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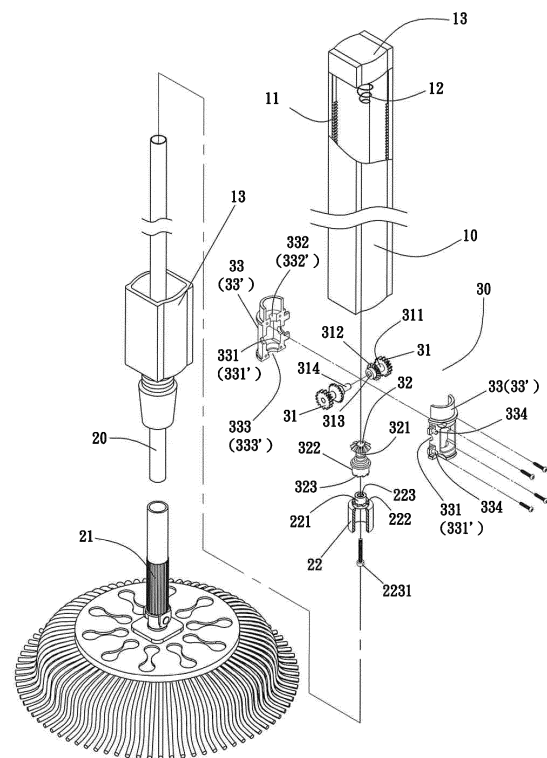
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(54) **Rotatable mop structure**

(57) The invention relates to a rotatable mop structure comprising a hollow outer rod (10), two rows of gear units being diagonally disposed on an inner wall of the outer rod (10); a hollow inner rod (20) with an outer diameter smaller than an inner diameter of the outer rod (10) being rotatably inserted into the outer rod, a mop disc (21) being coupled at a lower end of the inner rod (20); and a driving gear component (30) coupled with the gear units (11) and the inner rod (20) and being composed of a case for limitation of two driving gear elements (31) and a driven gear element (32), the two driving gear elements (31) being engaged with the two gear units (11), a small diameter quill (311) being extended from opposite ends of the two driving gear elements (31) respectively and an inner bevel gear being protrudingly disposed, a hole being disposed at a center of one of the inner bevel gears and a pole being disposed at a center of the other inner bevel gear (312) for inserting and supporting each other interactively, the driven gear element (32) being a bevel gear engaging with lower ends of the two inner bevel gears (312) and connected drivenly and downwardly to an upper end of the inner rod (20). Thereby, the two driving gear elements (31) can be reciprocally moved upward and downward along the gear units (11) by an external force to enable the driven gear element to be engaged and driven by the inner bevel gears (312) in order to drive the inner rod (20) to turn inside the outer rod (10), and therefore the mop disc (21) at the lower end can be swung to get dry.



**FIG. 1**

## Description

### BACKGROUND OF THE INVENTION

#### Field of Invention

[0001] The present invention relates to a rotatable mop structure and more particularly to a rotatable mop structure which can turn a mop by the disposition of a driving gear component in order to swing and dry the mop.

#### Related Art

[0002] A mop has always been a cleaning tool used for getting rid of dirt on floor. A conventional mop structure is commonly composed of a long rod handle and a base connected with a cleaning cloth or sponge. After the conventional mop has been washed clean, a user has to use both hands to squeeze out the water or operate a squeeze device disposed on top of the base in order to get rid of the water in the cleaning cloth or sponge. Getting rid of the water in such a way is a work load and rather troublesome for the user, especially for those who have sensitive skin will feel uncomfortable after contacting with the dirty water in the cleaning cloth or sponge. Furthermore, the way of squeezing out the water by both hands is inefficient. Therefore, for solving the above problem, there have been many different mops with improved structures introduced into the market. The most common mop is composed of a round cleaning cloth base and a bucket with a dewatering device. After the user has washed the mop, the mop is placed into the dewatering device in the bucket. Then, the dewatering device in the bucket is rotated in high speed electrically or by pressing with foot manually. Thereby, the water in the cleaning cloth or sponge can be got rid of by the centrifugal force created by high speed spinning of the dewatering device.

[0003] However, the above conventional mop with the dewatering device and bucket has to rely on the bucket with the dewatering device for performing dewatering by users; if the bucket with the dewatering device is damaged, the user has to use both hands to squeeze out the water for dewatering the cleaning cloth, which makes the mop no different from other conventional mops. As a result, the mop with the dewatering device and bucket has its disadvantages in usage which will cause inconvenience for users. Therefore, a rotatable mop structure of the present invention aims to improve the drawbacks of conventional mops.

### SUMMARY OF THE INVENTION

[0004] The present invention of a rotatable mop structure aims to solve the drawbacks and inconvenience in usage of the conventional mops.

[0005] A primary objective of the present invention is to provide a rotatable mop structure with rods and a mop disc coupled at a lower end which can be turned conveniently for getting rid of water by swinging.

iently for getting rid of water by swinging.

[0006] The rotatable mop structure of the present invention comprises a hollow outer rod, two rows of gear units being diagonally disposed on an inner wall of the outer rod; a hollow inner rod with an outer diameter smaller than an inner diameter of the outer rod being rotatably inserted into the outer rod, a mop disc being coupled at a lower end of the inner rod; and a driving gear component composed of a case for limitation of two driving gear elements and a driven gear element, the two driving gear elements being engaged with the two gear units, a small diameter quill being extended from opposite inner ends of the two driving gear elements respectively, an inner bevel gear being protrudingly disposed on inner ends of the small diameter quills respectively, a hole being disposed at a center of one of the inner bevel gears and a pole being disposed at a center of the other inner bevel gear for inserting and supporting each other interactively, the driven gear element being a bevel gear engaging with lower ends of the two inner bevel gears and connected drivenly and downwardly to an upper end of the inner rod, protruded portions being protrudingly disposed on a side of the case offsetting from the two gear units for pressing against the inner wall of the outer rod without the disposition of the gear units in order that the driving gear elements and the gear units being engaged with each other tightly. Thereby, the two driving gear elements can be reciprocally moved upward and downward along the gear units by an external force to enable the driven gear element to drive the inner rod to turn inside the outer rod.

[0007] Based on the above, in an embodiment of the invention the case of the driving gear component comprises two vertical tubular casings composed of two correspondingly assembled semi-cylindrical walls. Corresponding semi-circular grooves are disposed on a middle section of an outer wall of the two semi-cylindrical walls for forming two transverse holes for limiting and sleeving the small diameter quills of the two driving gear elements. An upper sleeve flange and a lower sleeve flange are respectively disposed on an upper section and a lower section of an inner side of the two semi-cylindrical walls for correspondingly forming an upper hole and a lower hole provided for limiting and sleeving the driven gear element. The protruded portions are protrudingly disposed on sides of the two semi-cylindrical walls offsetting from the two gear units for pressing against the inner wall of the outer rod.

[0008] Based on the above, in an embodiment of the invention the rotatable mop structure further comprises two end covers for sleeving and coupling on an upper end and a lower end of the outer rod respectively; a buffer spring being a coil spring disposed on an inner side of the end cover at the upper end of the outer rod for providing buffering effect between the driving gear component and the end cover when the driving gear component being moved upward; and an actuating end sleeve sleeved on an upper end of the inner rod for connecting

drivenly with a lower end of the driven gear element.

[0009] Based on the above, in an embodiment of the invention a small diameter quill sleeved inside the lower hole of the case is extended downwardly from the driven gear element and a driving sleeve is disposed at a lower end of the small diameter quill. A ratchet opening with unidirectional ratchets is formed at a lower end of the driving sleeve. A guiding bar is extended upwardly from the actuating end sleeve for sleeving and coupling with the driving sleeve. A ratchet base formed around an outer circumference on a lower section of the guiding bar is engaged drivenly with the ratchet opening of the driving sleeve. A central hole with a screw is disposed in the guiding bar. The screw is penetrated upwardly inside the actuating end sleeve and an end of the screw penetrated outside is connected with an inner end of the driving sleeve for engaging the ratchet opening with the ratchet base downwardly to perform unidirectional turning and enable the driven gear element to drive the driving sleeve upward in order to detach from engaging and stop driving.

[0010] Based on the above, in an embodiment of the invention an upper gear engaged with upper ends of the inner bevel gears of the two driving gear elements is further sleeved inside the upper hole of the case of the driving gear component.

[0011] Based on the above, in an embodiment of the invention spiral buffering slots are disposed on an outer wall of the guiding bar of the actuating end sleeve, and buffering pieces for correspondingly sliding in the buffering slots are protrudingly disposed on an inner wall of the driving sleeve of the driven gear element; thereby, the external force can be buffered by the above combination.

[0012] Based on the above, in an embodiment of the invention the spiral buffering slots are disposed on the inner wall of the driving sleeve of the driven gear element, and the buffering pieces for correspondingly sliding in the buffering slots are protrudingly disposed on the outer wall of the guiding bar of the actuating end sleeve; thereby, the external force can be buffered by the above combination.

[0013] The present invention will become more fully understood by reference to the following detailed description thereof when read in conjunction with the attached drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a perspective explosive view of a rotatable mop structure of the present invention;

Fig. 2 is a perspective assembled view of a driving gear component coupled on an upper end of an inner rod of the rotatable mop structure of the present invention;

Fig. 3 is a partially sectional, perspective assembled

view of the rotatable mop structure of the present invention;

Fig. 4 is a sectional view of the inner rod being driven and turned;

Fig. 5 is a sectional view of the inner rod being driven and turned in a direction through the driving gear component by pressing a buffer spring with an outer rod;

Fig. 6 is a sectional view of the outer rod being pulled upwardly in an opposite direction;

Fig. 7 is a schematic view of the rotatable mop structure of the present invention being turned and dewatered in a dewatering bucket;

Fig. 8 is a schematic view of the outer rod being arranged at the lower end and coupled with a mop disc according to an embodiment of the present invention;

Fig. 9 is a schematic view of the driving gear component additionally disposed with an upper gear for enhancing operational stability according to an embodiment of the present invention;

Fig. 10 is a perspective view of a guiding bar of an actuating end sleeve and a driving sleeve of a driven gear element additionally disposed with buffering structures according to an embodiment of the present invention;

Fig. 11 is a sectional assembled view of the guiding bar of the actuating end sleeve and the driving sleeve of the driven gear element additionally disposed with the buffering structures according to an embodiment of the present invention;

Fig. 12 is a perspective view of the guiding bar of the actuating end sleeve and the driving sleeve of the driven gear element additionally disposed with other buffering structures according to an embodiment of the present invention; and

Fig. 13 is a sectional assembled view of the guiding bar of the actuating end sleeve and the driving sleeve of the driven gear element additionally disposed with the other buffering structures according to an embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

[0015] Please refer to Figs. 1, 2 and 3. Fig. 1 is a perspective explosive view of a rotatable mop structure of the present invention; Fig. 2 is a perspective assembled view of a driving gear component coupled on an upper

end of an inner rod of the rotatable mop structure of the present invention; and Fig. 3 is a partially sectional, perspective assembled view of the rotatable mop structure of the present invention. The rotatable mop structure of the present invention mainly comprises an outer rod 10, an inner rod 20 and a driving gear component 30.

**[0016]** The outer rod 10 is a hollow rod and an opening is formed at a lower end. Two rows of gear units 11 are diagonally disposed on an inner wall of the outer rod 10. Two end covers 13 are respectively sleeved and coupled at an upper end and the lower end of the outer rod 10, and a buffer spring (a coil spring) 12 is disposed on an inner side of the end cover 13 at the upper end.

**[0017]** The inner rod 20 is a hollow rod with an outer diameter smaller than an inner diameter of the outer rod 10. The inner rod 20 is rotatably inserted into the outer rod 10 (the end cover 13 at the lower end), and a mop disc 21 is coupled at a lower end of the inner rod 20. An actuating end sleeve 22 is sleeved on an upper end of the inner rod 20. A guiding bar 221 is extended upwardly from the actuating end sleeve 22, and a ratchet base 222 with unidirectional ratchets (please refer to Fig. 10) is formed around an outer circumference on a lower section of the guiding bar 221. A central hole 223 with a screw 2231 is disposed in the guiding bar 221.

**[0018]** The driving gear component 30 is composed of a case 33' for limitation of two driving gear elements 31 and a driven gear element 32. The two driving gear elements 31 are engaged with the two gear units 11, and a small diameter quill 311 is extended from opposite inner ends of the two driving gear elements 31 respectively. An inner bevel gear 312 is protrudingly disposed on inner ends of the small diameter quills 311 respectively. A hole 313 is disposed at a center of one of the inner bevel gears 312 and a pole 314 is disposed at a center of the other inner bevel gear 312 for inserting and supporting each other interactively. The driven gear element 32 is a bevel gear engaging with lower ends of the two inner bevel gears 312. A small diameter quill 321 is extended downwardly from a lower end of the driven gear element 32 and a driving sleeve 322 is disposed at a lower end of the small diameter quill 321. A ratchet opening 323 with unidirectional ratchets is formed at a lower end of the driving sleeve 322. The case 33' is a vertical tubular casing composed of two correspondingly assembled semi-cylindrical walls 33. Corresponding semi-circular grooves 331 are disposed on a middle section of an outer wall of the two semi-cylindrical walls 33 for forming two transverse holes 331' for limiting and sleeving the small diameter quills 311 of the two driving gear elements 31. An upper sleeve flange 332 and a lower sleeve flange 333 are respectively disposed on an upper section and a lower section of an inner side of the two semi-cylindrical walls 33 for correspondingly forming an upper hole 332' and a lower hole 333' provided for limiting and sleeving the driven gear element 32. Protruded portions 334 are protrudingly disposed on sides of the two semi-cylindrical walls 33 offsetting from the two gear units 11 for pressing

against the inner wall of the outer rod 10 (please refer to Figs. 2 and 3).

**[0019]** Please refer to Fig. 4, which is a sectional view of the inner rod 20 being driven and turned. Based on the above structures and combinations, the actuating end sleeve 22 at the upper end of the inner rod 20 is inserted inside the end cover 13 (referring to Fig. 1) at the lower end of the outer rod 10. The screw 2231 is penetrated inside the actuating end sleeve 22 and an end of the screw 2231 penetrated outside is upwardly connected with an inner end of the driving sleeve 322 at the lower end of the driven gear element 32 for engaging the ratchet opening 323 with the ratchet base 222 downwardly to perform unidirectional turning and enable the driven gear element 32 to drive the driving sleeve 322 upward in order to detach from engaging and stop driving. After the case 33' is composed by the two semi-cylindrical walls 33, the two correspondingly formed transverse holes 331' (referring to Fig. 1) are provided for limiting and sleeving the small diameter quills 311 of the two driving gear elements 31 (referring to Fig. 1), and the correspondingly formed lower hole 333' is provided for limiting and sleeving the small diameter quill 321 of the driven gear element 32. The perspective assembled structures formed by coupling the driving gear component 30 on the upper end of the inner rod 20 is shown in Fig. 2.

**[0020]** Fig. 3 is a partially sectional, perspective assembled view of the rotatable mop structure of the present invention. The driving gear component 30 coupled on the upper end of the inner rod 20 is inserted inside the outer rod 10. The two driving gear elements 31 of the driving gear component 30 are engaged with the two gear units 11 diagonally disposed on the inner wall of the outer rod 10 for enabling the two driving gear elements 31 to move upward and downward reciprocally along the gear units 11 by an external force. The buffer spring 12 provides buffering effect when the driving gear component 30 is moved upward. Furthermore, the protruded portions 334 protrudingly disposed on the sides of the two semi-cylindrical walls 33 offsetting from the two gear units 11 are pressed against the inner wall of the outer rod 10 without the disposition of the gear units 11 for enabling the driving gear elements 31 and the gear units 11 to engage with each other tightly. Thereby, the rotatable mop structure is achieved.

**[0021]** Figs. 4 and 5 show how the inner rod is driven and turned. When the outer rod 10 is pushed downward, the gear units 11 moving downward (referring to Fig. 4) will drive the driving gear elements 31 of the driving gear component 30 and enable the inner bevel gears 312 to drive the driven gear element 32. Then, the ratchet opening 323 of the driving sleeve 322 at the lower end will engage with the ratchet base 222 of the actuating end sleeve 22 for driving the inner rod 20 to turn inside the outer rod 10 unidirectionally as indicated by arrows in the figures.

**[0022]** Fig. 6 is a sectional view of the outer rod 10 being pulled upwardly in an opposite direction. As men-

tioned above, the ratchet opening 323 of the driving sleeve 322 of the driven gear element 32 drives the ratchet base 222 of the actuating end sleeve 22 to turn unidirectionally. On the contrary, when the outer rod 10 is pulled upward, the gear units 11 moving upward will drive the driving gear elements 31 of the driving gear component 30 and enable the inner bevel gears 312 to drive the driven gear element 32; the ratchet opening 323 and the ratchet base 222 of the actuating end sleeve 22 will become idle and will not drive the inner rod 20.

**[0023]** Fig. 7 is a schematic view of the rotatable mop structure of the present invention being turned and dewatered in a dewatering bucket. As mentioned above, the inner rod 20 can be turned unidirectionally inside the outer rod 10. Thereby, the rotatable mop structure of the present invention can be turned unidirectionally in a dewatering bucket 41 of a water bucket 40 for getting rid of the water by swinging conveniently.

**[0024]** Fig. 8 is a schematic view of the outer rod 10 being arranged at the lower end and coupled with the mop disc 21 according to an embodiment of the present invention. The outer rod 10 can be arranged at the lower end and coupled with the mop disc 21 for composing the rotatable mop structure disposed with a reverse combination.

**[0025]** Fig. 9 is a schematic view of the driving gear component additionally disposed with an upper gear for enhancing operational stability according to an embodiment of the present invention. An upper gear 34 engaged with upper ends of the inner bevel gears 312 of the two driving gear elements 31 is further sleeved inside the upper hole 332' of the case 33' composed of the two semi-cylindrical walls 33 of the driving gear component 30 for enhancing operational stability of the driving gear component 30 driving the inner rod 20.

**[0026]** Figs. 10 and 11 are respectively perspective view and sectional assembled view of the guiding bar of the actuating end sleeve and the driving sleeve of the driven gear element additionally disposed with buffering structures according to an embodiment of the present invention. Spiral buffering slots 224 are disposed on an outer wall of the guiding bar 221 of the actuating end sleeve 22, and buffering pieces 324 for correspondingly sliding in the buffering slots 224 are protrudingly disposed on an inner wall of the driving sleeve 322 of the driven gear element 32. Thereby, as shown in Fig. 11, the buffering pieces 324 sliding in the buffering slots 224 can provide buffering effect for the external force.

**[0027]** Figs. 12 and 13 are respectively perspective view and sectional assembled view of the guiding bar of the actuating end sleeve and the driving sleeve of the driven gear element additionally disposed with other buffering structures according to an embodiment of the present invention. Spiral buffering slots 325 are disposed on the inner wall of the driving sleeve 322 of the driven gear element 32, and buffering pieces 225 for correspondingly sliding in the buffering slots 325 are protrudingly disposed on the outer wall of the guiding bar 221

of the actuating end sleeve 22 for providing buffering effect for the external force.

**[0028]** As a conclusion from the above, the rotatable mop structure of the present invention can turn the mop by the disposition of the driving gear component in order to swing and dry the mop.

**[0029]** Note that the specifications relating to the above embodiments should be construed as exemplary rather than as limitative of the present invention, with many variations and modifications being readily attainable by a person of average skill in the art without departing from the spirit or scope thereof as defined by the appended claims and their legal equivalents.

## Claims

### 1. A rotatable mop structure comprising:

a hollow outer rod (10), two rows of gear units being diagonally disposed on an inner wall of the outer rod (10);

a hollow inner rod (20) with an outer diameter smaller than an inner diameter of the outer rod (10) rotatably inserted into the outer rod, a mop disc (21) being coupled at a lower end of the inner rod (20); and

a driving gear component (30) composed of a case for limitation of two driving gear elements (31) and a driven gear element (32), the two driving gear elements (32) being engaged with the two gear units (11), a small diameter quill (311) being extended from opposite inner ends of the two driving gear elements (31) respectively, an inner bevel gear (312) being protrudingly disposed on inner ends of the small diameter quills (311) respectively, a hole (313) being disposed at a center of one of the inner bevel gears (312) and a pole (314) being disposed at a center of the other inner bevel gear (312) for inserting and supporting each other interactively, the driven gear element (32) being a bevel gear engaging with lower ends of the two inner bevel gears (312) and connected drivenly and downwardly to an upper end of the inner rod (20), protruded portions being protrudingly disposed on a side of the case offsetting from the two gear units (11) for pressing against the inner wall of the outer rod (10) without the disposition of the gear units (11) in order that the driving gear elements (31) and the gear units (11) being engaged with each other tightly for enabling the two driving gear elements (31) to move reciprocally upward and downward along the gear units by an external force and enabling the driven gear element (31) to drive the inner rod (20) to turn inside the outer rod (10).

2. The rotatable mop structure as claimed in Claim 1, wherein the case of the driving gear component (30) comprises two vertical tubular casings composed of two correspondingly assembled semi-cylindrical walls (33), corresponding semi-circular grooves (331) are disposed on a middle section of an outer wall of the two semi-cylindrical walls (33) for forming two transverse holes (331') for limiting and sleeving the small diameter quills (311) of the two driving gear elements (31), an upper sleeve flange (332) and a lower sleeve flange (333) are respectively disposed on an upper section and a lower section of an inner side of the two semi-cylindrical walls (33) for correspondingly forming an upper hole (332') and a lower hole (333') provided for limiting and sleeving the driven gear element (32), the protruded portions are protrudingly disposed on the side of the two semi-cylindrical walls (33) offsetting from the two gear units (11) for pressing against the inner wall of the outer rod (10).
  3. The rotatable mop structure as claimed in Claim 2, wherein further comprises:
    - two end covers (13) for sleeving and coupling on an upper end and a lower end of the outer rod (10) respectively;
    - a buffer spring (12) being a coil spring disposed on an inner side of the end cover (13) at the upper end of the outer rod (10) for providing buffering effect between the driving gear component (30) and the end cover (13) when the driving gear component (30) is moved upward; and
    - an actuating end sleeve (22) sleeved on an upper end of the inner rod (20) for connecting drivenly and turnably with a lower end of the driven gear element (32).
  4. The rotatable mop structure as claimed in Claim 3, wherein a small diameter quill (311) sleeved inside the lower hole (333') of the case is extended downwardly from the driven gear element (32) and a driving sleeve (322) is disposed at a lower end of the small diameter quill (311), a ratchet opening (323) with unidirectional ratchets is formed at a lower end of the driving sleeve (322), a guiding bar (221) is extended upwardly from the actuating end sleeve (22) for sleeving and coupling with the driving sleeve (322), a ratchet base (222) formed around an outer circumference on a lower section of the guiding bar (221) is engaged drivenly with the ratchet opening (323) of the driving sleeve (322), a central hole (223) with a screw (2231) is disposed in the guiding bar (221), the screw (2231) is penetrated upwardly inside the actuating end sleeve (22) and an end of the screw (2231) penetrated outside is connected with an inner end of the driving sleeve (322) for engaging the ratchet opening (323) with the ratchet base (222) downwardly to perform unidirectional turning and enable the driven gear element (32) to drive the driving sleeve (322) upward in order to detach from engaging and stop driving.
5. The rotatable mop structure as claimed in Claim 2, 3 or 4, wherein an upper gear (34) engaged with upper ends of the inner bevel gears (312) of the two driving gear elements (31) is further sleeved inside the upper hole (332') of the case of the driving gear component (30).
6. The rotatable mop structure as claimed in Claim 4, wherein spiral buffering slots (325) are disposed on an outer wall of the guiding bar (221) of the actuating end sleeve (22), and buffering pieces (225) for correspondingly sliding in the buffering slots (325) are protrudingly disposed on an inner wall of the driving sleeve (322) of the driven gear element (32) for providing buffering effect for an external force.
7. The rotatable mop structure as claimed in Claim 4, wherein the spiral buffering slots (325) are disposed on the inner wall of the driving sleeve (322) of the driven gear element (32), and the buffering pieces (225) for correspondingly sliding in the buffering slots (325) are protrudingly disposed on the outer wall of the guiding bar (221) of the actuating end sleeve (22) for providing buffering effect for the external force.

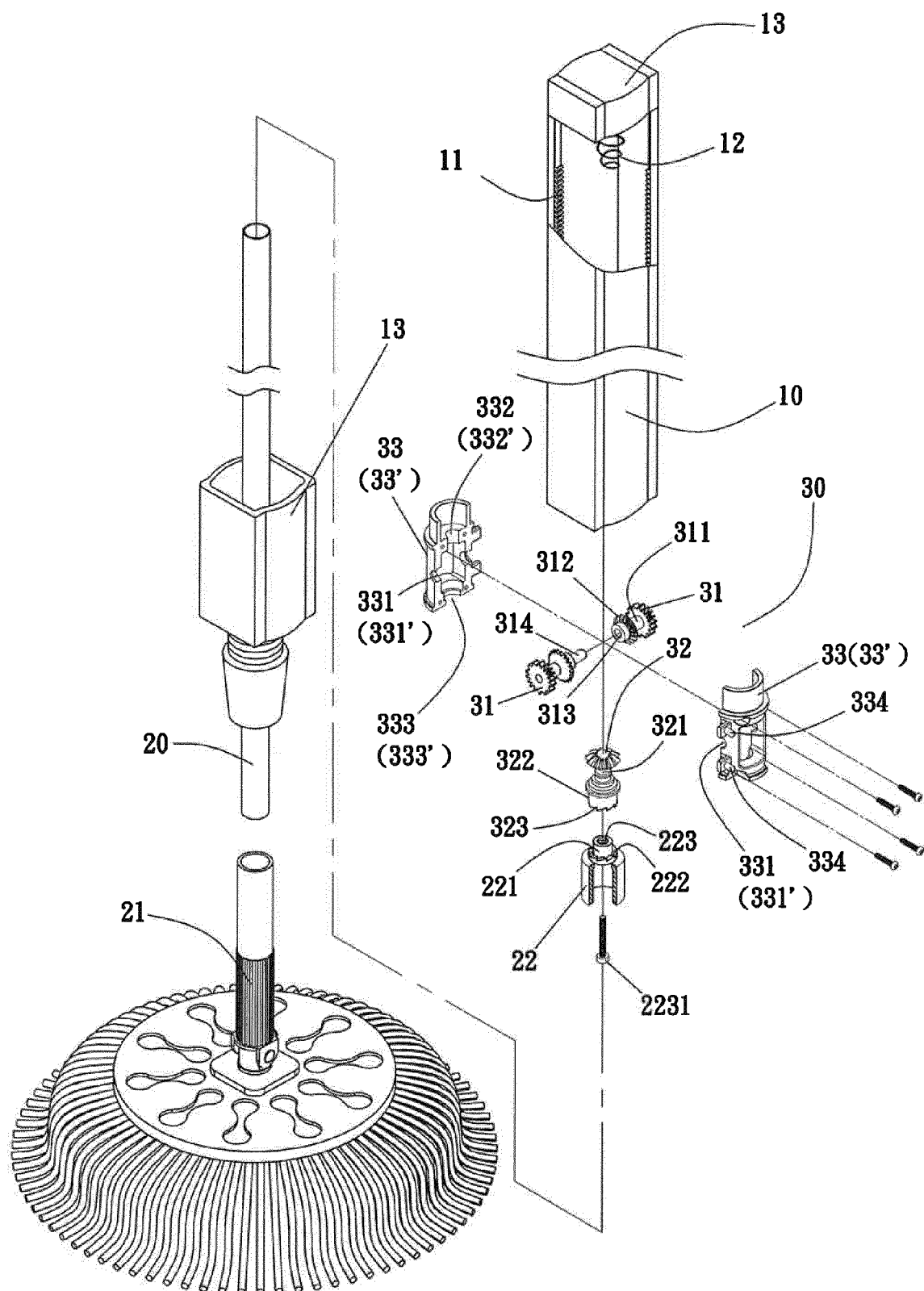


FIG. 1

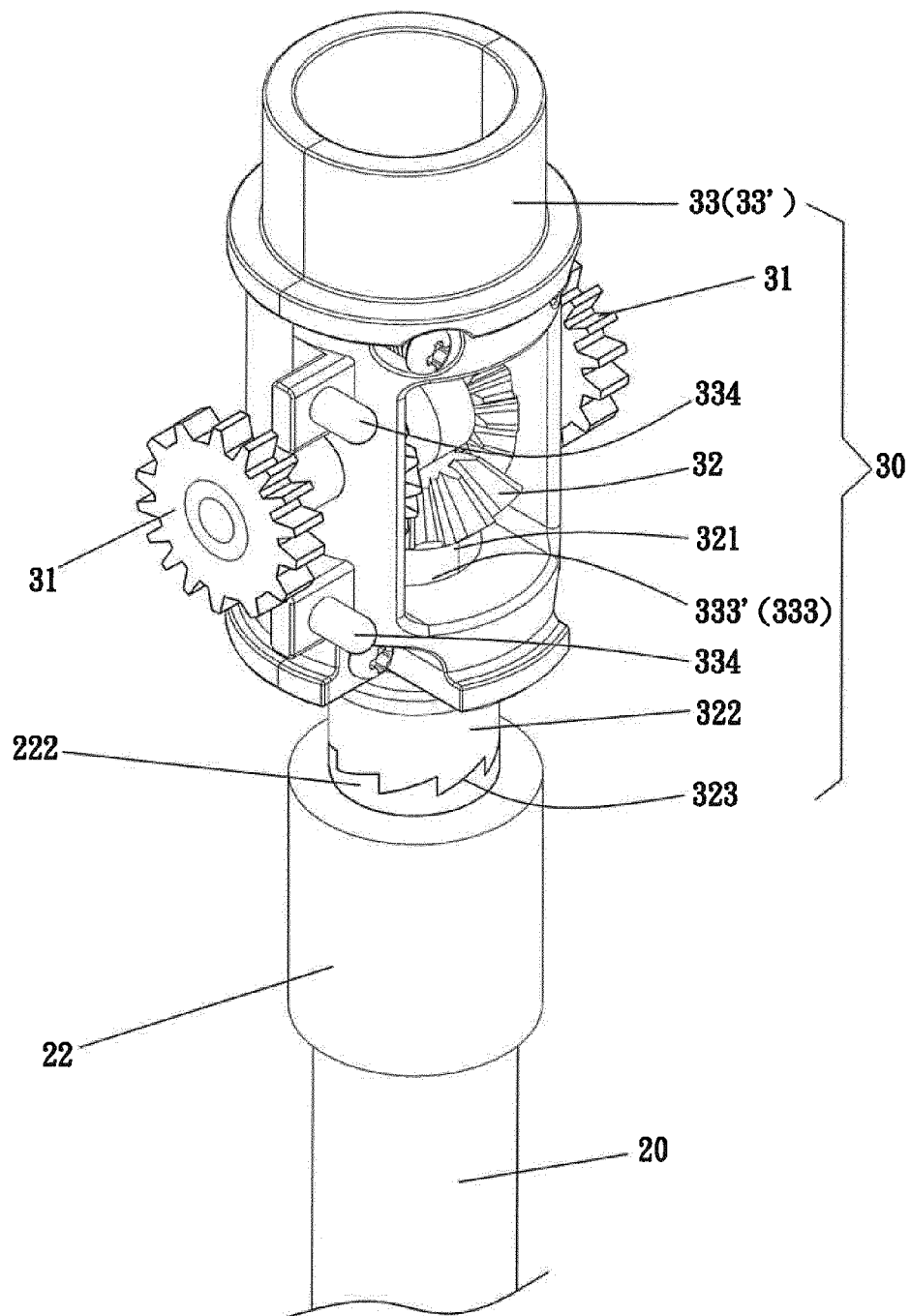


FIG. 2



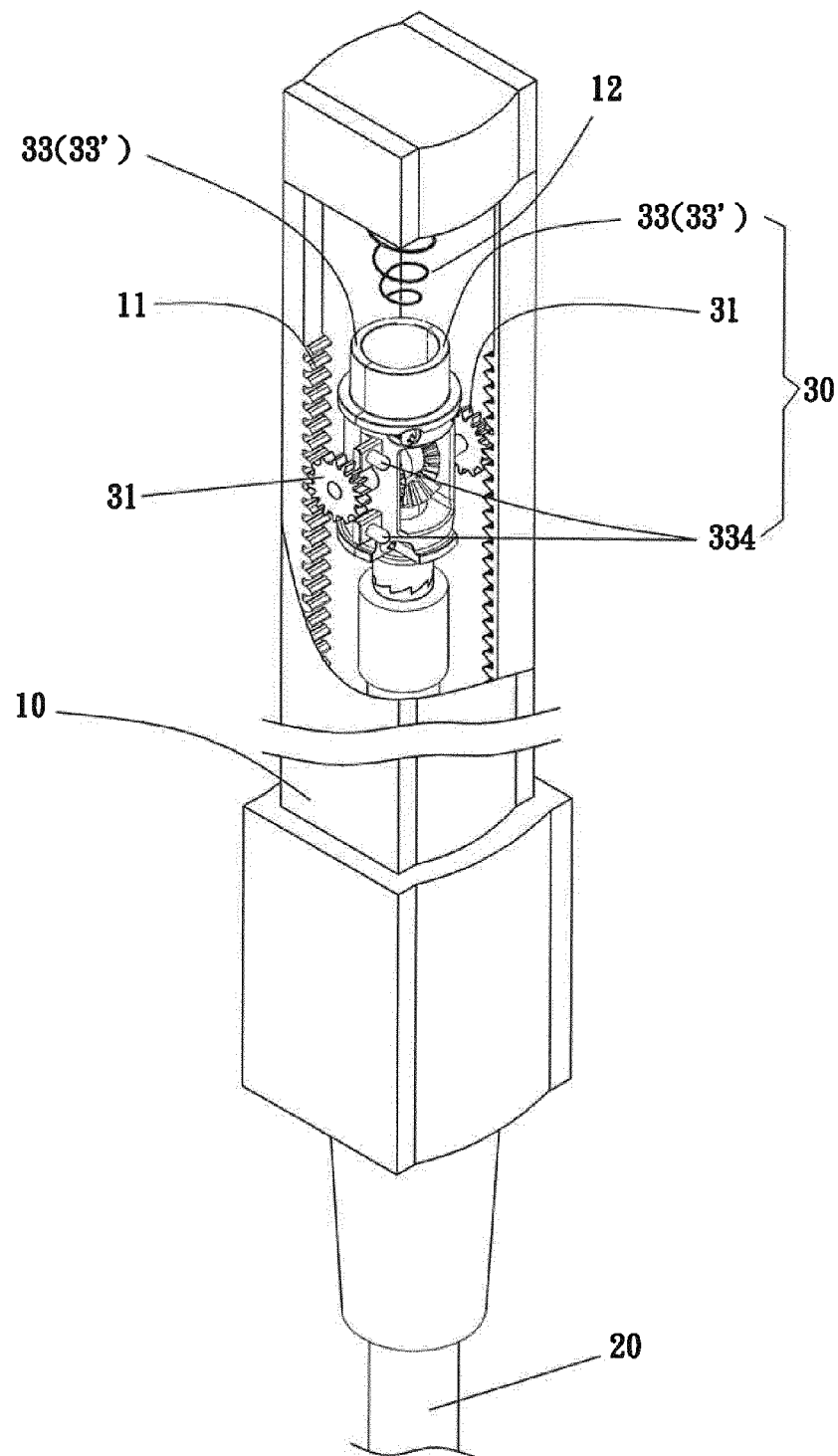


FIG. 3

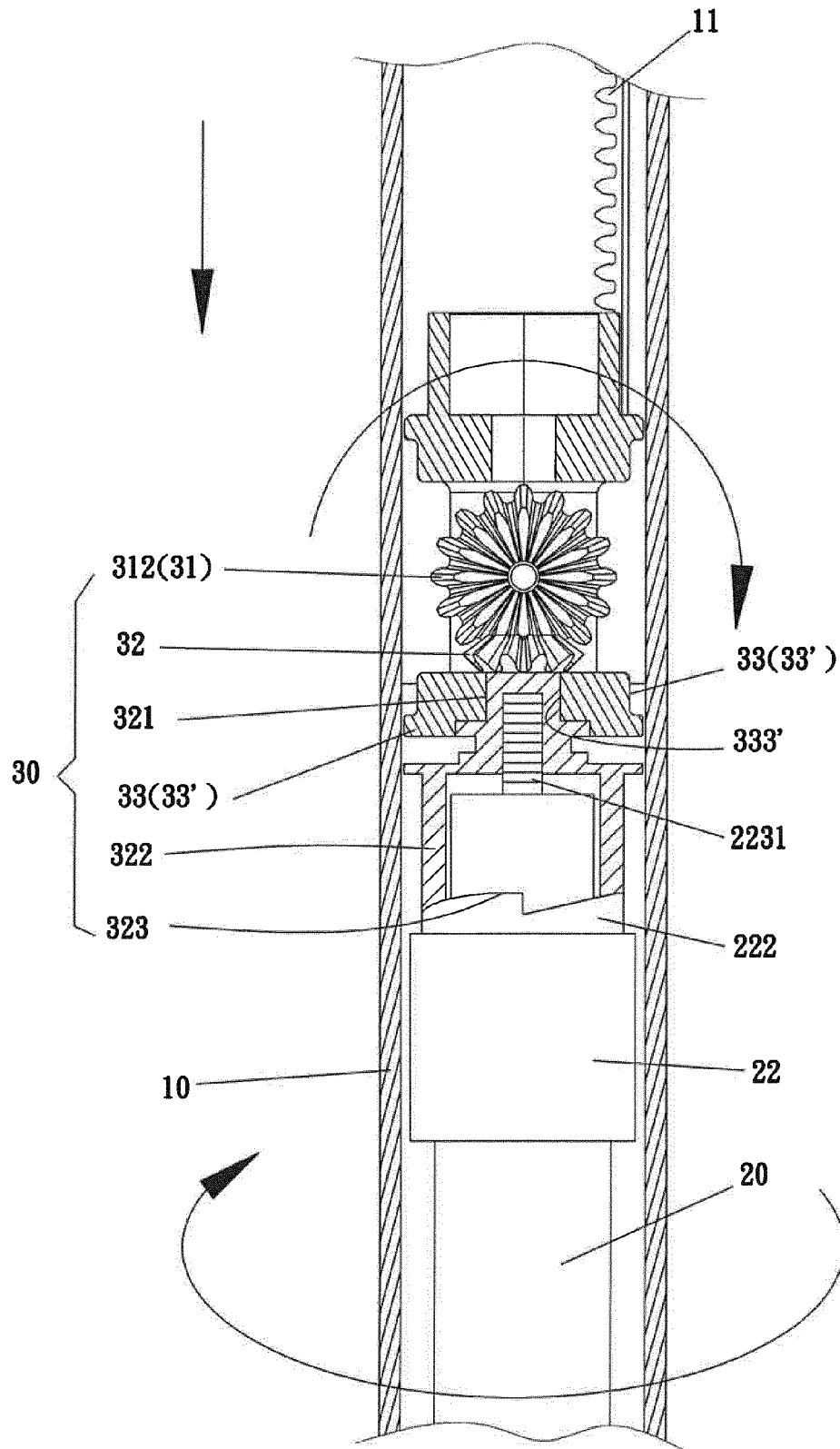


FIG. 4

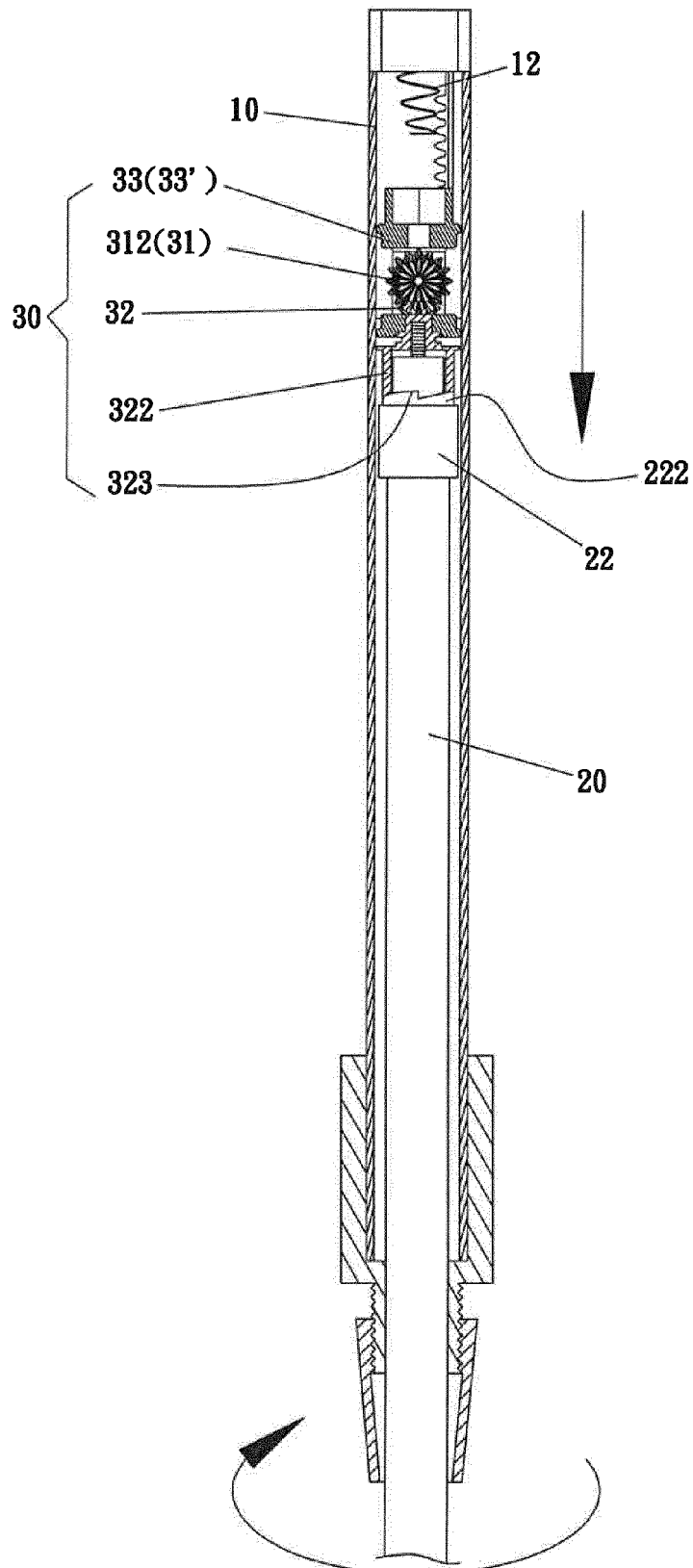


FIG. 5

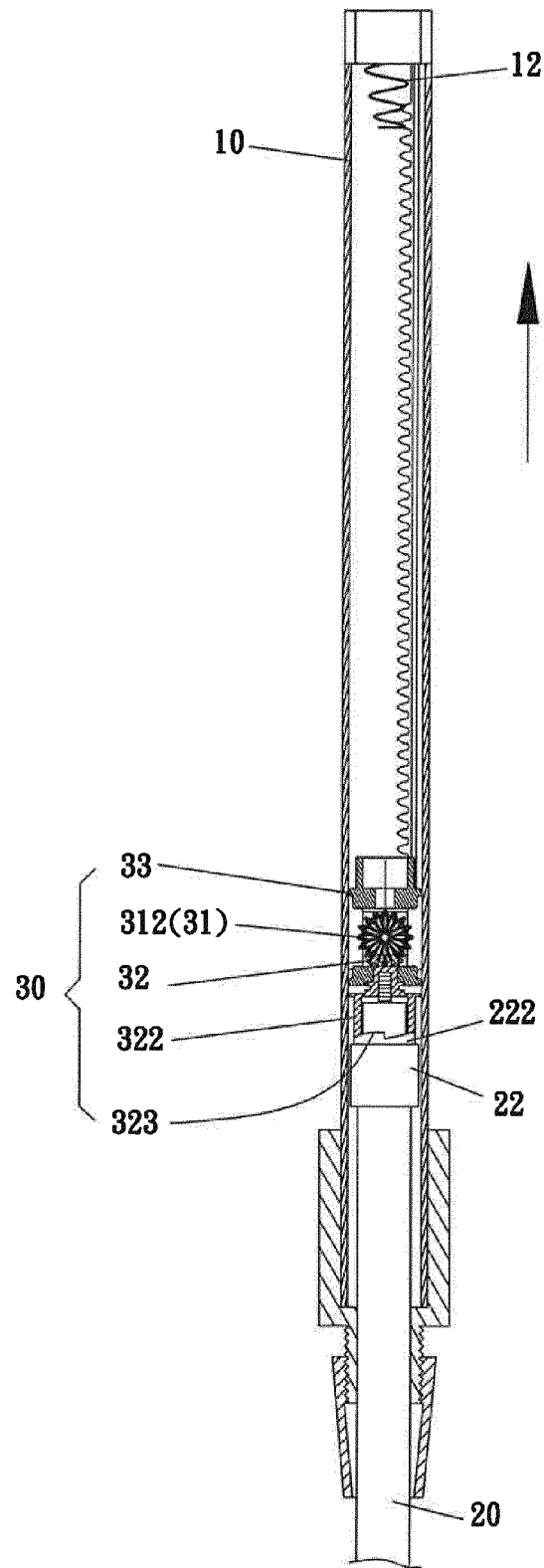


FIG. 6

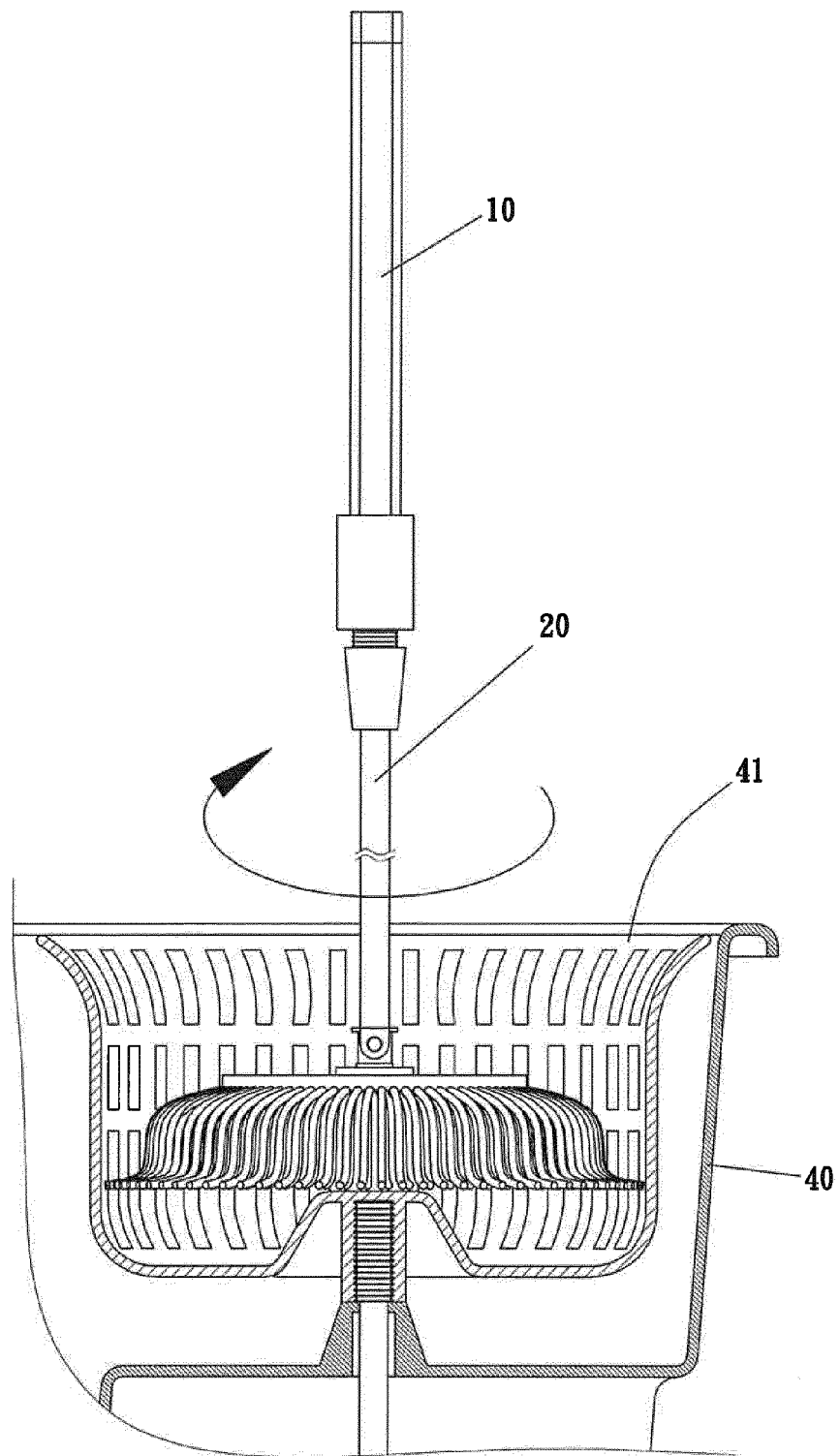


FIG. 7

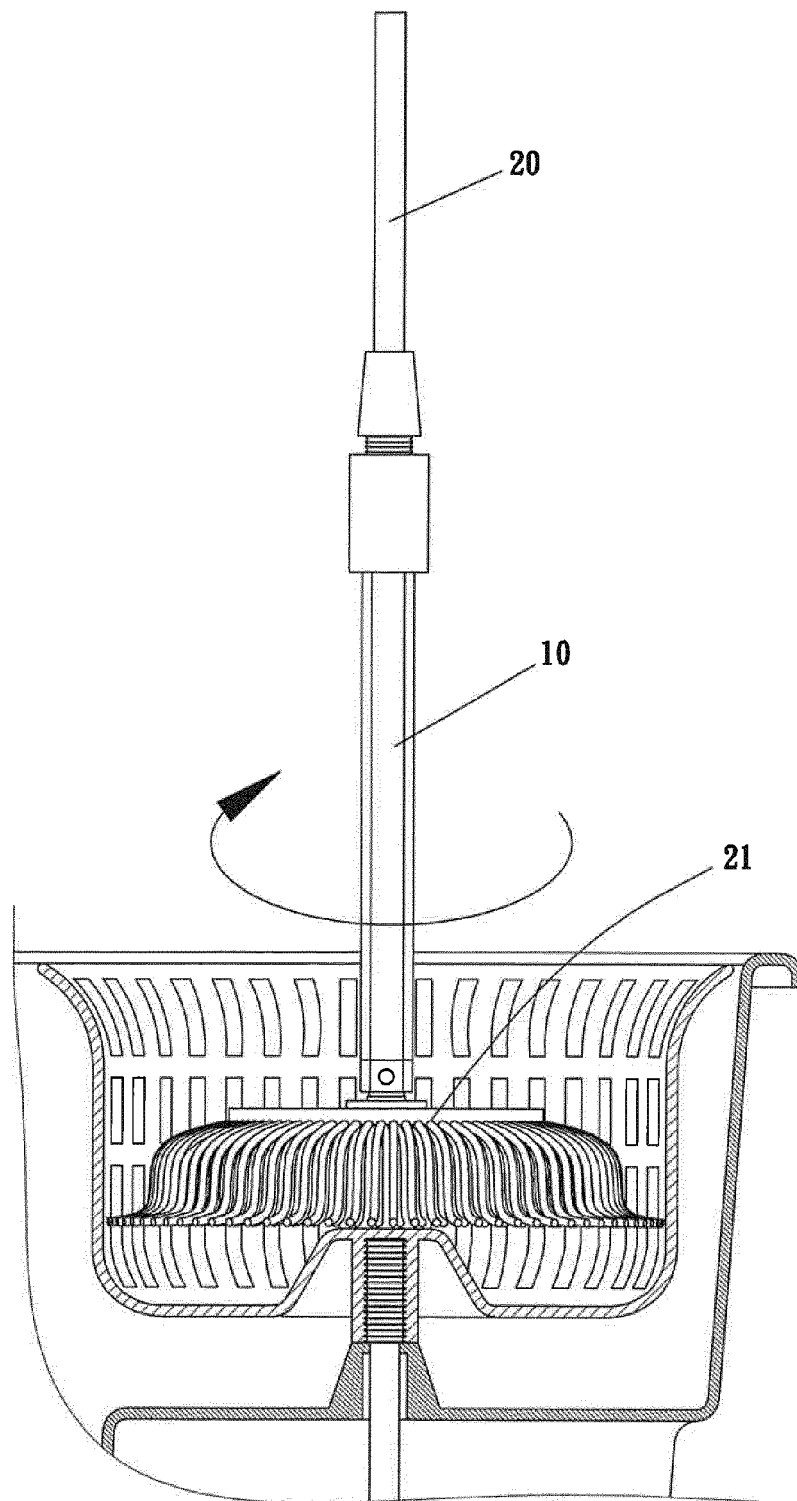


FIG. 8

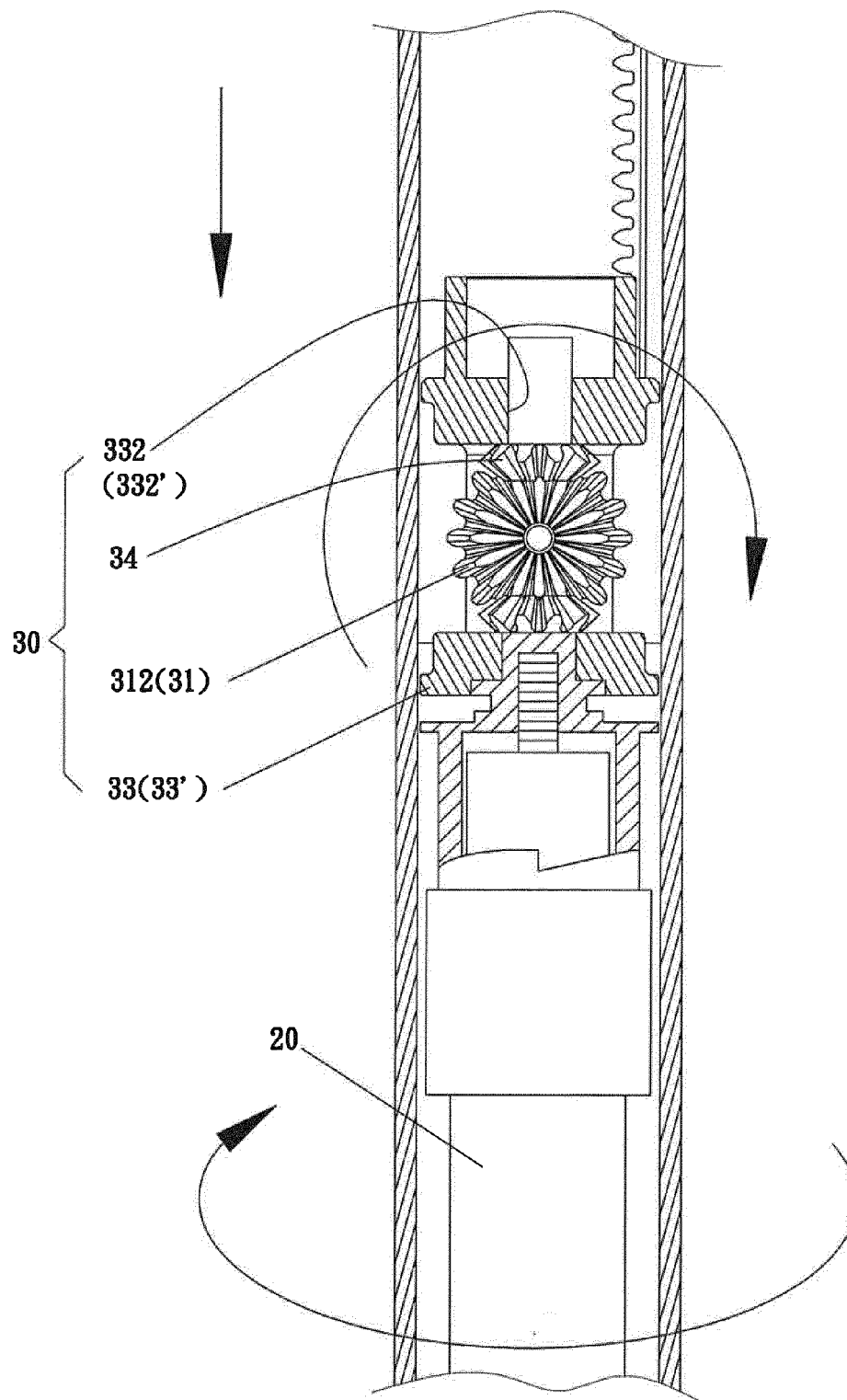


FIG. 9

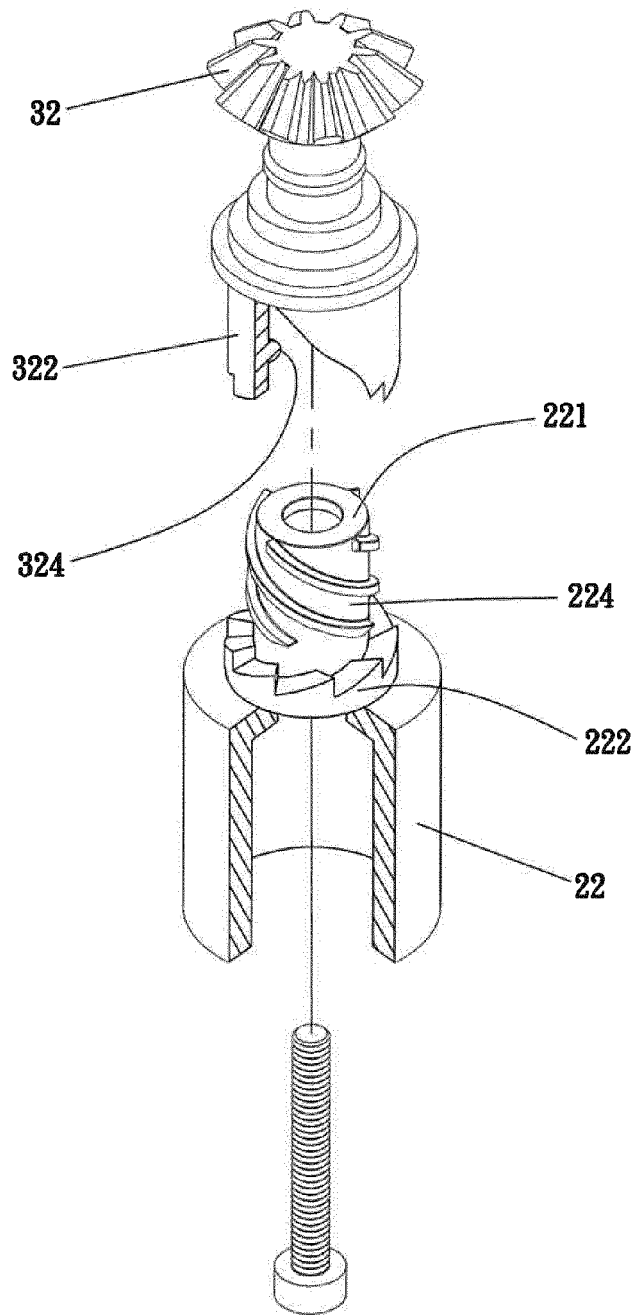


FIG. 10



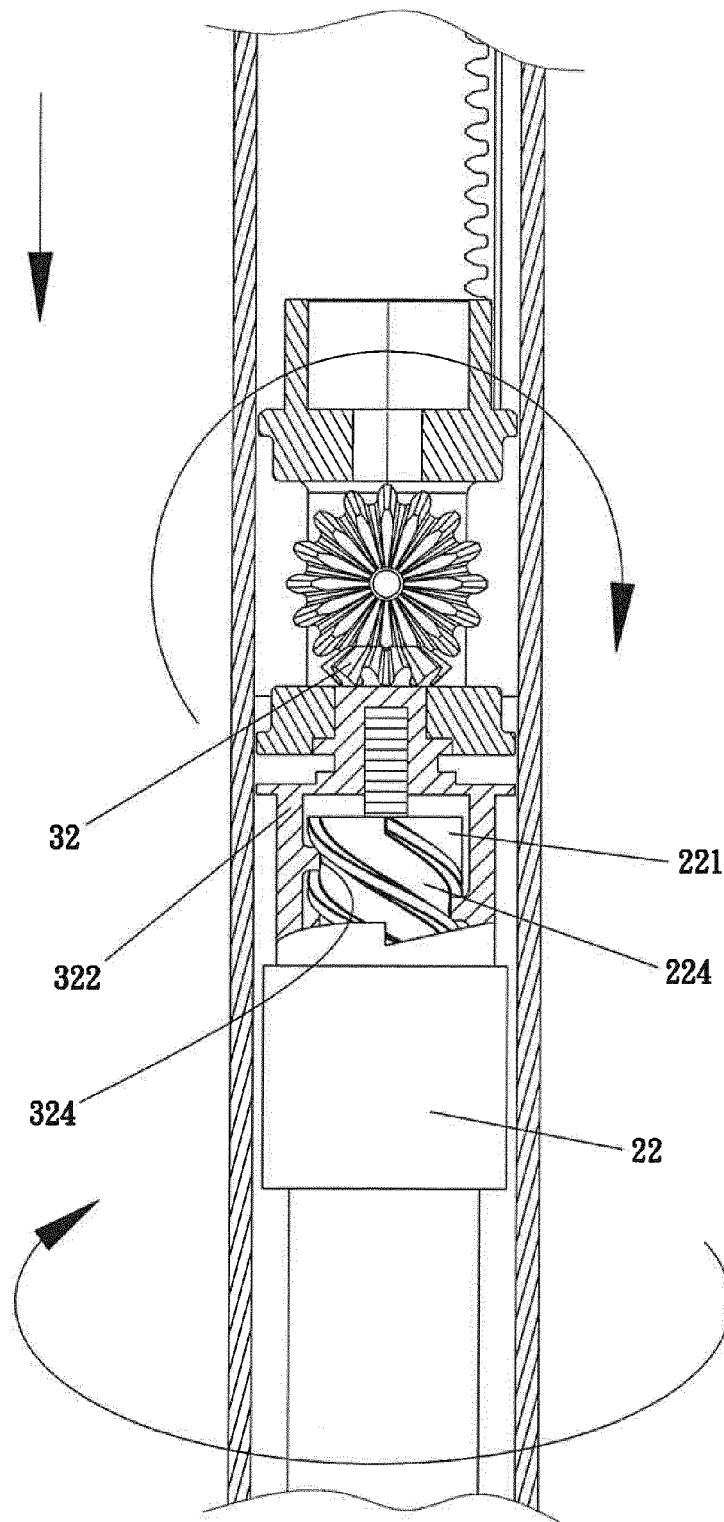


FIG. 11

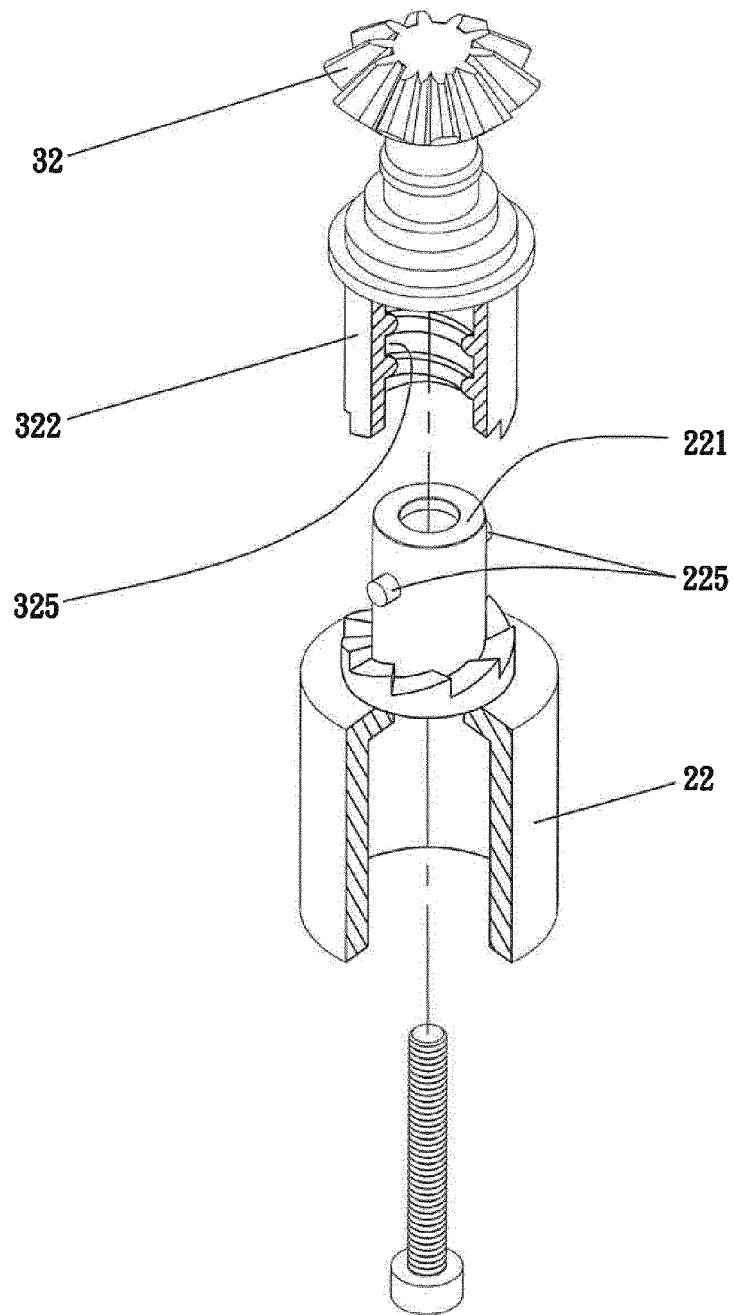


FIG. 12

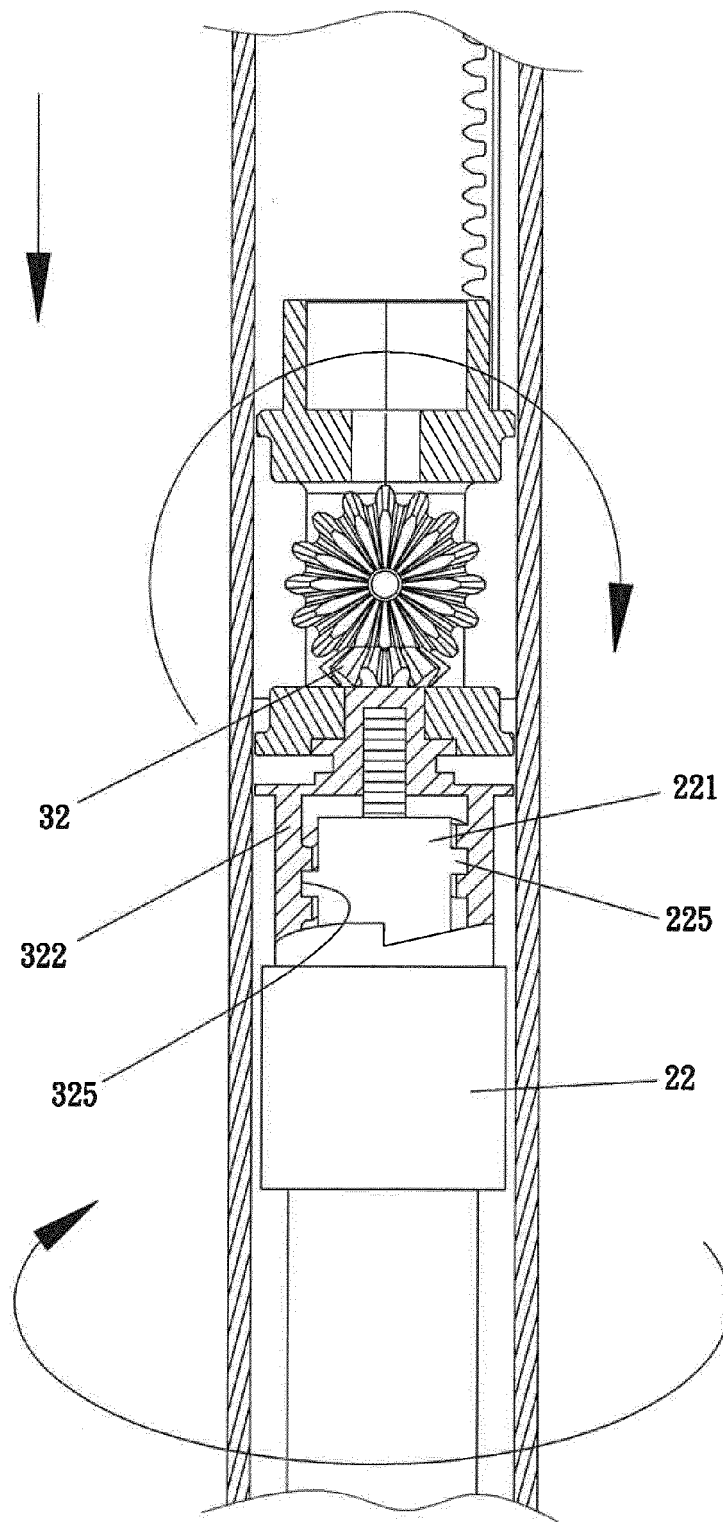


FIG. 13



## EUROPEAN SEARCH REPORT

Application Number  
EP 14 15 0021

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                 | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC) |
| A                                                                                                                                                                                                                                                      | DE 20 2011 052363 U1 (ROCK TONE ENTPR CO [TW]) 24 January 2012 (2012-01-24)<br>* paragraphs [0068] - [0071] * | 1-7                                                                                                                                                                                                                                                                                   | INV.<br>A47L13/14                       |
| A                                                                                                                                                                                                                                                      | US 2011/271475 A1 (YANG MEI LING [TW] ET AL) 10 November 2011 (2011-11-10)<br>* paragraphs [0018] - [0024] *  | 1-7                                                                                                                                                                                                                                                                                   |                                         |
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