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Chou

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(54) **AIR COMPRESSOR**

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(72) Inventor: **Wen-San Chou**, Tainan (TW)

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F04B 49/22	(2006.01)
F16K 15/02	(2006.01)
F04B 39/14	(2006.01)
F04B 53/10	(2006.01)
F04B 39/10	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***F04B 53/22*** (2013.01); ***F04B 35/01*** (2013.01); ***F04B 35/04*** (2013.01); ***F04B 39/10*** (2013.01); ***F04B 39/1006*** (2013.01); ***F04B 39/121*** (2013.01); ***F04B 39/122*** (2013.01); ***F04B 39/123*** (2013.01); ***F04B 39/14*** (2013.01); ***F04B 41/02*** (2013.01); ***F04B 49/22*** (2013.01); ***F04B 53/1002*** (2013.01); ***F04B 53/1085*** (2013.01); ***F16K 15/026*** (2013.01); *F05C 2225/00* (2013.01)

(58) **Field of Classification Search**

CPC F04B 35/04; F04B 39/121; F04B 39/14; F04B 39/122; F04B 39/1006; F04B 39/1013; F04B 39/102; F04B 49/22; F04B 35/01; F04B 39/10; F04B 39/123; F04B 41/02; F04B 53/14; F04B 39/1066; F04B 53/1002; F04B 53/101; F04B 53/1012; F04B 53/102; F04B 53/1032; F04B 53/1035; F04B 53/1085; F04B 53/22; F05C 2225/00; F16K 15/00; F16K 15/025; F16K 15/026; F16K 15/04; F16K 15/042; F16K 15/044; F16K 15/046; F16K 15/06; F16K 15/063

USPC 417/410.1, 415, 443, 442, 454, 458, 502, 417/504, 559, 569, 571; 137/511, 528, 137/535, 539

See application file for complete search history.

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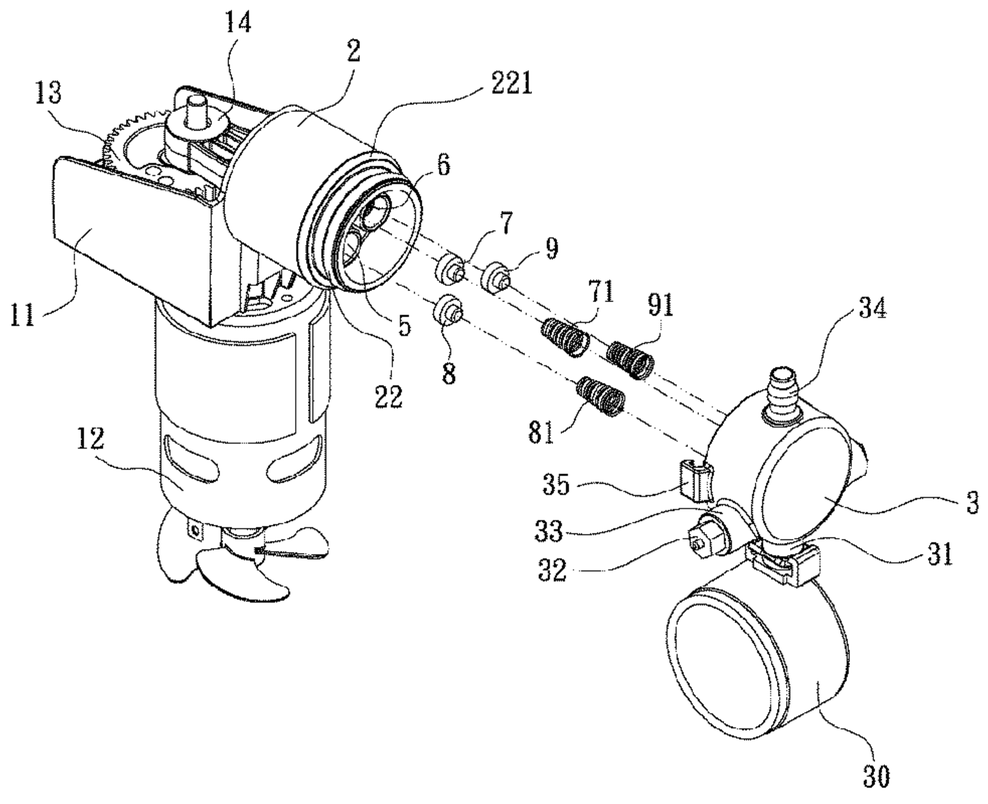
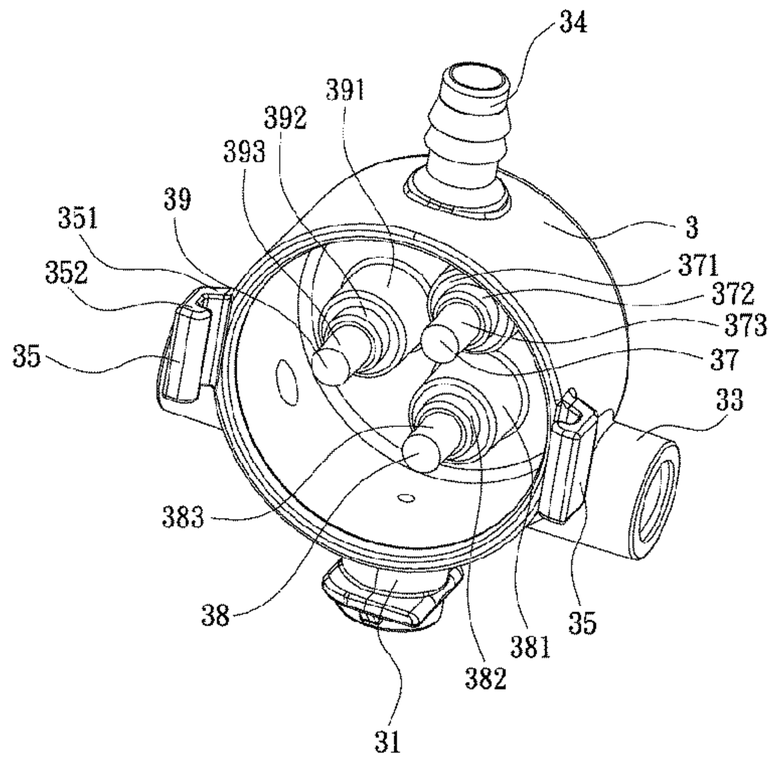
Primary Examiner — Alexander B Comley
Assistant Examiner — Chirag Jariwala

(57) **ABSTRACT**

An improved air compressor includes a cylinder that is fitted with a piston body and defines at its top wall a plurality of exit holes which are approximately equal in diameter and can be regulated by plugs to enable the cylinder to communicate with an air storage container. The exit holes are normally sealed by the plugs with the assistance of compression springs when the air compressor is not in operation. The exit holes allow the compressed air produced in the cylinder to quickly enter the air storage container, so that the piston body can conduct reciprocating motion more smoothly and thus the performance of the air compressor can be increased.

7 Claims, 12 Drawing Sheets





(51) **Int. Cl.**

F04B 35/04	(2006.01)
F04B 39/12	(2006.01)
F04B 35/01	(2006.01)
F04B 41/02	(2006.01)

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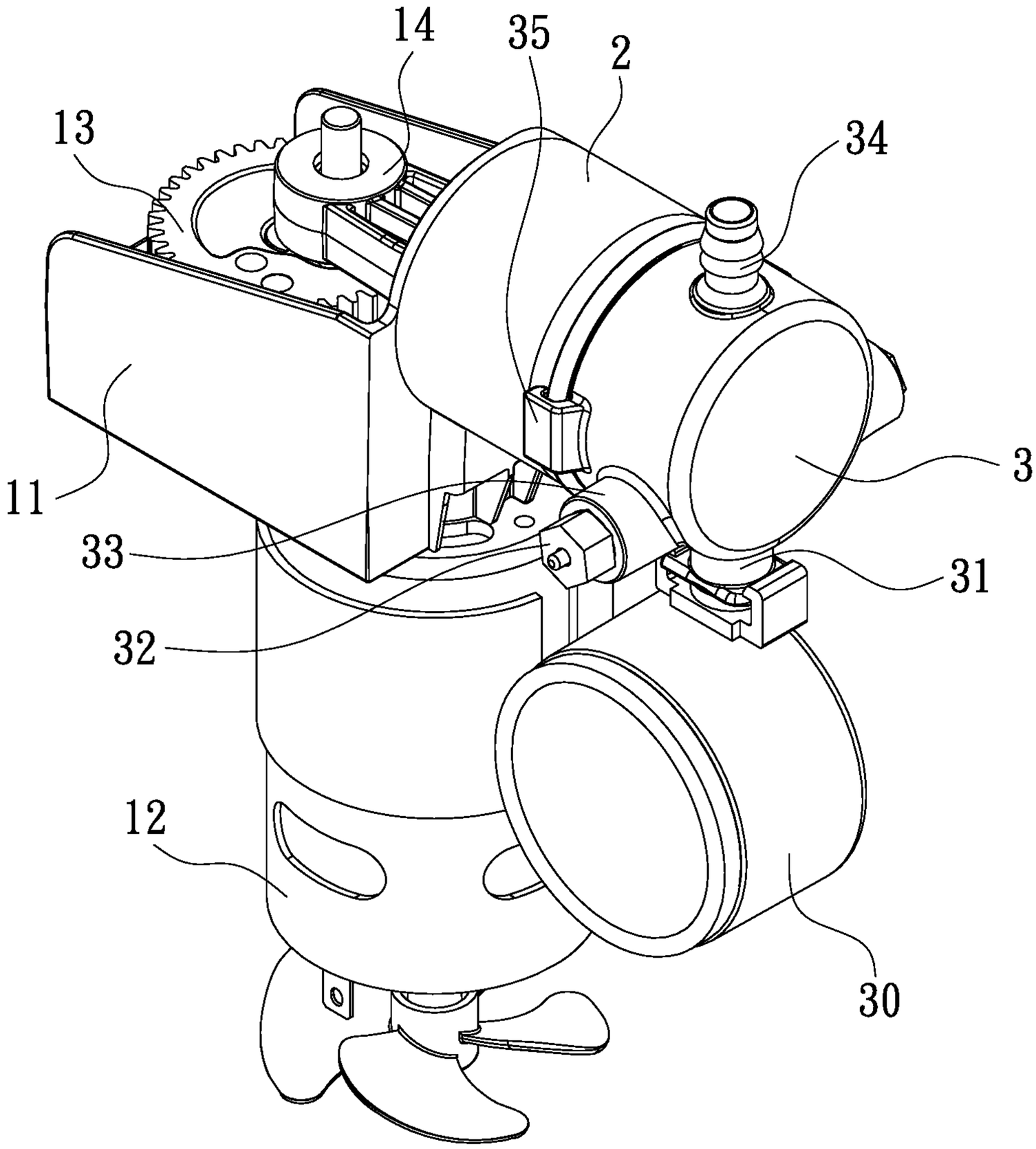

FIG. 1

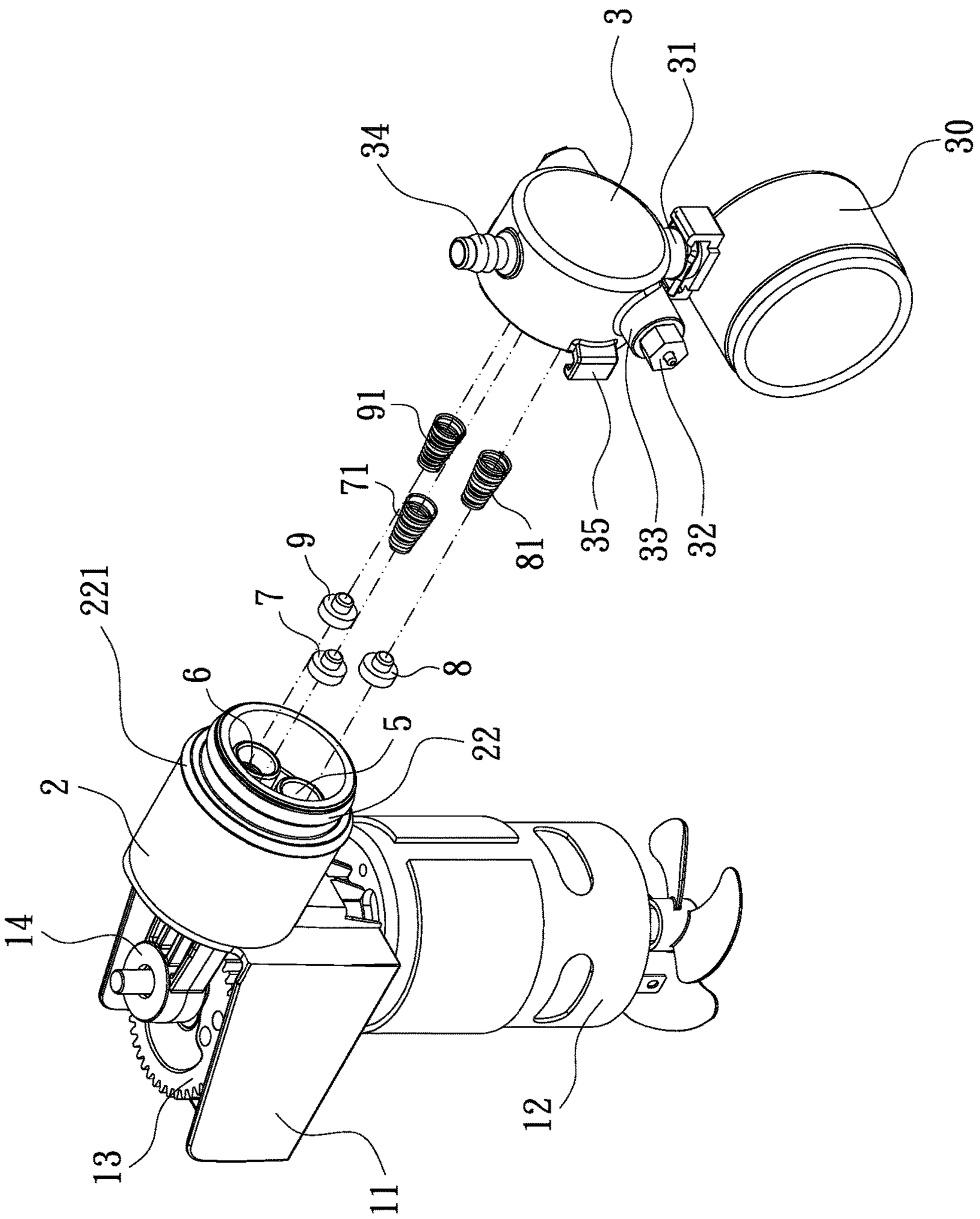

FIG. 2

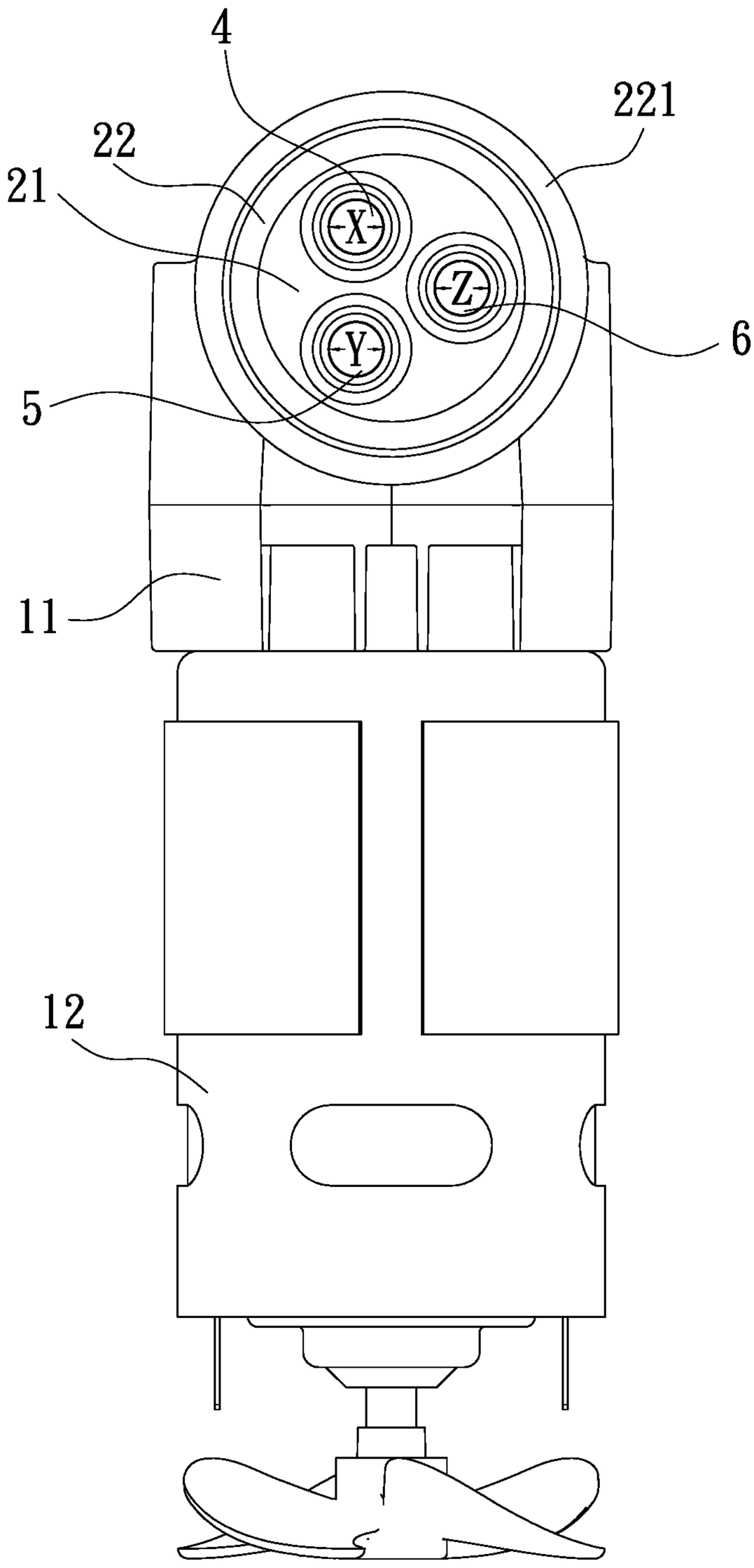

FIG. 3

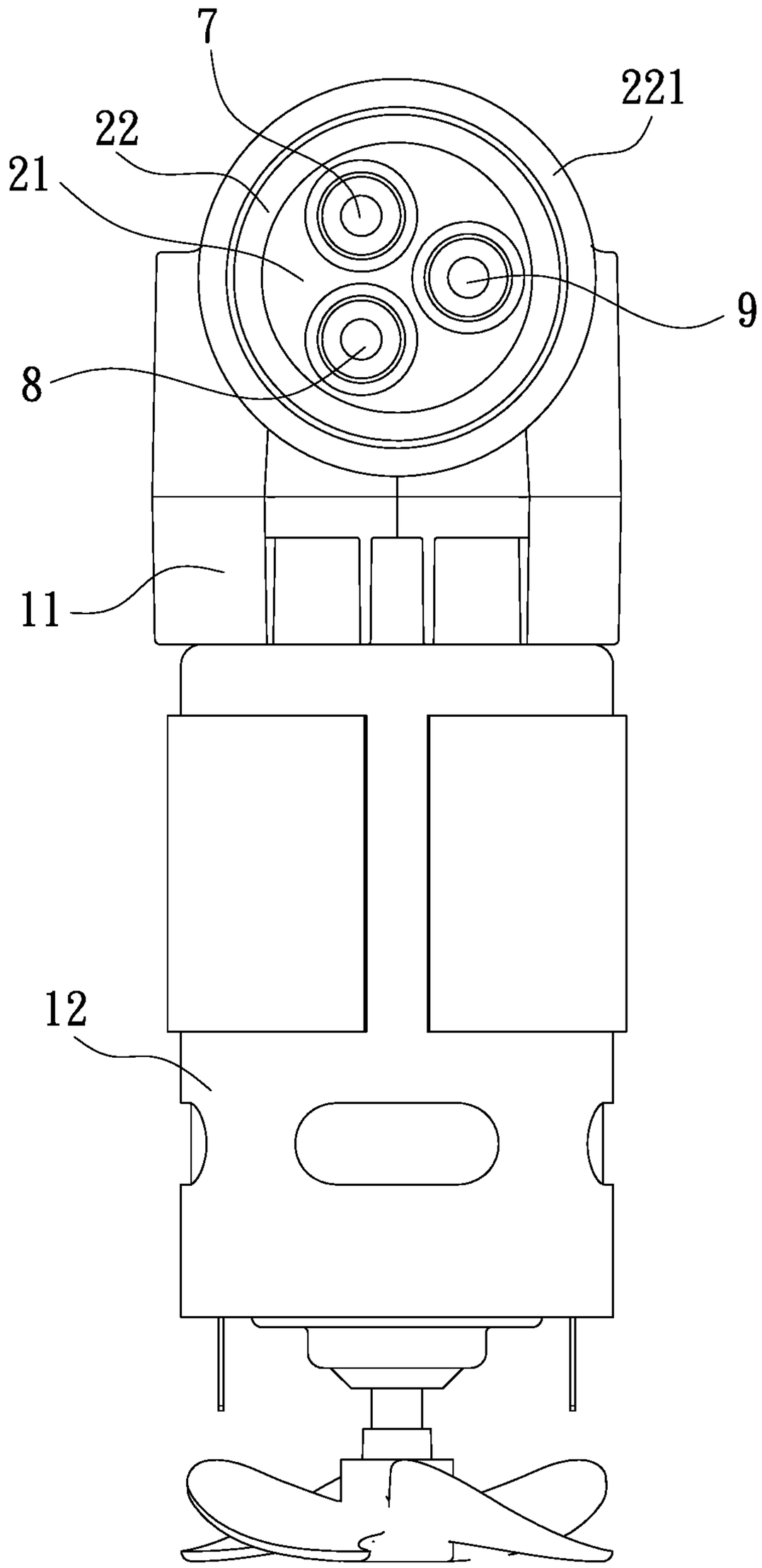

FIG. 4

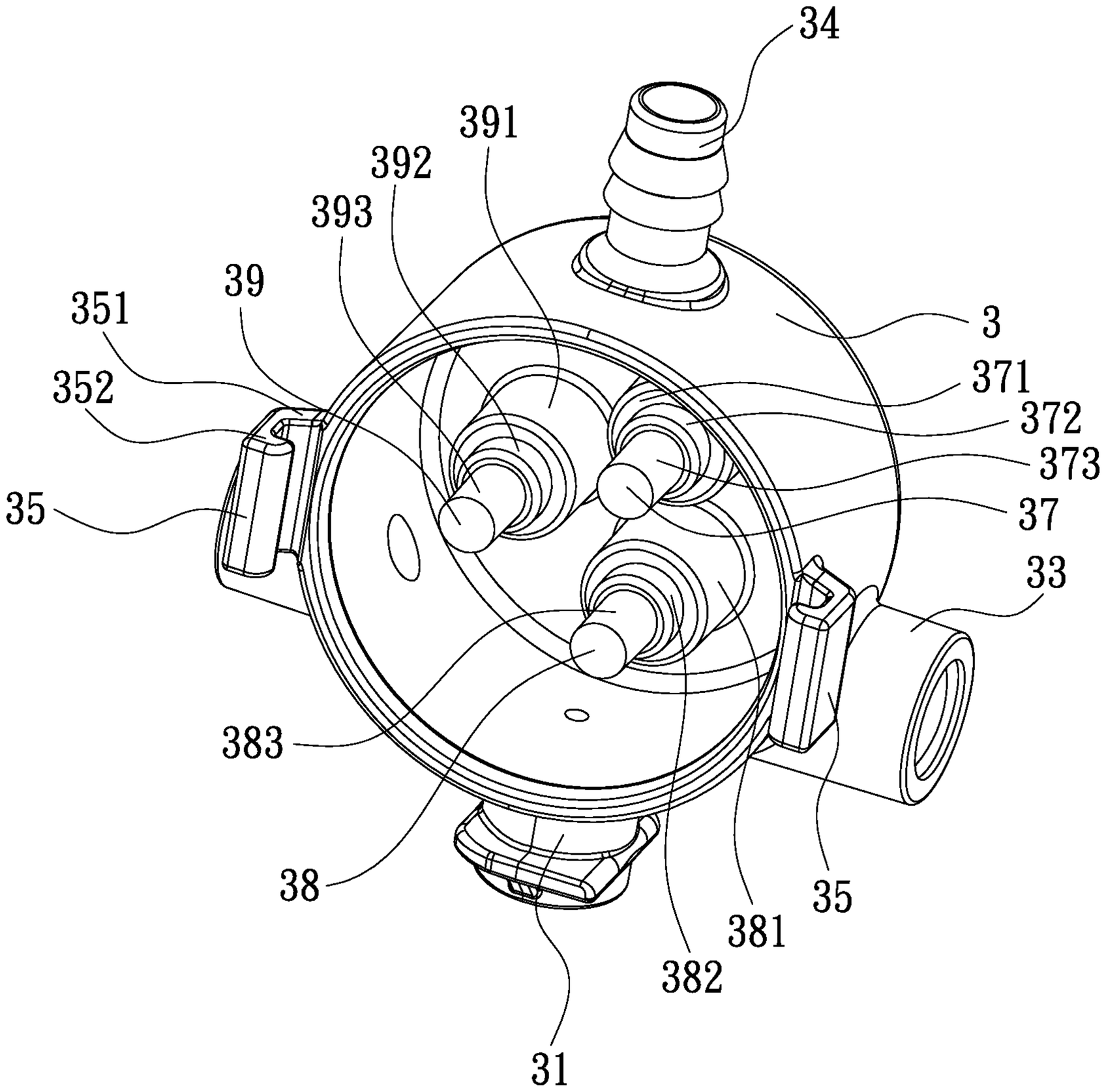
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FIG. 5

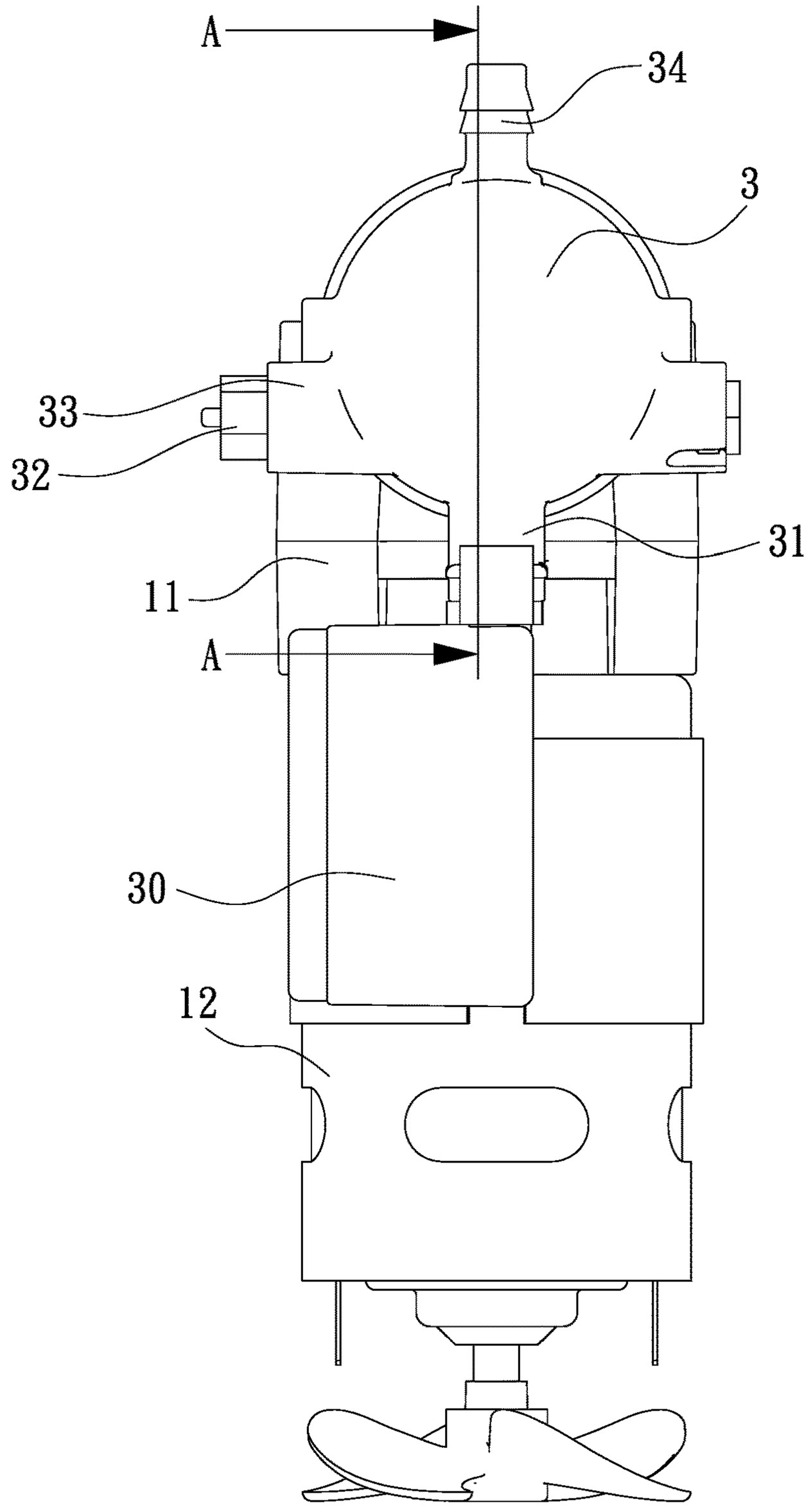

FIG. 6

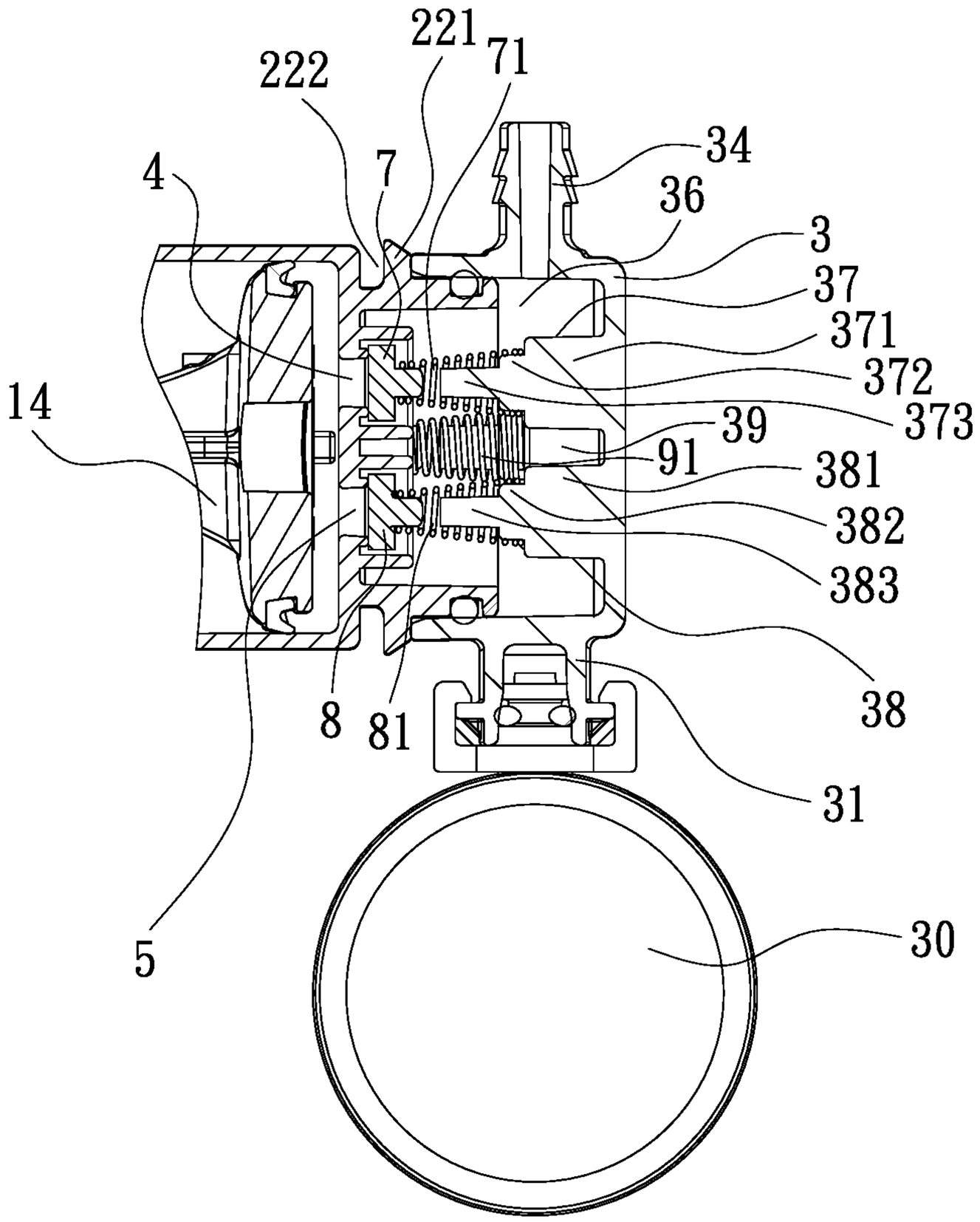
221
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FIG. 7

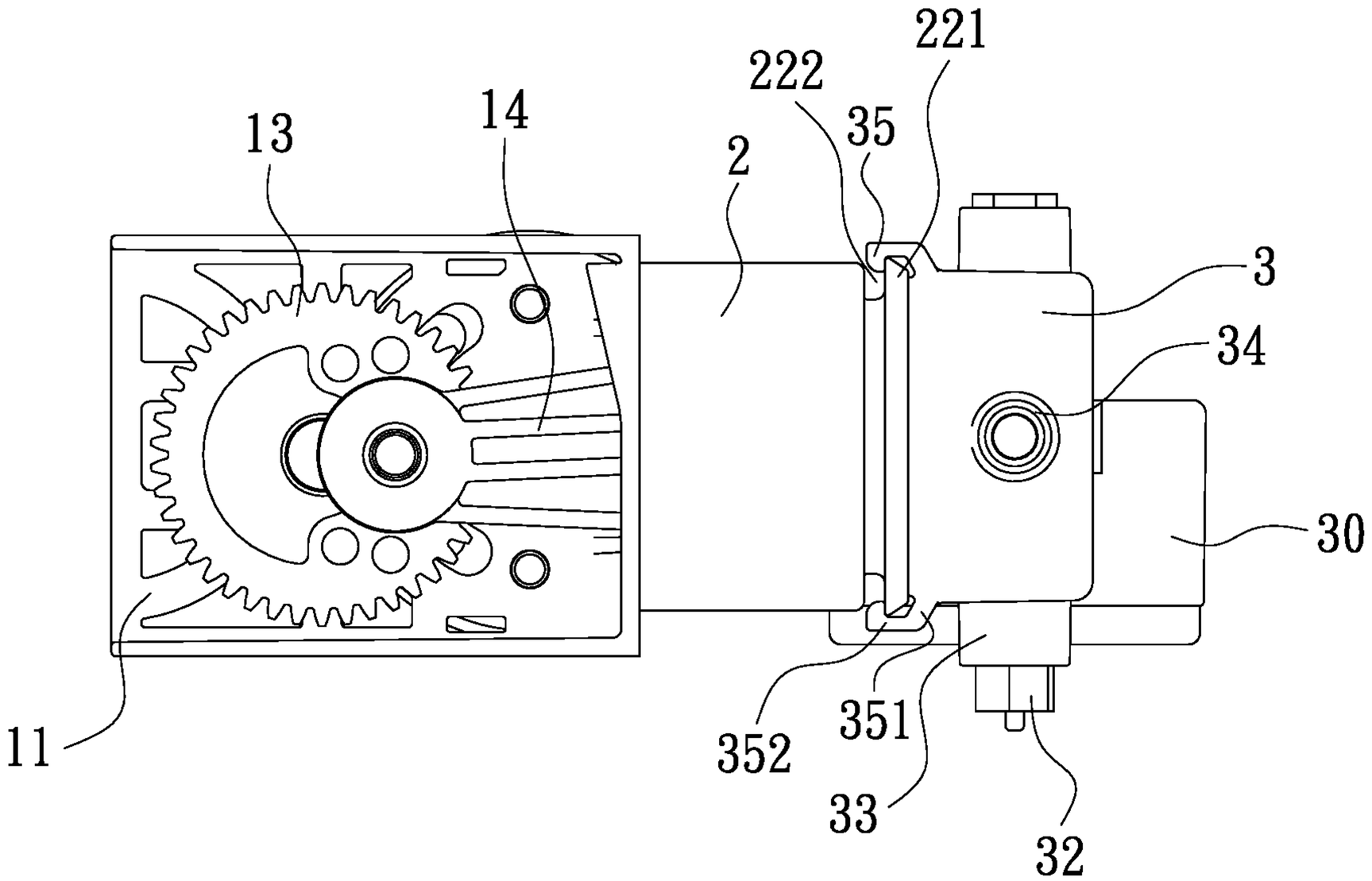

FIG. 8

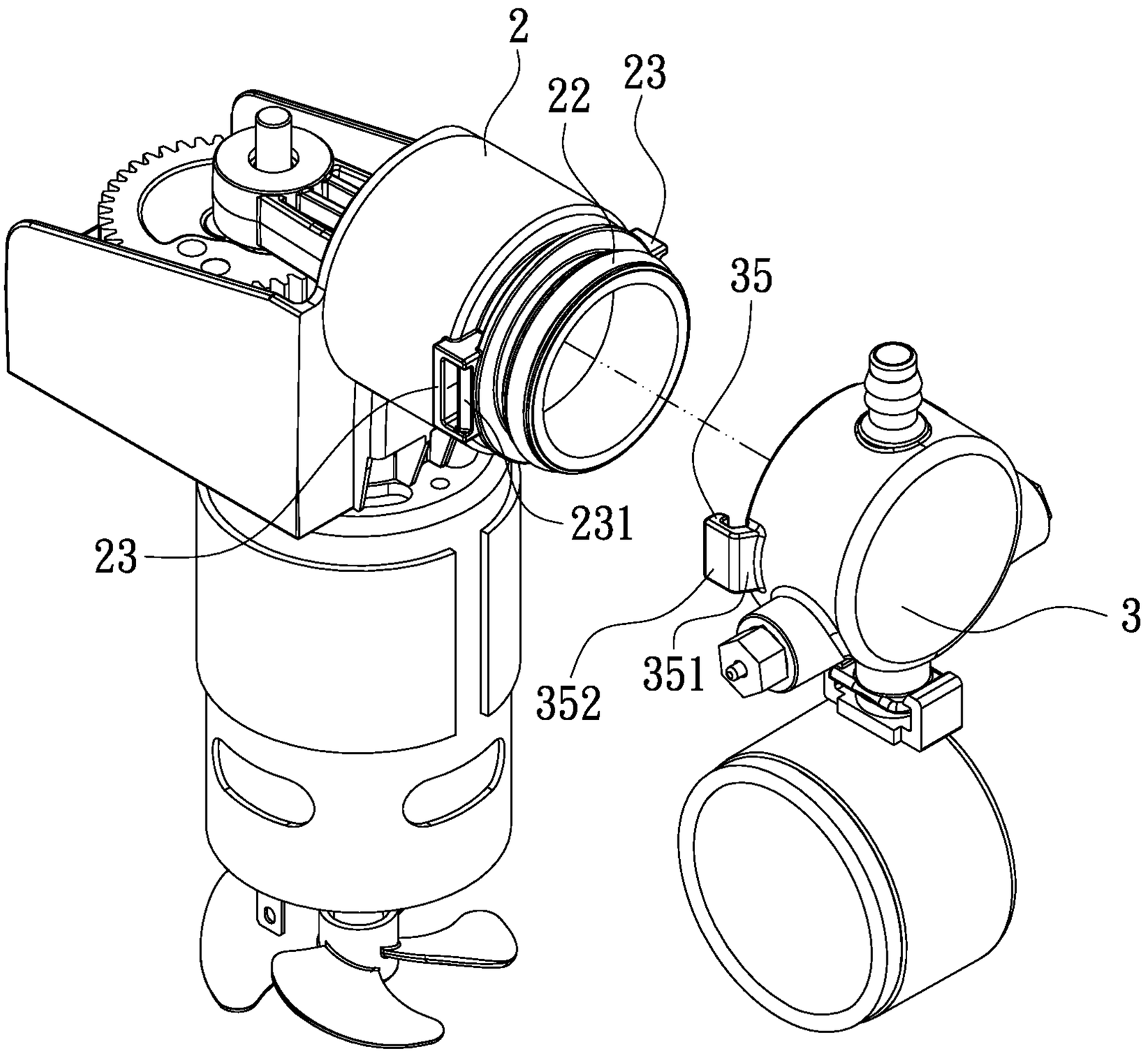

FIG. 9

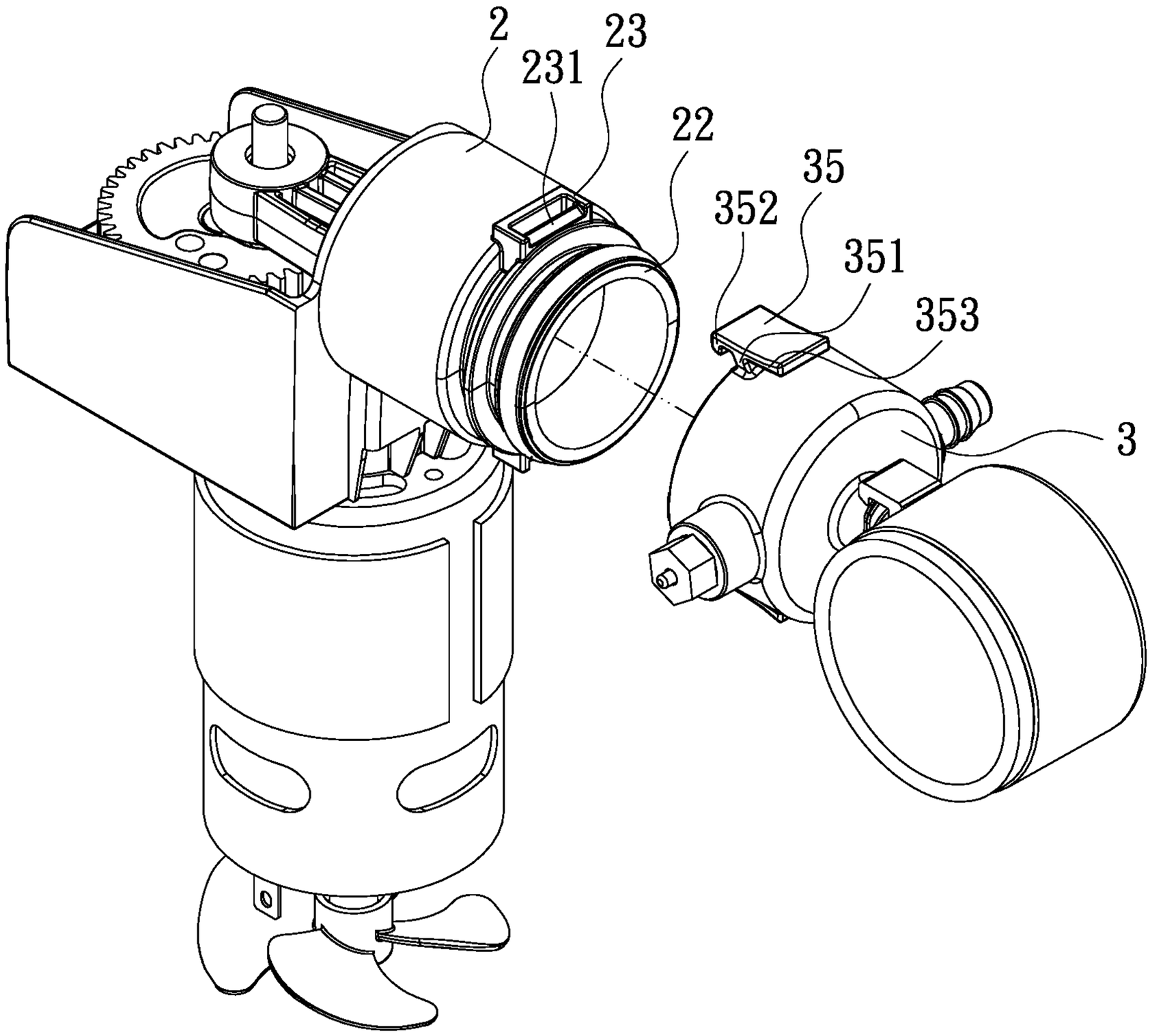

FIG. 10

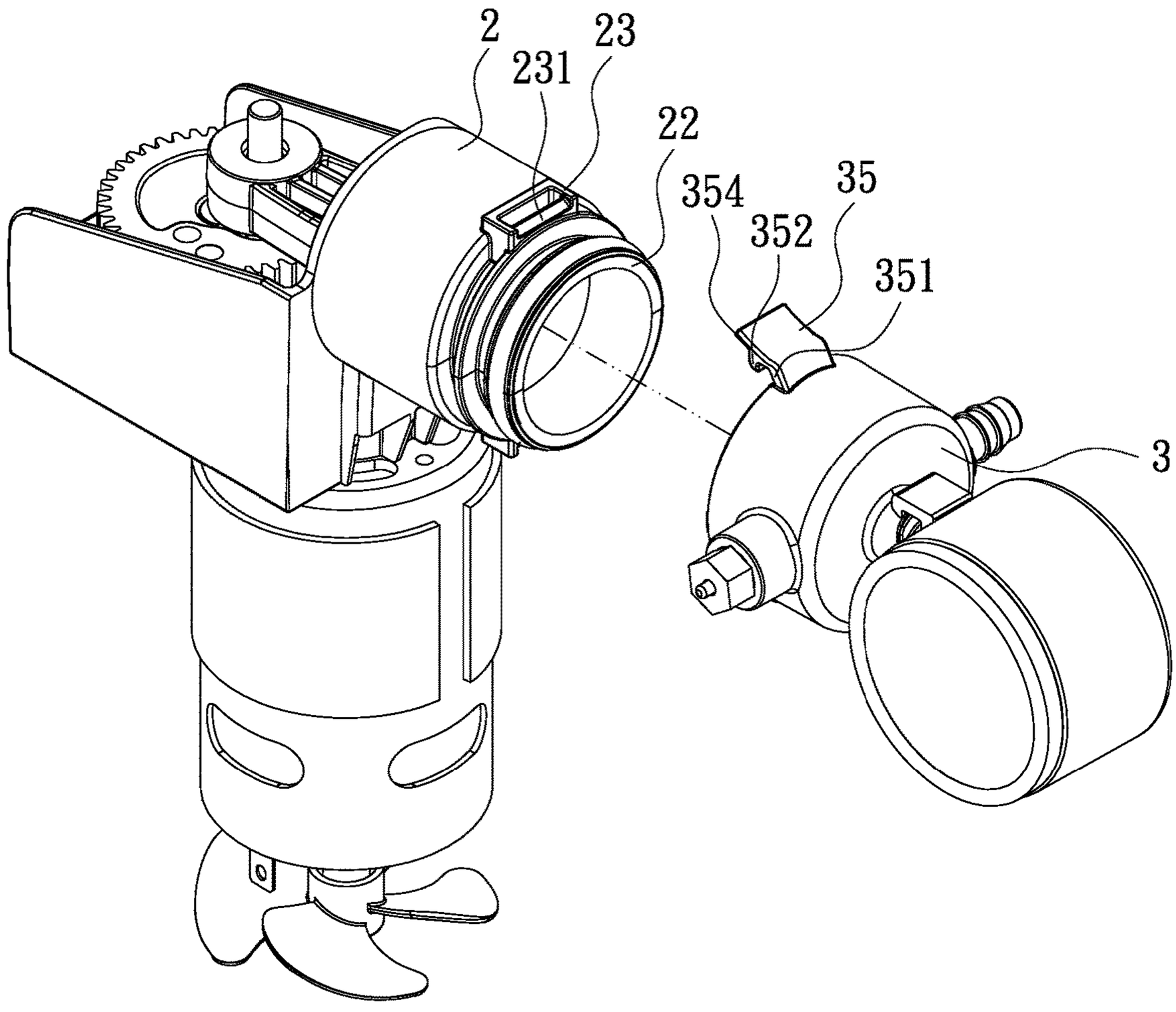

FIG. 11

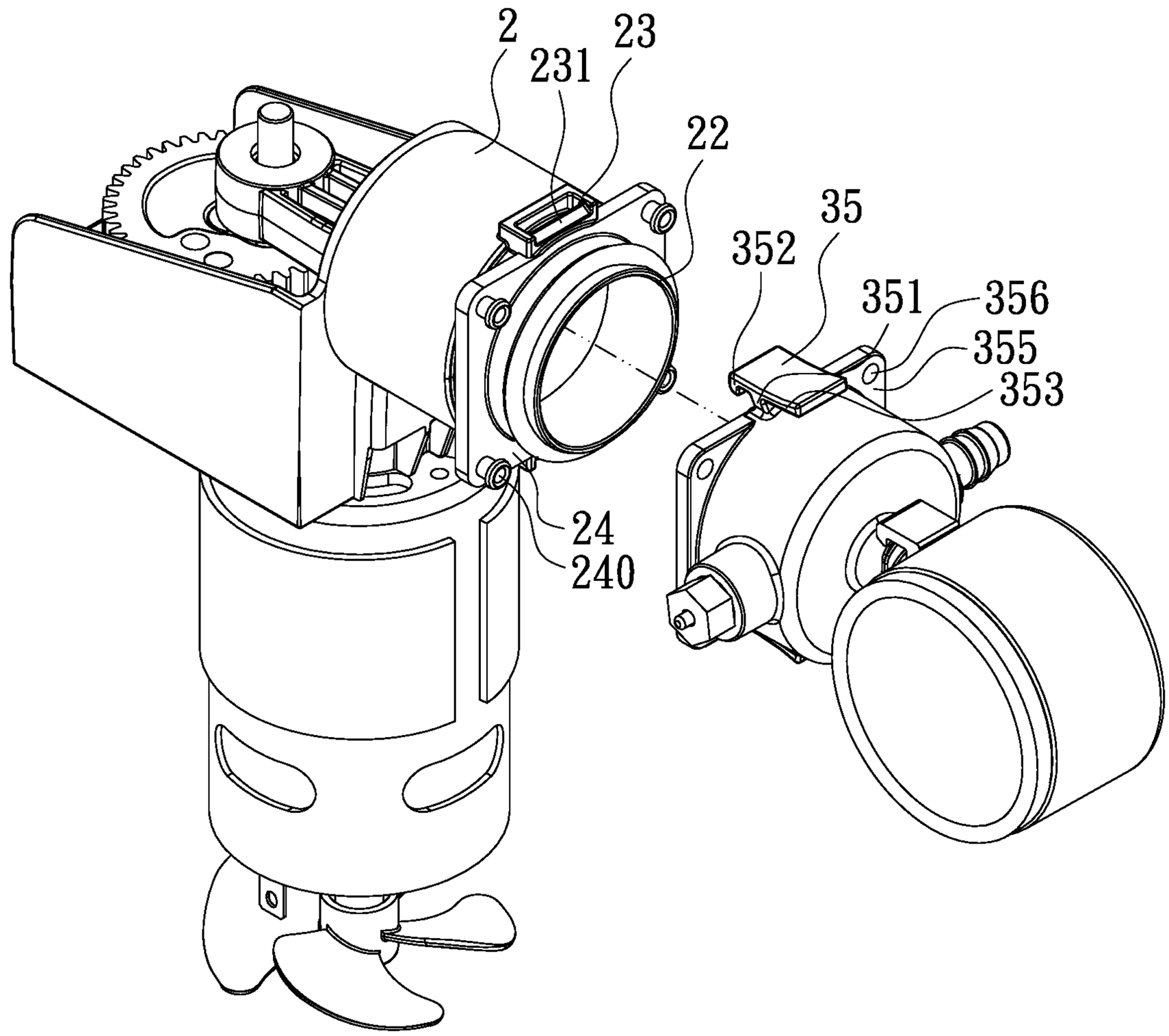

FIG. 12

AIR COMPRESSOR

TECHNICAL FIELD OF THE INVENTION

The present invention relates to an air compressor and, more particularly, to an improved air compressor which includes a cylinder being fitted with a piston body and defining a plurality of exit holes of approximately equal dimension, so that compressed air produced in the cylinder may quickly enter an air storage container, so that the piston body can conduct reciprocating motion more smoothly and thus the performance of the air compressor can be increased.

DESCRIPTION OF THE PRIOR ART

Currently, an air compressor basically has a cylinder which allows a piston body to conduct reciprocating motion therein to produce compressed air which can overcome a valve mechanism, so that the compressed air can flow through an exit hole of the cylinder to enter the inner space of an air storage container or an air tank. The air storage container is provided with outlets for delivering the compressed air to an object to be inflated.

In conventional air compressors, there is only one exit hole defined at the cylinder for communicating with the air storage container. The exit hole of the cylinder is controlled by a valve mechanism, which generally includes a plug and a compression spring, so that the exit hole can be opened or closed properly according to the pressure of the compressed air. In operation, the compressed air produced in the cylinder can overcome the compressive force of the compression spring to enter the inner space of the air compressor. However, the compressed air stored in the air storage container can exert a back force on the plug, thus restraining the plug being moved away from the exit hole. As a result, the piston body, which conducts reciprocating motion in the cylinder, will be subjected to greater resistance. Therefore, the piston body may not move smoothly in the cylinder, and thus the speed of inflating an object will become slow. Furthermore, the motor of the air compressor may become too hot, thus decreasing the performance of the motor. Even worse, the motor may be under the risk of burning out.

In view of the foregoing, the applicant intends to develop an improved air compressor which can solve the shortcomings of conventional air compressors.

SUMMARY OF THE INVENTION

One object of the present invention is to provide an improved air compressor, wherein a cylinder thereof defines a plurality of exit holes, through which a large amount of compressed air produced in the cylinder may enter an air storage container in a short time.

Another object of the present invention is to provide an improved air compressor, wherein a cylinder thereof is fitted with a piston body and defines a plurality of exit holes of approximately equal dimension, so that a large amount of compressed air produced in the cylinder may enter an air storage container in a short time. Since the compressed air can quickly enter the air storage container, the piston body can conduct reciprocating motion more smoothly and thus the performance of the air compressor and the speed of inflating an object can be increased.

Other objects, advantages, and novel features of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a 3-dimensional view of an air compressor according to one embodiment of the present invention.

FIG. **2** shows an exploded view of the air compressor.

FIG. **3** shows a plan view of the air compressor, wherein a plurality of exit holes defined at a cylinder thereof are revealed.

FIG. **4** shows a plan view of the air compressor, wherein a plurality of plugs being used to seal the exit holes are revealed.

FIG. **5** shows a 3-dimensional view of an air storage container used in the air compressor, wherein a plurality of columns provided at an inner surface of the air storage container are revealed.

FIG. **6** shows a plan view of the air compressor, wherein the air storage container is assembled onto the cylinder.

FIG. **7** shows a sectional view of the air compressor taken along line A-A in FIG. **6**.

FIG. **8** shows a plan view of the air compressor, wherein a gear and a piston body used in the air compressor are revealed.

FIG. **9** shows an exploded view of an air compressor according to another embodiment of the present invention.

FIG. **10** shows an exploded view of an air compressor according to a further embodiment of the present invention.

FIG. **11** shows an exploded view of an air compressor according to a still further embodiment of the present invention.

FIG. **12** shows an exploded view of an air compressor according to a yet still further embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2**, an air compressor according to one embodiment of the present invention is shown, which generally comprises a cylinder **2** fitted with a piston body **14**, and a main frame **11** for mounting a motor **12** which can rotate a gear **13** to drive the piston body **14** to conduct reciprocating motion for producing compressed air in the cylinder, which may enter an air storage container **3** provided with one or more outlets for supplying air to various devices. For example, the outlet **31** can be used for connecting with a pressure gauge **30**, the outlet **33** can be used for connecting with a relief valve **32**, and the outlet **34** can be connected with a hose for inflating an object (not shown).

Referring to FIGS. **2** through **7**, the air compressor is designed in a way different from conventional technology. The cylinder **2**, which defines three exit holes **4**, **5**, **6** at its top wall **21**, is formed of a plastic material, integrally with the main frame **11**. The exit holes **4**, **5**, **6** are approximately equal in dimension. As shown in FIG. **3**, the exit hole **4** is defined to have a diameter of (X), the exit hole **5** is defined to have a diameter of (Y), and the exit hole **6** is defined to have a diameter of (Z), wherein X=Y=Z; namely, the exit holes **4**, **5**, **6** have the same diameter. The exit holes **4**, **5**, **6** are regulated by a control mechanism to be opened or closed. The control mechanism includes a plurality of plugs **7**, **8**, **9** and a plurality of compression springs **71**, **81**, **91**, corresponding to plugs **7**, **8**, **9**. The compression springs **71**, **81**, **91** can urge the plugs **7**, **8**, **9** to seal the exit holes **4**, **5**, **6**, respectively (see FIGS. **2**, **4** and **7**). The cylinder **2** has a

tubular projection **22** formed on the top wall **21**. The tubular projection **22** is provided with a circular flange **221** at its outer surface and defines an annular groove **222** between the circular flange **221** and the top wall **21**. The air storage container **3** is provided with two opposite coupling means **35** (see FIG. **5**), each of which includes a base portion **351** extending outwardly from a bottom edge of the air storage container **3**, and an L-shaped holding portion **352** integrally formed at one end of the base portion **351** distal from the bottom edge of the air storage container **3**. Furthermore, the air storage container **3** is provided at an inner surface thereof with a plurality of columns **37**, **38**, **39** corresponding to the compression springs **71**, **81**, **91**. The column **37** has a base round portion **371**, a middle round portion **372**, and an end round portion **373**; the column **38** has a base round portion **381**, a middle round portion **382**, and an end round portion **383**; the column **39** has a base round portion **391**, a middle round portion **392**, and an end round portion **393**; wherein the diameter of the base round portion **371**, **381** or **391** is greater than that of the corresponding middle round portion **372**, **382** or **392**, and the diameter of the middle round portion **372**, **382** or **392** is greater than that of the corresponding end round portion **373**, **383** or **393**. The L-shaped holding portions **352** of the coupling means **35** of the air storage container **3** can be inserted into the annular groove **222** and engaged with the circular flange **221**, so that the air storage container **3** can be detachably assembled onto the cylinder **2**. As shown in FIG. **7**, each of the compression springs **71**, **81**, **91** has one end forcing against the corresponding plug **7**, **8** or **9**, and has another end being fitted around the middle round portion **372**, **382** or **392** of the corresponding column and forcing against the base round portion **371**, **381** or **391** of the corresponding column. Each of the end round portions **373**, **383**, **393** of the columns **37**, **38**, **39** is located at a predetermined height above the corresponding plug so as to limit the movement of the corresponding plug. FIG. **1** shows the air storage container **3** being assembled onto the cylinder **2**.

Referring to FIGS. **7** and **8**, when the piston body **14** conducts reciprocating motion, the compressed air produced in the cylinder **2** can overcome the force of the compression springs **71**, **81**, **91** exerted on the plugs **7**, **8**, **9**, thus pushing the plugs **7**, **8**, **9** away from the exit holes **4**, **5**, **6**, respectively, so that the compressed air can flow into the inner space **36** of the air storage container **3**. Initially, since the compressed air can flow into the inner space **36** of the air storage container **3** simultaneously via the exit holes **4**, **5**, **6**, the air storage container **3** can be filled with a large amount of air in a short time. Later, since there is a large amount of air having entered the inner space **36** of the air storage container **3**, the air contained in the air storage container **3** can exert a greater back force on the plugs **7**, **8**, **9** compared to the air initially contained in the air storage container **3**. In other words, the piston body **14** may experience greater resistance in conducting reciprocating motion, and thus may cause the exit holes **4**, **5**, **6** more difficult to be opened. However, upon a decrease of the pressure of the air contained in the air storage container **3**, the back force exerted on the plugs **7**, **8**, **9** will decrease and this allows the compressed air produced in the cylinder **2** to quickly enter the inner space **36** of the air storage container **3**. Considering the operation of the air compressor as a whole, since the multiple exit holes allow the piston body **14** to conduct reciprocating motion more smoothly, the performance of the air compressor can be increased. Thus, the air compressor can inflate an object more quickly.

FIG. **9** shows another embodiment of the present invention, wherein the tubular projection **22** is provided at its outer surface with two opposite lugs **23** each having an engagement section **231**. The L-shaped holding portions **352** of the two coupling means **35** can engage with the engagement sections **231** of the two lugs **23**, so that the air storage container **3** can be detachably assembled onto the cylinder **2**.

FIG. **10** shows a further embodiment of the present invention, wherein the tubular projection **22** is provided at its outer surface with two opposite lugs **23** each having an engagement section **231**. The L-shaped holding portions **352** of the two coupling means **35** can engage with the engagement sections **231** of the two lugs **23**, so that the air storage container **3** can be detachably assembled onto the cylinder **2**. Besides, each of the two coupling means **35** further includes an operation portion **353**, which is a resilient member and integrally formed at one end of the base portion **351** distal from the bottom edge of the air storage container **3** and located at a side of the base portion **351** opposite to the L-shaped holding portion **352**. As such, a user may depress the operation portions **353** to have the L-shaped holding portions **352** disengaged from the lugs **23**, so that the air storage container **3** can be dissembled from the cylinder **2** conveniently when maintenance is required.

FIG. **11** shows a still further embodiment of the present invention, wherein the tubular projection **22** is provided at its outer surface with two opposite lugs **23** each having an engagement section **231**. The L-shaped holding portions **352** of the two coupling means **35** can engage with the engagement sections **231** of the two lugs **23**, so that the air storage container **3** can be detachably assembled onto the cylinder **2**. Besides, each of the two coupling means **35** further includes an operation portion **354**, which is a resilient member and extends from the L-shaped holding portion **352** in a direction opposite to the base portion **351**. As such, a user may pull the operation portions **354** outwardly from the cylinder **2** to have the L-shaped holding portions **352** disengaged from the lugs **23**, so that the air storage container **3** can be dissembled from the cylinder **2** easily when maintenance is required.

FIG. **12** shows a yet still further embodiment of the present invention, wherein the tubular projection **22** is provided at its outer surface with two opposite lugs **23** each having an engagement section **231**. The tubular projection **22** is further provided at its outer surface with a first rectangular flange **24** which defines a plurality of first positioning holes **240**. The air storage container **3** is further provided at its bottom edge with a second rectangular flange **355** which defines a plurality of second positioning holes **356** corresponding to the first positioning holes **240** of the first rectangular flange **24**. In addition to the L-shaped holding portions **352** of the coupling means **35** being engaged with the engagement sections **231** of the lugs **23**, the first and second flanges **24**, **355** can be attached together by fasteners fitted through the first and second positioning holes **240**, **356**. As such, the air storage container **3** can be assembled onto the cylinder **2** more securely.

As a summary, the air compressor of the present invention has a breakthrough over the prior art in that the top wall **21** of the cylinder **2** defines a plurality of exit holes **4**, **5**, **6**, which are approximately equal in dimension and controlled by the plugs **7**, **8**, **9** to allow the compressed air produced in the cylinder **2** to quickly enter the inner space **36** of the air storage container **3**, so that the piston body **14** can conduct reciprocating motion more smoothly and thus the performance of the air compressor can be increased. These features render the air compressor of the present invention useful and inventive.

I claim:

1. In an air compressor including a main frame for mounting a motor which rotates a gear to drive a piston body fitted in a cylinder to conduct reciprocating motion for producing compressed air which is allowed to enter an inner space of an air storage container; wherein the improvement comprises:

the cylinder defines at a top wall thereof a plurality of exit holes of equal dimension, the exit holes being regulated by a control mechanism to be opened or closed, the control mechanism including a plurality of plugs and a plurality of compression springs capable of urging the plugs to seal the exit holes, respectively, the air storage container provided with two opposite coupling means at a bottom edge thereof, each coupling means including a base portion extending outwardly from the bottom edge of the air storage container, and an L-shaped holding portion integrally formed at one end of the base portion distal from the bottom edge of the air storage container, the air storage container provided at an inner surface thereof with a plurality of columns corresponding to the compression springs, each of the compression springs having one end forcing against a corresponding plug, and having another end being fitted around a corresponding column, wherein each of the columns is located at a predetermined height above the corresponding plug so as to limit movement of the corresponding plug.

2. The air compressor of claim **1**, wherein the cylinder has a tubular projection formed on the top wall, the tubular projection provided at its outer surface with two opposite lugs each having an engagement section, the L-shaped holding portion of each coupling means capable of engaging with the engagement section of one of the two lugs, so that the air storage container is detachably assembled onto the cylinder.

3. The air compressor of claim **1**, wherein the cylinder has a tubular projection formed on the top wall, the tubular projection provided at its outer surface with two opposite lugs each having an engagement section, the L-shaped holding portion of each coupling means capable of engaging with the engagement section of one of the two lugs, each of the two coupling means further including an operation portion extending from the L-shaped holding portion in a direction opposite to the base portion, so that the air storage container is detachably assembled onto the cylinder.

4. The air compressor of claim **1**, wherein the cylinder has a tubular projection formed on the top wall, the tubular projection provided at its outer surface with a circular flange and defining an annular groove between the circular flange and the top wall for allowing the L-shaped holding portion of each coupling means to be inserted into the annular groove and engaged with the circular flange, so that the air storage container is detachably assembled onto the cylinder.

5. The air compressor of claim **1**, wherein the cylinder has a tubular projection formed on the top wall, the tubular projection provided at its outer surface with two opposite lugs each having an engagement section , the L-shaped holding portion of each coupling means capable of engaging with the engagement section of one of the two lugs, each of the two coupling means further including an operation portion which is integrally formed at one end of the base portion distal from the bottom edge of the air storage container and located at a side of the base portion opposite to the L-shaped holding portion, so that the air storage container is detachably assembled onto the cylinder.

6. The air compressor of claim **5**, wherein the tubular projection further provided at its outer surface with a first rectangular flange defining a plurality of first positioning holes, the air storage container further provided at its bottom edge with a second rectangular flange defining a plurality of second positioning holes corresponding to the first positioning holes of the first rectangular flange, so that the air storage container is detachably assembled onto the cylinder.

7. An air compressor, which comprises a main frame for mounting a motor which rotates a gear to drive a piston body fitted in a cylinder to conduct reciprocating motion for producing compressed air which is allowed to enter an inner space of an air storage container; wherein the cylinder defines at a top wall thereof a plurality of exit holes of equal dimension, the exit holes being regulated by a control mechanism to be opened or closed, the control mechanism including a plurality of plugs and a plurality of compression springs capable of urging the plugs to seal the exit holes, respectively, the air storage container provided with two opposite coupling means at a bottom edge thereof, each coupling means including a base portion extending outwardly from the bottom edge of the air storage container, and an L-shaped holding portion integrally formed at one end of the base portion distal from the bottom edge of the air storage container; wherein the air storage container is provided at an inner surface thereof with a plurality of columns corresponding to the compression springs, each of the columns having a base round portion, a middle round portion, and an end round portion; each of the compression springs has one end forcing against a corresponding plug, and has another end being fitted around the middle round portion of a corresponding column and forcing against the base round portion of the corresponding column, wherein each of the end round portions of the columns is located at a predetermined height above the corresponding plug so as to limit movement of the corresponding plug.

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