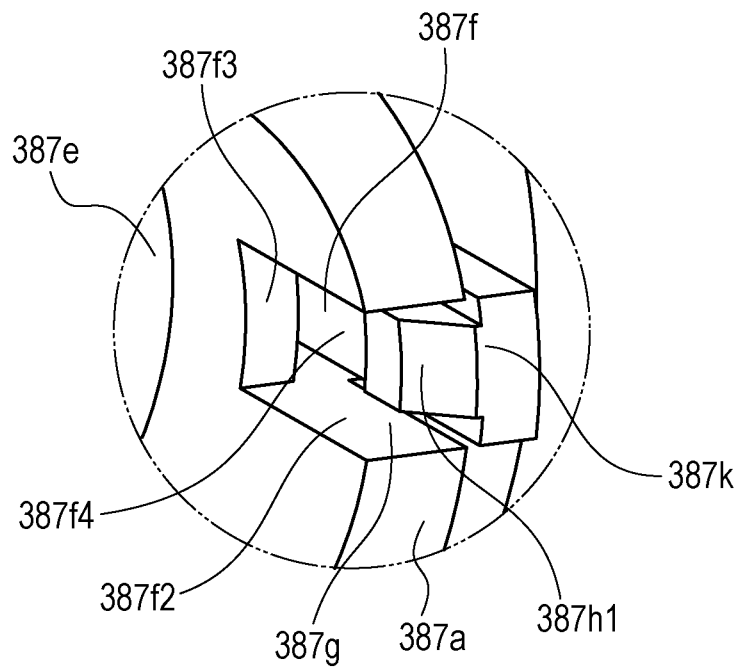


FIG. 17A

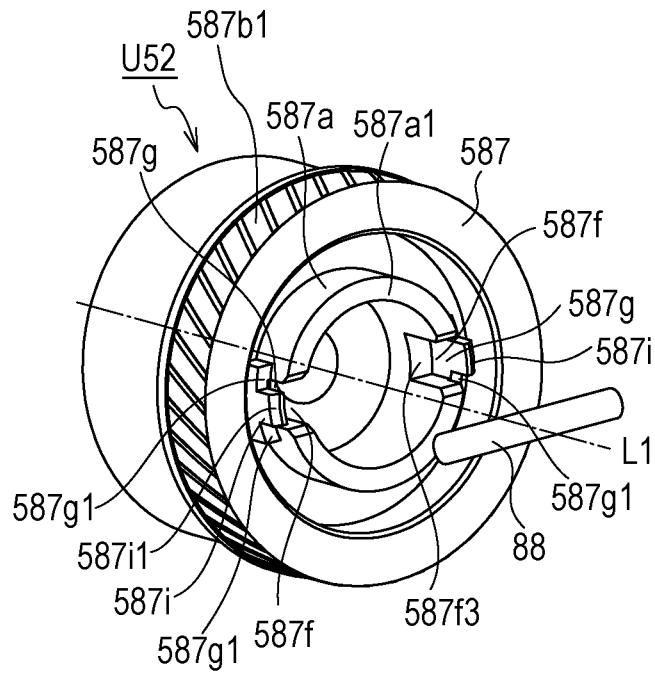


FIG. 17B

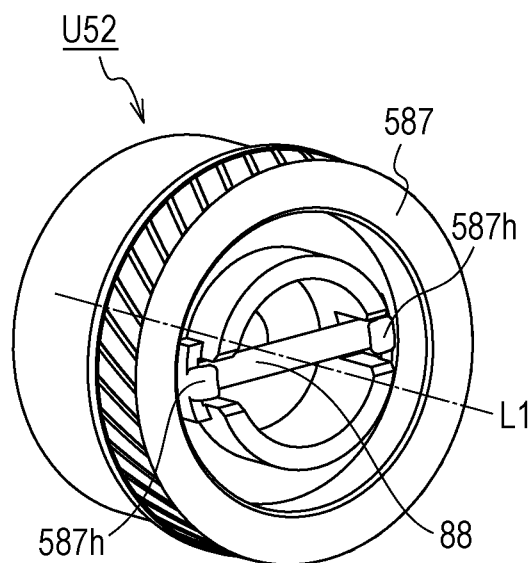


FIG. 17C

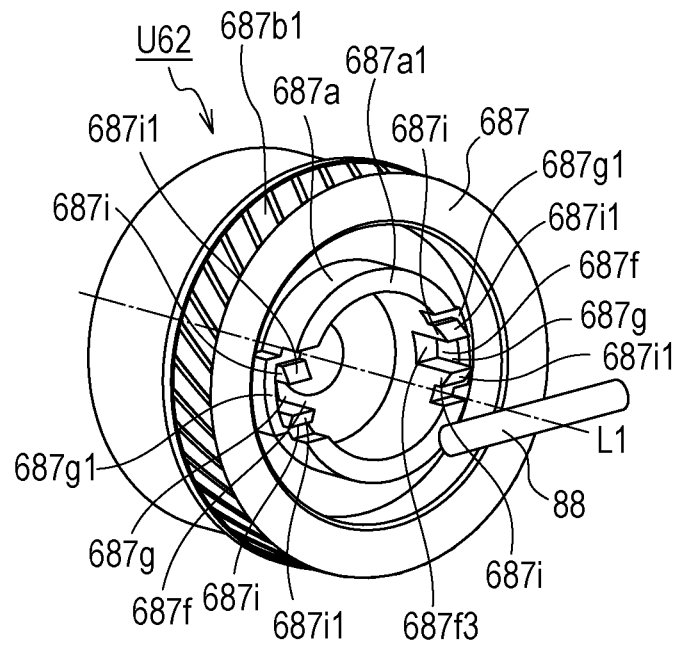


FIG. 17D

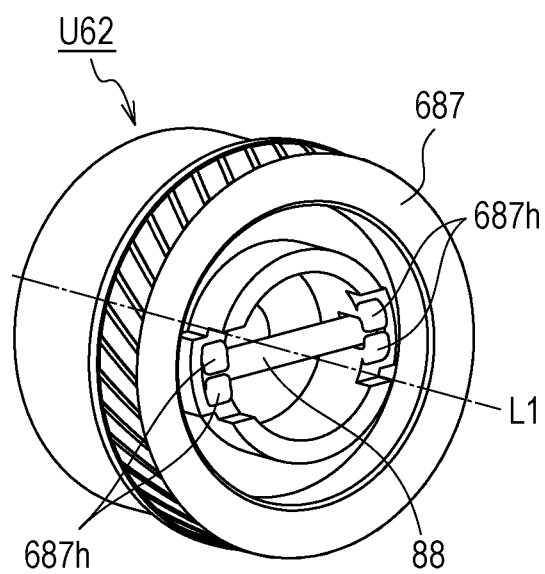


FIG. 18A

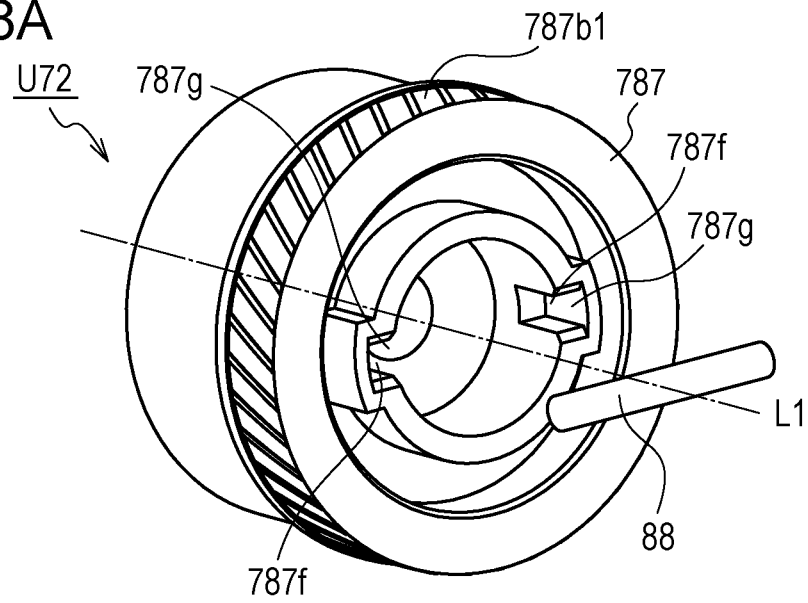


FIG. 18B

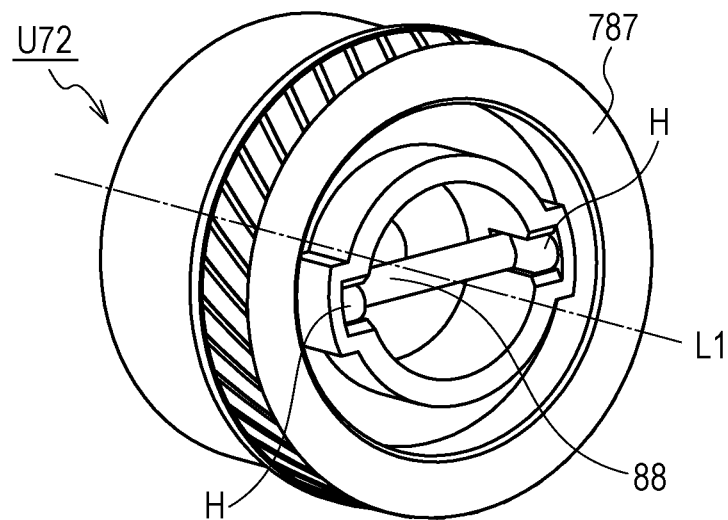


FIG. 18C

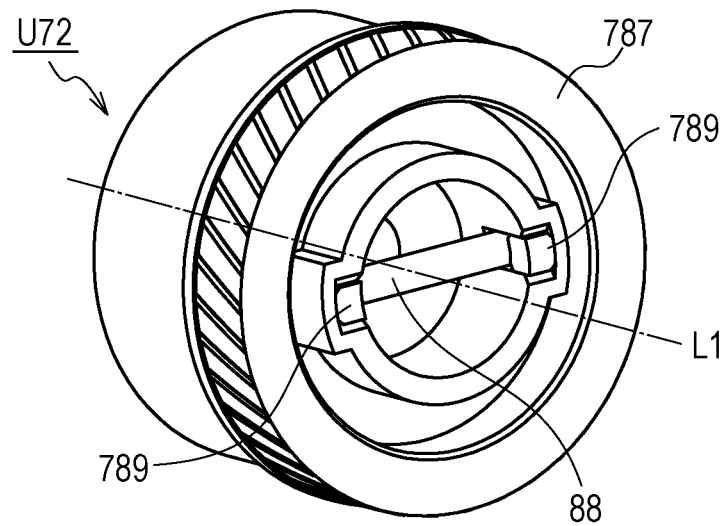


FIG. 19A

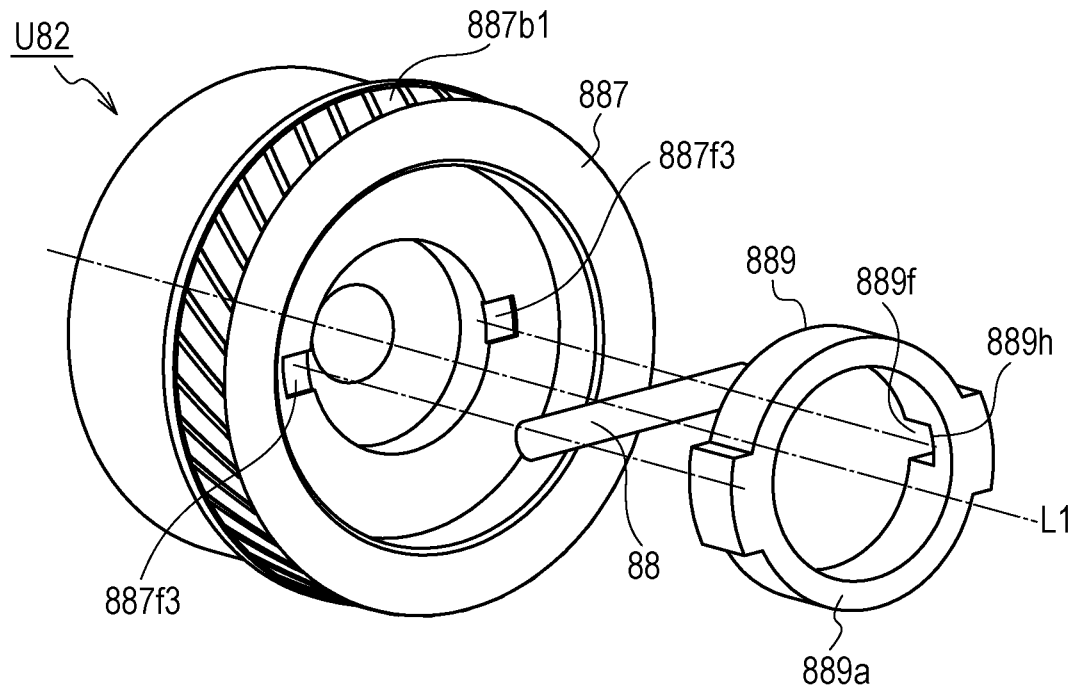
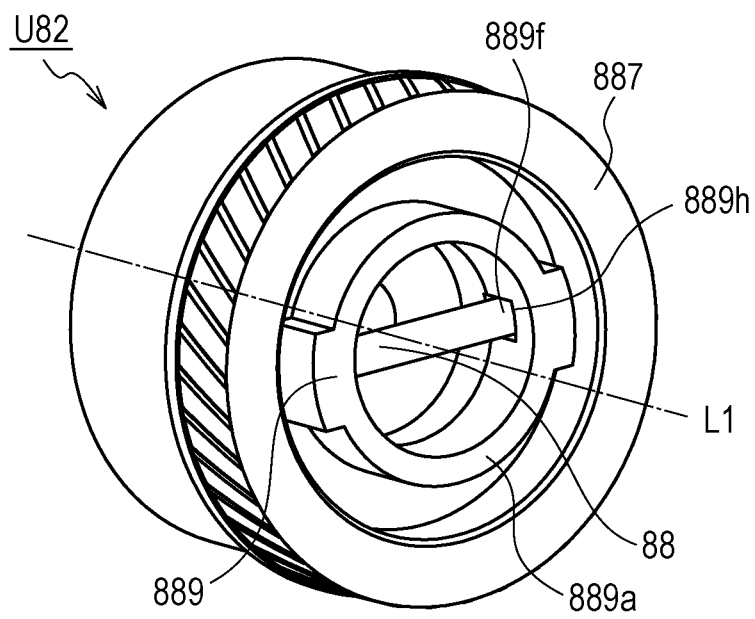


FIG. 19B



25 / 26

FIG. 20A

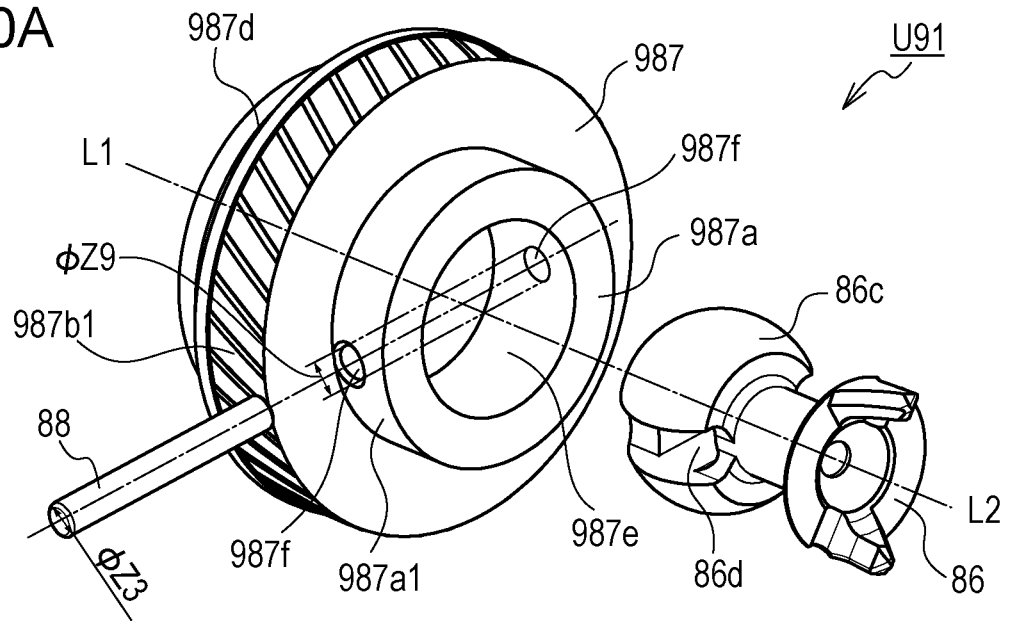


FIG. 20B

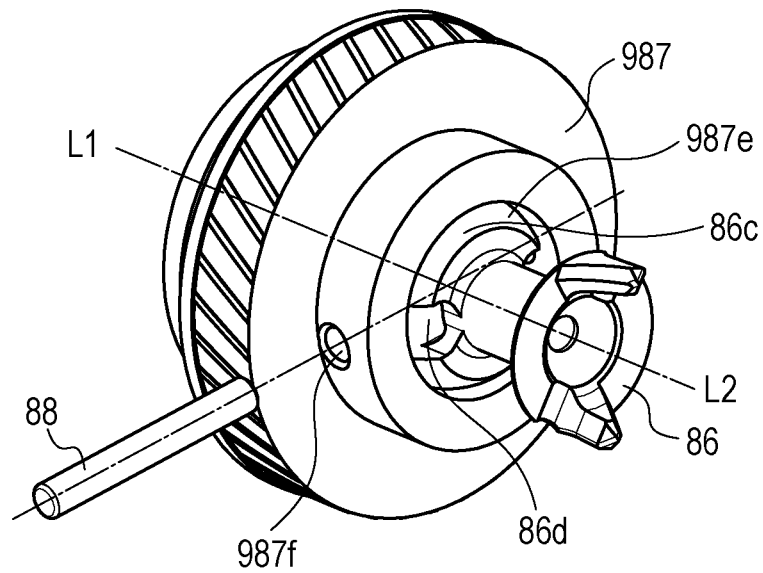


FIG. 20C

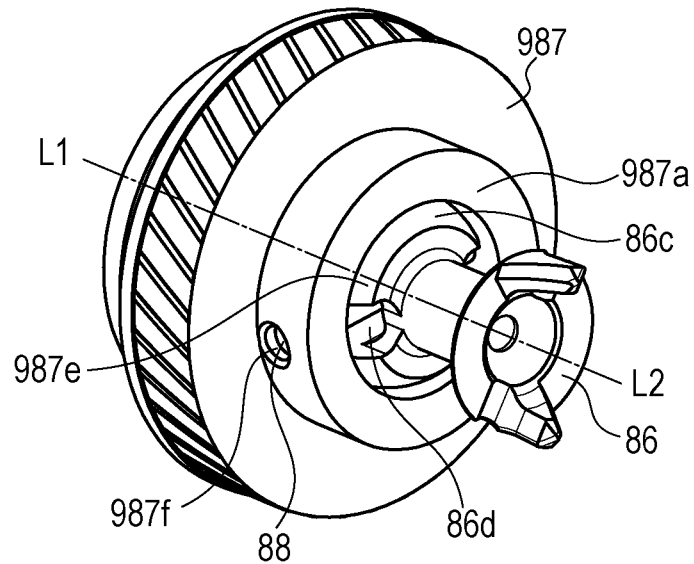


FIG. 21

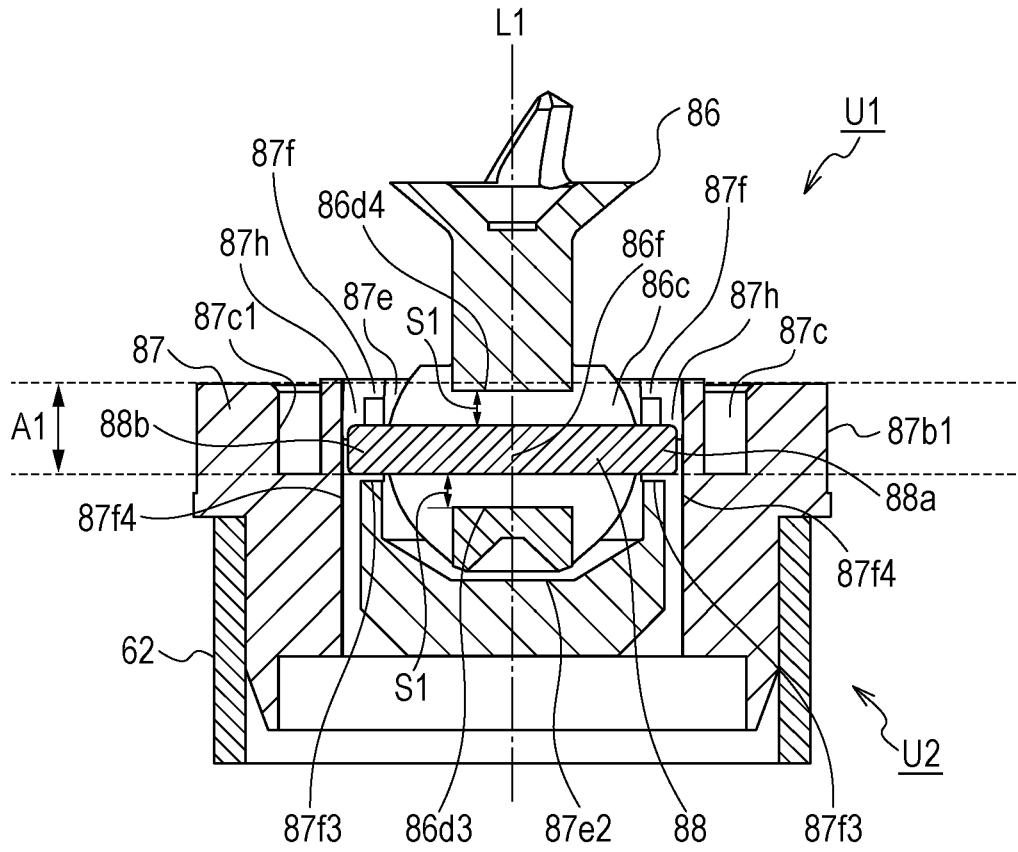


FIG. 22

