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(54) **POWER RECEIVING UNIT AND PROCESSING BOX**

(57) The present disclosure relates to a force receiving unit and a process cartridge. The force receiving unit is disposed at one side of a process cartridge. The force receiving unit includes an engaging portion and a force transmitting portion. The engaging portion engages with the driving unit of the electronic imaging device to receive a rotational driving force. The force transmitting portion transfers the driving force to the process cartridge. The

engaging portion is restricted by a position-limiter, causing the central axis of the engaging portion to remain inclined with respect to the rotation axis of the force transmitting portion or the rotation axis of the developing unit. Thus, this may solve the problem of the structural interference when the engaging portion of the force receiving unit engages or disengages with the transmitting pin of the driving unit of the electronic imaging device.

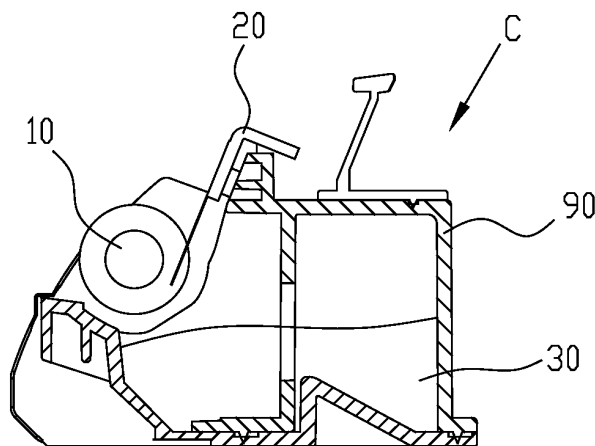


FIG.4

EP 3 141 965 A1

DescriptionFIELD OF THE INVENTION

[0001] The present disclosure relates to a force receiving unit and a process cartridge.

BACKGROUND

[0002] A process cartridge can be detachably installed to an electronic imaging device. The electronic imaging device is provided with a driving unit with a rotational driving force. The process cartridge comprises at least a developing unit, toner, a toner control unit, and a force receiving unit disposed at one side of the process cartridge along an axial direction of the developing unit. When the engaging portion engages with the driving unit of the electronic imaging device, the force receiving unit receives the rotational driving force and drives the developing unit, causing the developing unit to rotate and to participate the developing process of the electronic imaging device.

[0003] Currently, before the electronic imaging device can perform the developing operation (i.e., generally referred to as "printing"), a user needs to install the process cartridge into the electronic imaging device, the force receiving unit of the process cartridge makes contact and engage with the driving unit of the electronic imaging device.

[0004] As shown in FIGS. 1 and 2, the driving unit 500 of an electronic imaging device (not shown) engages with the force receiving unit 100 located at one end of the process cartridge C, and the driving unit 500 moves toward the force receiving unit 100 along the longitudinal direction Y1 (the longitudinal direction Y1 is approximately perpendicular to the rotational axis L3 of the developing unit 10). When moving to a coaxial position with the force receiving unit 100, the transmitting pin 510 of the driving unit 500 engages with the projection 110 of the force receiving unit 100 to transfer the rotational driving force to the force receiving unit 100, and the force receiving unit 100 transfers the driving force to various units of the process cartridge C through a set of gears. After the driving unit 500 engages with the force receiving unit 100, the rotational axis L1 of the driving unit 500 is substantially coaxial with the rotational axis L2 of the force receiving unit 100. However, currently, as shown in FIG. 3, when transferring the driving force, the transmitting pin 510 needs to make contact and engage with the projection 110. When the driving unit 500 moves along the longitudinal Y1 direction, because the two ends of process cartridge C of the electronic imaging device are relatively fixed by the inner wall or guiding rails of the electronic imaging device, the process cartridge C cannot move in the axial direction. Similarly, the driving unit 500 inside the electronic imaging device is also designed to move only long the longitudinal direction Y1 but not along its own axis. Thus, before the driving unit 500 engages with

the force receiving unit 100, the driving unit can only move along the longitudinal direction Y1. Because there is a height difference H1 between the lowest point of the transmitting pin 510 and the highest point of the projection 110, there is a possibility that transmitting pin 510 and the projection 110 of the force receiving unit 100 can structurally interfere with each other during the engagement. To reduce the structural wear or interference on the transmitting pin 510 or the projection 110, the outer surface of the transmitting pin 510 or the projection is generally configured as a tilted surface or a smooth and round surface. Therefore, such existing approach can only reduce the structural interference between the projection 110 and the transmitting pin 510. Similarly, because the transmitting pin 510 and the projection 110 make contact with each other to transfer the driving force, when the driving unit 500 disengages with the force receiving unit 100 after the transfer of the driving force, the driving unit 500 needs to withdraw from the force receiving unit 100 through a translation motion (cannot move in the axial direction), and the transmitting pin 510 still in the abutment state often can only (through the inclination or smooth transition of its outer surface) forcibly disengage with the projection 110 to part from the projection.

[0005] Thus, when the above driving unit 500 and the force receiving unit 100 repeatedly engage and disengage with each other, it is easy to cause the structure of the driving unit 500 or the force receiving unit 100 of the process cartridge C to be worn or broken, making it difficult or impossible for the driving unit 500 to stably engage with force receiving unit 100 to transfer the driving force. As such, the electronic imaging device or the process cartridge C cannot continue normal operation, and the quality of subsequent development processing can also be affected to various degrees.

[0006] The disclosed process cartridges and methods are directed to solve one or more problems set forth above and other problems.

BRIEF SUMMARY OF THE DISCLOSURE

[0007] The present disclosure includes a force receiving unit to resolve the issue of structural interference when the force receiving unit engages or disengages with the driving unit of an electronic imaging device.

[0008] In order to solve the above-mentioned technical problems, the technical solution provided in the present disclosure includes:

A force receiving unit, to be installed at one end of a process cartridge, comprising:

an engaging portion for engaging with a driving unit of an electronic imaging device to receive a rotational driving force; and
a force transmitting portion coupled to the engaging portion for transferring the rotational driving force to the process cartridge,

before the engaging portion of the force receiving unit engages with the driving unit, a center axis of the engaging portion remains inclined with respect to a rotation axis of the force transmitting portion or a rotation axis of the developing unit; and
 when the engaging portion of the force receiving unit engages with the force receiving unit to receive the rotational driving force, the center axis of the engaging portion remains inclined with respect to the rotation axis of the force transmitting portion, or the rotation axis of the developing unit, or the rotation axis of the driving unit.

[0009] And,
 A force receiving unit, to be installed at one end of a process cartridge, comprising:

- an engaging portion for engaging with a driving unit of an electronic imaging device to receive a rotational driving force; and
- a force transmitting portion coupled to the engaging portion for transferring the rotational driving force to the process cartridge,
- a center line of the engaging portion and a rotation axis of the force transmitting portion intersect at a point outside an end surface of the force transmitting portion.

[0010] Based on the above-mentioned technical solutions, the engaging portion of the force receiving unit remains at an inclined state before and during engaging with the driving unit, so as to resolve the issue of the structural interference when the engaging portion of the force receiving unit engages or disengages with the transmitting pin of the driving unit of the electronic imaging device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] In order to more clearly illustrate the embodiments of the present invention or the technical solutions of the prior art, the followings briefly describe the drawings used by these embodiments or prior art. It will be apparent that the drawings in the following description are merely some embodiments of the present invention and, to those skilled in the art, other drawings may be derived based on these drawings without any inventive effort.

- Figures 1 and 2 illustrate schematic diagrams of the force receiving unit of an existing process cartridge engaging with the driving unit of an electronic imaging device;
- Figure 3 illustrates a schematic diagram of an existing force receiving unit engaging with the driving unit;
- Figure 4 illustrates an axial sectional diagram of the internal structure of an exemplary process cartridge;

- Figure 5 illustrates a structural diagram of another exemplary process cartridge consistent with disclosed embodiments;
- Figures 6A and 6B illustrates structural diagrams of an exemplary force receiving unit consistent with disclosed embodiments;
- Figure 7 illustrates a structural diagram of an inclined engaging portion of the force receiving unit consistent with disclosed embodiments;
- Figure 8A illustrates a structural diagram of a position-limiter causing the engaging portion to tilt consistent with disclosed embodiments;
- Figure 8B illustrates a schematic diagram of another position-limiter portion causing the engaging portion to tilt consistent with disclosed embodiments;
- Figure 9 illustrates a schematic diagram of an engagement process between the force receiving unit engaging portion and the driving unit consistent with disclosed embodiments;
- Figure 10 illustrates a structural diagram of the semispherical member in the engaging portion of the force receiving unit consistent with disclosed embodiments;
- Figure 11a illustrates a structural diagram of a position-limiter portion causing the engaging portion to tilt consistent with disclosed embodiments;
- Figure 11b illustrates is a schematic diagram of another engagement process between the engaging portion of the force receiving unit and the driving unit consistent with disclosed embodiments;
- Figure 12A illustrates a structural diagram of a connecting member (elastic member) of the force receiving unit consistent with disclosed embodiments;
- Figure 12B illustrates a structural diagram of the connecting member (elastic member) of the force receiving unit consistent with disclosed embodiments;
- Figure 13 illustrates a structural diagram of another position-limiter portion causing the engaging portion to tilt consistent with disclosed embodiments;
- Figures 14 and 15 illustrate structural diagrams of another exemplary force receiving unit consistent with disclosed embodiments;
- Figures 16A and 16B illustrates structural diagrams of a base portion consistent with disclosed embodiments;
- Figures 17A, 17B, and 17C illustrate structural diagrams of a force transmitting portion consistent with disclosed embodiments;
- Figure 18 illustrates a structural diagram of the engaging portion consistent with disclosed embodiments;
- Figures 19A and 19B structural diagrams of a base coupling with the force transmitting portion consistent with disclosed embodiments;
- Figure 20 illustrates a schematic diagram of a tilting engaging portion consistent with disclosed embodiments;
- Figures 21A and 21B illustrate schematic diagrams

of an engagement process between the engaging portion of the force receiving unit and the driving unit consistent with disclosed embodiments;

Figures 22 and 23 illustrate structural diagrams of another exemplary force receiving unit consistent with disclosed embodiments;

Figures 24A and 24B illustrate structural diagrams of a base portion consistent with disclosed embodiments;

Figures 25A, 25B and 25C illustrate structural diagrams of an exemplary force transmitting portion consistent with disclosed embodiments;

Figures 26A and 26B illustrate structural diagrams of an engaging portion consistent with disclosed embodiments;

Figures 27A and 27B illustrate schematic diagrams of another exemplary drive unit consistent with disclosed embodiments;

Figure 28 illustrates a schematic diagram of a tilting engaging portion consistent with disclosed embodiments;

Figure 29 illustrates a schematic diagram of an engagement process between the engaging portion of the force receiving unit and the driving unit consistent with disclosed embodiments;

Figures 30A and 30B illustrate structural diagrams of another exemplary engaging portion consistent with disclosed embodiments;

Figure 31 illustrates a structural diagram of another exemplary engaging portion consistent with disclosed embodiments; and

Figure 32 illustrates a schematic diagram of an engagement process between the engaging portion of the force receiving unit and the driving unit consistent with disclosed embodiments.

DETAILED DESCRIPTION

[0012] Reference will now be made in detail to exemplary embodiments of the disclosure, which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. It is apparent that the described embodiments are some but not all of the embodiments of the present invention. Based on the disclosed embodiments, persons of ordinary skill in the art may derive other embodiments consistent with the present disclosure, all of which are within the scope of the present invention. Further, in the present disclosure, the disclosed embodiments and the features of the disclosed embodiments may be combined in different ways as long as such combination does not incur any conflict.

[0013] Figure 5 illustrates an exemplary process cartridge C inserted into the electronic imaging device. As shown in Figure 5, the process cartridge C may include a housing 90 in which toner 30 is stored, and a toner control unit 20 is disposed on the surface of the housing 90. The baffle 80 and another baffle 70 are located at

both ends of the housing 90, respectively. The developing unit 10 is rotatably installed on the housing 90 by the baffle 80 and the baffle 70. In general, the force receiving unit 100 is located at one end of the process cartridge C, and the force receiving unit 100 is rotatably disposed between the baffle plate 80 and the housing 90.

[0014] In order to mitigate or remove the structural interference or the structural wear of the transmitting pin 510 when moving to engage or disengage with the projection 110, the present disclosure provides an improved assembly structure.

Embodiment One

[0015] Figures 6A, 6B, and 7 illustrate an exemplary force receiving unit in the electronic imaging device. As shown in Figures 6A, 6B, and 7, the force receiving unit 100 can engage with the developing unit 10 through a gear 15. The force receiving unit 100 includes an engaging portion 130, a force transmitting portion 150, and a position-limiter 600. The engaging portion 130 includes a projection 110 for engaging with the transmitting pin 510 of the driving unit (i.e., the projection thereof is provided with at least two projections), and transferring the rotational driving force to the connecting member 120. One end of the connecting member 120 is connected to the projection 110, and the other end of the connecting member 120 is disposed with the transferring member 125. The force transmitting portion 150 is provided with a transmission gear 152 for transferring a driving force, a cavity 155 in the center, and one or more chutes 151 on the side wall of the cavity 155.

[0016] In certain embodiments, the various components may be assembled in certain ways. One end of the connecting member 120 (i.e., the end with the transferring member 125) is placed in the cavity 155 of the force transmitting portion 150, the transferring member 125 abuts the chute 151 thereof to transfer the driving force, and the transmission gear 152 on the surface of the force transmitting portion 150 then transfers the driving force to the gear 15 of the developing unit 10, to drive the rotation of the developing unit 10.

[0017] As shown in Figures 6B and 7, after the engaging portion 130 is installed to the force transmitting portion 150, the engaging portion 130 can swing toward at least a certain direction in the force transmitting portion 150. That is, there is an inclination angle R1 between the center line L5 of the engaging portion 130 and the rotation axis of the force transmitting portion 150 or the rotation axis L3 of the developing unit 10, and the inclination range of the inclination angle R1 may be approximately between 5 degrees to 50 degrees.

[0018] As shown in Figures 8A and 8B, the position-limiter 600 disposed on the process cartridge C causes the engaging portion 130 to tilt toward the developing unit 10, and the center line L5 of the engaging portion 130 may remain constantly inclined to the rotation axis L4 of the force transmitting portion 150 or the rotation

axis L3 of the developing unit 10. Because the engaging portion 130 remains at an inclined state, the distances between each one of the projections of the engaging portion 130 and the force transmitting portion 150 are different; that is, one projection is closer to the transmitting unit 150 than the other projection.

[0019] As shown in Figure 8A, the position-limiter 600 is a tensile spring. One end of the position-limiter 600 is attached to the connecting member 120, and the other end of the position-limiter 600 is attached to a protrusion or projection 81 of the position-limiter 80 (e.g., referring to Figure 5). The engaging portion 130 remains inclined due to the elastic force of the tensile spring.

[0020] As shown in Figure 8B, the position-limiter 600 may be a separate component disposed on the baffle 80, or the position-limiter 600 may also be a part of the baffle 80. The position-limiter 600 may include a blocking recess 650, and the blocking recess 650 abuts the connecting member 120 to cause the engaging portion 130 to remain in an inclined state constantly. Further, additionally or optionally, the outer surface of the position-limiter 600 also has a slope 630. The slope 630 is able to abut the reverse side of the projection 110, also causing the engaging portion 130 to remain in an inclined state.

[0021] As shown in Figure 9, before the driving unit 500 engages with the force receiving unit 100, the driving unit 500 moves in the longitudinal direction Y1. At the same time, under the effect of the position-limiter 600, the engaging portion 130 remains in an inclined state constantly.

[0022] Because the engaging portion 130 remains in an inclined state, the projection 110a of the engaging portion 130, which is closer to the force transmitting portion 150, can substantially avoid structural interference with the transmitting pin 510 moving together with the driving unit 500. Thus, the drive mechanism 500 can more easily enter the center position of the engaging portion 130.

[0023] When the driving unit 500 engages with the force receiving unit 100 to transfer the driving force, even when the distances between each of the projections (110a, 110b) and the force transmitting portion 150 are different, at least one transmitting pin 510 on the driving unit 500 can abut the projection 110b further from the force transmitting portion 150. As such, when the driving unit 500 engages with the force receiving unit 100 and transfers the rotational driving force, the force receiving unit 100 remains inclined due to the restriction of the position-limiter 600. That is, the center line L5 of the engaging portion 130 remains inclined to the rotational axis L1 of the driving unit 500, and an inclination angle R2 exists between the center line L5 and the rotational axis L1.

[0024] Accordingly, because the engaging portion 130 remains in the inclined state, when the force receiving unit 100 engages with the driving unit 500 to transfer the driving force, the drive assembly 100 may not need to be coaxial with the axial direction (i.e., L1, L2/L5) of the driv-

ing unit 500. In addition, because the connecting member 120 of the engaging portion 130 also remains in the inclined state, when the force receiving unit 100 engages with the driving unit 500 at the other end of the connecting member 120, the rotation center of the force transmitting portion 150 is apart from the rotation center of the drive mechanism 500. That is, the rotation axis L4 of the force transmitting portion 150 is apart from the rotation axis L1 of the driving unit 500 (i.e., there is a distance H2 in between), and the rotation axis L4 is substantially parallel to the rotation axis L1. If the force transmitting portion 150 and the gear 15 are separated from each other due to the distance H2, an additional gear may be added between the force transmitting portion 150 and the gear 15, or the size of the gear 15 may also be adjusted.

[0025] Further, as shown in Figure 10, to engage the force receiving unit 100 with the driving unit 500 without occurrence of disengagement during the transfer of the driving force, the projection 110 of the engaging portion 130 may be replaced by a bowl-shaped body 160 having an inner recess. The bowl-shaped body 160 is disposed at one end of the connecting member 120 in the same manner as the projection 110. The bowl-shaped 160 has a concave opening 165, and the opening 165 has at least two blocking walls 161.

[0026] The concave opening 165 enclaves or fittingly wraps the circular arc projection 515 at the front side of the driving unit 500 (e.g., Figure 11a), and the blocking wall 161 is disposed to abut the transmitting pin 510 of the driving unit 500 to receive the driving force. Likewise, the bowl-shaped body 160 is restricted by the position-limiter 600, and the center line L5 of the bowl-shaped body 160 remains inclined with respect to the rotation axis L4 of the transmission unit 150 or the rotation axis L1 of the driving unit 500.

[0027] As shown in Figures 11A and 11B, the driving unit 500 moves along the longitudinal direction Y1 into the bowl-shaped body 160 of the engaging portion 130, and the transmitting pin 510 of the driving unit 500 transfers the driving force by abutting one blocking wall 160 on the bowl-shaped body 160. Due to the shape configuration of the bowl-shaped body 160, during the transfer of the driving force, the arc projection 515 of the driving unit 500 is enclaved by the bowl-shaped 160, and the transmitting pin 510 also abuts the blocking wall 161 in the opening 165. Accordingly, when the driving unit 500 engages with the force receiving unit 100 to transfer the driving force, the driving unit 500 and the engaging portion 130 can largely avoid disengagement.

[0028] In certain embodiments, the connecting member 120 of the engaging portion 130 may be a cylindrical rod, or an elastic member (i.e., a tensile spring) connecting the projection 110 and the transmitting unit 150. As shown in Figures 12A and 12B, 150 by replacing the connecting rod with the elastic member, the transferring member 125 of the connecting member 120, and the cavity 155 and chutes 151 of the force transmitting portion 150 may be omitted. A simple process, e.g., gluing, buck-

ling, or riveting, may be used to connect the elastic member with the projection 110 and the force transmitting portion 150.

[0029] As shown in Figure 13, to maintain the inclination angle of the engaging portion 130, because the connecting member 120 is an elastic member (e.g., a tensile spring), the position-limiter 600 may have a blocking recess 650 and may abut the connecting member 120 or the reverse side of the projection 110, causing the engaging portion 130 to maintain the inclined state. That is, the center line L5 of engaging portion 130 constantly remains inclined with respect to the rotation axis L4 of the force transmitting portion 150 or the rotation axis L3 of the developing unit 10. In certain embodiments, the projection 110 of the engaging portion 130 can also be replaced by the bowl-shaped body 160 shown in Figure 10.

[0030] Further, because the engaging portion 130 remains inclined when engaging with the transmitting pin 510 of the driving unit 500, two or more projections 110 on the engaging portion 130 or two or more blocking walls 161 in the bowl-shaped body 160 may be provided. Thus, the transmitting pin 510 can more easily abut the projection 110 or the blocking wall 161 to transfer the driving force.

Embodiment Two

[0031] Figures 14 and 15 illustrate another exemplary force receiving unit of the process cartridge C. As shown in Figures 14 and 15, the force receiving unit 200 includes an engaging portion 230, a force transmitting portion 250, a position-limiter 600, and a base 270. The position-limiter 600 may be a tensile spring and, in one embodiment, may be a conical tensile spring.

[0032] As shown in Figure 16A, a base 270 is provided with a cavity 275 on one end; one or more chute 276 is provided on the side of the cavity 275; and a positioning protrusion 272 is provided on the cylindrical side-surface of the base 270. When viewed from the axial direction at one end of the cavity 270, as shown in Figure 16B, the cavity 275 is located at an offset from the central axis of the base 270. That is, the center point A1' of the cavity 275 is at an offset from the rotation central axis A1 of the base 270, and a distance D1 exists between the center point A1' and the rotation central axis A1, which may be in a range of approximately 2mm to 8mm.

[0033] As shown in Figure 17A, an opening 255 and a blocking protrusion 257 are disposed on one end of the force transmitting portion 250; a recess 256 is disposed next to the opening 255, and a positioning hole 252 is situated on the cylindrical surface of the force transmitting portion 250.

[0034] As shown in Figure 17B, viewed from the axial direction at one end of the force transmitting portion 250, the opening 255 is not centered on the central axis of the force transmitting portion 250. That is, the center point A2' of the opening 255 is at an offset from the rotation central axis L4 of the force transmitting portion 250. A

distance D1 exists between the center point A2' and the rotation central axis L4 exists, and may be in a ranges from approximately 2mm to 8mm.

[0035] In addition, as shown in Figure 17C, in the cross-sectional diagram of the force transmitting portion 250, a part of the end surface 251a surrounding the opening 255 is inclined with respect to the reverse surface 251b of the force transmitting portion 250. That is, an inclination angle R3 exists between the end surface 251a and the reverse surface 251b, which may be in a range from approximately 2 to 20 degrees.

[0036] As shown in Figure 18, the engaging portion 230 includes a projection 210 and a connecting member 220. The connecting member 220 is connected to the projection 210 at one end, and includes a sphere body 225 at the other end. The connecting member 220 may also include a blocking layer 222.

[0037] In certain embodiments, the various components may be assembled in certain ways. As shown in Figures 15 to 20, the sphere body 225 of the engaging portion 230 passes through the position-limiter 600 and a transferring member 226 is assembled into the sphere body 225. The sphere body 225 and the transferring member 226 pass through the opening 255 and the recess 256 of the force transmitting portion 250. The sphere body 225 at one end of the connecting member 220 is placed into the cavity 275, and the transferring member 226 is located in the chute 276.

[0038] At the same time, the base 270 is fixed on the force transmitting portion 250, through the positioning protrusion 272 locked to the positioning hole 252. After these components are assembled, the connecting member 220 passes through the position-limiter 600, and the connecting member 220 is disposed between the end surface 251a and the blocking layer 222. Because the opening 255 is structurally deviated from the cavity 275, when coupling the force transmitting portion 250 with the base 270, the center point A2' needs to be coaxially aligned with the center point A1'.

[0039] After coupling the force transmitting portion 250 with the base 270, as shown in Figure 19B, the opening 255 may substantially overlap with the cavity 275, while the recess 256 and the chute 276 may not substantially overlap or do not overlap. Accordingly, after the transferring member 226 of the sphere body 225 is placed into the chute 276, the transferring member 226 may be confined in the chute 276, so as to prevent engaging portion 230 from disengaging from the force transmitting portion 250.

[0040] As shown in Figure 20, due to the inclined disposition of the end surface 251a, the position-limiter 600 abutting the end surface 251a may also remain inclined. Under the force applied by the position-limiter 600 on the blocking layer 222, the engaging portion 230 may also be tilted, and the center line L5 of the engaging portion 230 remains inclined with respect to the rotation axis L4 of the force transmitting portion 250. In addition, the elastic property of the position-limiter 600 may cause the en-

gaging portion 230 to retreat inwardly when being compressed, and to extend outwardly when not being compressed. Further, a blocking or retaining projection 257 may be disposed on the end surface of the force transmitting portion 250. The retaining projection 257 may prevent the position-limiter 600 from separating from the end surface 251a.

[0041] The engagement process of the force receiving unit 200 with the driving unit 500 may be similar to those described above, for example, as shown in Figures 9, 11A and 13.

[0042] As shown from Figures 20, 20A, and 21B, and comparing with the first embodiment, by offsetting the cavity 275/the opening 255, the center line L5 of the assembled engaging portion 230 is at an offset position with respect to the rotation axis L4 of the force transmitting portion 250. Further, by the disposition of the position-limiter 600 and the end surface 251a, the position-limiter 600 not only can cause the engaging portion 230 to constantly remain inclined with respect to the force transmitting portion 250, but also can cause the entire engaging portion 230 to retreat inwardly relative to the force transmitting portion 250 (Figure 21A) when under pressure due to a certain probability that the projection 210 structurally interferes with the transmitting pin 510.

[0043] When the driving unit 500 rotates, the rotating transmitting pin 510 can contact with the engagement claws in a staggered format. The projection 210 is not under pressure, and the engaging portion 230 receives an elastic force from the position-limiter 600 and extends outwardly. Finally, the projection 210 contacts and engages the transmitting pin 510 to receive the rotational driving force (Figure 21B). In addition, during the engagement of the driving unit with the force receiving unit 200 for transferring the driving force, the center line L5 remains constantly inclined with respect to the rotation axis L1 of the driving unit 500 or the rotation axis L4 of the force transmitting portion 250.

Embodiment Three

[0044] Figures 22 and 23 illustrate another exemplary force receiving unit of the process cartridge C. As shown in Figures 22 and 23, the force receiving unit 300 includes an engaging portion 330, a force transmitting portion 350, a position-limiter 600, and a base 370. In certain embodiments, the position-limiter 600 is a tensile spring, and the tensile spring may be in a conical shape.

[0045] As shown in Figure 24A, comparing with the second embodiment, the center point A10' of the cavity 375 on the end surface is substantially coaxial with the rotation center A1 of the base 370 (Figure 24B); and the chute 376 and the positioning protrusion 372 may be disposed in similar ways as described in the second embodiment.

[0046] As shown in Figures 25B and 25C, comparing with the second embodiment, the center point A20' of the opening 355 on the end surface is substantially coaxial

with the rotation axis L4 of the force transmitting portion 350; and the recess 356, positioning hole 352 and blocking protrusion 357 may be disposed in similar ways as described in the second embodiment.

5 **[0047]** As shown in Figures 26A and 26B, the engaging portion 330 includes a projection 310 and a connecting member 320. The connecting member 320 is connected to the projection 310 at one end and is provided with a sphere 325 at the other end. The connecting member may also be disposed with a blocking layer 322.

10 **[0048]** In addition, when viewed along a side direction of the engaging portion 330, the center line L5 of the engaging portion 330 is deviated from the center line L5a of the sphere 325 on one end of the connecting member 320, and a distance D3 exists between the center line L5 and the center line L5a, which may be in a ranges of approximately 2mm to 8mm. Furthermore, one side 320a of the connecting member 320 is outwardly higher (i.e., along the Y' axis) than one side 325b of the sphere 325, and a distance H3 exists between the side 320a and the side 325a.

15 **[0049]** In addition, as shown in Figures 25B and 26B, the diameter H5 of the opening 355 is larger than or equal to the diameter H4 of the sphere 325, the diameter H4 of the sphere 325 plus the total length of the distance H3 is larger than the diameter H5 of the opening 355, and the diameter H5 of the opening 355 is substantially equal to the diameter of the cavity 375.

20 **[0050]** In certain embodiments, the various components may be assembled in certain ways. As shown from Figures 23 to 29, the sphere 325 of the engaging portion 330 passes through the position-limiter 600, and the transferring member 326 is assembled into the sphere 325. The sphere 325 and the transferring member 326 pass through the opening 355 and the recess 356 of the force transmitting portion 350. The sphere 325 at one end of the connecting member 320 is placed into the cavity 375, and the transferring member 326 is located in the chute 376.

25 **[0051]** At the same time, through the positioning protrusion 372 inserted into the positioning hole 352 of the force transmitting portion 350, the base 370 is fixed on the force transmitting portion 350. After these components are assembled, the position-limiter 600 is passed through by the connecting member 320, and is situated between the transferring surface 350 and the blocking layer 322. Because the diameter H5 of the opening 355 is greater than or equal to the diameter H4 of the sphere 325, the sphere 325 can smoothly passes through the opening 355 and can be assembled inside the cavity 375 (Figure 27A).

30 **[0052]** However, because the diameter H5 of the opening 355 is smaller than the total length of the diameter H4 of the sphere 325 plus the distance H3, after the above components are assembled, the side 320a is restricted by the diameter size of the opening 355, causing the engaging portion 330 to remain inclined with respect to the force transmitting portion 350. That is, the center line L5

of the engaging portion 330 is inclined with respect to the rotation axis L4 of the force transmitting portion 350 (Figure 27B).

[0053] Finally, under the force of the position-limiter 600 on the blocking layer 322, the engaging portion 330 remains at a predetermined inclination angle. When the side 320a abuts the opening 355, the engaging portion 330 reaches a minimum inclination angle with respect to the force transmitting portion 350.

[0054] In addition, as shown in Figure 29, during the engagement process of the force receiving unit 200 with the driving unit 500, the engaging portion 330 may retreat or extend with respect to the force transmitting portion 350, as similarly described in the second embodiment.

Embodiment Four

[0055] Those structures similar to the above embodiments, such as the force transmitting portion of the force receiving unit, position-limiter, and base, may be referred to those embodiments (e.g., the force transmitting portion 350, the position-limiter 600, and the base 370 in the third embodiment) and not described herein in detail, while differences from other embodiments may be further illustrated.

[0056] As shown in Figures 30A and 30B, an engaging portion 430 includes a projection 410 and a connecting member 420. The connecting member 420 is connected to the projection 410 at one end and is disposed with a sphere 325 at the other end, and a baffle 422 may also be disposed on the connecting member 420. Further, when viewed from a side direction of the engaging portion 430, the engaging portion 430 is an arc-shaped structure, and the center line L6 of the engaging portion 430 is not a straight line, rather having a certain degree of curving or arc.

[0057] As shown in Figures 31 and 32, after various components of the engaging portion 430 are assembled, the arc-shaped engaging portion 430 can achieve the same effect through the inclination angle between the engaging portion (130/230/330) and the force transmitting portion (150/250/350) as illustrated in the third, fourth, and third embodiments, such that the driving unit 500 can be easily entered into the center of the engaging portion 430 and the rotating transmitting pin 510 can abut the projection 410 to transfer the driving force.

[0058] Referring to Figures 7, 20, 28, and 31, with the force receiving unit 100 in the first embodiment, the structural dispositions and installations of the engaging portion (i.e., 230/330/430) in the second, third and fourth embodiments are different from the structural disposition and installation of the engaging portion 330 in the first embodiment. The axis or center line (i.e., L5/L6) of the engaging portion (i.e., 230/330/430) and the rotation axis L4 of the force transmitting portion (i.e., 250/350) intersect at a point X1 outside the end surface of the force transmitting portion (i.e., 250/350). The center line (L5) of the engaging portion (i.e., 230 / 330) is inclined with

respect to the rotation axis L4 of the force transmitting portion (i.e., 250 / 350). However, the center axis L5 of the engaging portion 130 and the rotation axis L4 of the power transfer 150 may intersect at a point X2 inside the force transmitting portion 150 in the first embodiment.

[0059] Further, with respect to the force receiving unit 100 in the first embodiment, the structural disposition of the position-limiter 600 in the second, third, and fourth embodiments are different. In the first embodiment, the position-limiter 600 is situated in the engaging portion 130 at one end and in the baffle 80 or the housing of the process cartridge C at the other end; while in the fourth, fifth and fourth embodiments, the position-limiter 600 can be disposed in the force receiving unit 200/300. This way, the operation can be facilitated, the operation length can be shortened, and the procedures can be reduced.

[0060] Further, referring to Figure 11a, after the transfer of the driving force, the force receiving unit 100/200/300 and the driving unit 500 may detach from each other, and the drive mechanism 500 moves in the opposite direction to the longitude direction Y1. Because the engaging portion 130/230/330 of the force receiving unit 100/200/300 remain in the inclined state with respect to the force transmitting portion 150/250/350, the driving unit 500 can easily detach from the engaging portion 130/230/330, and the transmitting pin 510 of the driving unit 500 does not substantially interfere with projection 110/210/310 or the blocking wall 161 (similarly with the arc-shaped engaging portion 430).

[0061] By using the disclosed structures and methods, before the engaging portion of the force receiving unit engages the driving unit in the electronic imaging device or after the engaging portion of the force receiving unit engages the driving unit in the electronic imaging device to transfer the driving force, the engaging portion of the force receiving unit remains constantly inclined with respect to the force transmitting portion, the driving unit, or the developing unit of the force receiving unit. Thus, the present invention not only overcomes the structural interference occurred in the engagement or disengagement of the force receiving unit with the driving unit, but also maintains structural strength even after multiple engagement and disengagement, avoiding the structural tear or breaking and improving the service life of the process cartridge or the electronic imaging device.

[0062] It should be noted that the above embodiments are merely provided for describing the technical solutions of the present invention, and not intended to limit the scope thereof. Although detailed descriptions are provided regarding the various embodiments, those skilled in the art can appreciate that the disclosed technical solutions can be modified, or some or all of the technical features can be equivalently replaced without inventive efforts. Such modifications or replacements will be readily apparent to those skilled in the art, and do not depart from the spirit or scope of the invention.

Claims

1. A force receiving unit, to be installed at one end of a process cartridge, comprising:
- an engaging portion for engaging with a driving unit of an electronic imaging device to receive a rotational driving force; and
 a force transmitting portion coupled to the engaging portion for transferring the rotational driving force to the process cartridge, wherein:
- before the engaging portion of the force receiving unit engages with the driving unit, a center line of the engaging portion remains inclined with respect to a rotation axis of the force transmitting portion; and
 when the engaging portion of the force receiving unit engages with the force receiving unit to receive the rotational driving force, the center line of the engaging portion remains inclined with respect to the rotation axis of the force transmitting portion.
2. The force receiving unit according to claim 1, wherein:
- when the engaging portion of the force receiving unit engages with the driving unit to receive rotational driving force, the rotation axis of the force transmitting portion is apart from the rotation axis of the driving unit and the rotation axis of the force transmitting portion is substantially parallel with the rotation axis of the driving unit.
3. The force receiving unit according to claim 2, further including:
- a position-limiter, wherein the position-limiter causes the center line of the engaging portion to remain inclined with respect to the rotation axis of the force transmitting portion.
4. The force receiving unit according to claim 3, wherein:
- one end of the position-limiter is installed on the engaging portion and the other end of the position-limiter is installed on a first baffle; and
 the position-limiter is a tensile spring.
5. The force receiving unit according to claim 3, wherein:
- the position-limiter has a blocking recess for causing the engaging portion to remain inclined.
6. The force receiving unit according to claim 3, wherein:
- an outer surface of the position-limiter has a slope; and
 the slope abuts a protrusion or projection or bowl-shaped body for causing the engaging portion to remain inclined.
7. A force receiving unit, to be installed at one end of a process cartridge, comprising:
- an engaging portion for engaging with a driving unit of an electronic imaging device to receive a rotational driving force; and
 a force transmitting portion coupled to the engaging portion for transferring the rotational driving force to the process cartridge, wherein a center line of the engaging portion and a rotation axis of the force transmitting portion intersect at a point outside an end surface of the force transmitting portion.
8. The force receiving unit according to claim 7, wherein:
- before or when the engaging portion engages with the driving unit to receive the rotational driving force, the center line of the engaging portion remains inclined with respect to the rotation axis of the force transmitting portion.
9. The force receiving unit according to claim 7 or 8, wherein:
- the engaging portion contains an opening; and
 the opening is deviated from a rotation center of the force transmitting portion.
10. The force receiving unit according to claim 7 or 8, further including:
- a base, wherein the base contains a recess and the recess is at an offset from a center of the base.
11. The force receiving unit according to claim 7 or 8, wherein:
- the force transmitting portion is provided with an end surface; and
 the end surface remains inclined with respect to a reverse side of the end surface.
12. The force receiving unit according to claim 11, wherein:
- the engaging portion contains a blocking layer;

and
the position-limiter is situated between the
blocking layer and the end surface.

13. The force receiving unit according to claim 7 or 8, 5
wherein:

the engaging portion contains a connecting
member, and the connecting member includes
a spherical member; 10
the force transmitting portion includes an open-
ing;
the connecting member has a side;
the spherical member has a side; and
a distance between the side of the connecting 15
member and the side of the spherical member
plus a diameter of the spherical member is larger
than a diameter of the opening.

14. The force receiving unit according to claim 13, 20
wherein:

the center line of the engaging portion is deviat-
ed from the center line of the spherical member
of the connecting member. 25

15. The force receiving unit according to claim 7, where-
in:

the engaging portion is an arc-shaped structure. 30

16. The force receiving unit according to claim 15,
wherein:

the center line of the engaging portion has a cer- 35
tain degree of arc.

17. A process cartridge capable of being detachably in-
stalled in an electronic imaging device, comprising
the force receiving unit according to any of claims 1 40
to 16.

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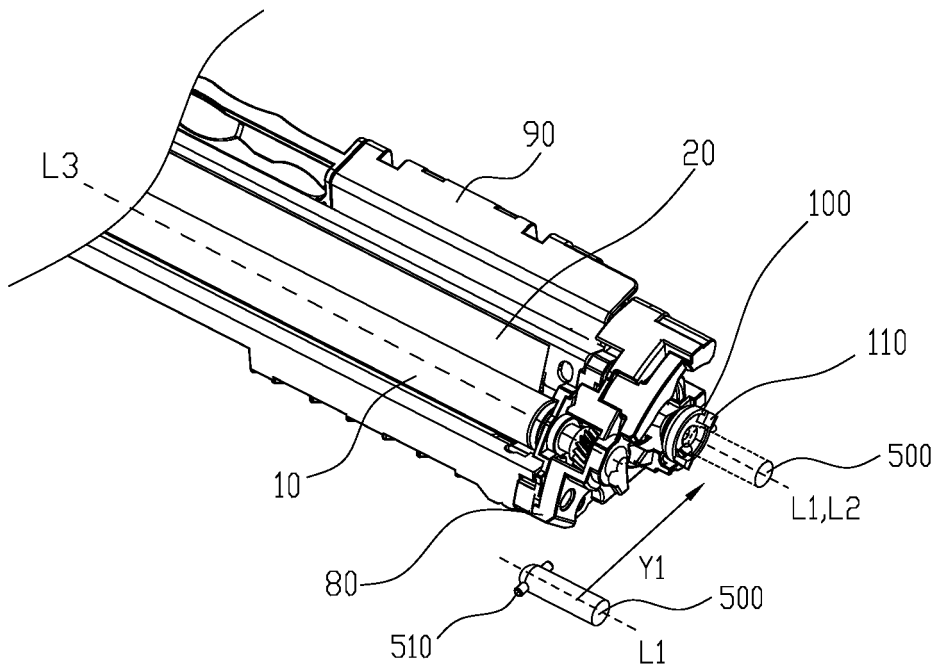


FIG. 1

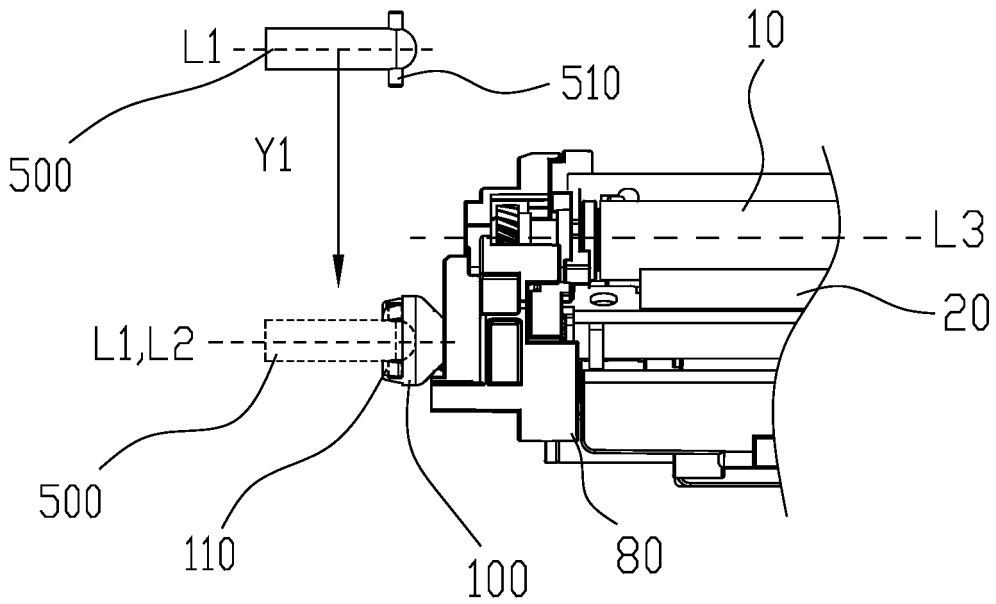


FIG. 2

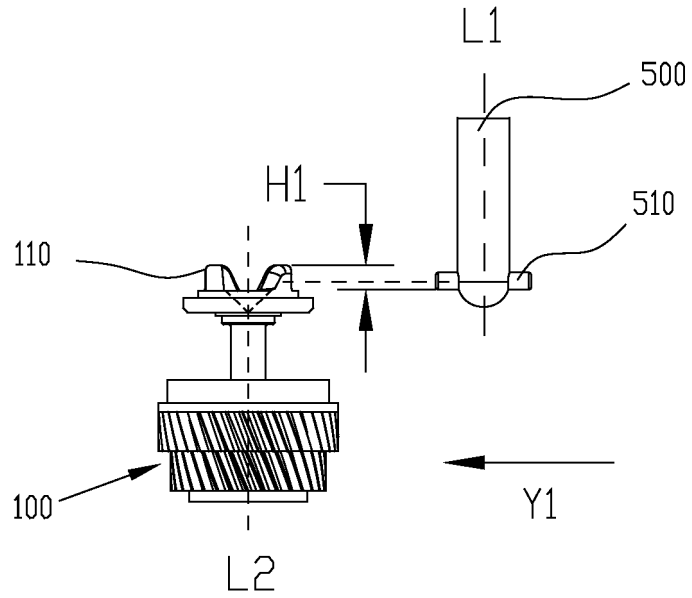


FIG.3

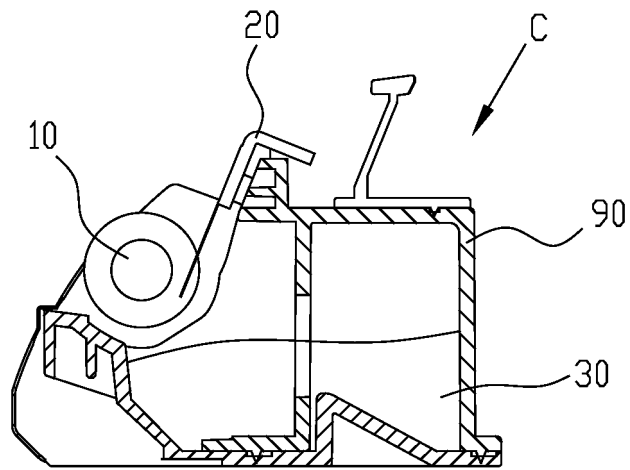


FIG.4

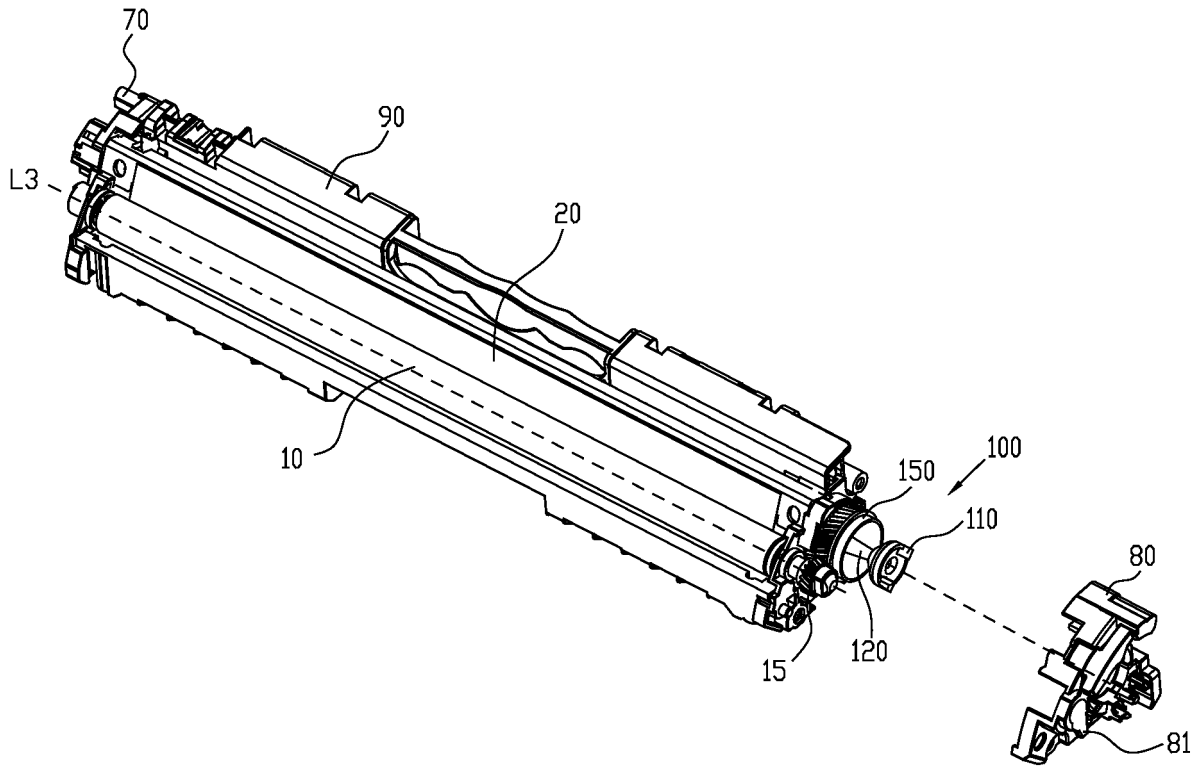


FIG. 5

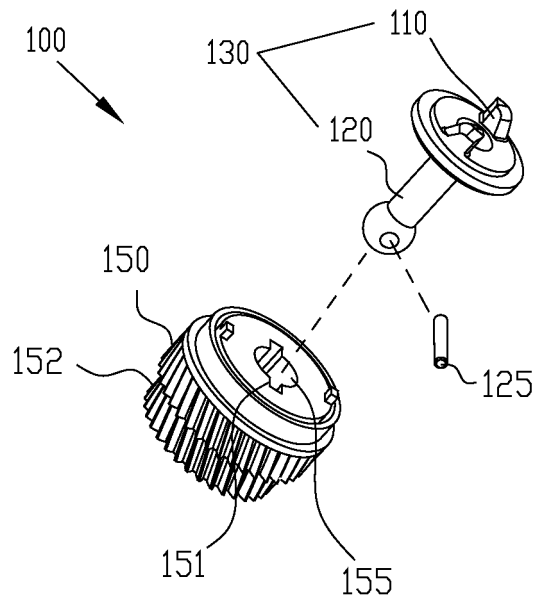


FIG. 6a

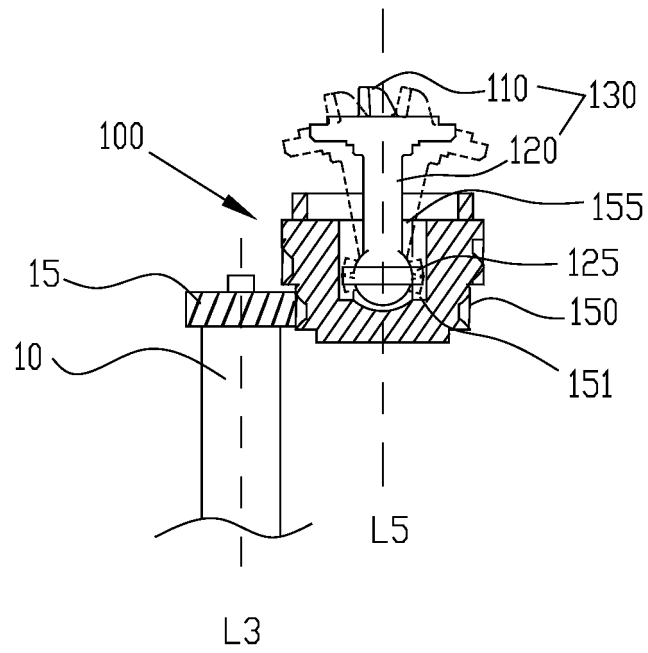


FIG. 6b

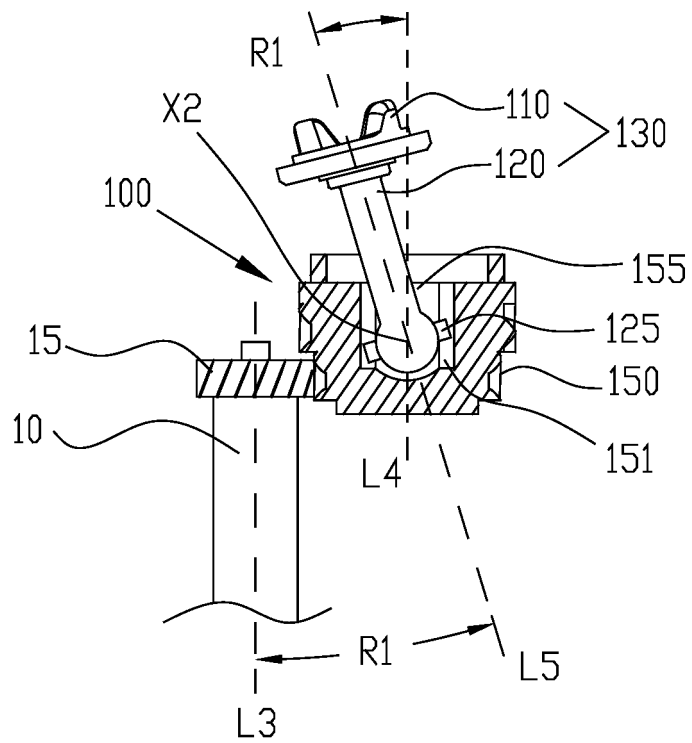


FIG. 7

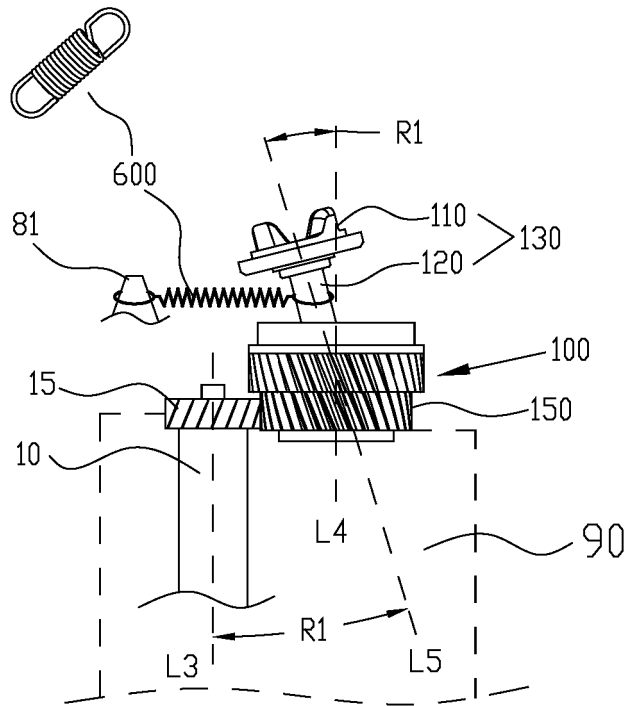


FIG. 8a

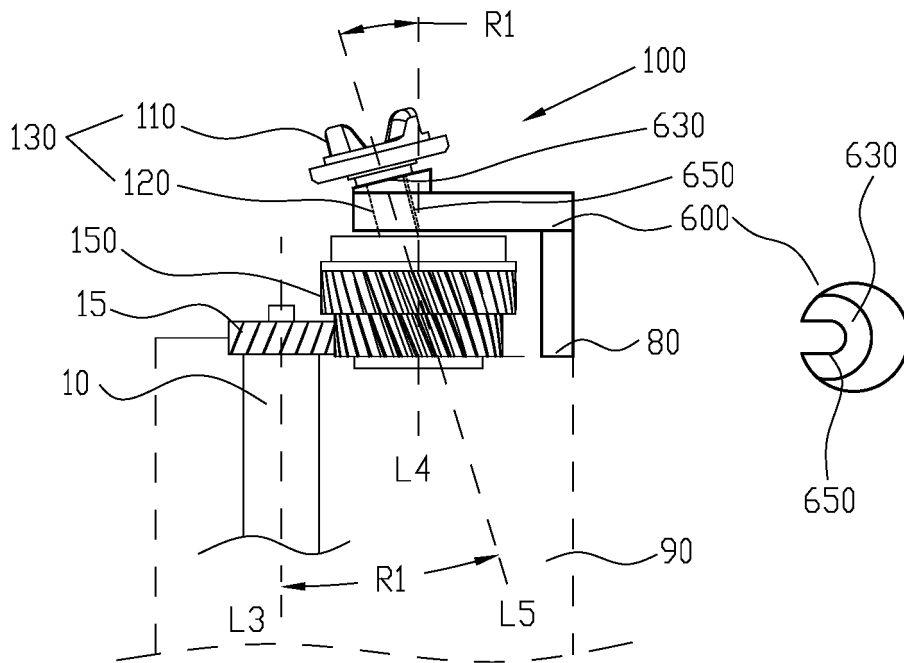


FIG. 8b

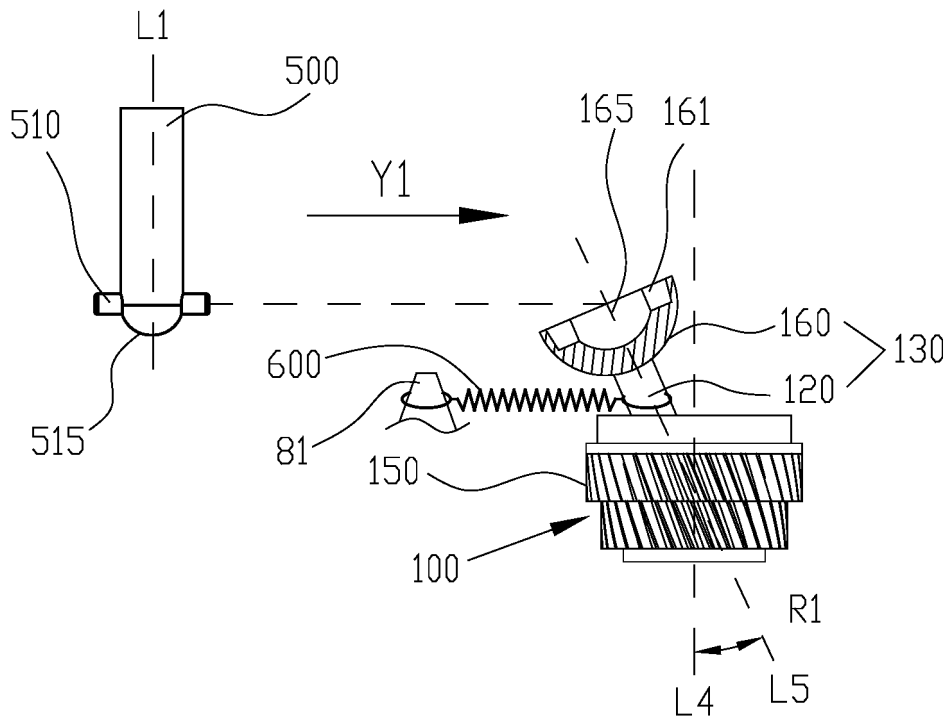


FIG. 11a

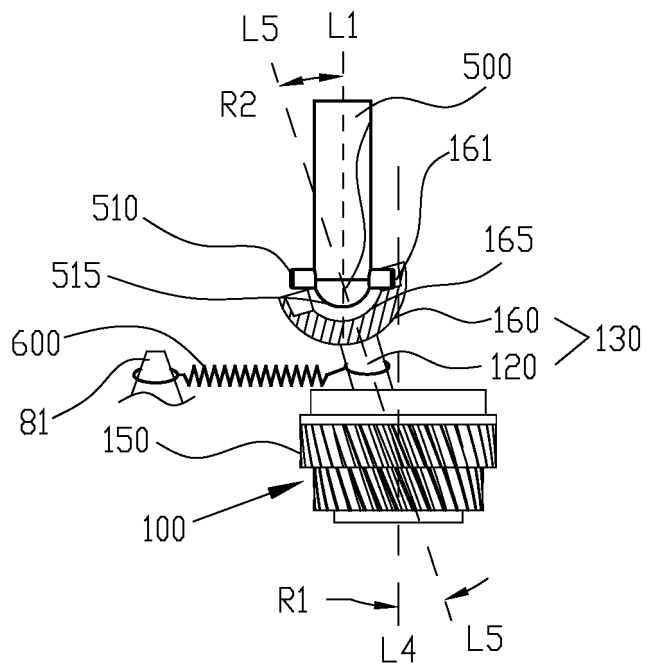


FIG. 11b

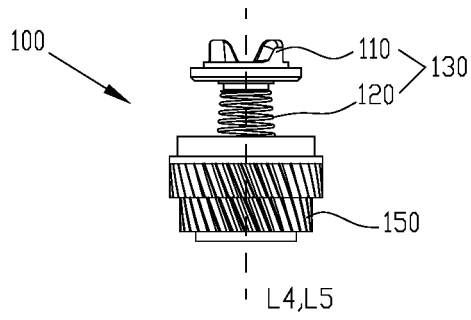


FIG.12a

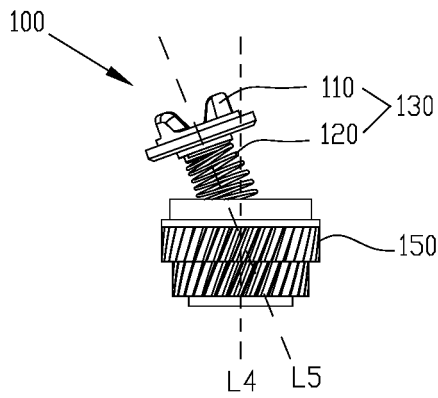


FIG.12b

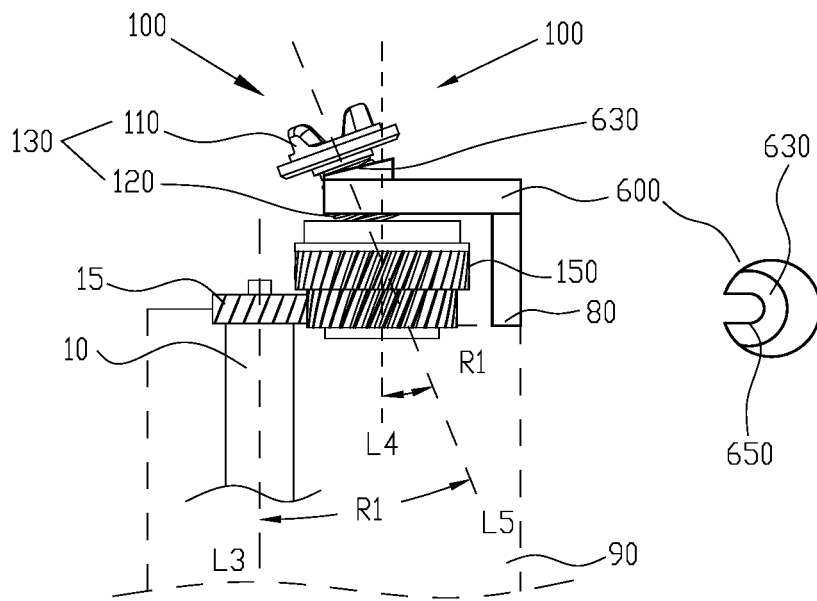


FIG.13

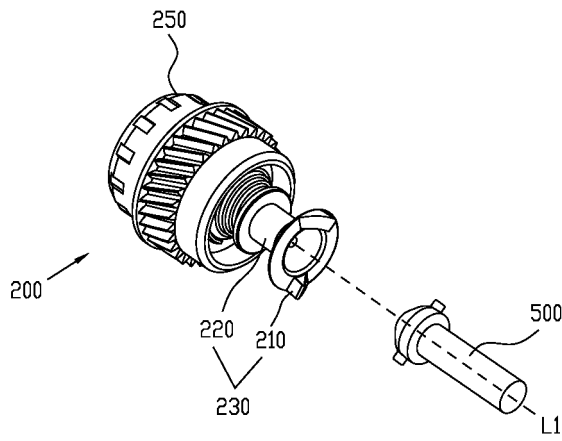


FIG. 14

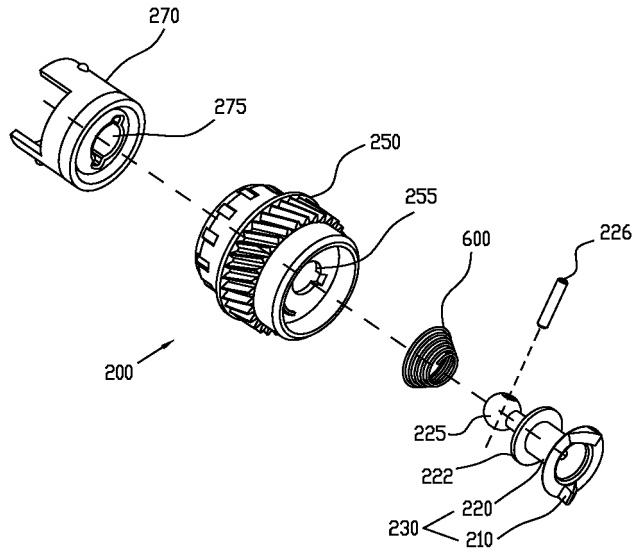


FIG. 15

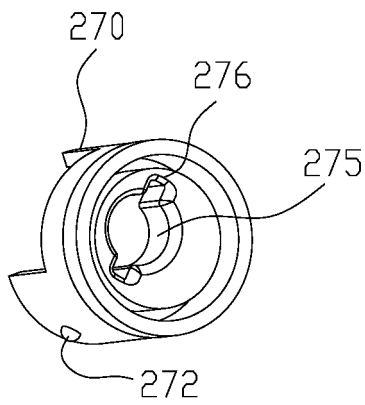


FIG. 16a

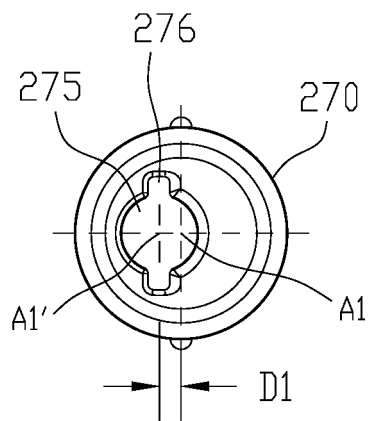


FIG. 16b

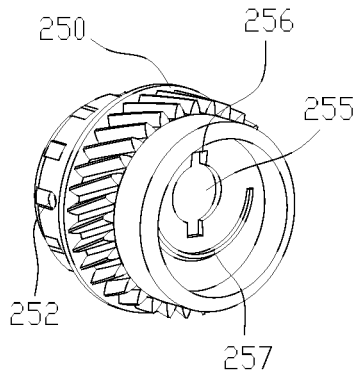


FIG.17a

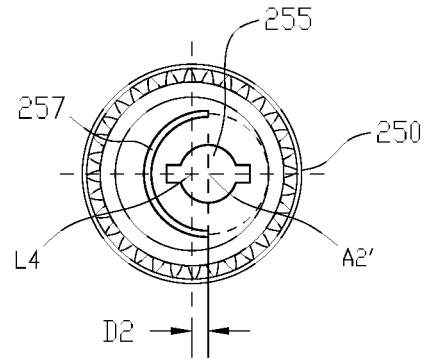


FIG.17b

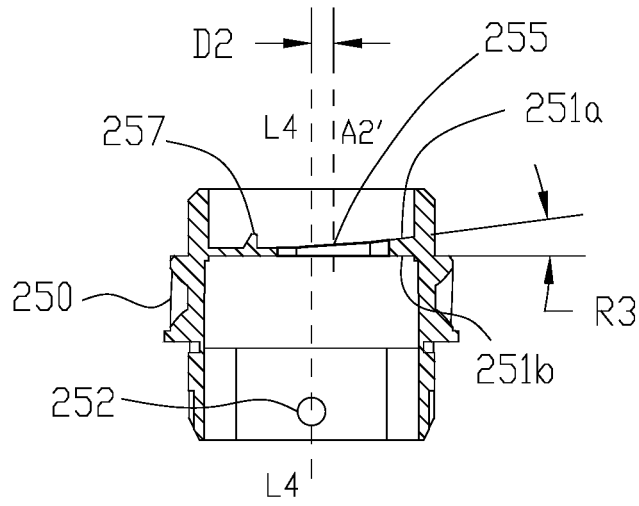


FIG.17c

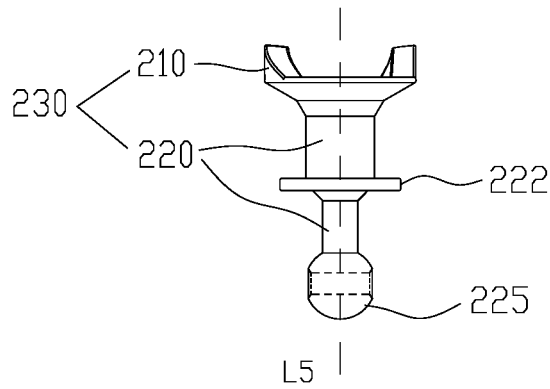


FIG.18

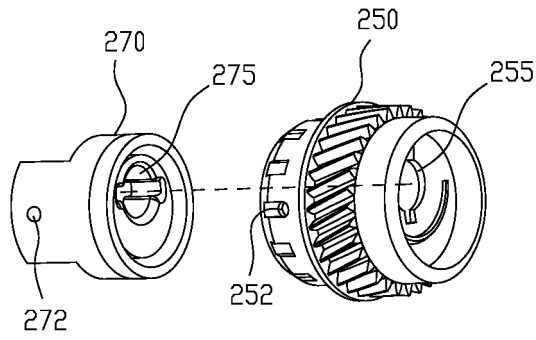


FIG. 19a

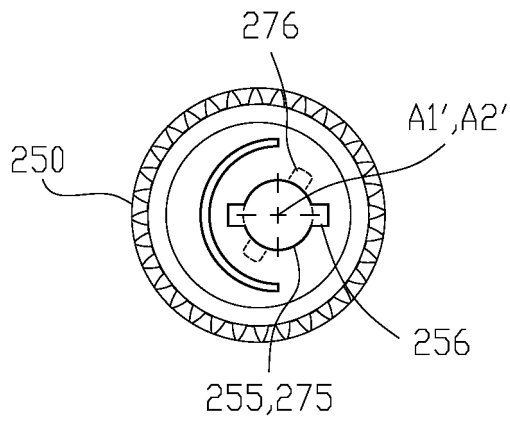


FIG. 19b

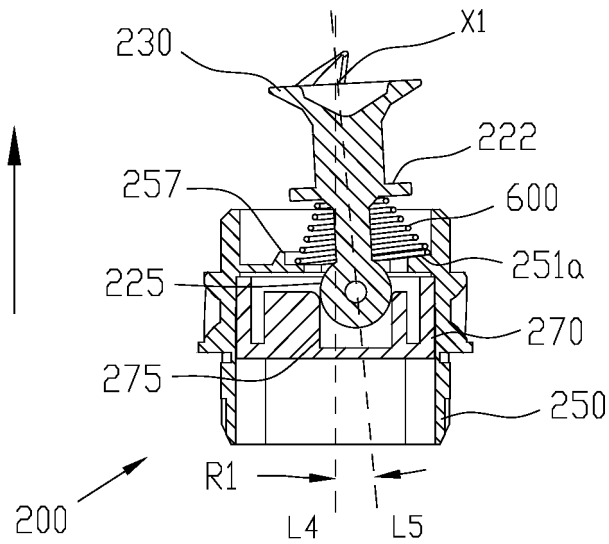


FIG. 20

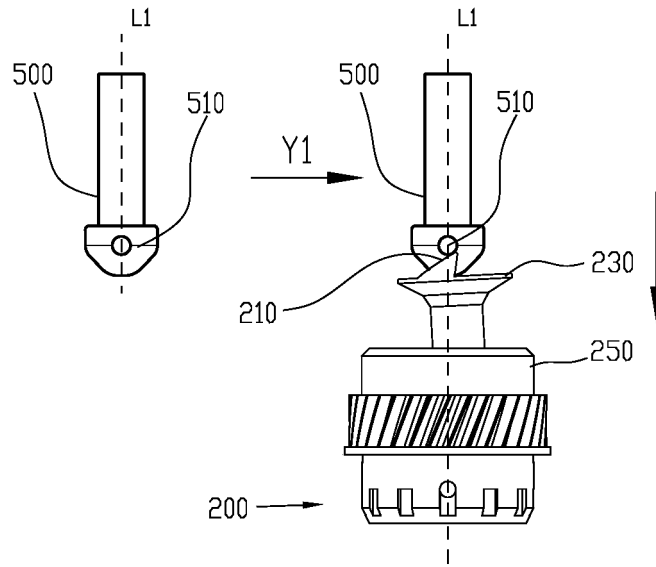


FIG.21a

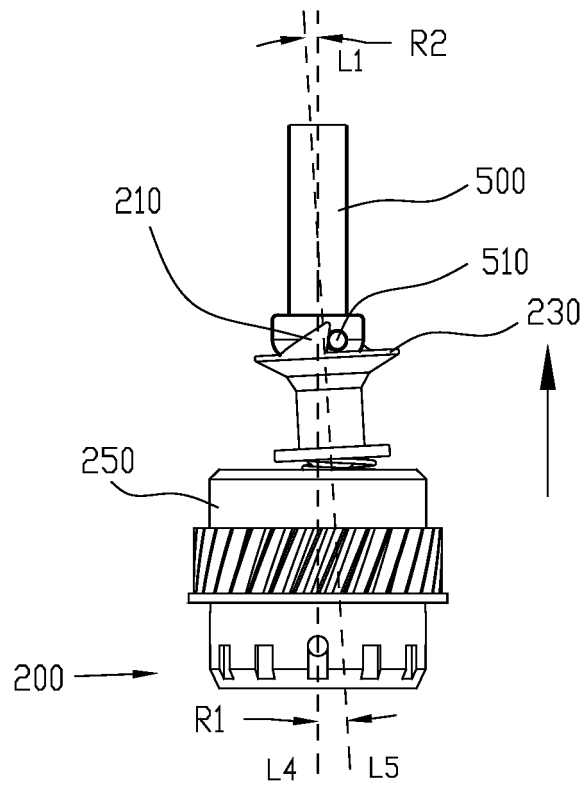


FIG.21b

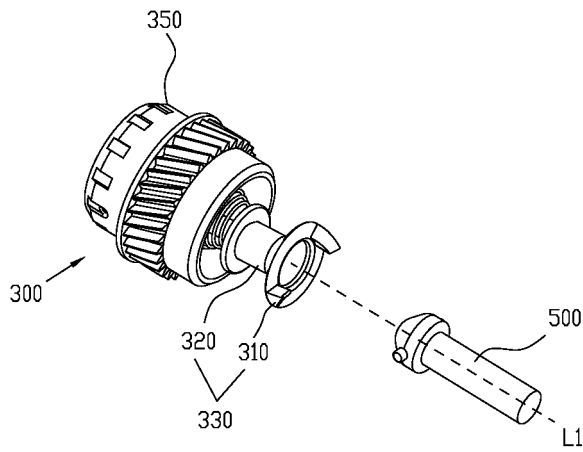


FIG. 22

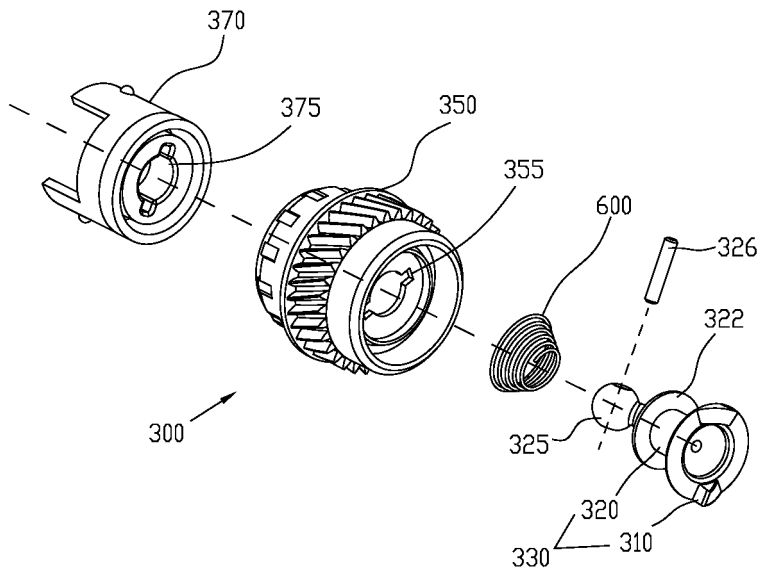


FIG. 23

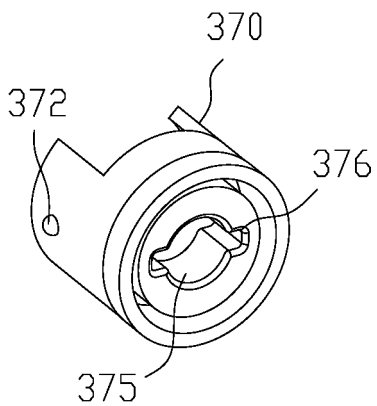


FIG. 24a

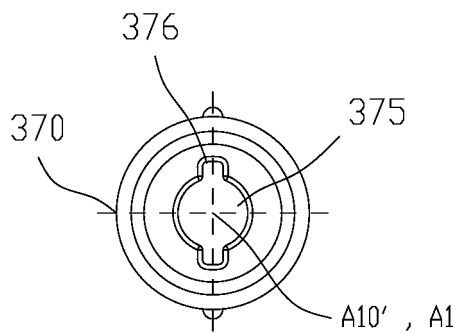


FIG. 24b

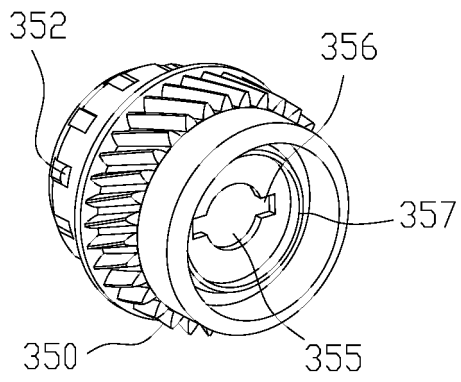


FIG. 25a

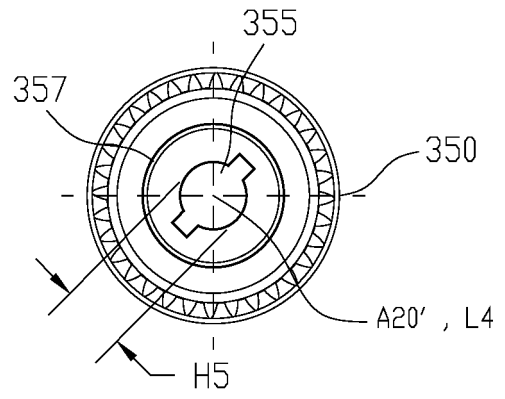


FIG. 25b

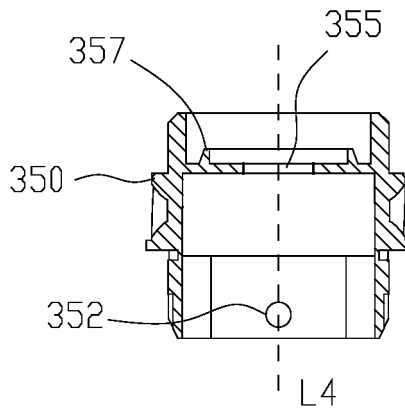


FIG. 25c

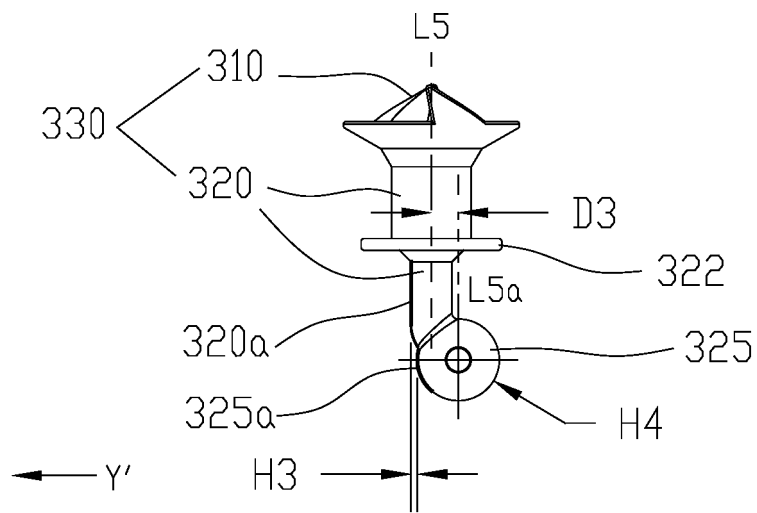


FIG. 26a

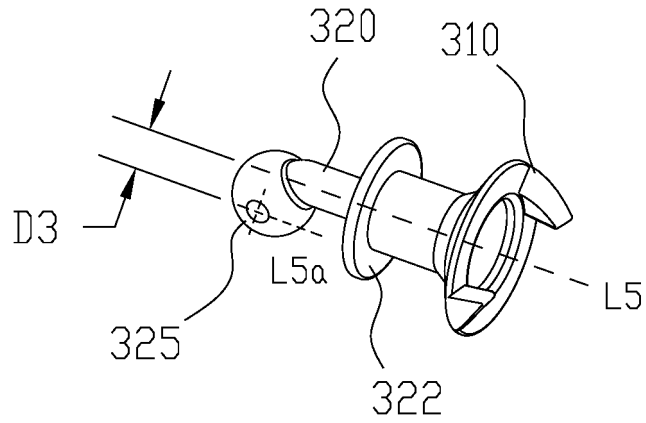


FIG. 26b

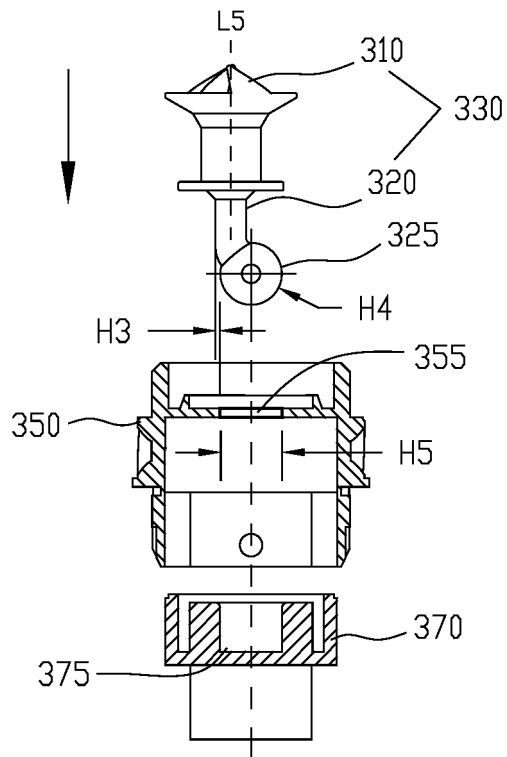


FIG. 27a

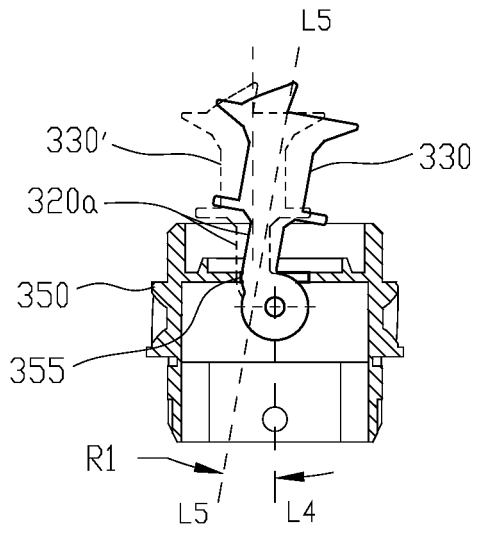


FIG. 27b

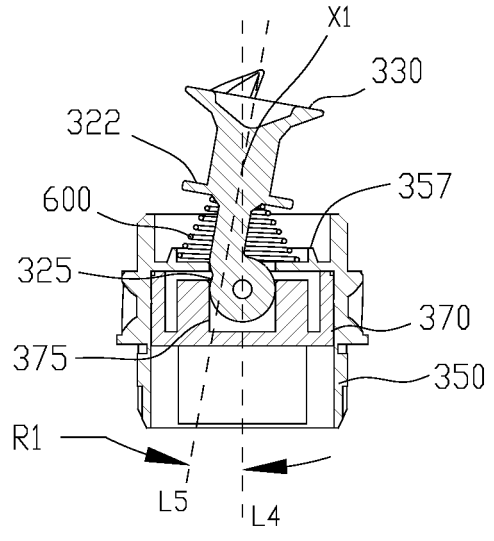


FIG. 28

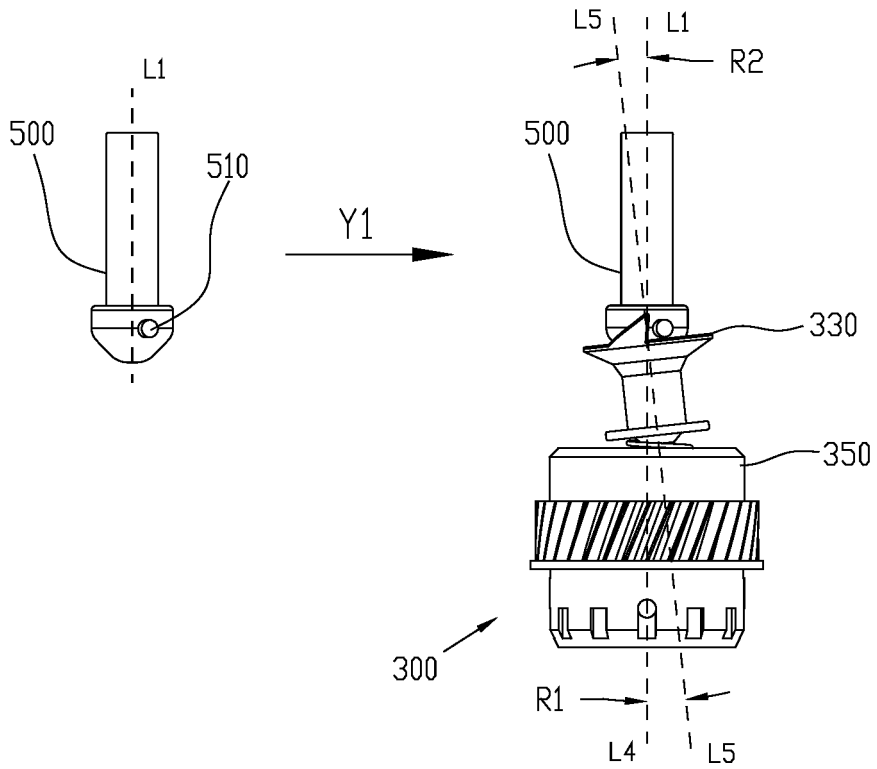


FIG. 29

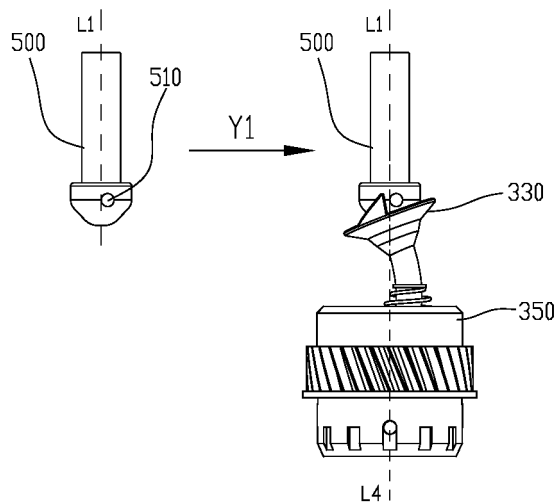
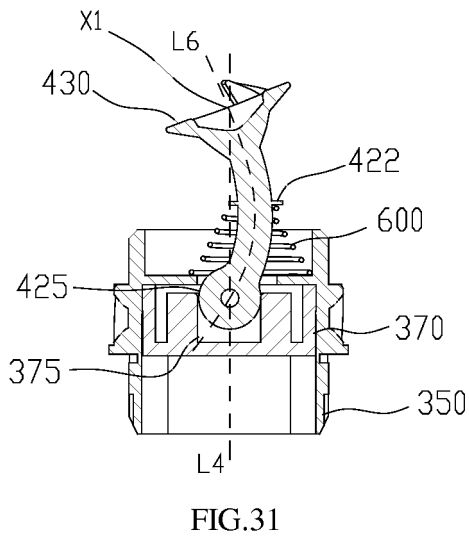
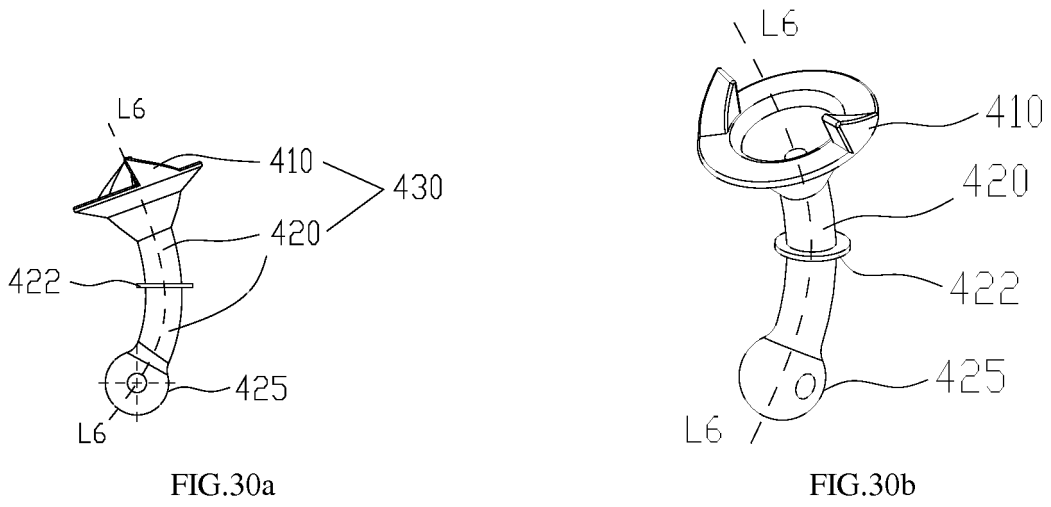


FIG. 32

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/078260

A. CLASSIFICATION OF SUBJECT MATTER

G03G 21/18 (2006.01) i; G03G 15/00 (2006.01) i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G03G15, G03G21

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, VEN: power, receive, transmission shaft, disassemble, assemble, drive, transfer, transmission, deliver, shaft, angle, incline

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 204009372 U (ZHUHAI SEINE TECHNOLOGY CO., LTD), 10 December 2014 (10.12.2014), description, paragraphs [0062]-[0064], and figures 21-22	1-6
A	CN 203573085 U (ZHUHAI KAIWEI HOUSE PURCHASING CO., LTD.), 30 April 2014 (30.04.2014), description, paragraph [0075], and figures 11a-12c	1-17
A	CN 103376683 A (GENERAL PLASTIC INDUSTRIAL CO., LTD.), 30 October 2013 (30.10.2013),	1-17
A	CN 101568887 A (CANON INC.), 28 October 2009 (28.10.2009), the whole document	1-17
A	CN 101819400 A (CANON INC.), 01 September 2010 (01.09.2010), the whole document	1-17
A	JP 2004045603 A (KONICA MINOLTA HOLDINGS INC.), 12 February 2004 (12.02.2004), the whole document	1-17

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
“E” earlier application or patent but published on or after the international filing date	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

04 August 2015 (04.08.2015)

Date of mailing of the international search report

12 August 2015 (12.08.2015)

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Authorized officer

QV, Yunxia

Telephone No.: (86-10) 62085878

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2015/078260

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2015/078260

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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101819400 A	01 September 2010	SG 190459 A1	28 June 2013
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		JP 5344580 B2	20 November 2013
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		JP 2010197893 A	09 September 2010
JP 2004045603 A	12 February 2004	US 8478166 B2	02 July 2013
		None	