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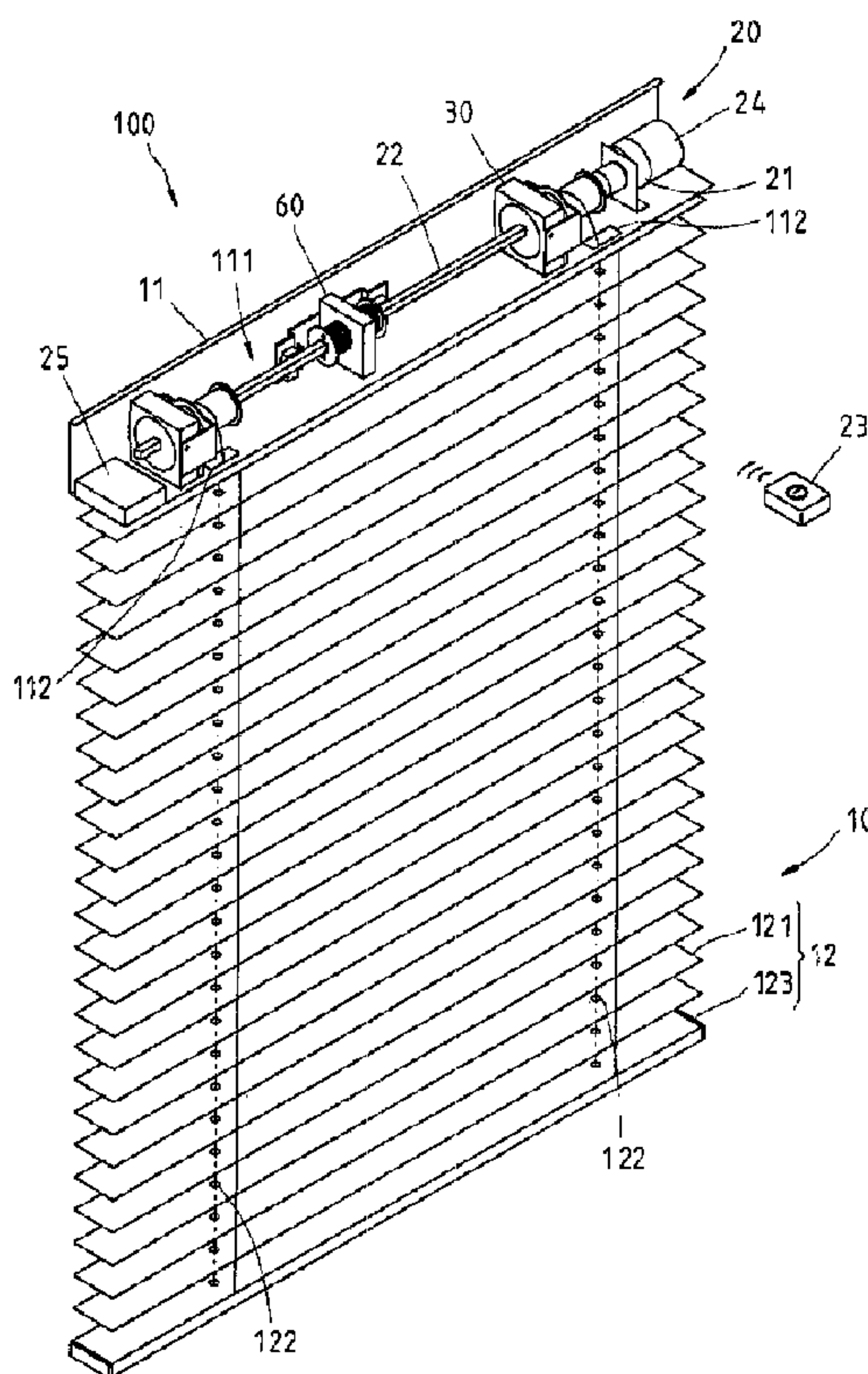
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(54) Title: PLUG-IN TRANSMISSION MECHANISM FOR A BLIND



(57) Abrégé/Abstract:

A plug-in transmission mechanism for a blind is constructed to include a driving unit, two cord roll-up units controlled by the driving unit to lift/lower or tilt the slats of the motor-driven Venetian blind. Each cord roll-up unit includes an amplitude modulation wheel rotated by the driving unit to lift/lower the slats and bottom rail of the Venetian blind, a frequency modulation wheel for rotation with the amplitude modulation wheel to tilt the slats of the Venetian blind, a stop block adapted to limit the angle of rotation of the frequency modulation wheel, and a link supported on a spring in a longitudinal groove of the amplitude modulation wheel and detachably engaged into a notch of the frequency modulation wheel to control linkage between the amplitude modulation wheel and the frequency modulation wheel.

ABSTRACT OF THE DISCLOSURE

A plug-in transmission mechanism for a blind is constructed to include a driving unit, two cord roll-up units controlled by the driving unit to lift/lower or tilt the slats of the motor-driven Venetian blind. Each cord roll-up unit includes an amplitude modulation wheel rotated by the driving unit to lift/lower the slats and bottom rail of the Venetian blind, a frequency modulation wheel for rotation with the amplitude modulation wheel to tilt the slats of the Venetian blind, a stop block adapted to limit the angle of rotation of the frequency modulation wheel, and a link supported on a spring in a longitudinal groove of the amplitude modulation wheel and detachably engaged into a notch of the frequency modulation wheel to control linkage between the amplitude modulation wheel and the frequency modulation wheel.

PLUG-IN TRANSMISSION MECHANISM FOR A BLIND

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to Venetian blinds and, more specifically, to a plug-in transmission mechanism for a blind.

2. Description of the Related Art:

A regular Venetian blind comprises a headrail, a bottom rail, a plurality of slats arranged in parallel between the headrail and the bottom rail, an amplitude modulation control mechanism for controlling lifting and positioning of the bottom rail to change the extending area of the blind, a frequency modulation control mechanism for controlling the tilting angle of the slats to regulate the light. The amplitude modulation control mechanism comprises an endless lift cord suspended from the headrail at one lateral side for pulling by hand to lift/lower the bottom rail. The frequency modulation control mechanism comprises a frequency modulation member disposed at one lateral side of the blind for permitting rotation by the user to regulate the tilting angle of the slats. When adjusting the elevation of the bottom rail, the user must approach the blind and pull the lift cord by hand with much effort. Further, because the lift cord is not kept out of reach of children, children may

pull the lift cord for fun. In case the lift cord is hung on a child's head, a fatal accident may occur.

US Patent No. 5,103,888 discloses a motor-driven blind, which keeps the lift cord from sight. According to this design, a motor is mounted in the headrail or bottom rail, and controlled by a remote controller to roll up or let off the lift cord. The motor is used to control lifting of the lift cord only. When adjusting the tilting angle of the slats, the user must approach the blind and touch-control a tilting control unit. This operation manner is still not convenient.

SUMMARY OF THE INVENTION

10 The present invention has been accomplished to provide a plug-in transmission mechanism for a blind, which eliminates the aforesaid drawbacks. It is a feature of one embodiment of the present invention to provide a plug-in transmission mechanism for a blind, which controls lifting/lowering of the slats and bottom rail of the Venetian blind as well as tilting of the slats. It is another feature of a preferred form of the present invention to provide a plug-in transmission mechanism for a blind, which is compact, and requires less installation space. It is still another feature of preferred forms of the present invention to provide a plug-in transmission mechanism for a blind, which is inexpensive to manufacture.

20 In accordance with an embodiment of the present invention, the plug-in transmission mechanism is installed in a Venetian blind and adapted

to lift/lower the slats and bottom rail of the Venetian blind and to tilt the slats, comprising at least one cord roll-up unit and a driving unit adapted to drive the cord roll-up unit. The cord roll-up unit comprises: an amplitude modulation set, the amplitude modulation set comprising an amplitude modulation lift cord
5 connected to the slats and bottom rail of the Venetian blind and adapted to lift/lower the slats and bottom rail of the Venetian blind, a support, and an amplitude modulation wheel rotatably mounted in the support and coupled to the driving unit for free rotation and relative to the support to roll up/let off the amplitude modulation lift cord upon operation of the driving unit, the amplitude
10 modulation wheel comprising a longitudinal groove; a frequency modulation set, the frequency modulation set comprising a frequency modulation lift cord adapted to tilt the slats of the Venetian blind, and a frequency modulation wheel sleeved onto the amplitude modulation wheel and adapted to roll up/let off the frequency modulation lift cord, the frequency modulation wheel
15 comprising a notch; and a linkage, the linkage comprising a link mounted in the groove of the amplitude modulation wheel and the notch of the frequency modulation wheel to couple the frequency modulation wheel to the amplitude modulation wheel for synchronous rotation, and a stop block adapted to limit the angle of

20

rotation of the frequency modulation wheel and to force the link away from the frequency modulation wheel when the amplitude modulation wheel rotated to a predetermined position.

BRIEF DESCRIPTION OF THE DRAWINGS

5 FIG. 1 is an applied view of the present invention, showing the plug-in transmission mechanism installed in a Venetian blind.

 FIG. 2 is an exploded view of the cord roll-up unit for the plug-in transmission mechanism according to the present invention.

10 FIG. 3 is an elevational assembly view of the cord roll-up unit shown in FIG. 2.

 FIG. 4 is a sectional view of the cord roll-up unit shown in FIG. 3.

15 FIGS. 5~8 are side views showing continuous action of the amplitude modulation set and the frequency modulation set according to the present invention.

 FIGS. 9~11 are sectional views showing the action of the amplitude modulation set and the frequency modulation set according to the present invention.

20 FIGS. 12~13 are schematic drawings showing lift cord rolling up action of the amplitude modulation set according to the present invention.

 FIG. 14 is a perspective view in an enlarged scale of the detector shown in FIG.1.

FIGS. 15~17 are schematic drawings showing the action of the detector according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. From 1 through 4, the present invention provides a plug-in transmission mechanism 100 mountable to a Venetian blind 10. The Venetian blind 10, as shown in FIG. 1, comprises a headrail 11 and a slat set 12. The headrail 11 is mountable to the top side of the window, comprising an inside holding chamber 111, and two through holes 112 bilaterally disposed at a bottom side in communication with the holding chamber 111. The slat set 12 is comprised of a plurality of slats 121 and a bottom rail 123. Each slat 121 has two-wire holes 122 corresponding to the through holes 112 of the headrail 11. Because the Venetian blind 10 is of the known art, no further detailed structural description is necessary. The plug-in transmission mechanism 100 comprises a driving unit 20 and two cord roll-up units 30.

As shown in FIG.1, the driving unit 20 comprises a reversible motor 21, a transmission shaft 22, a signal transmitter 23, a signal receiver 24, and a battery 25. The motor 21 is mounted inside the holding chamber 111 of the headrail 11. The transmission shaft 22 is a rod member of non-circular cross section, having one end coupled to the motor 21 for rotation by the motor 21. The

signal transmitter **23** can be a remote controller or wired controller for providing control signal to the signal receiver **24**. According to the present preferred embodiment, the signal transmitter **23** is a remote controller. The signal receiver **24** is electrically connected
5 to the motor **21**, and adapted to control the operation of the motor **21** subject to the nature of the control signal received from the signal transmitter **23**. The battery **25** can be storage battery, dry battery, planar battery, cylindrical battery, or mercury battery mounted inside of the holding chamber **111** and electrically
10 connected to the motor **21** to provide the motor **21** with the necessary working power.

Referring to FIGS. From 2 through 4, the cord roll-up units **30** are respectively mounted inside the holding chamber **111** of the headrail **11** corresponding to the through holes **112**, each comprised
15 of an amplitude modulation set **31**, a frequency modulation set **32**, and a linkage **33**.

The amplitude modulation set **31** comprises an amplitude modulation wheel **311**, a support **312**, and an amplitude modulation lift cord **313**. The amplitude modulation wheel **311** is a stepped
20 cylindrical wheel, comprising a head **311a** at one end, a tail **311d** at an opposite end, a body **311b** axially connected between the head **311a** and the tail **311d**, a conical face **311c** axially connected between the body **311b** and the tail **311d** and disposed

corresponding to one through hole 112 of the headrail 11, a center through hole of non-circular cross section 311e axially extended through the tail 311d, the conical face 311c, the body 311b and the head 311a and coupled to the transmission shaft 22 for enabling the amplitude modulation wheel 311 to be rotated with the transmission shaft 22, and a groove 311g longitudinally extended in the periphery of the head 311a toward the body 311b. The support 312 is fixedly mounted inside the holding chamber 111 of the headrail 11, having a stepped center through hole formed of a through hole 312a and a recessed hole 312b. The inner diameter of the through hole 312a is smaller than the recessed hole 312b and the outer diameter of the amplitude modulation wheel 311. The inner diameter of the recessed hole 311b is approximately equal to the outer diameter of the head 311a of the amplitude modulation wheel 311. The head 311a of the amplitude modulation wheel 311 is inserted into the recessed hole 311b. As illustrated in FIG. 3, the amplitude modulation lift cord 313 has one end fixedly connected to a fixed point 311f of the amplitude modulation wheel 311, and the other end inserted through one through hole 112 of the headrail 11 and one wire hole 122 of each slat 12 and then fixedly connected to the bottom rail 123.

The frequency modulation set 32 is comprised of a frequency modulation wheel 321, and a frequency modulation lift

cord **322**. The frequency modulation wheel **321** comprises an axially extended circular hole **321d**, a body **321a** and a head **321b** disposed around the periphery. The body **321a** is provided with a notch **321c**. The outer diameter of the head **321b** is greater than the outer diameter of the body **321a**. By
5 means of the circular hole **321d**, the frequency modulation wheel **321** is sleeved onto the body **311b** of the amplitude modulation wheel **311**, keeping the body **321a** aimed at the head **311a**. The frequency modulation lift cord **322** has one end fixedly connected to the frequency modulation wheel **321**, and the other end inserted through one through hole **112** of the headrail **11** and fixedly
10 connected to each slat **12** and the bottom rail **123**.

The linkage **33** comprises a spring **331**, a stop block **332**, a link **333**, and a limiter **334**. The spring **331** is mounted in the groove **311g** of the amplitude modulation wheel **311**, having one end stopped at one end of the groove **311g**. The stop block **332** is fixedly fastened to the support **312** at
15 the outside of the recessed hole **312b**, having a semi-circular notch **332a**, and two bevelled faces **332b**; **332c** disposed at two sides of the semi-circular notch **332a** and respectively downwardly sloping from the top toward the recessed hole **312b**. The link **333** is an oblong key member having one end inserted into the groove **311g** of the amplitude modulation
20 wheel **311** and stopped against the spring **331**, and the other end inserted into the notch

321c of the frequency modulation wheel **321**. Therefore, the link **333** couples the frequency modulation wheel **321** to the amplitude modulation wheel **311**. The limiter **334** is fixedly fastened to the support **312**, stopping the frequency modulation wheel **321** from falling out of the amplitude modulation wheel **311**.

The operation of the present invention is outlined hereinafter with reference to FIGS. from 5 through 8, when the user operated the signal transmitter **23** of the driving unit **20** to transmit a control signal of lifting the Venetian blind, the signal receiver **24** immediately receives the signal. Upon receipt of the signal, the signal receiver **24** drive the motor **21** to rotate the transmission shaft **22**. Because the center through hole **311a** of the amplitude modulation wheel **311** is a non-circular hole that fits the transmission shaft **22**, rotating the transmission shaft **22** causes the amplitude modulation wheel **311** to be synchronously rotated to roll up the amplitude modulation lift cord **313**, as shown in FIGS. from 12 and 13. During rotary motion, the amplitude modulation lift cord **313** is smoothly wound round the amplitude modulation wheel **311**. When the amplitude modulation wheel **311** rolling up the amplitude modulation lift cord **313**, the bottom rail **123** is lifted, thereby causing the slats **121** to be received and

moved with the bottom rail 123 upwards toward the headrail 11 to the desired elevation.

Because the linkage 33 links the frequency modulation wheel 321 and the amplitude modulation wheel 311, the frequency modulation wheel 321 is rotated with the amplitude modulation wheel 311 at this time, as shown in FIGS. 5 and 6 and FIGS. 9 and 10. During rotary motion of the frequency modulation wheel 321, the frequency modulation lift cord 322 is moved, causing the slats 121 to be tilted. When the frequency modulation wheel 321 turned to a predetermined position (the position where the link 333 touches the beveled face 332b of the stop block 332), as shown in FIGS. 4, 7, and 8, the link 333 moves along the beveled face 333b toward the recessed hole 312b to compress the spring 331, enabling the link 334 to be forced out of the notch 321c of the frequency modulation wheel 321 to disconnect the frequency modulation wheel 321 from the amplitude modulation wheel 311. Therefore, when the frequency modulation wheel 321 rotated to this angle, it is disengaged from the amplitude modulation wheel 311. At this time, the transmission shaft 22 continuously rotates the amplitude modulation wheel 311 to roll up the amplitude modulation lift cord 313 and to receive the slats 121 without changing the tilting angle of the slats 121.

When releasing the slats 121, operates the signal

transmitter 23 to transmit a control signal of releasing the slats to the signal receiver 24. Upon receipt of the signal, the signal receiver 24 immediately drives the motor 21 to rotate in the reversed direction, thereby causing the transmission shaft 22 and
5 the amplitude modulation wheel 311 to be rotated in the same direction. Reverse rotation of the amplitude modulation wheel 311 lets off the amplitude modulation lift cord 313, and therefore the bottom rail 123 and the slats 121 are lowered to extend out the Venetian blind 10. At the initial stage during rotary motion of the
10 amplitude modulation wheel 311, the beveled face 332b of the stop block 332 keeps the frequency modulation wheel 321 out of the amplitude modulation wheel 311. However, when the link 333 reversed with the amplitude modulation wheel 311 to the beveled face 332b again, the spring power of the spring 331 forces the link
15 333 into the notch 321c, thereby causing the frequency modulation wheel 321 and the amplitude modulation wheel 311 to be linked again. At this time, the frequency modulation wheel 321 is rotated with the amplitude modulation wheel 311 to tilt the bottom rail 123 and the slats 121. When the link 333 moved to the other beveled
20 face 332c, the beveled face 332c forces the link 333 away from the frequency modulation wheel 321 (see FIG. 11) to disconnect the amplitude modulation wheel 311 from the frequency modulation wheel 321. At this time, the transmission shaft 22 continuously

rotates the amplitude modulation wheel 311 to let off the amplitude modulation lift cord 313 and to release the slats 121 without changing the tilting angle of the slats 121.

With respect to the tilting of the slats 121, the operation is
5 described hereinafter. At first, the user operates the signal transmitter 23 to transmit a slat tilting control signal to the signal receiver 24. Upon receipt of the control signal, the signal receiver 24 immediately drives the motor 21 to rotate the transmission shaft 22 and the amplitude modulation wheel 311, and to further forces
10 the link 333 into engagement with the amplitude modulation wheel 311 and the frequency modulation wheel 321, permitting synchronous rotation of the frequency modulation wheel 321 with the amplitude modulation wheel 311 to let off the frequency modulation lift cord 322 and to further control the tilting angle of
15 the slats 121. In actual practice, it is not necessary to tilt the slats 121 at a wide angle, therefore the angle of rotation of the frequency modulation wheel 311 can be limited within a limited range. According to the present preferred embodiment, the frequency modulation wheel 321 is rotatable with the amplitude modulation
20 wheel 311 within about 180°. The stop block 332 limits the angle of rotation of the frequency modulation wheel 311. When the slats 121 tilted to the desired angle, the motor 21 is stopped. (during the aforesaid slat angle tilting control operation, the amount of upward

or downward movement of the bottom rail 11 due to rotation of the amplitude modulation wheel 311 is insignificant, without affecting the reliability of the operation).

Referring to FIG. 1 and FIGS. from 14 through 17, the
5 plug-in transmission mechanism 100 further comprises a detector
60 installed in the middle of the transmission shaft 22. When the
slats 121 moved to the upper limit or lower limit position, the
detector 60 is induced to stop the motor 21. According to the
present preferred embodiment, the detector 60 comprises a
10 mounting plate 61, a wheel 62, two limit switches 63;64, and a
locating block 65. The mounting plate 61 is fixedly fastened to the
peripheral wall of the holding chamber 111 of the headrail 11. The
locating block 65 is fixedly mounted inside the holding chamber
111 of the headrail 11. having a center screw hole 651. The wheel
15 62 is coupled to the transmission shaft 22 for synchronous rotation,
having an outer thread 621 threaded into the center screw hole 651
of the locating block 65. Rotation of the transmission shaft 22
causes synchronous rotation of the wheel 62 with the transmission
shaft 22 and axial movement of the wheel 62 in the locating block
20 65. The limit switches 63;64 are respectively mounted on the
mounting plate 61 at two sides relative to the wheel 62 (in positions
of the ends of path of the axial movement of the wheel 62 of the
detector 60 corresponding to the upper limit position and lower

limit position of the slats 121 of the Venetian blind 10), and electrically connected to the motor 21. When the slats 121 moved to the upper or lower limit position, the wheel 62 touches one limit switch 63 or 64, thereby causing the limit switch 63 or 64 to cut off
 5 power supply from the motor 21.

The structure and function of the present invention are well understood from the aforesaid detailed description. The advantages of the present invention are outlined hereinafter.

1. Slat lifting and tilting dual-control function:

10 The link serves as clutch means to couple the amplitude modulation wheel, which controls lifting of the slats, and the frequency modulation wheel, which controls tilting of the slats, enabling the amplitude modulation wheel and the frequency modulation wheel to be driven by same driving source to lift or
 15 tilt the slats.

2. Single drive source and compact size:

Because the link serves as clutch means to couple the amplitude modulation wheel and the frequency modulation wheel, one single driving source is sufficient to drive the
 20 amplitude modulation wheel and the frequency modulation wheel. Therefore, the invention is compact and inexpensive, and requires less installation space.

3. Durable mechanical design:

Because the plug-in transmission mechanism is provided with a detector, the motor is immediately stopped when the slats moved to the upper or lower limit position, preventing damage to the parts of the mechanism.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A plug-in transmission mechanism mounted in a motor-driven Venetian blind for controlling lifting of slats and bottom rail of the Venetian blind and tilting of slats of the Venetian blind, comprising at least one cord roll-up unit and a driving unit adapted to drive said cord roll-up unit, wherein said cord roll-up unit comprises:

an amplitude modulation set, said amplitude modulation set comprising an amplitude modulation lift cord connected to the slats and bottom rail of the Venetian blind and adapted to lift/lower the slats and bottom rail of the Venetian blind, a support, and an amplitude modulation wheel rotatably mounted in said support and coupled to said driving unit for free rotation relative to said support to roll up/let off said amplitude modulation lift cord upon operation of said driving unit, said amplitude modulation wheel comprising a longitudinal groove;

a frequency modulation set, said frequency modulation set comprising a frequency modulation lift cord adapted to tilt the slats of the Venetian blind, and a frequency modulation wheel sleeved onto said amplitude modulation wheel and adapted to roll up/let off said frequency modulation lift cord, said frequency modulation wheel comprising a notch; and

a linkage, said linkage comprising a link mounted in the

groove of said amplitude modulation wheel and the notch of said frequency modulation wheel to couple said frequency modulation wheel to said amplitude modulation wheel for synchronous rotation, and a stop block adapted to limit the angle of rotation of said frequency modulation wheel and to force said link away from said frequency modulation wheel when said amplitude modulation wheel rotates to a predetermined position.

2. The plug-in transmission mechanism as claimed in claim 1, wherein said driving unit comprises a reversible motor, a transmission shaft coupled between said reversible motor and said amplitude modulation wheel and driven by said reversible motor to rotate said amplitude modulation wheel, said transmission shaft having a non-circular cross section fitted into a non-circular axial center through hole of said amplitude modulation wheel, a signal transmitter adapted to transmit control signal, a signal receiver adapted to receive the control signal from said signal transmitter and to control operation of said reversible motor subject to a received control signal.

3. The plug-in transmission mechanism as claimed in claim 2, wherein said signal transmitter is a remote controller.

4. The plug-in transmission mechanism as claimed in claim 2, wherein said signal transmitter is a wired controller.

5. The plug-in transmission mechanism as claimed in claim 1,

wherein said linkage further comprises a spring mounted in the groove of said amplitude modulation wheel and stopped between said support and said frequency modulation wheel.

6. The plug-in transmission mechanism as claimed in claim 5, wherein said linkage further comprises a limiter fixedly fastened to said stop block to stop said frequency modulation wheel from falling out of said amplitude modulation wheel.

7. The plug-in transmission mechanism as claimed in claim 1, wherein said stop block is fixedly fastened to said support, comprising two bevelled faces disposed at two sides of said link and adapted to separate said link from said frequency modulation wheel when said link moved with said frequency modulation wheel in one direction to one of said beveled faces.

8. The plug-in transmission mechanism as claimed in claim 1, wherein said amplitude modulation wheel comprises a conical face adapted to guide winding of said amplitude modulation lift cord around said amplitude modulation wheel in order.

9. The plug-in transmission mechanism as claimed in claim 1, further comprising a detector adapted to cut off power supply from said reversible motor when the slats of the Venetian blind are lifted or lowered to an upper limit or lower limit position.

10. The plug-in transmission mechanism as claimed in claim 9, wherein said detector comprises a mounting plate fixedly mounted in the Venetian blind, a locating block fixedly supported on said mounting plate, two limit switches bilaterally mounted on said mounting plate and electrically connected to said driving unit a wheel threaded into said locating block and coupled to said driving unit for rotation and axial movement between said limit switches upon operation of said driving unit for triggering said limit switches to cut off power supply from said driving unit when said limit switches are triggered off.

11. The plug-in transmission mechanism as claimed in claim 10, wherein said limit switches are respectively disposed in positions of the ends of path of the axial movement of the wheel of said detector corresponding to the upper limit position and lower limit position of the slats of the Venetian blind.

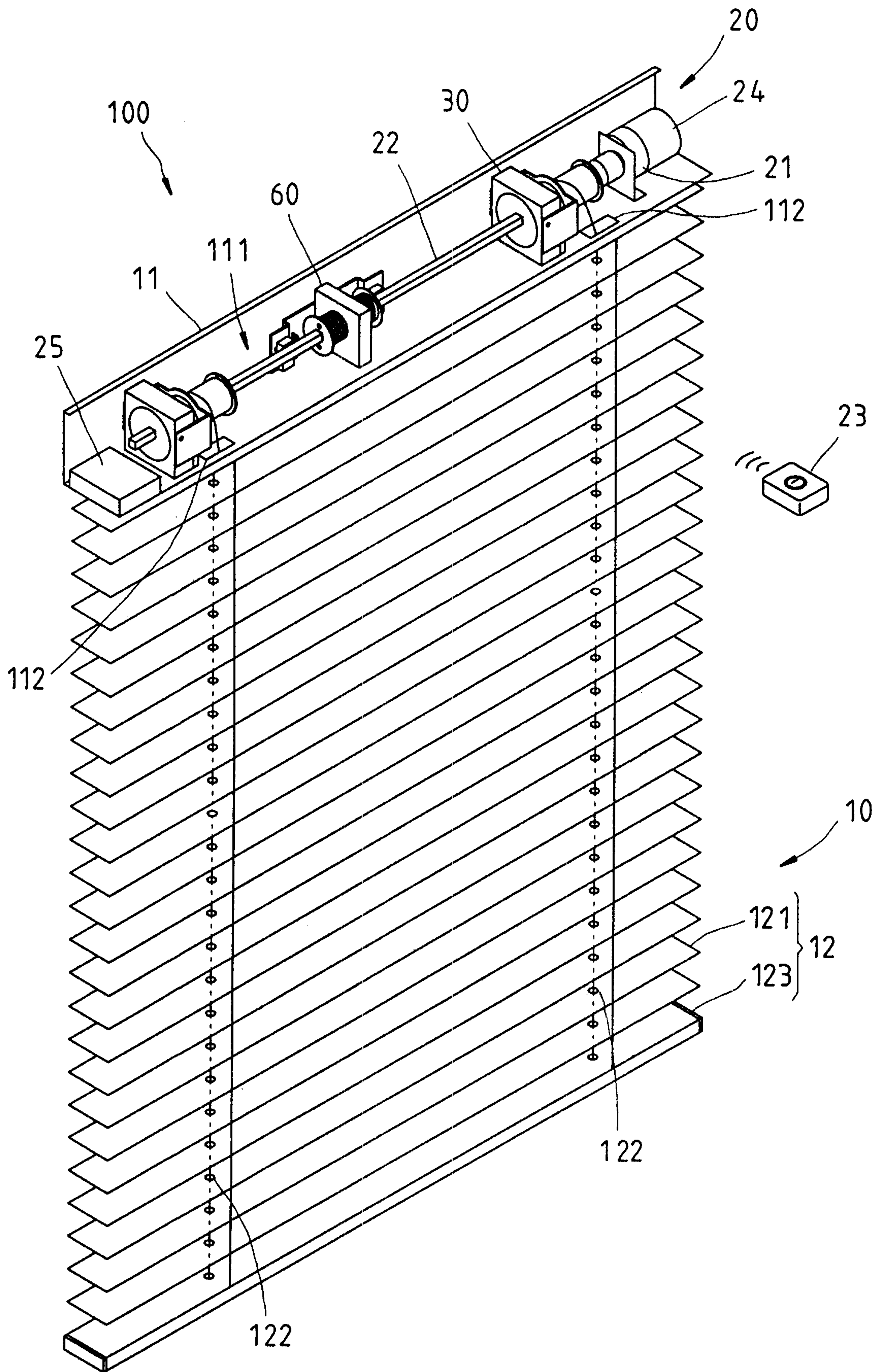


FIG. 1

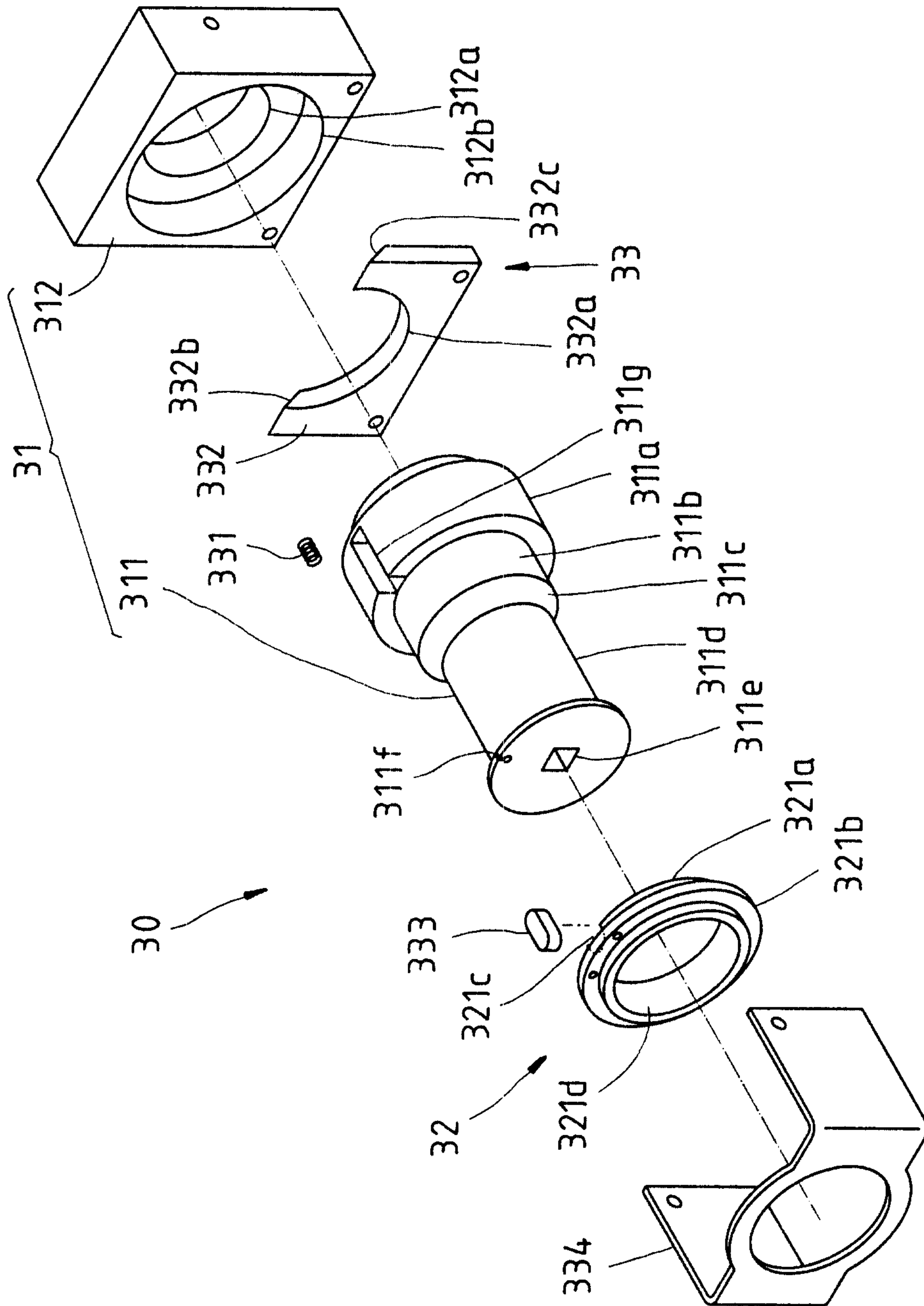


FIG. 2

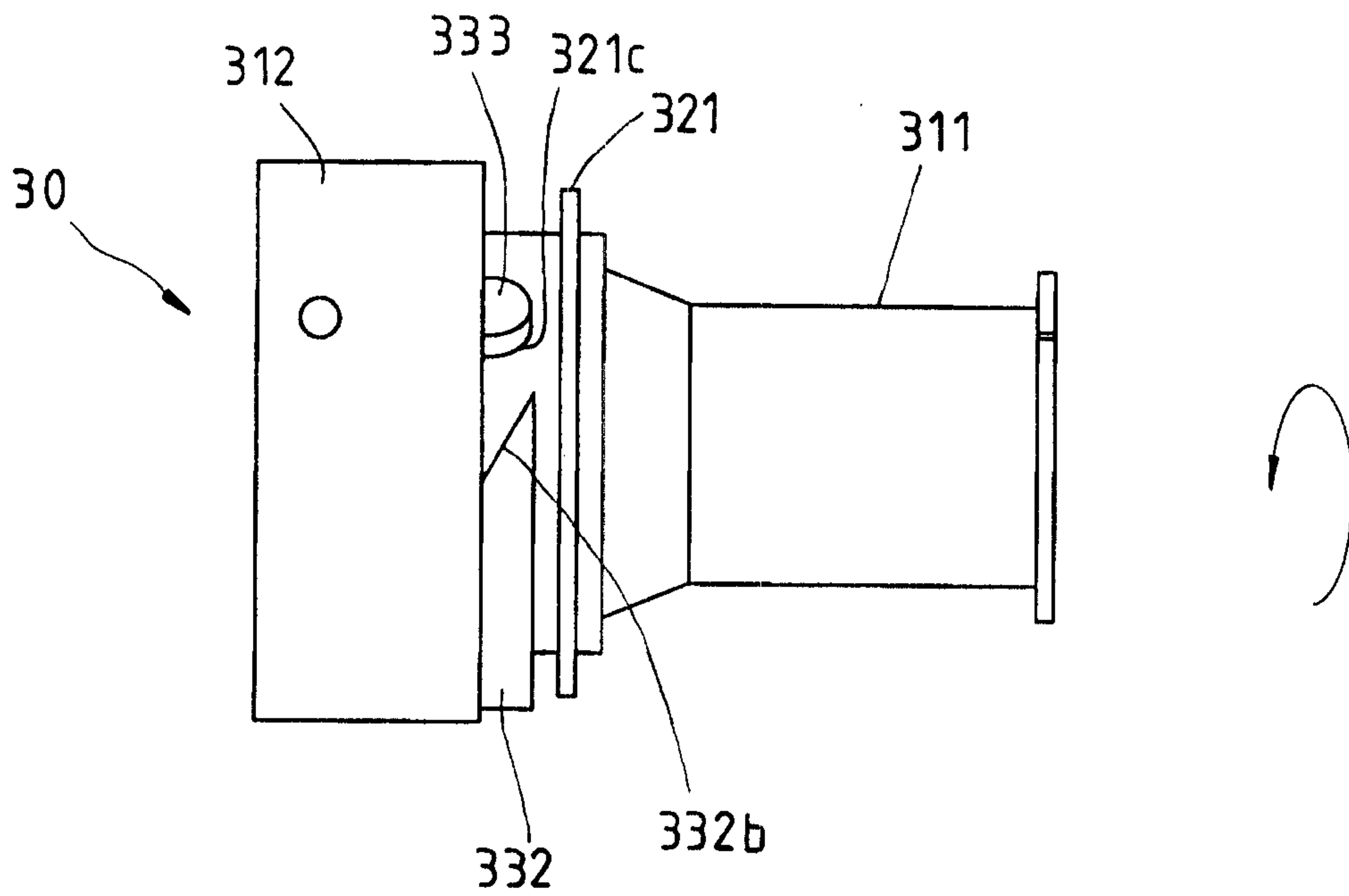


FIG. 5

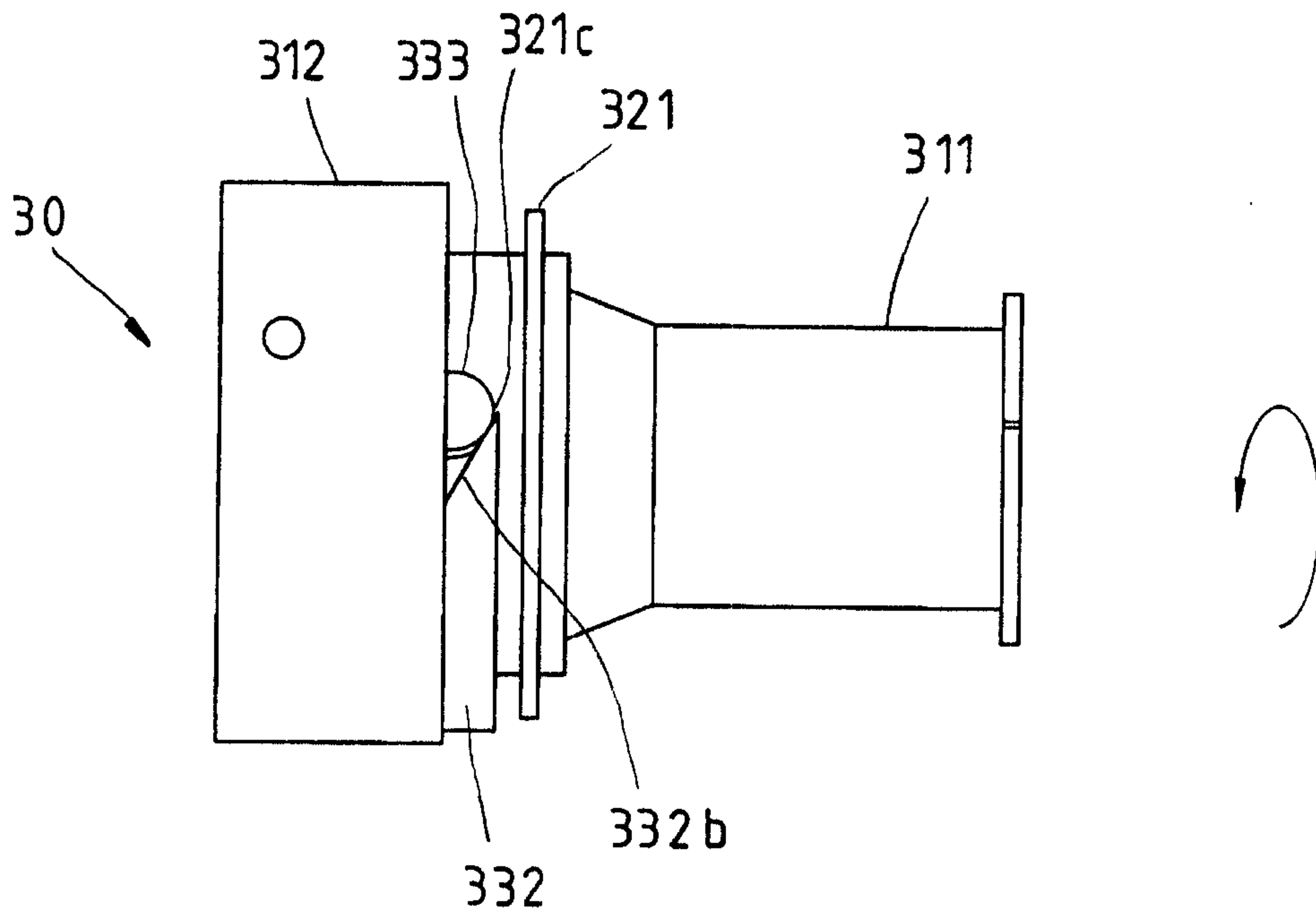


FIG. 6

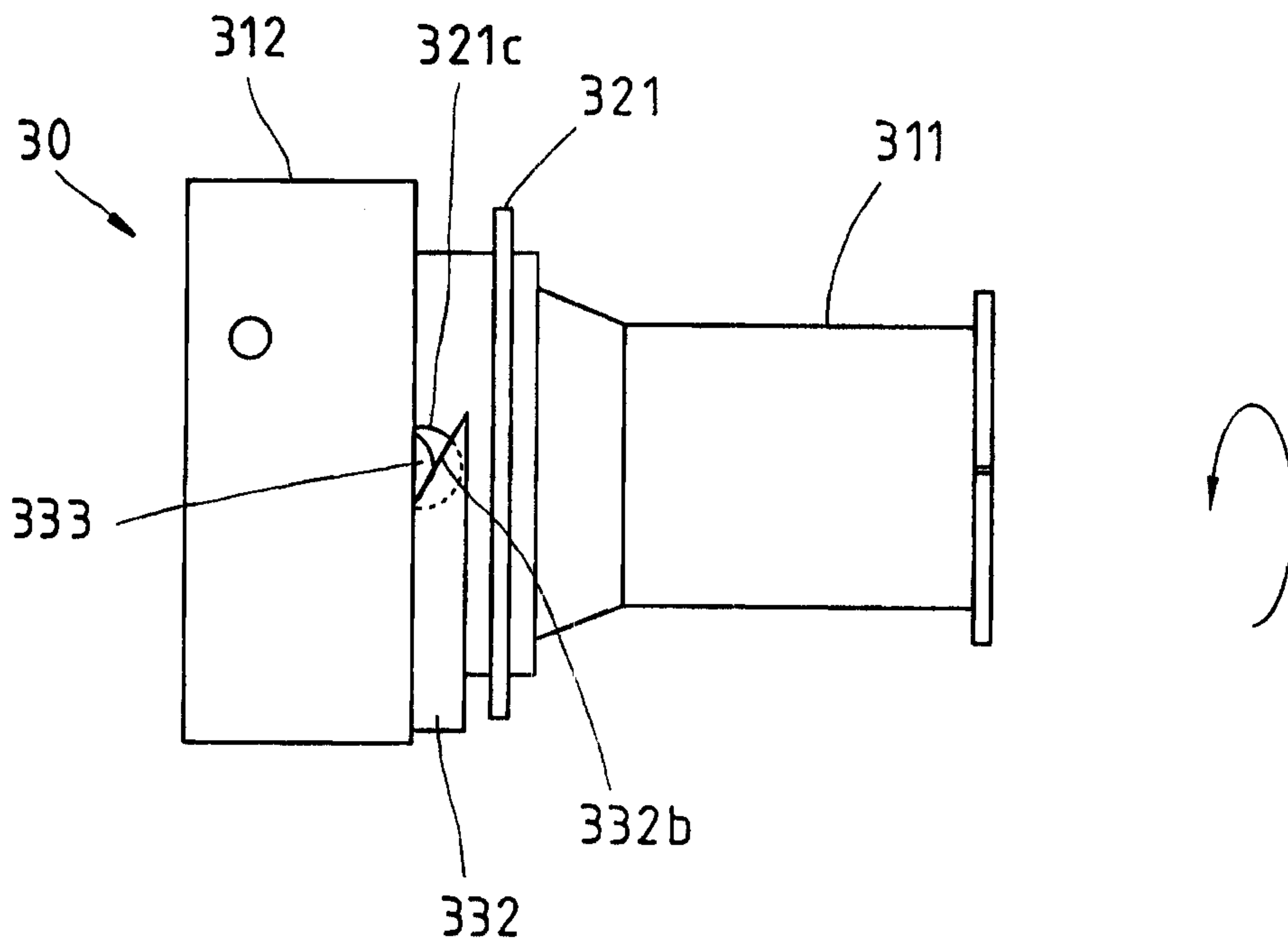


FIG. 7

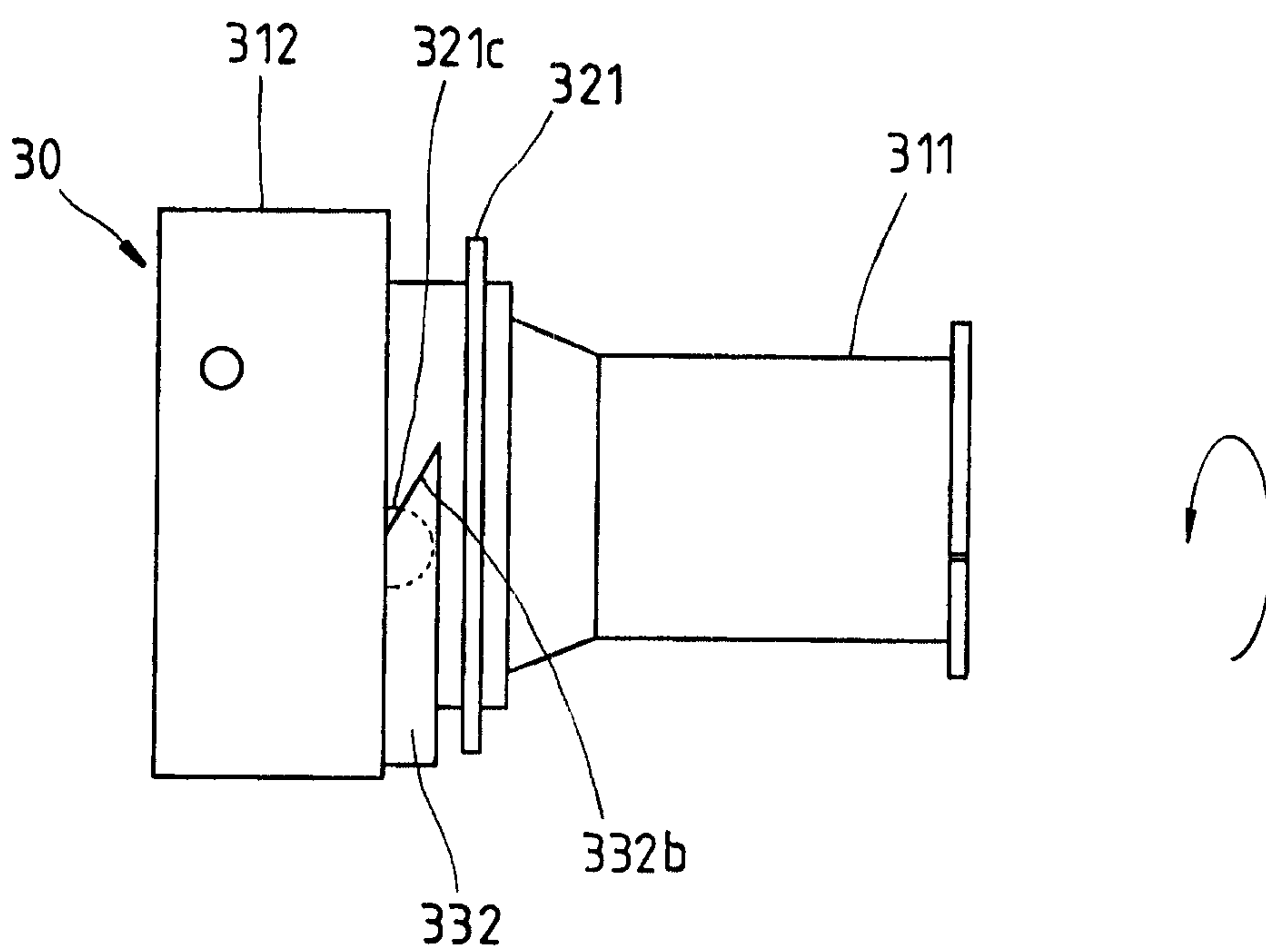


FIG. 8

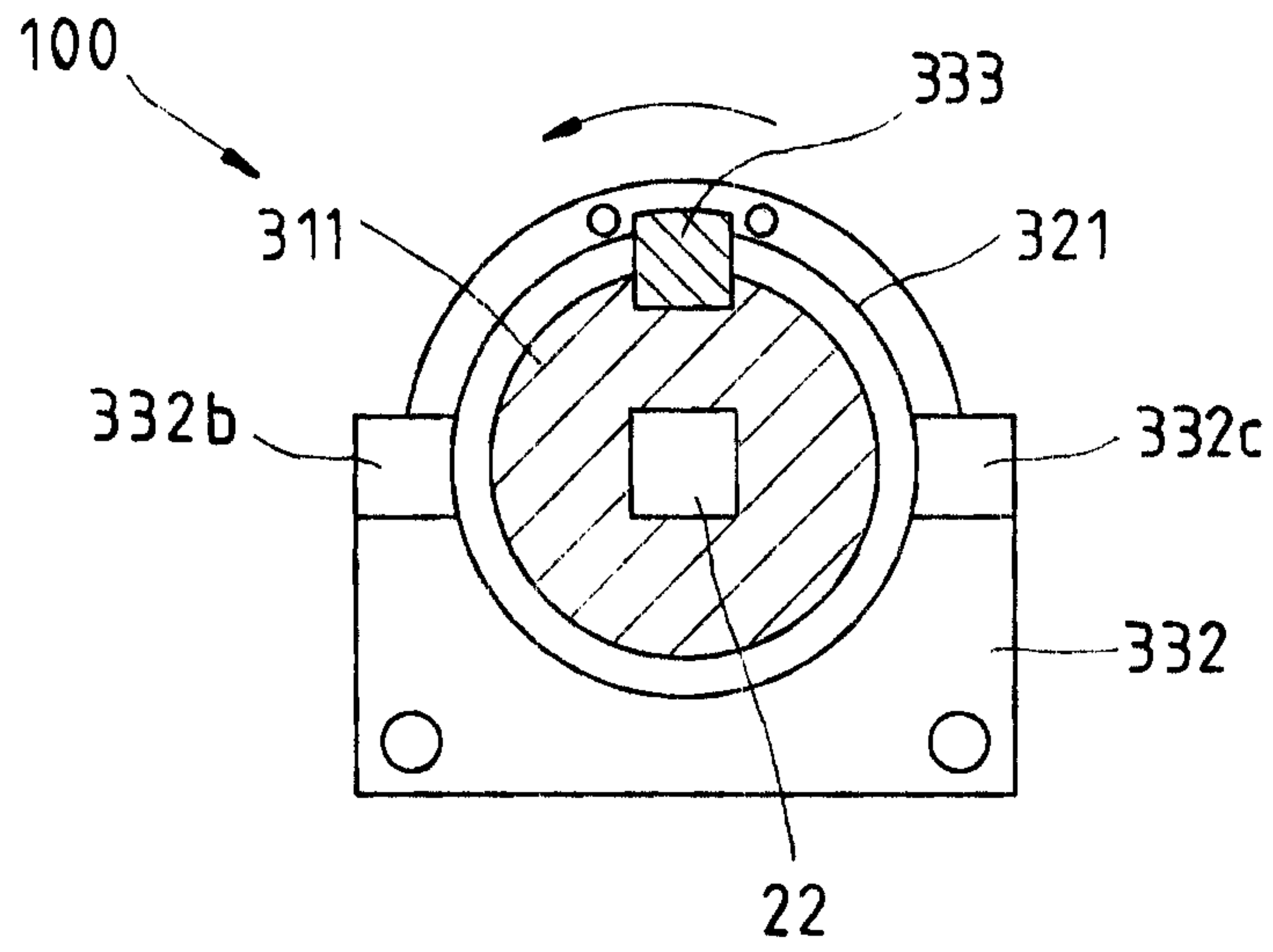


FIG. 9

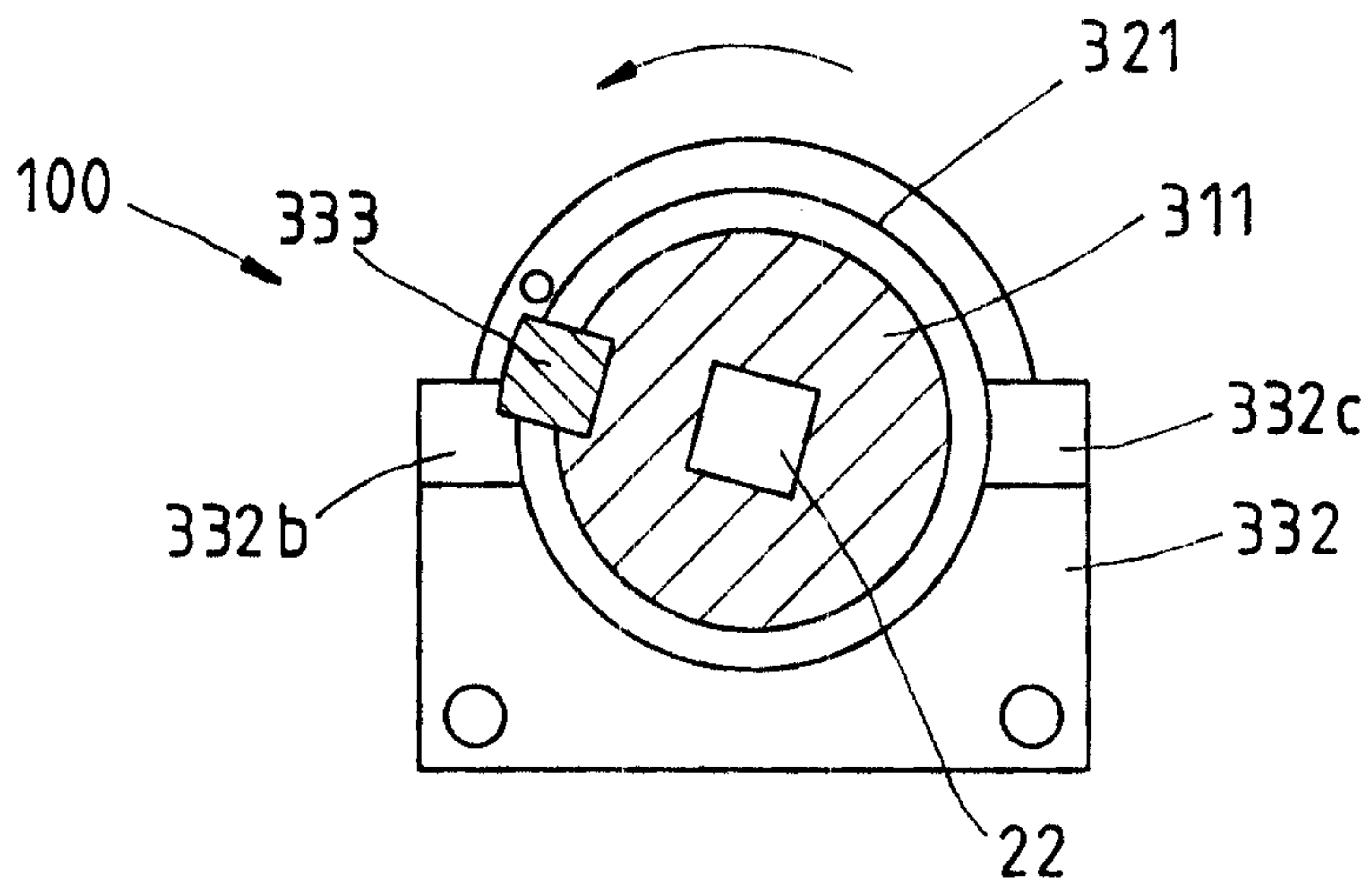


FIG. 10

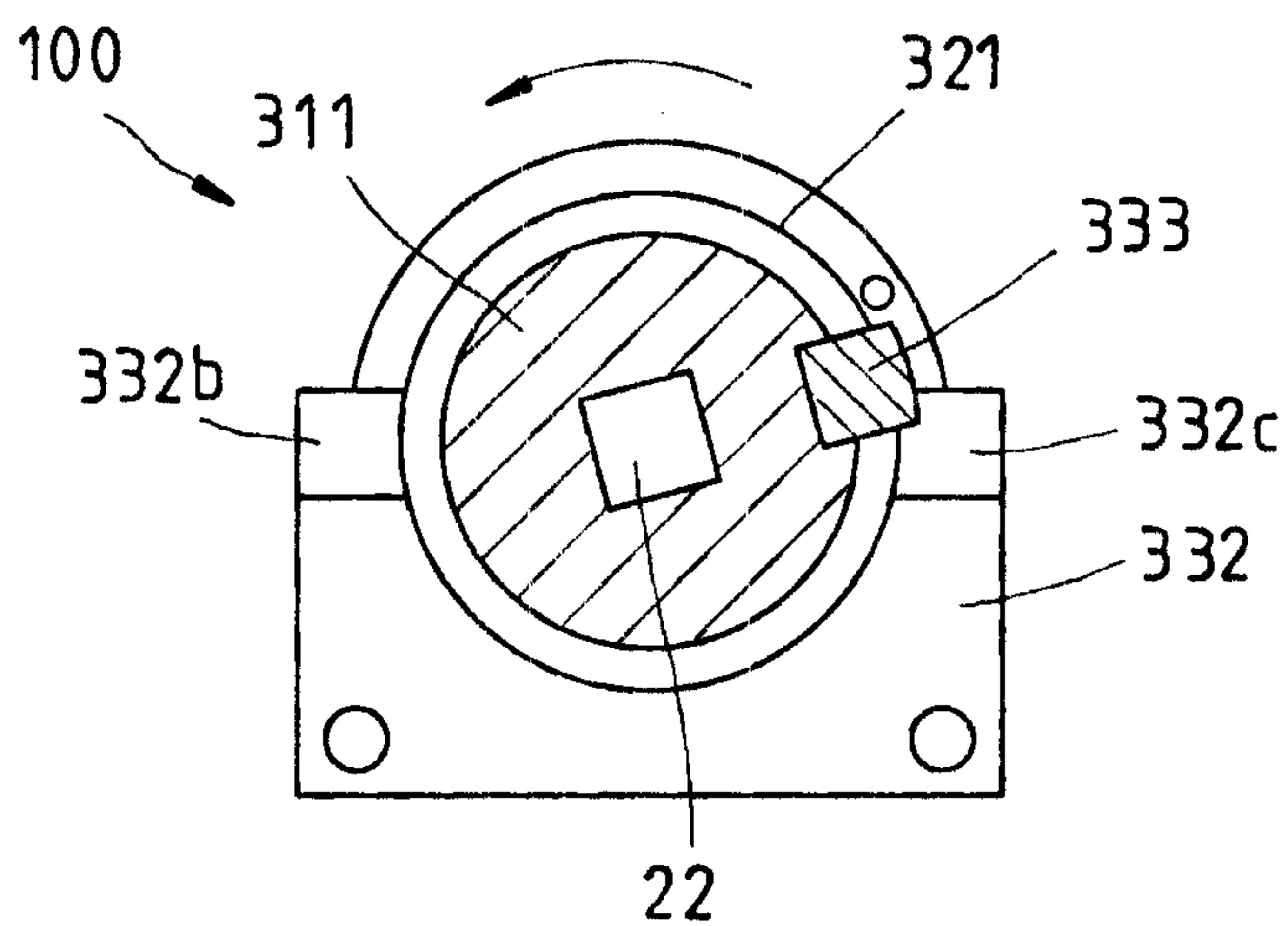


FIG. 11

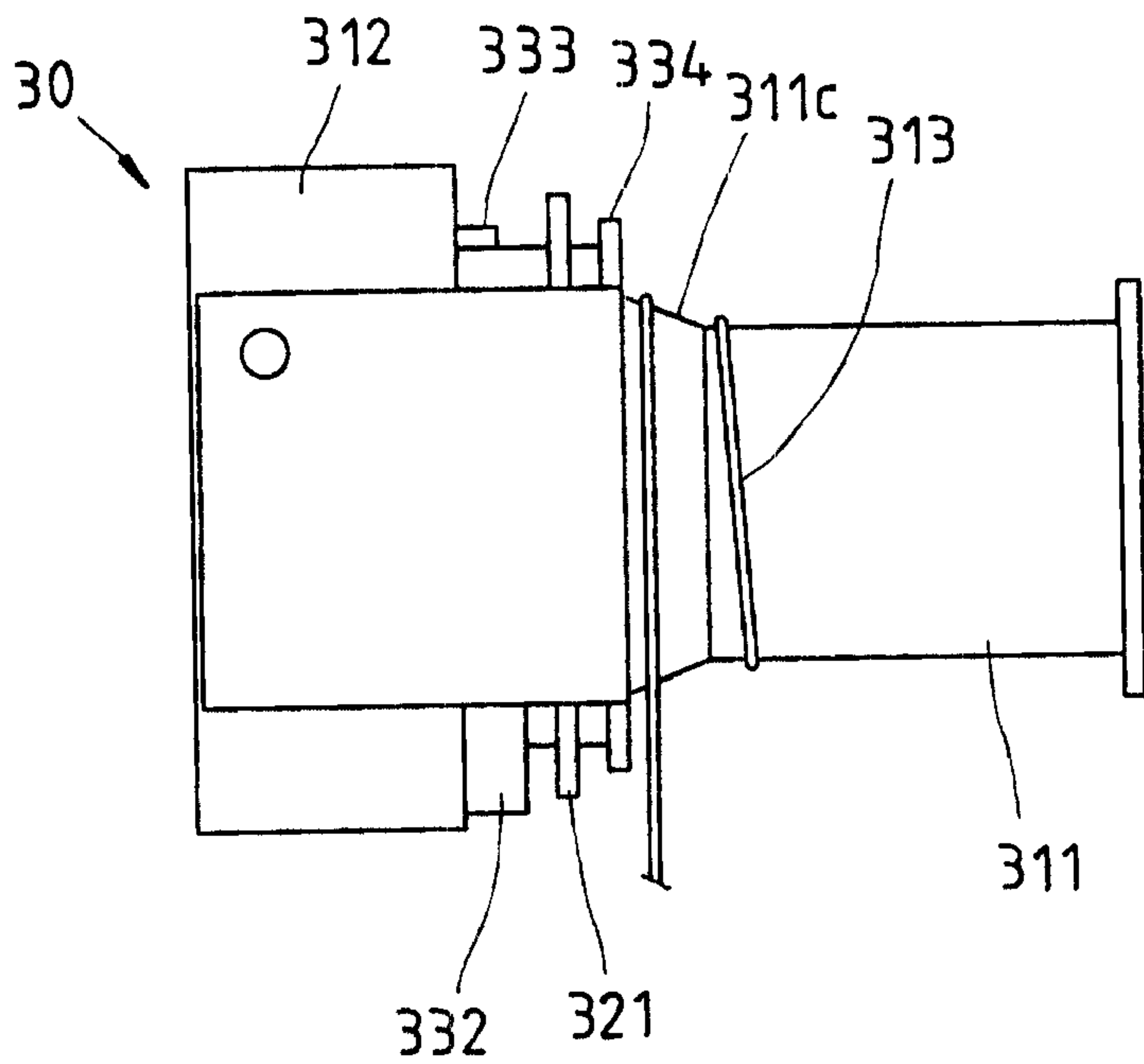


FIG. 12

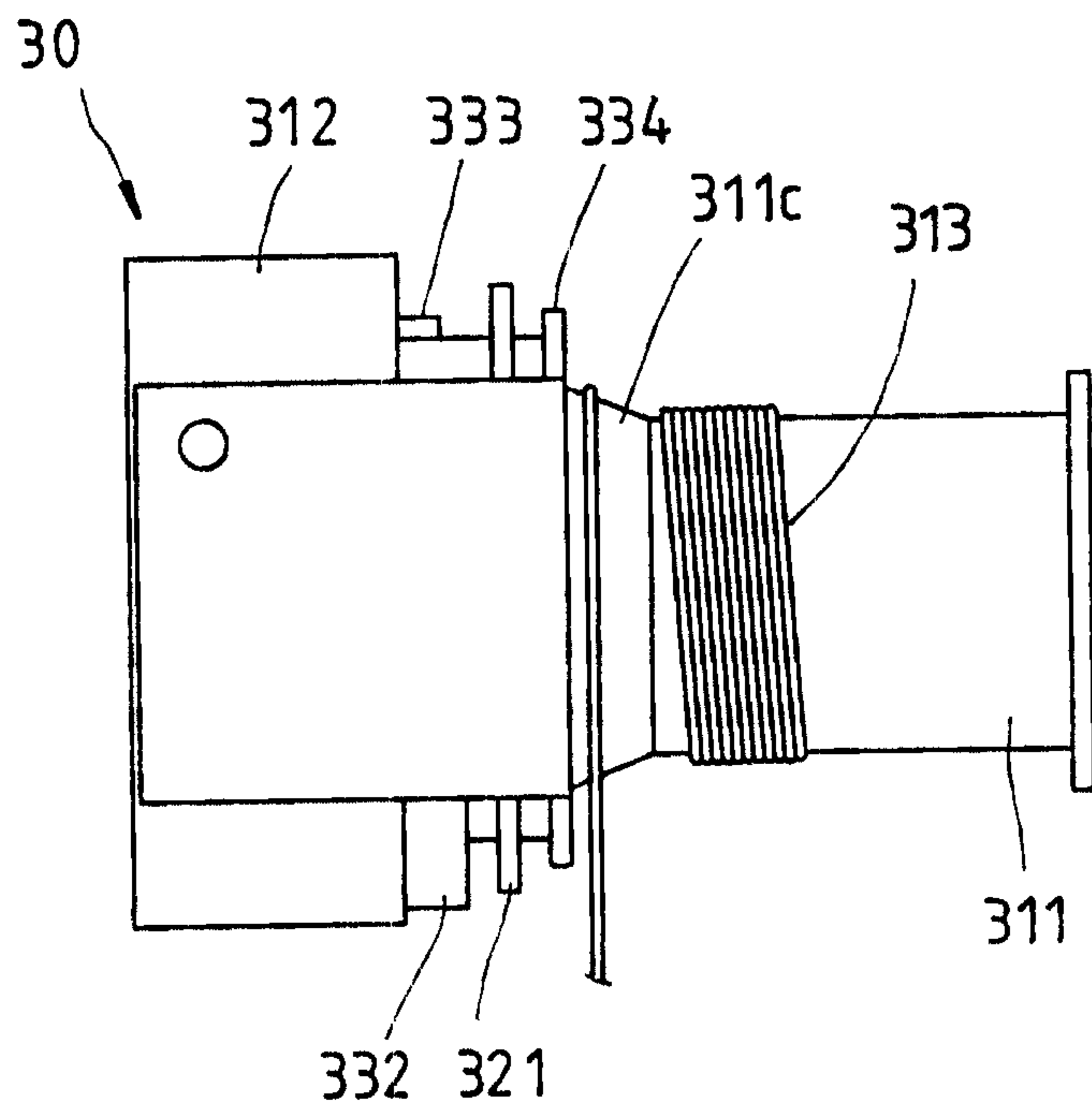


FIG. 13

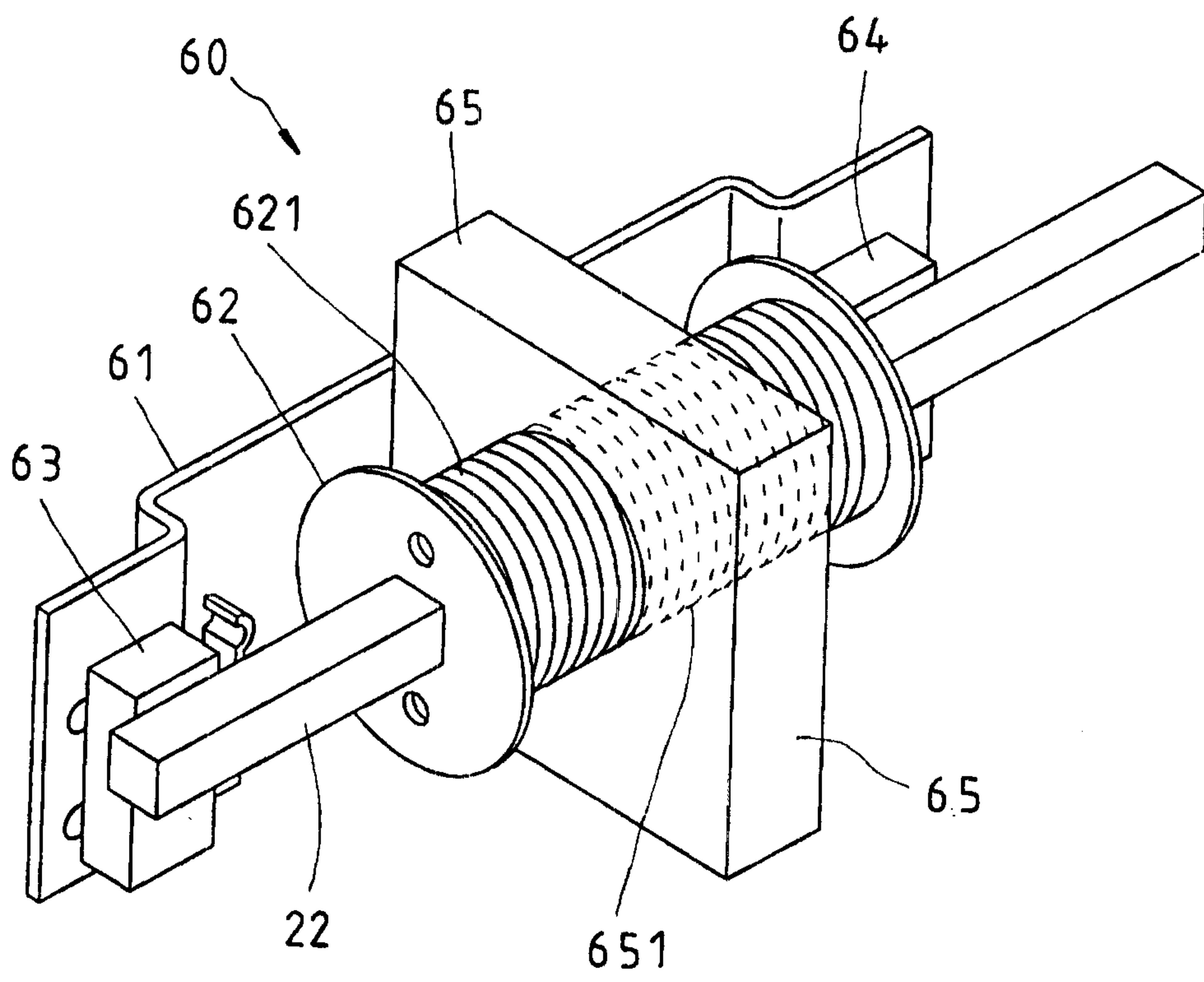


FIG. 14

