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(54) **DOUBLE AXIS MIXER FOR LIQUIDS IN A RECEPTACLE, PARTICULARLY FOR HOMOGENIZATION OF PAINTS**

(57) The present invention proposes a double axis mixing device which comprises a frame means with its upper (28) and lower (29) plates, the lower plate receiving a receptacle, the contents of which are subjected to homogenization, a triangular frame support means (11), a vertical support frame (12) connected to a shaft (14) and rotating an upper support means together with said upper and lower receptacle plates. The upper support means is connected to a series of clamping arms (24) by means of rotatable element (23) from which said clamping arms project radially. The tip portions of said clamping arms make contact with an elastic circular friction element (25), which extends along a circular trajectory of said clamping arms so as to induce a second rotation axis by way of their tip portions contacting said circular rubber element successively. Also an auto-centering and pressing device comprising a plurality of horizontal springs (30,31) along grooves (32,33) within said lower and upper plates are employed.

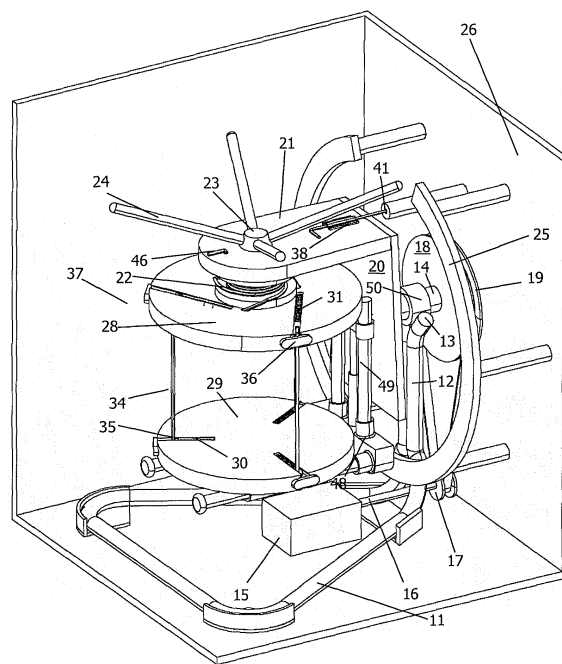


Fig. 1

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Description

Technical Field of the Invention

[0001] The present invention relates to a mixer for homogenization of liquids or for mixing liquids and semi-liquids, particularly paints, in a homogenized manner.

Background of the Invention

[0002] Several types of shakers, mixers and agitator devices have been used so far, especially in dyeing industry and also in laboratories, to homogenize liquids or to mix compositions of liquids or semi liquids with pulverized or granulated materials. In such a mixing device, it is of greatest concern to achieve perfect homogenization of a mixture prepared in strict percentages in order for obtaining desired physical effects, such as desired color in a paint composition. Particularly in dyeing industry, mixing a plurality of colors in certain doses to obtain a definite color shade requires perfect homogenization of the composition.

[0003] In the technical field of the present invention, a number of patents which provide a variety of solutions to above specified problem exist. In particular, apparatuses mixing by way of agitation of a receptacle into which paint and other materials are dispensed have been heavily worked with. Those apparatuses shake or move a receptacle in a manner that a frame which is used to accommodate a receptacle filled with certain dose contents is rotated around one or more axis. These devices also comprise means for movably supporting the frame, clamping means for safely securing the receptacle into said frame means and driving means for moving said frame to agitate the contents.

[0004] According to the disclosure proposed by EP 0478212, a receptacle is agitated about two separate axes in order to achieve homogenization of the receptacle contents. To accomplish this, a motor driven shaft, rotating said receptacle together with said clamping means, is connected to a pulley that also drives, via a belt, a turntable so as to rotate one of the receptacle clamping plates.

[0005] According to the present invention, the receptacle is rotated around two separate axes and preferably agitated in pulsations to provide serial strokes, which basically constitute the most useful type of motion in the sense that the pulsations induce swift accelerations, substantially contributing to achieve perfect homogenization as such accelerations create forces that induce dynamic oscillations in the receptacle being agitated.

[0006] On the other hand, compared to the teachings of EP 0478212, the present invention proposes a much simpler structure not entailing additional mechanical transmission means such as pulleys and belts to effect rotation of the receptacle around the second axis. According to the present invention, a motor excites the system only in one axis in a conventional manner and rota-

tion around the second axis is accomplished through use of a series of special arms connected to the clamping means and inducing rotation about said second axis by itself.

5 [0007] Another relevant issue as to placing of the receptacles between said clamping means in a secure manner is to ensure centering of the receptacle during mixing operation. In failure of this, there is a risk for centrifugal forces to hurl the receptacle much easily. To prevent this, the present invention proposes an auto-centering device that automatically centers the receptacle when the same is safely secured between said clamping means, i.e. the upper and lower plates that carry and fix the receptacle.

10 [0008] As well known by those skilled in the art, many producers use receptacles of different sizes and shapes. In addition, these receptacles usually have a handle which are movable or rotatably attached to the receptacle. This freedom of movement of the handles cause noise and incidentally damage during mixing operation. To avoid such inconveniences, the auto-centering device of the present invention also locks the handle and prevent it from moving or rotating during mixing.

15 [0009] To provide further homogenization, the present invention also benefits from a very basic principle, which is based on providing an unbalanced rotation due to the fact that the main rotation axis does not particularly lie over the centre of gravity of the agitated assembly, which simply creates varying centrifugal forces in different magnitudes at the two furthest points to the rotation axis within the receptacle.

Objects of the Invention

20 [0010] One of the objects of the present invention is to provide a two-axis mixing apparatus having a simple structure not entailing additional mechanical transmission means such as pulleys and belts to effect rotation of the receptacle about a second axis.

25 [0011] Another object of the present invention is to provide a two-axis mixing apparatus operating in pulsations about one of the rotation axes, hence inducing swift accelerations which substantially contribute to achieve perfect homogenization in result of irregular accelerations that create dynamic oscillations within the receptacle.

30 [0012] Another object of the present invention is to provide a two-axis mixing apparatus having additional rotation means other than a motor driven shaft, accommodating a series of special arms and clamping means which are used to fix the receptacle in place and which are used to create the rotation around the second axis in the absence of an additional drive motor or transmission organs.

35 [0013] Yet another object of the present invention is to provide a two-axis mixing apparatus having an auto-centering device that automatically centers the receptacle when the same is secured in between the clamping means.

[0014] A further object of the present invention is to provide a two-axis mixing apparatus having an auto-centering device, automatically locking the handle of a receptacle and constricting freedom of movement of the same to avoid damage and undesired noise during mixing operation.

[0015] Still a further object of the present invention is to provide a two-axis mixing device which stands on three feet in order to eliminate stability problems associated with one suspended foot of four feet devices that occur on uneven surfaces.

Summary of the Invention

[0016] The mixing device of the present invention comprises a frame means with an upper and a lower plate, the lower plate receiving a receptacle, the contents of which are desired to be mixed thoroughly or homogenized, a triangular frame support means, a vertical support frame connected to a shaft and an upper support means rotating together with said upper and lower receptacle plates. The upper support means is connected to a series of clamping arms by means of a rotatable element from which said clamping arms preferably project upwardly with a slight inclination. The tip portions of said clamping arms, in one embodiment of the invention, make contact with an elastic circular friction element which extends along a circular trajectory of said clamping arms so as to induce rotation around a second axis in result of smooth contact of tip portions of the arms on said circular rubber element. Also an auto-centering and pressing device comprising a plurality of horizontal springs located along grooves drilled co-planar within said lower and upper plates are employed. Each spring on the upper plate is connected at one end to another spring on the lower plate by means of a cable. The cables between two corresponding springs travel along said grooves within said upper and lower plates to compress and lock a receptacle.

Brief Description of the Figures

[0017] A complete appreciation of the invention and many of the advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, which are solely given for exemplifying some of the embodiments of the invention, where:

Fig. 1 shows a general perspective view of a mixing device according to a first embodiment of the present invention in which an elastic circular friction element is used to effect pulsating rotation around a second axis.

Fig. 2 shows a general frontal perspective view of the mixing device shown in Fig. 1.

Fig. 3 shows a general perspective view of the mixing device shown in Fig. 1 in which a receptacle is placed in between the upper and lower clamping plates.

Fig. 4 shows the top view of the mixing device shown in Fig. 1.

Fig. 5 shows the bottom view of the mixing device shown in Fig. 1.

Fig. 6 shows a perspective view of the mixing device according to the first embodiment of the present invention in which a receptacle is clamped and centered in between the upper and lower plates and rotation around two axes has recently started during the mixing operation.

Fig. 7 shows a top view of the mixing device described in Fig. 6.

Fig. 8 shows a perspective view of the mixing device described in Fig. 1 where a receptacle is placed but not secured in between the upper and lower clamping plates.

Fig. 9 shows a perspective view of the mixing device according to a second embodiment of the present invention in which a circular element is connected to the tip portions of the clamping arms to effect non-pulsating rotation about the second axis.

Fig. 10 shows a perspective view of the mixing device described in Fig. 9 in which a receptacle is clamped and centered in between the upper and lower plates and rotation around two axes has recently started during the mixing operation.

Fig. 11 shows the top view of the mixing device described in Fig. 10.

Fig. 12 shows a perspective view of the mixing device described in Fig. 9 in which a receptacle is secured in between the lower and upper clamping plates and the mixing operation has not started.

Fig. 13 shows the frontal view of the mixing device described in Fig. 12.

Fig. 14 shows the pulley-belt mechanism attached to the frame support member of the mixing device according to the present invention.

Fig. 15 shows the side view of the mixing device described in Fig. 9 in which the mixing device in the loading position, i.e. the lower clamping plate is moved outwardly for easily locating a receptacle.

Fig. 16 shows a shock absorber and guiding rods

according to the present invention.

Fig. 17 is a perspective view of the upper clamping plate and the unidirectional locking gear which helps in securing the receptacle in place.

Fig. 18 shows the horizontal support member and the upper clamping plate according to the present invention.

Fig. 19 shows the lower clamping plate and the lower plate springs connected to the cables according to the present invention.

Fig. 20 shows a perspective view of the mixing device according to a third embodiment of the present invention in which the elastic circular friction element is replaced with a series of elastic rods for effecting pulsating rotation around a second axis.

Fig. 21 shows the frontal view of the mixing device described in Fig. 20

Fig. 22 shows the perspective view of the mixing device described in Fig. 20 where the fixing cables protrude outside the springs located in the grooves within the lower and upper clamping plates.

Fig. 23 shows the lower perspective of the mixing device described in Fig. 22.

Fig. 24 shows the upper plate and the lower plate which are connected by cables that protrude outside the grooves of the plates.

Detailed Description of the Invention

[0018] Now referring to the figures outlined above, the present invention proposes a frame support element (11), which stands on the ground with a triangular base. Said frame support element (11) is attached to a vertical support member (12), extending as a "V" projection (13) to carry a shaft (14), by means of a shaft bushing (50), the shaft being driven by a motor (15) via mechanical transmission elements in a conventional manner. These transmission organs include a shaft (16) connected to the motor (15) and a pulley-belt mechanism in which a first pulley (17) is connected to a second pulley (18) by means of a belt (19), said second pulley (18) driving said shaft (14) in the usual way.

[0019] The main assembly (37), which is subjected to agitation according to the present invention, comprises means for both clamping and securing a medium to be agitated and additional means to provide rotation about a second rotation axis. Said assembly (37) is connected to said shaft (14) by means of a vertical support plate (20), rotating the entire assembly (37). The vertical support plate (20) projects vertically towards central axis of

said main assembly (37) to form a horizontal support member (21) in between a clamping pulley (22) on the underside and a rotatable element (23) on the upperside. Said rotatable element (23) and said clamping pulley (22) are concentric to each other.

[0020] Said horizontal support member (21) is connected to a series of clamping arms (24) by means of said rotatable element (23) from which said clamping arms project (24) radially and upwardly, preferably with a slight inclination with respect to the horizontal axis. The tip portions of said clamping arms (24) are designed to make smooth contact, in one embodiment of the invention, with an elastic circular friction element (25), which is fixedly attached to a back support panel (26) and which extends along the circular trajectory of said clamping arms (24) during rotation. The clamping arms (24) rotate together with said rotatable element (23) with their center forming the center of rotation of the second axis and their tip portions forming the circular trajectory drawn by the friction element (25). The circular friction element (25) is preferably made of rubber material for providing smooth contact with the tips of each of the arms (24).

[0021] The tip portions of said clamping arms (24) sink slightly into said circular friction element (25) during rotation around the shaft (50) that form the first axis of rotation. This displacement, depending on the elasticity module of said circular rubber element (25), pushes back on said arms (24) with a restoring force to produce a pulsative rotation. The friction in between the tip portions of the arms (24) and the circular element (25) create forces that induce dynamic oscillations in the receptacle (27). These pulsating forces constitute a highly desired motion as the pulsating forces induce swift accelerations during rotation and contribute substantially in achieving perfect homogenization.

[0022] The clamping arms (24) are also used in centering and pressing a given receptacle (27) in between the upper and lower clamping plates (28, 29). The auto-centering and pressing device according to the present invention comprises a plurality of springs (30, 31) in the lower and upper plates extending along horizontally drilled grooves (32, 33) which are co-planar with the corresponding plates. While the grooves (32) on the lower clamping plate (29) extend radially within the plate in one embodiment, the grooves (33) on the upper clamping (28) run tangent to the bottom surface of the clamping pulley (22), which is concentric with the rotatable element (23). This differentiation in the positioning of the grooves (32, 33) is advantageous in the sense that the cables (34) connecting the upper and lower clamping plates can be easily wrapped around the clamping pulley (22) which is located on top of the upper clamping plate (28). The grooves (32) on the lower plate are designed to occupy the most reasonable location on the lower plate (29). Each spring (31) on the upper plate (28) is connected at one end to a corresponding spring (30) on the lower plate (29) by means of said cable (34) and at the other end to another cable (34) that turns over in said clamping pulley

(22). The cables (34) shall have strength sufficient for safely pulling up said lower plate (29) which is loaded with a receptacle (27), securing the upper and lower plates and the receptacle securely and keeping them in integrity during operation of the agitator device.

[0023] Once an operator loads a receptacle on the lower plate (29) and rotates the arms (24), the lower plate and the receptacle (27) will rise towards to upper plate (28) as the cables are wind in the clamping pulley (22). While the distance in between the lower and upper plates (28, 29) decrease, until it equals to the height of the receptacle, the receptacle (27) will be automatically centered by the cables which are in effect of the tensile forces and which lean on the sides of the receptacle. Needless to mention, the cables are pre-loaded with a plurality of upper and lower springs (30, 31) which travel inwardly along said grooves (32, 33) when arms are rotated by an operator or a motor which is not exemplified in the accompanying figures. As the arms (24) are further rotated, the compression on the springs (30, 31) will increase with the consequence of fully centering the receptacle and securing the same in place as the upper and lower plates (28, 29) will not be able to move any further due to the presence of the receptacle. Once the receptacle (27) is secured in its place for avoiding movement during mixing, it works as a shaft which connects the upper plate (28) to the lower plate (29).

[0024] The cables (34) are directly operated by clamping arms (24) for drawing the lower clamping plate (28) in the direction of said upper plate (29), which is fixedly attached to said horizontal support member (21). Rotation of said arms (24) for the purpose of pressing and centering said receptacle (27) prior to agitation may be accomplished by means of an electric motor as well as a pneumatic or a hydraulic motor attached to the vicinity of the stationary upper clamping plate (28). While still remaining within the scope of the present invention, it is apparent that the clamping arms can be driven by a pneumatic or hydraulic motor, instead of the operator's hands, as the case might be more advantageous where flammable or hazardous fluids are to be processed. As this automation which might be adopted for eliminating human intervention in the securing step is already well known by those skilled in the art, we will not discuss this issue any further.

[0025] During pressing and auto-centering, the assembly (37) is prevented from rotating about the shaft's (14) axis by means of a locking element (38) located on said horizontal support member (21). The locking element (38) engages to a corresponding slot (41) of a locking rod (50) connected to said back support panel (26) in the examples shown in the figures. According to the present invention, the lower clamping plate (29) remains stationary only during the pressing and auto-centering steps. This is accomplished by means of a lower plate locking means, which might be engaged only in the pressing and auto-centering steps that take place after loading. This additional locking means, which is not shown in the

attached figures, may be provided in the form of a tooth equipped with a push-spring on the lateral wall of said lower clamping plate (29), engaging in a corresponding lower plate slot on said vertical support plate (20). Due to the simplicity of such type a locking mechanism, further details need not be described herein.

[0026] The plurality of cables (34) is wind onto a clamping pulley (22) when the clamping arms (24) are rotated clockwise. On the other hand, a stop gear (39) which is located on the inside of said upper clamping plate (28) and which is co-axial to said clamping pulley (22), is coupled to a unidirectional locking pin (40), which only enables unidirectional rotation of said stop gear (39) and which does not allow counterclockwise rotation of said clamping arms (24) in order to avoid unwanted release of said lower clamping plate (29) and the receptacle during securing or mixing operations. The stop gear can be released manually by disengaging a locking pin (46).

[0027] It is also preferable that the clamping pulley (22) has individual sections divided by separators for each individual cable (34) employed in the assembly (37). In all of the accompanying figures, all sample embodiments were shown to have three cables (34) for securing a receptacle (27) in between the lower and upper clamping plates (28, 29). Thus, the clamping pulley (22) of the examples may preferably have three sections on each of which separate cables are wind.

[0028] When a receptacle (27) is placed on said lower clamping plate (29), the latter may be locked by said lower plate locking means. In case the horizontal support member (21) is also locked by the locking means (38), the receptacle may be safely pressed and centered by way of rotating said clamping arms (24), either manually or by way of a motor, such as an electric or pneumatic motor or other drive means.

[0029] The plurality of cables (34), disposed around the peripheries of said upper and lower plates (28, 29), not only serve to the purpose of securing the lower and upper plates and the receptacle but also to the purpose of automatically centering said receptacle (27). The outer ends of the springs (30 and 31) are provided with caps (35) to enable easy slide of the cables (34). There are also taps (36) fastened on the lateral surfaces corresponding to the outermost groove orifices of upper and lower plates (28, 29) to keep the springs (30, 31) within said grooves (32, 33) during unloaded position. More important than that, these taps (36) serve to the purpose of increasing the stability and rigidity of the lower and upper clamping plates (28, 29). Thus, these taps (36) are adapted to securely attach two successive parts which are separated by a groove (32 or 33).

[0030] When said receptacle (27) is pressed in between the lower (29) and the upper (28) clamping plates and centered by said cables (34) that move radially inward along grooves (32, 33), the mixer is ready for operation upon disengagement of the locking element (38) and other locking means provided for preventing the lower clamping plate from rotating around its center. While

the connecting cables (34) can protrude within the springs (30, 31) in the grooves (32, 33) as shown in Figs. 17 or 19, it may be preferable that these cables (34) run outside the springs (30, 31) as exemplified in Figs. 22, 23 and 24.

[0031] Once the mixing operation is done, the lower and upper plates (28, 29) can be separated by way of releasing the unidirectional locking gear (40) via an arm (46) located on said upper clamping plate (28). When, however, the locking gear (40) is released the lower clamping plate (29) and the "H" projection support element (47) carrying the same are allowed to fall freely together with the receptacle. To avoid this free fall, a shock absorber (48), which is positioned vertically in between two rods (49) that guide said lower clamping plate (29) vertically, is used. The shock absorber (48) operates in a conventional manner so as to absorb and dissipate the impact of kinetic energy, hence enabling soft landing of the lower clamping plate (29) loaded with said receptacle (27).

[0032] According to the present invention, the lower clamping plate (29) may be moved back and forth on said "H" projection lower plate support element (47) located on the underside. This is specifically provided for easy loading and unloading the receptacle. Moving said plate (29) on the support element (47) may be accomplished through use of a motor. This may especially be advantageous in the event that the receptacle (27) is too heavy to be handled solely by the operator.

[0033] According to the present invention, there is provided an empty portion along said elastic circular friction element (25), which is thereby in the form of a crescent, to permit rotation of the clamping arms (24) during pressing and auto-centering without said arms (24) contacting said elastic element (25) on the upper parts immediately before the mixing operation. In the event that rotation about said shaft's (14) axis is prevented by means of said locking element (38), the main assembly (37) will by itself stand in a position where said clamping arms (24) can not contact said elastic element (25) so as to be rotated freely in order for pressing and auto-centering said receptacle (27).

[0034] According to a second embodiment of the present invention which is exemplified in Fig. 9, rotation about the second axis, which is normally provided by means of said clamping arms (24) contacting said elastic circular friction element (25), may also be accomplished through use of circular element (42), like a driving wheel, connected to the tip portions of said arms (24) and providing rotation through non-pulsating continuous contact of two separate circular bodies (25, 42). Said second circular element (42) is preferably coated with a non-skid surface enabling frictional contact of two circular bodies.

[0035] According to the present invention, said clamping arms' (24) tip portions sink successively into said circular element's (25) surface at a substantially low level during axial rotation of said receptacle (27) and this contact induces a restoring force that pushes back on said

arms (24) to produce periodically pulsating rotation. The periodically pulsating rotation of this type can be accomplished by means of an alternate arrangement according to a third embodiment of the present invention. This third embodiment is exemplified in figures 20 and 21. According to this third embodiment, said elastic circular friction element (25) may be replaced by a series of elastic rods (51), extending perpendicular to said back support panel (26) and placed preferably in equal distances along the same circular path, designed in the form to make side contact with said clamping arms (24) to provide axial rotation of the assembly (37). To ensure continuity of axial movement, the clamping arms (24) in this arrangement, are provided with rounded tips (52) to contact semi-pointed tips (53) of said elastic rods (51).

[0036] One of the prominent features of the present invention is its ability to provide an unbalanced rotation due to the fact that the main rotation axis of the shaft (14) does not particularly lie over the centre of gravity of the assembly (37), which simply creates varying centrifugal forces in different positions within the receptacle (27).

[0037] An alternate embodiment of the present invention which is not shown in the figures have a gear which is located in place of the rotatable element (23), i.e. concentric with the upper and lower plates (28, 29). In this embodiment the rotatable element (23) is located closer to the fixing slot (41) and continuously in touch with and driven by said gear. The purpose is to adopt shorter arms (24) to decrease the volume of the mixing device and to change the ratio of revolutions in between the two rotational axis.

[0038] The motor (15), which produces rotational energy need not to be limited with an electric motor and can be of a type which is driven pneumatically, hydraulically or other sources of rotational movement. Likewise, the lower clamping plate (29) can be moved back and forth on the support element (47), in order to ease loading and unloading the receptacle (27), by means of a motor which is driven pneumatically or hydraulically. These would especially be advantageous in the cases of processing flammable or hazardous fluids where ex-proof conditions should be met.

Claims

1. A mixing device suitable for mixing and homogenizing liquids and semi-liquids, the device comprising a frame support element (11) connected to a vertical support member (12) that carries a shaft (14) driven by a motor (15), an assembly (37) comprising an upper clamping plate (28), a lower clamping plate (29) which is adapted to receive a receptacle (27) and which is slidably attached to guiding rods (49), horizontal and vertical support members (20, 21), said assembly (37) being rotatable by way of and around said shaft (14) which forms a first axis of rotation **characterized in that** the mixing device fur-

ther comprises ;

a rotatable element (23) from which a plurality of clamping arms (24) project radially, an elastic circular friction element (25) lying in a plane parallel to the rotation plane of said drive shaft (14) and extending along a circular trajectory of the tips of said clamping arms (24) when the drive shaft (14) is actuated, said elastic circular friction element (25) being adapted for establishing smooth contacts, when the shaft (14) is rotated, with the tip portions of said clamping arms (24) and thereby inducing rotation around the center of said rotatable element (23), which forms a second axis of rotation.

2. A mixing device suitable for mixing and homogenizing liquids and semi-liquids, the device comprising a frame support element (11) connected to a vertical support member (12) that carries a shaft (14) driven by a motor (15), an assembly (37) comprising an upper clamping plate (28), a lower clamping plate (29) which is adapted to receive a receptacle (27) and which is slidably attached to guiding rods (49), horizontal and vertical support members (20, 21), said assembly (37) being rotatable by way of and around said shaft (14) which forms a first axis of rotation **characterized in that** the mixing device further comprises ;

a rotatable element (23) from which a plurality of clamping arms (24) project radially, a plurality of elastic rods (51) which extend and are fixed on a plane which is parallel to the rotation plane of said first rotation axis and which are placed along a circular trajectory of the tips of said clamping arms (24) when the drive shaft (14) is actuated, the tips of said elastic rods (51) being adapted to make contact with the tip portions (52) of said clamping arms (24) to provide rotation of the assembly (37) around the center of said rotatable element (23), which forms a second axis of rotation.

3. A mixing device as defined in Claim 1 or 2 wherein the assembly (37) comprises a clamping pulley (22) on said upper clamping plate (28), concentric to said rotatable element (23) and driven by said clamping arms (24), said clamping pulley (22) being adapted for winding a plurality of cables (34) which connect the upper clamping plate (28) to said lower plate (29) so as to draw the same upwardly.
4. A mixing device as defined in Claim 3 wherein the upper and lower plates are provided with a plurality of grooves (33, 32) in which a plurality of springs (31, 30) are located for preloading and restricting the movement of cables (34) which carry and secure the lower clamping plate (29) and a receptacle (27) during operation.
5. A mixing device as defined in Claim 4 wherein the

plurality of cables (34) are disposed around the peripheries of said upper and lower plates (28, 29) whereby the receptacle (27) is automatically centered by said cables that lean on its lateral surfaces when said clamping arms (24) are rotated and the plurality of cables (34) are wind onto said clamping pulley (22).

6. A mixing device as defined in Claim 5 wherein a stop gear (39) located within said upper clamping plate (28) and concentric to said clamping pulley (22), is coupled to a unidirectional locking pin (40), which allows unidirectional rotation of said stop gear (39) and which eliminates unwinding of cables to block backward rotation of said clamping arms (24) during mixing operation.
7. A mixing device as defined in Claim 6 wherein said clamping arms (26) are rotated by means of a motor which is driven electrically, pneumatically or hydraulically.
8. A mixing device as defined in Claim 5 wherein said grooves (32, 33) are provided with taps (36) on the outer peripheries of lower and upper clamping plates (28, 29) whereby the stability and strength of the plates (28, 29) are increased.
9. A mixing device as defined in Claim 8 wherein the device is provided with a shock absorber (48) which is positioned vertically in between two rods (49) and attached to said lower clamping plate (29), to avoid free fall of said lower plate (29) after the clamping pulley (22) is released.
10. A mixing device as defined in Claim 1 wherein the device is provided with a second circular element (42) which is connected to the tip portions of said arms (24) and which continuously contacts the elastic circular friction element (25) when the drive shaft (14) is rotated.
11. A mixing device as defined in any of the preceding claims wherein the frame support element (11) of device is in the form of a circular section triangular chassis which stands exactly on three feet.

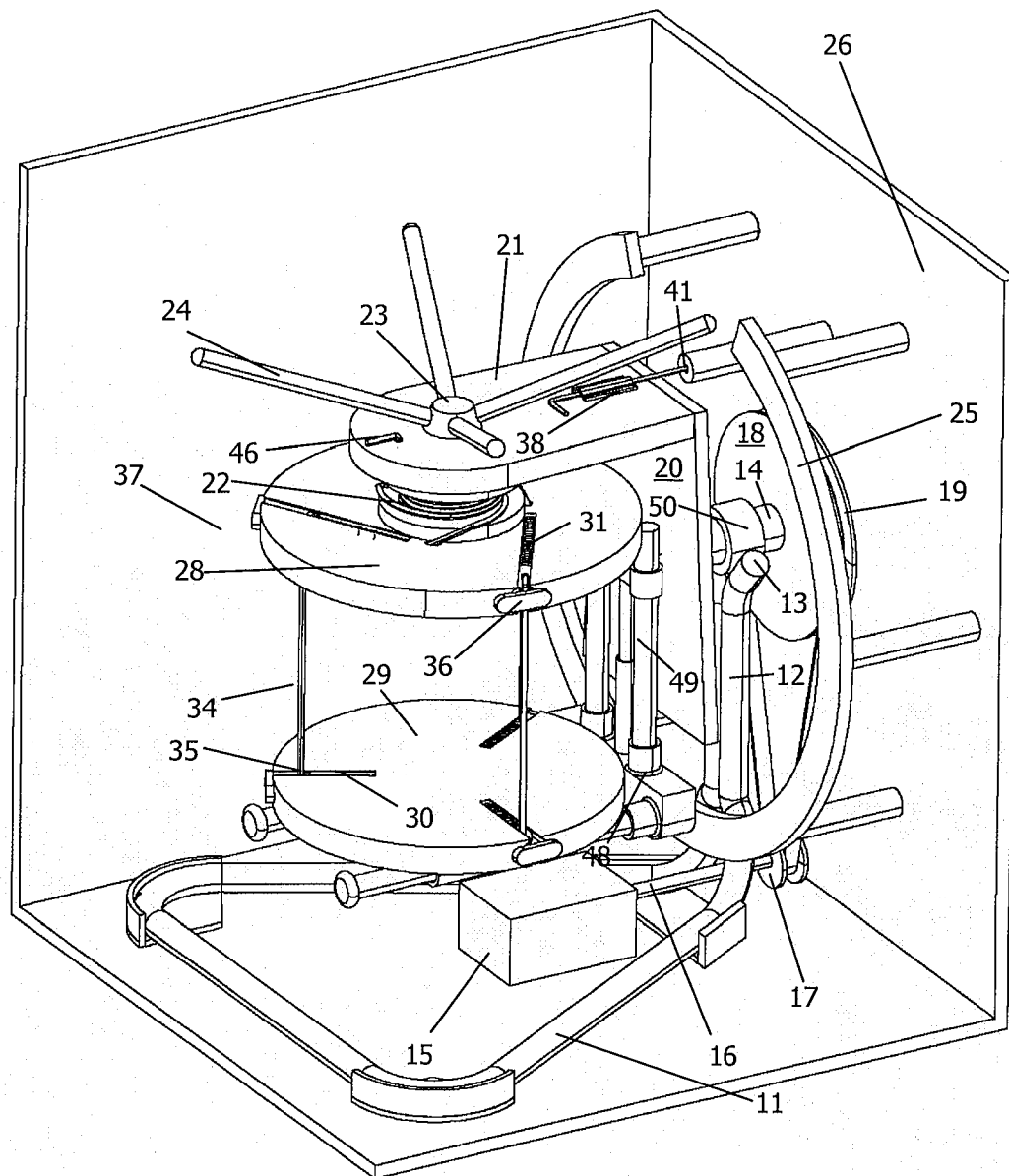


Fig. 1

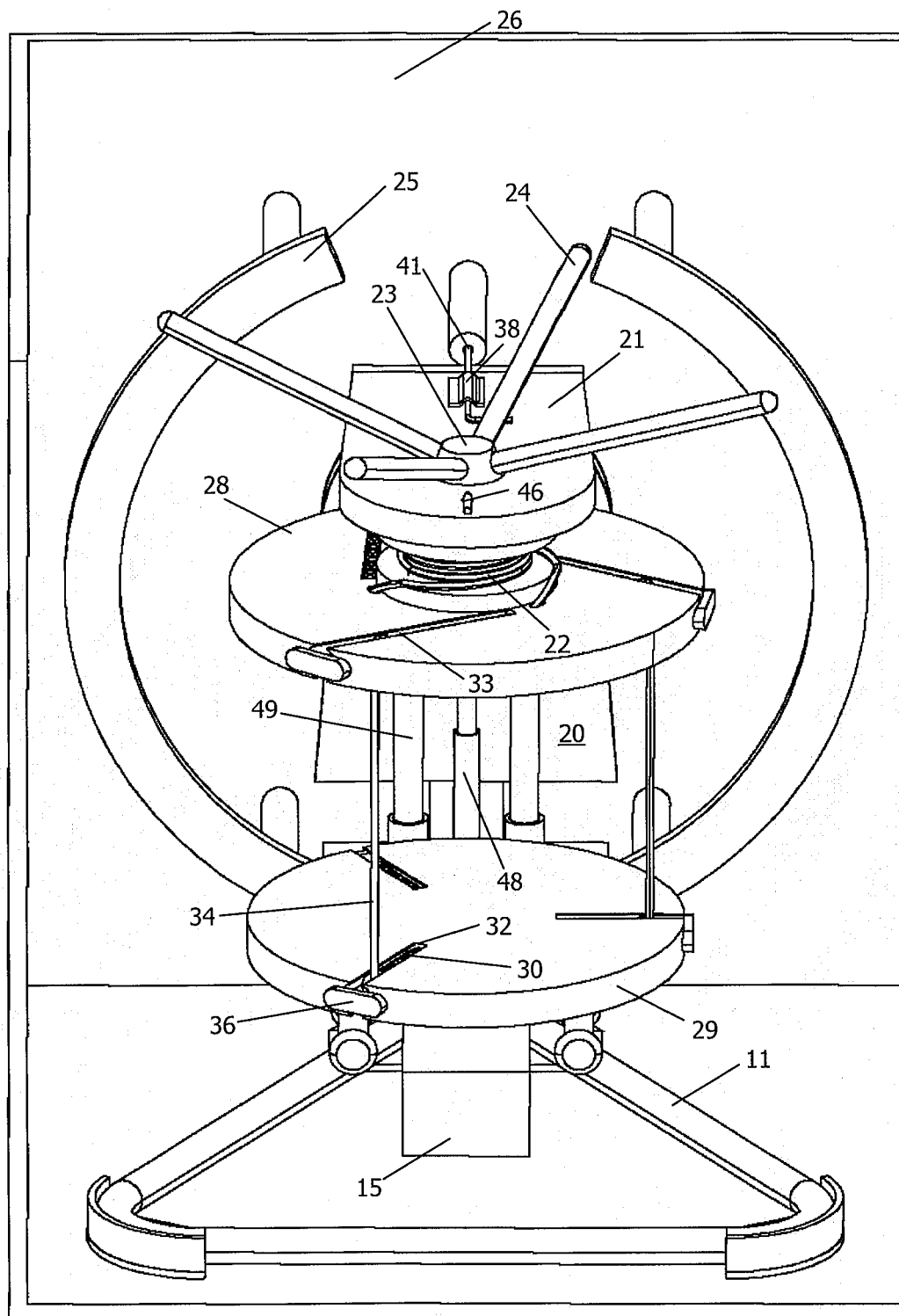


Fig. 2

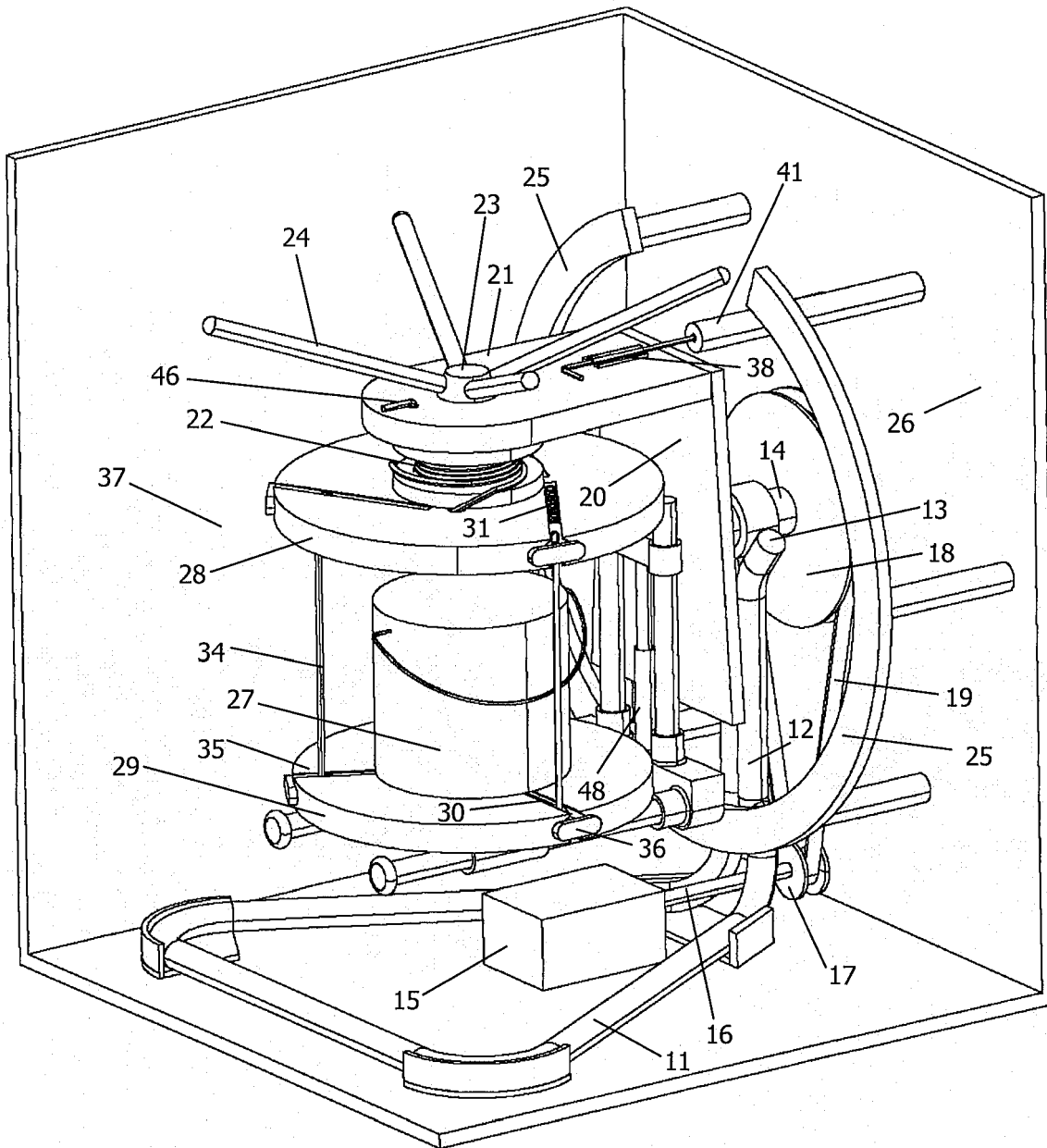


Fig. 3

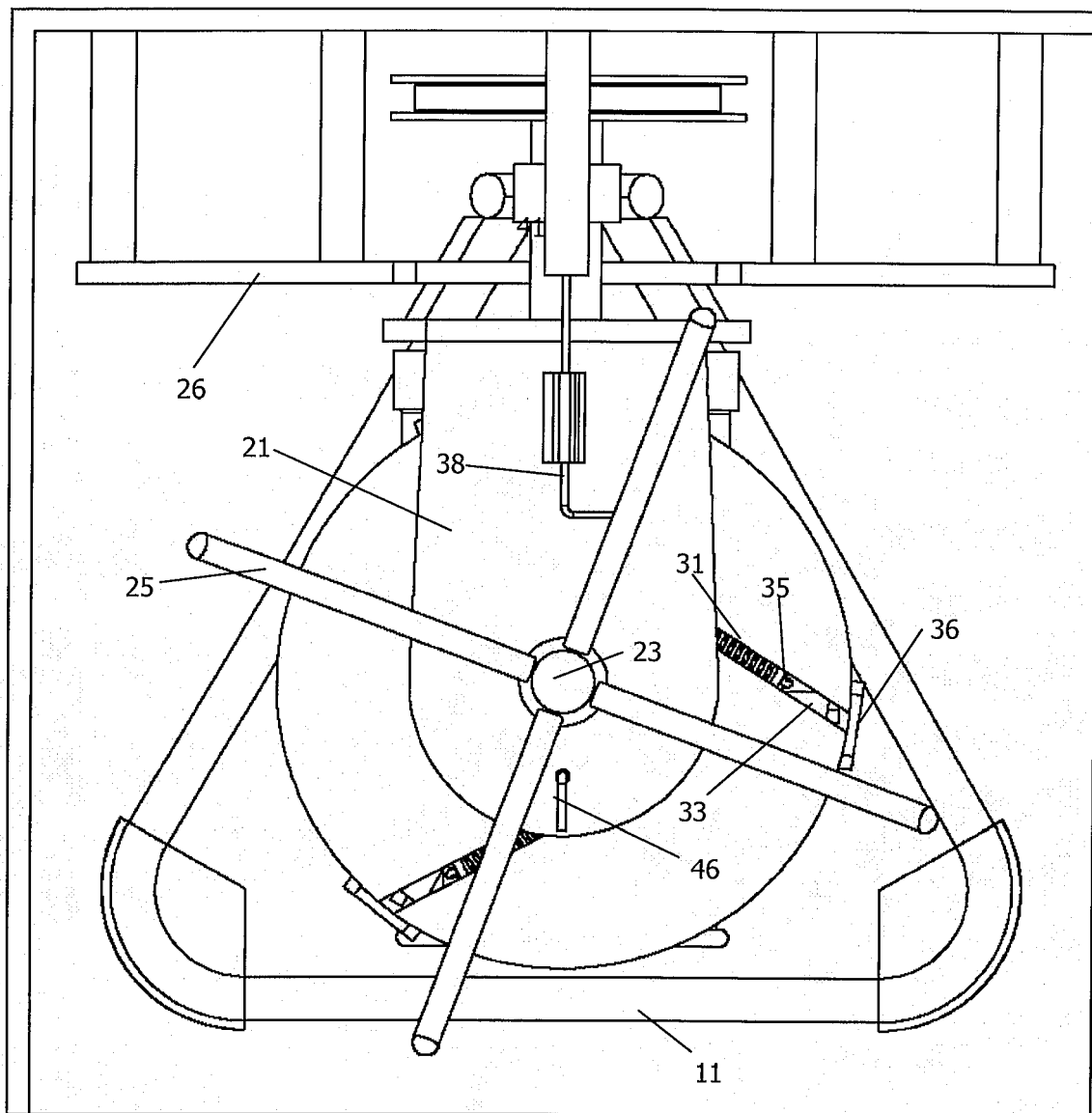


Fig. 4

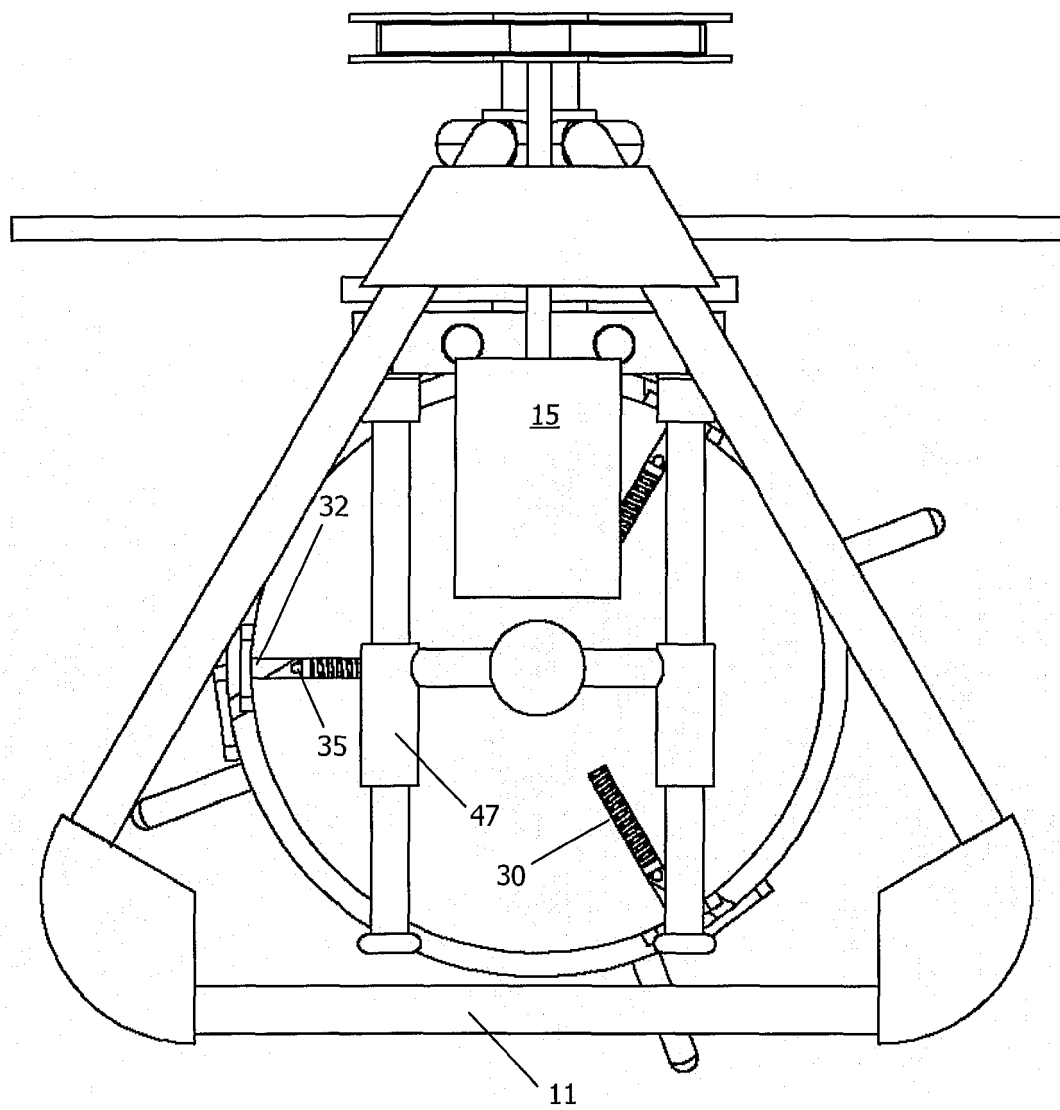


Fig. 5

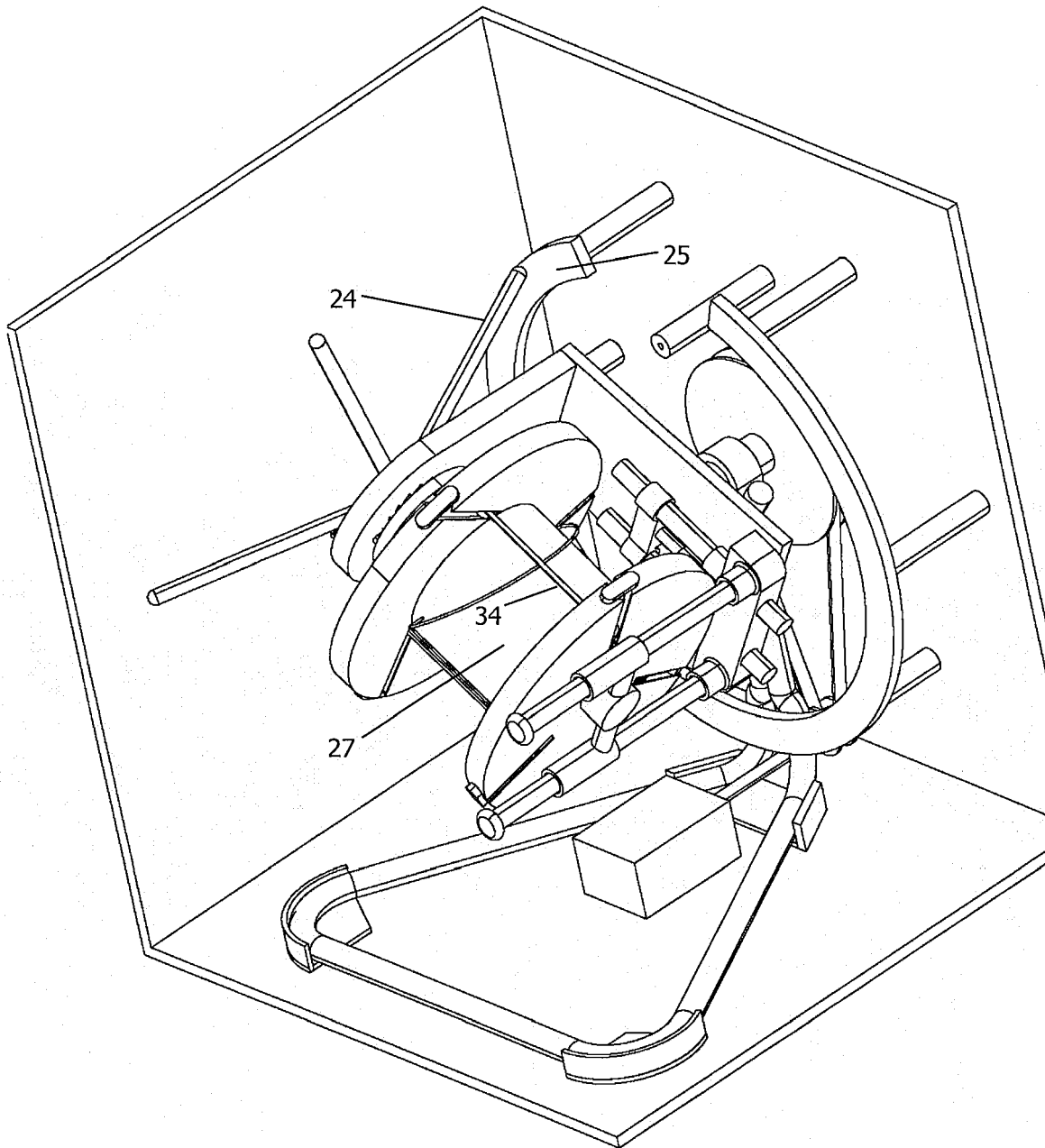


Fig. 6

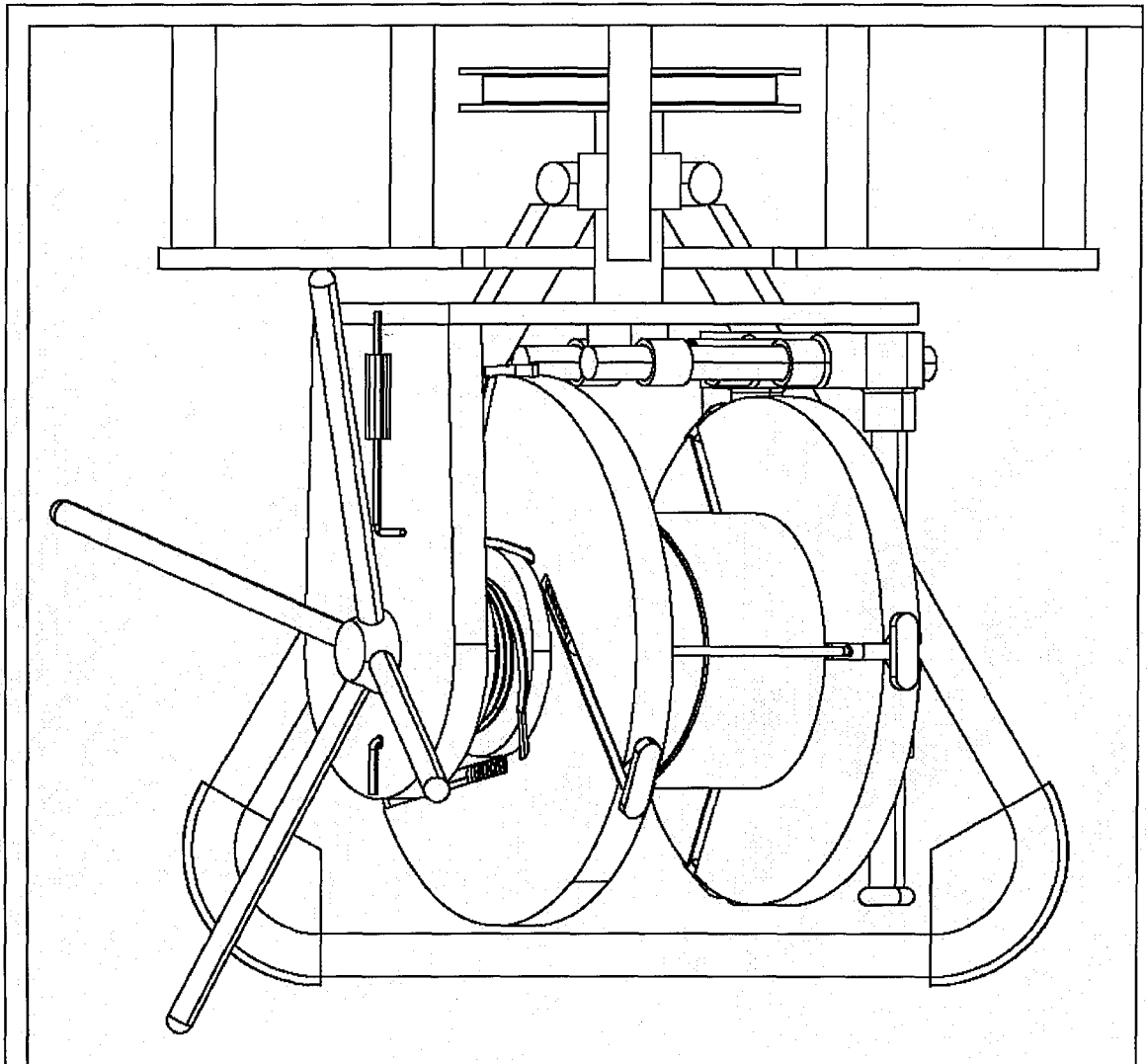


Fig. 7

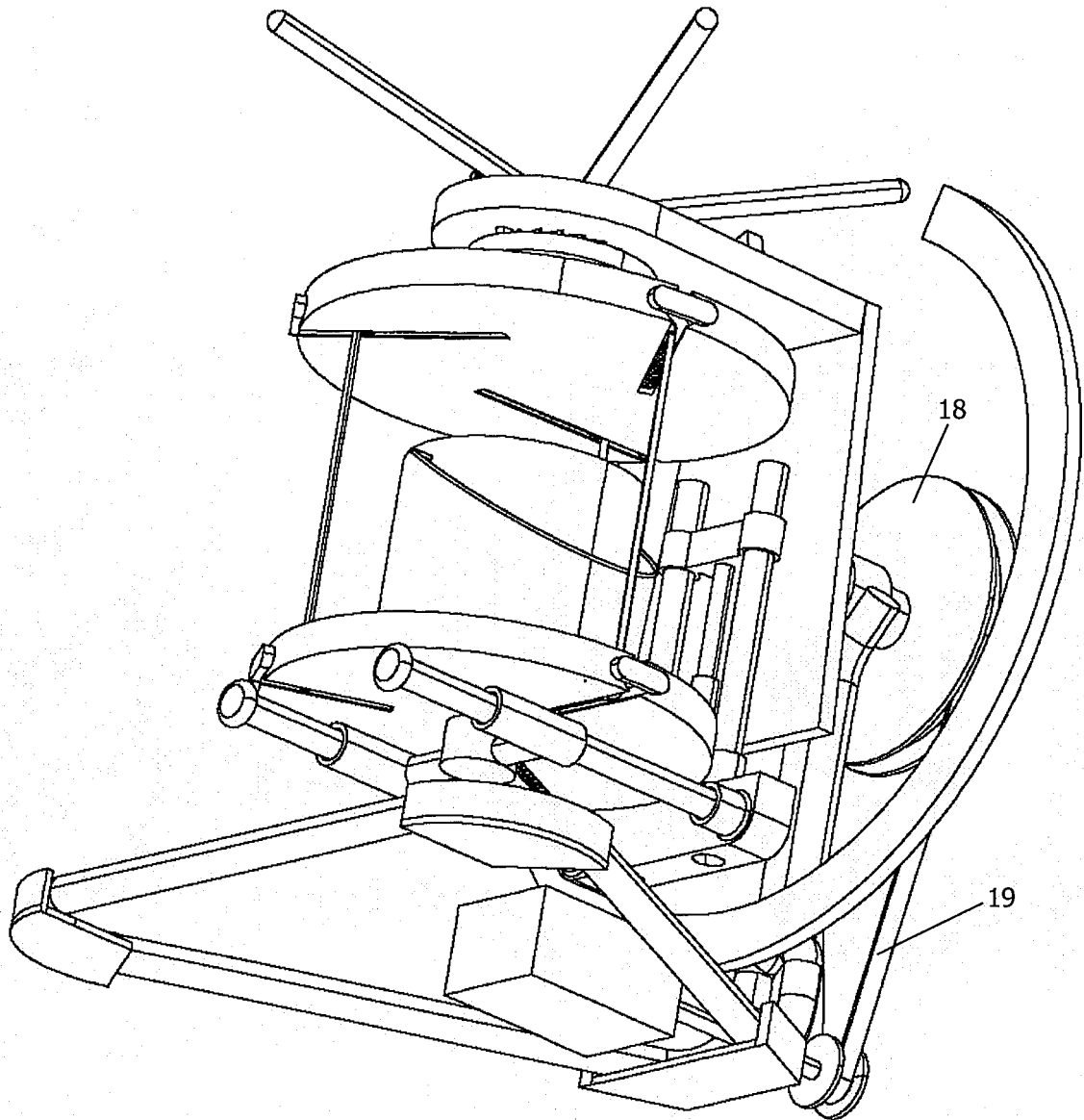


Fig. 8

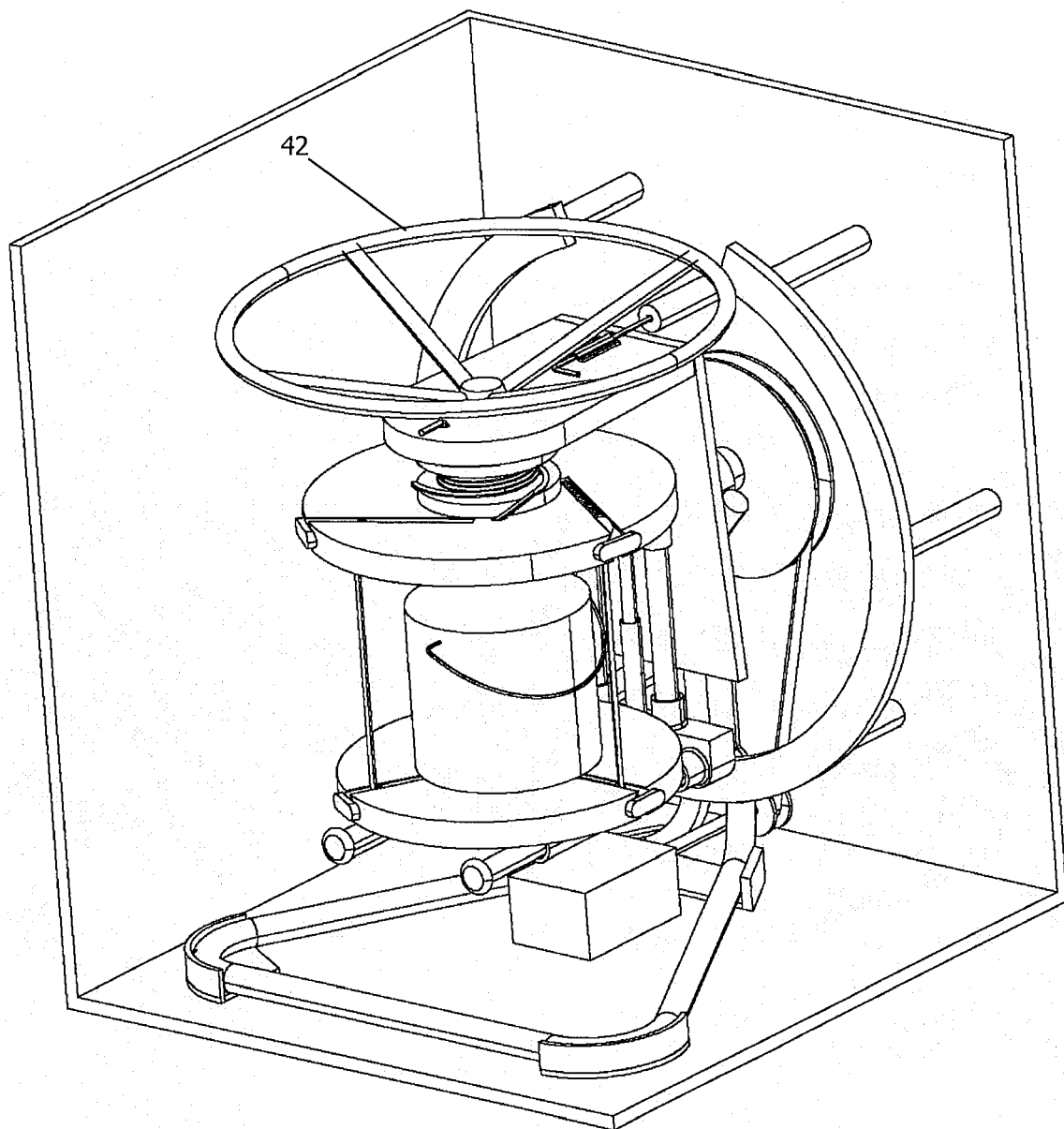


Fig. 9

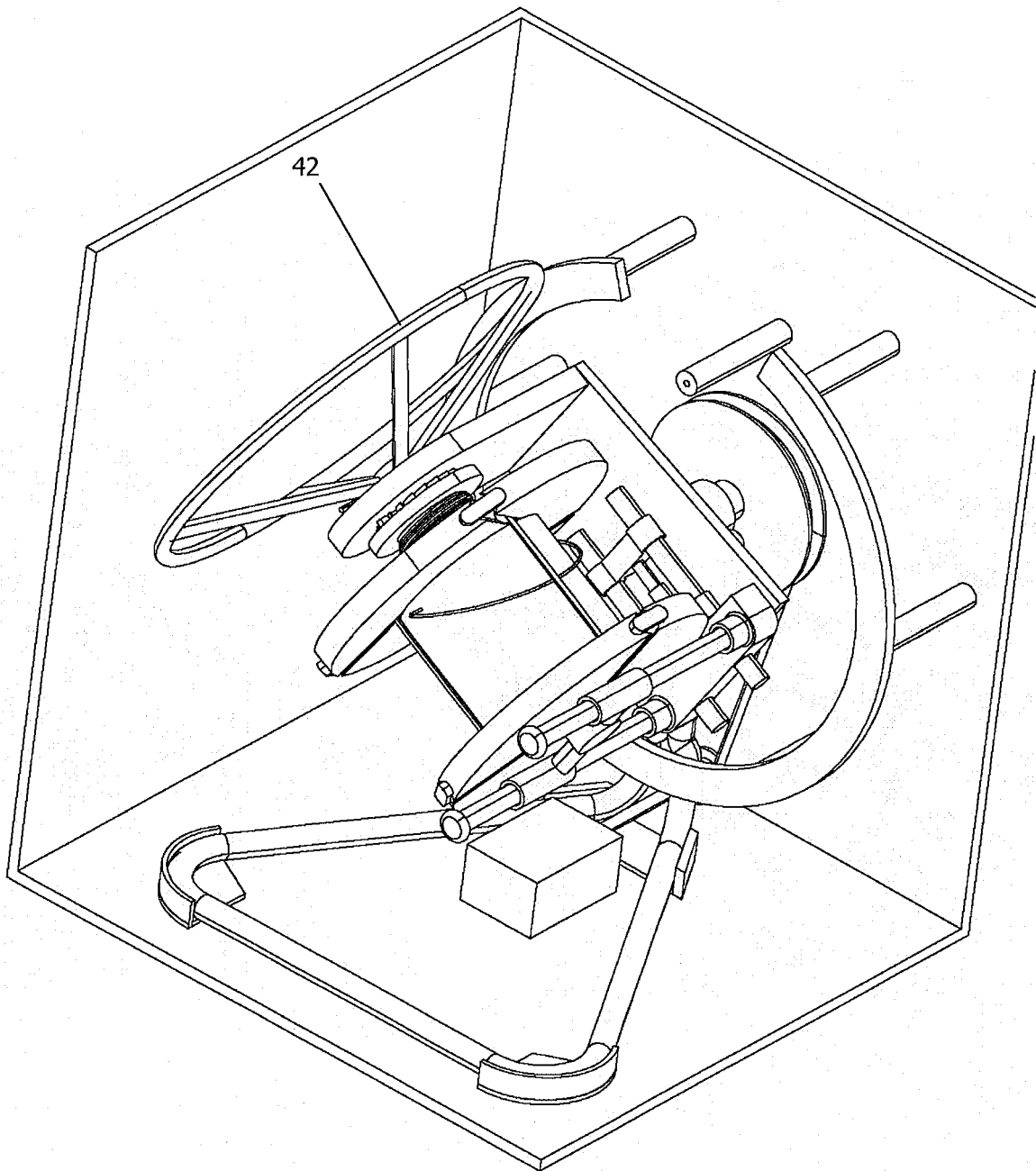


Fig. 10

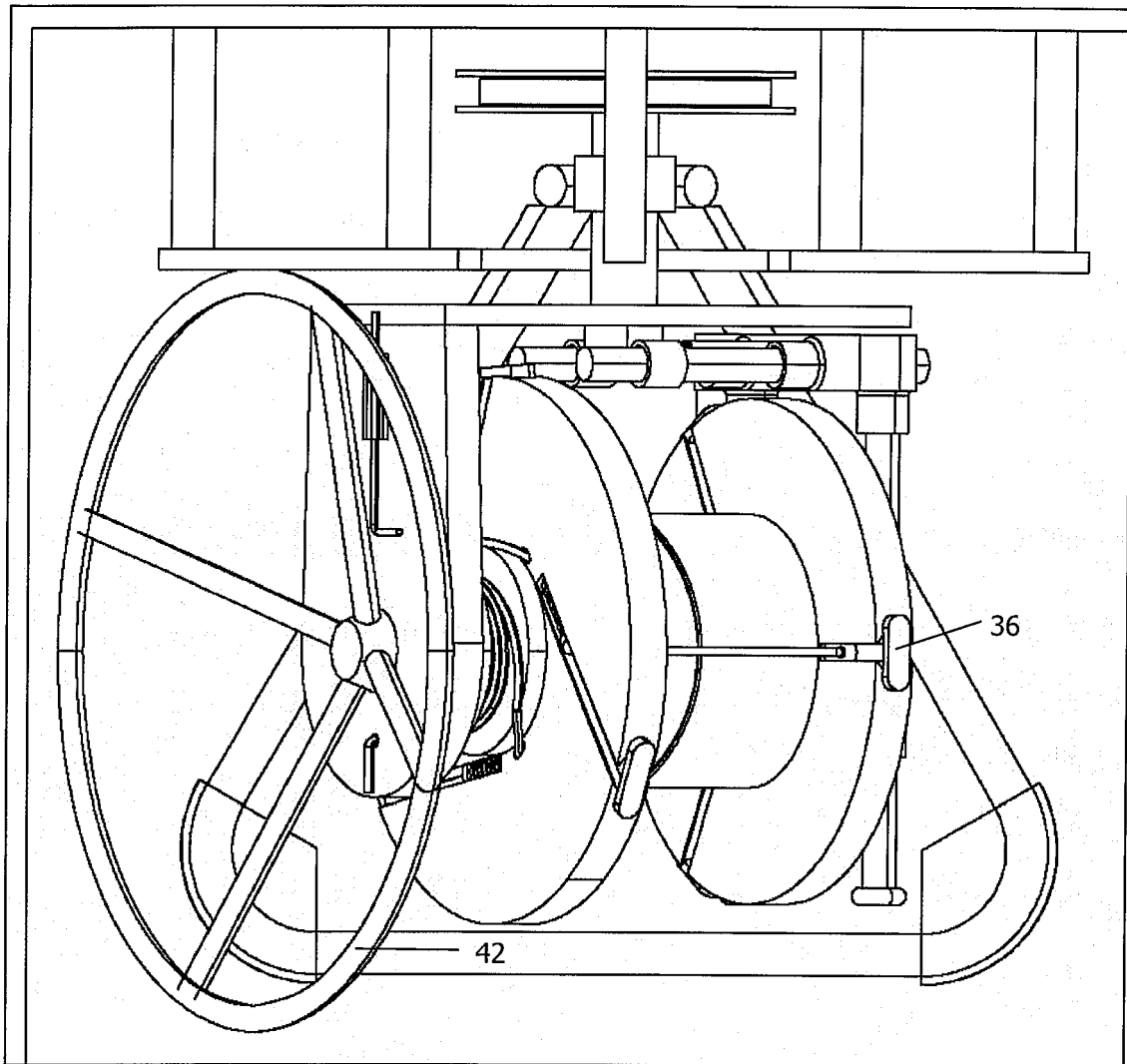


Fig. 11

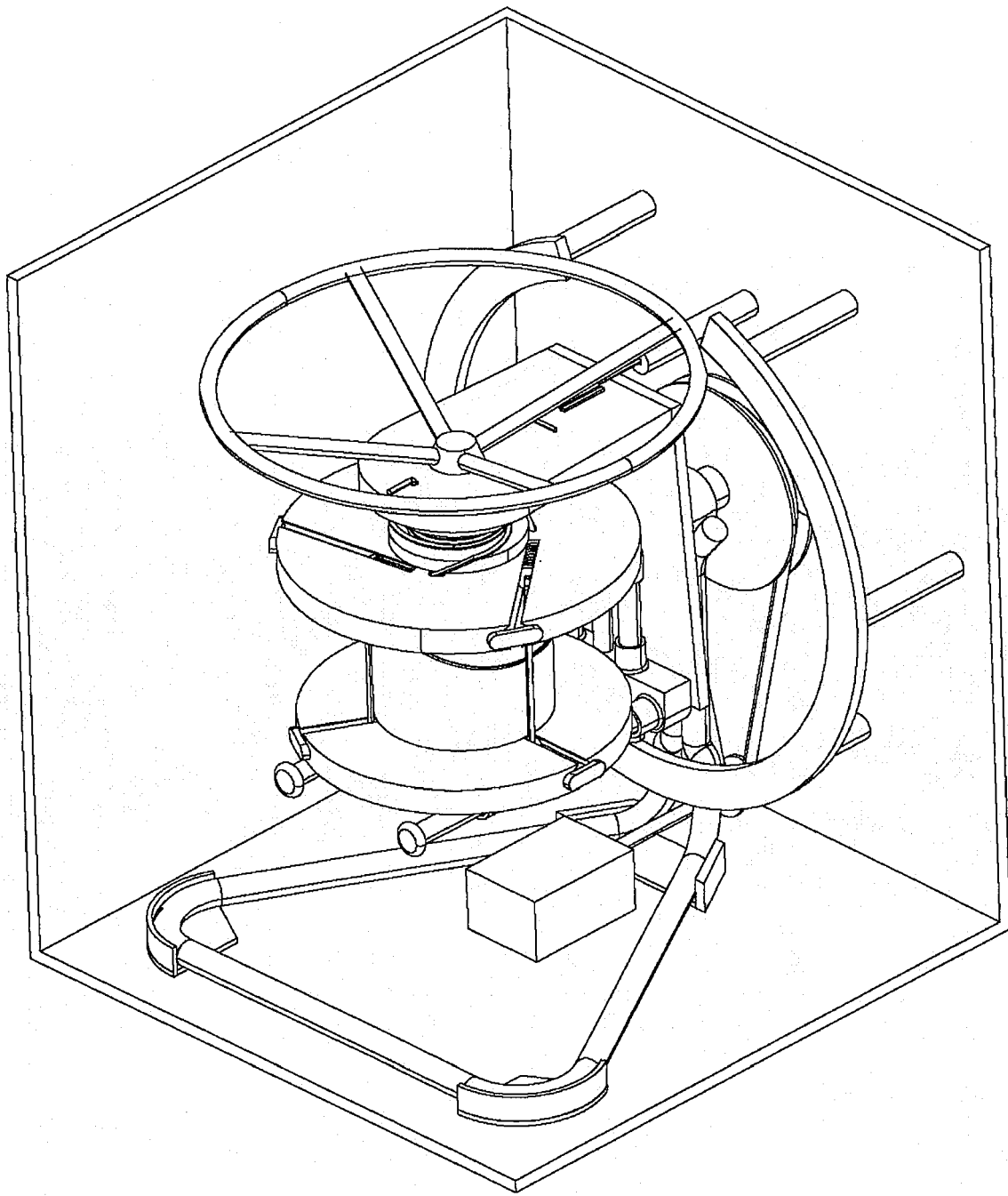


Fig. 12

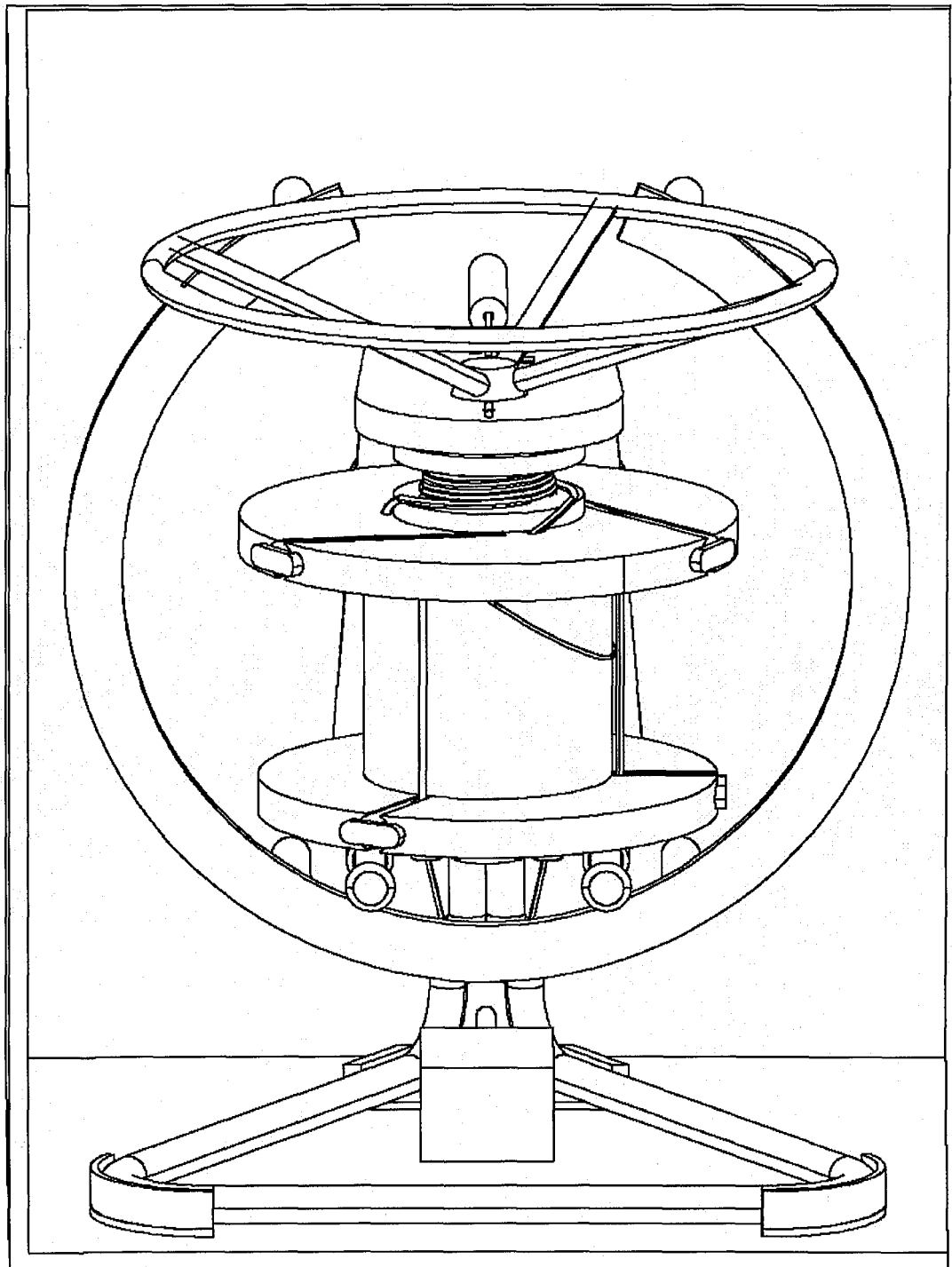


Fig. 13

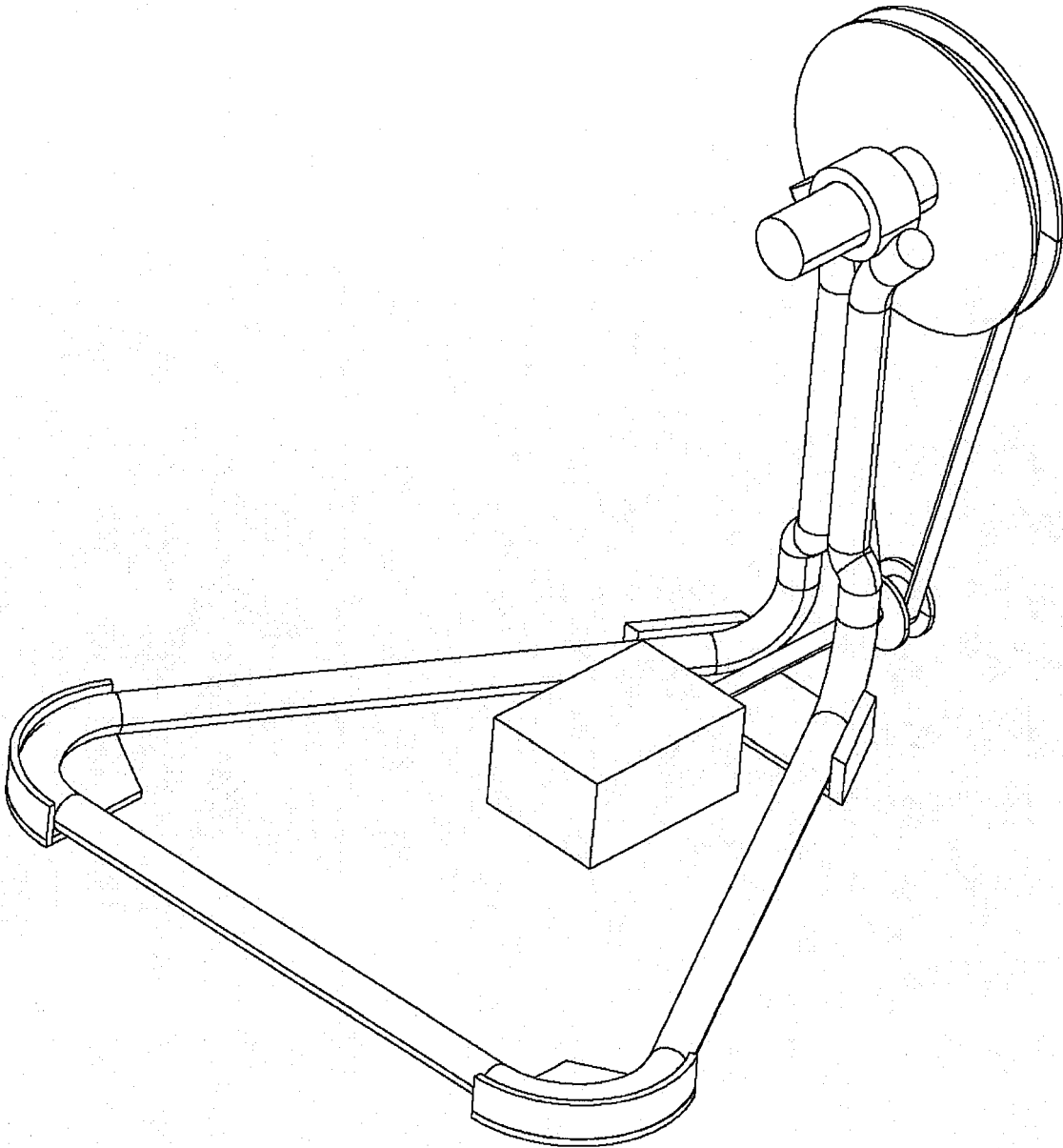


Fig. 14

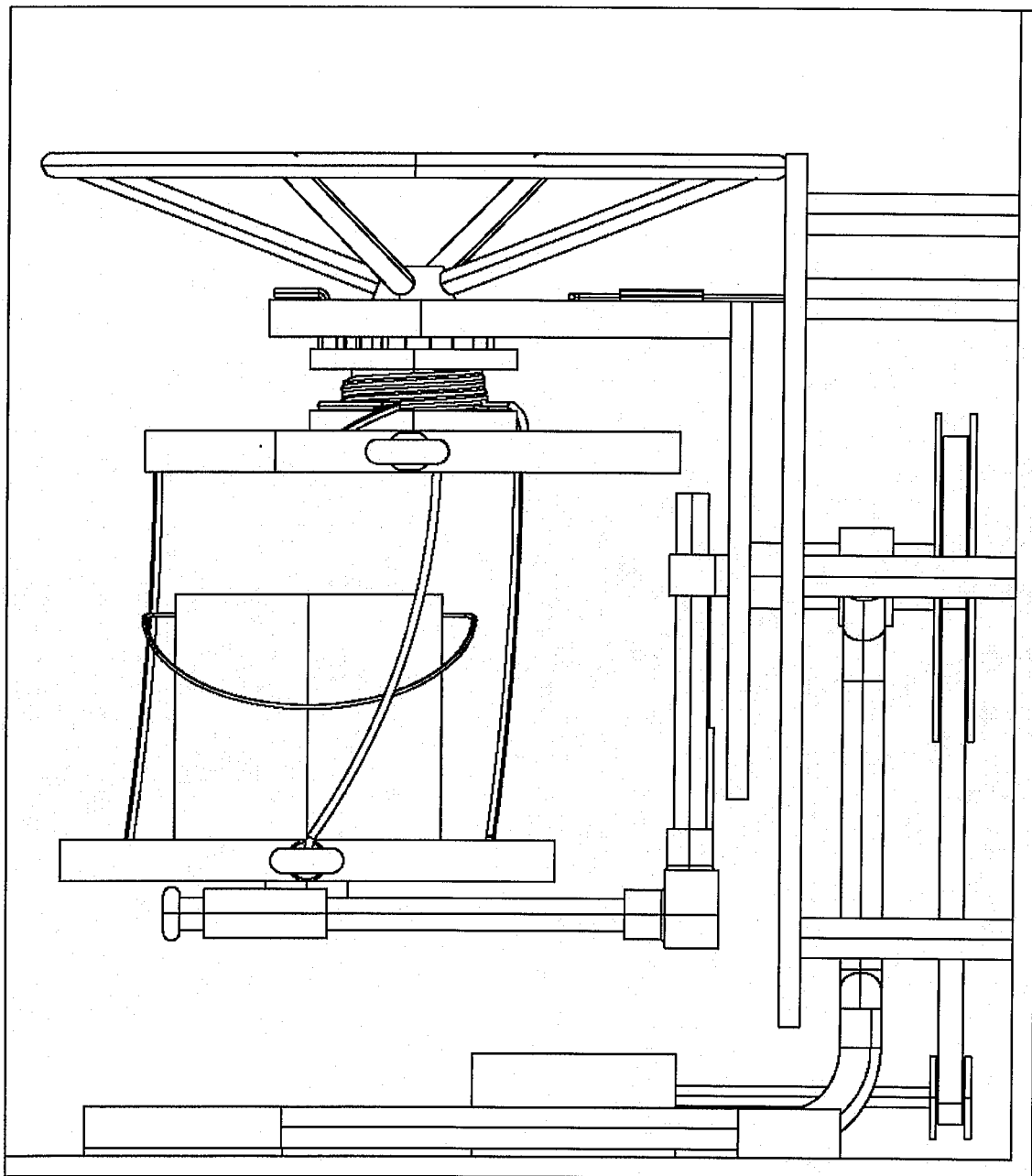


Fig. 15

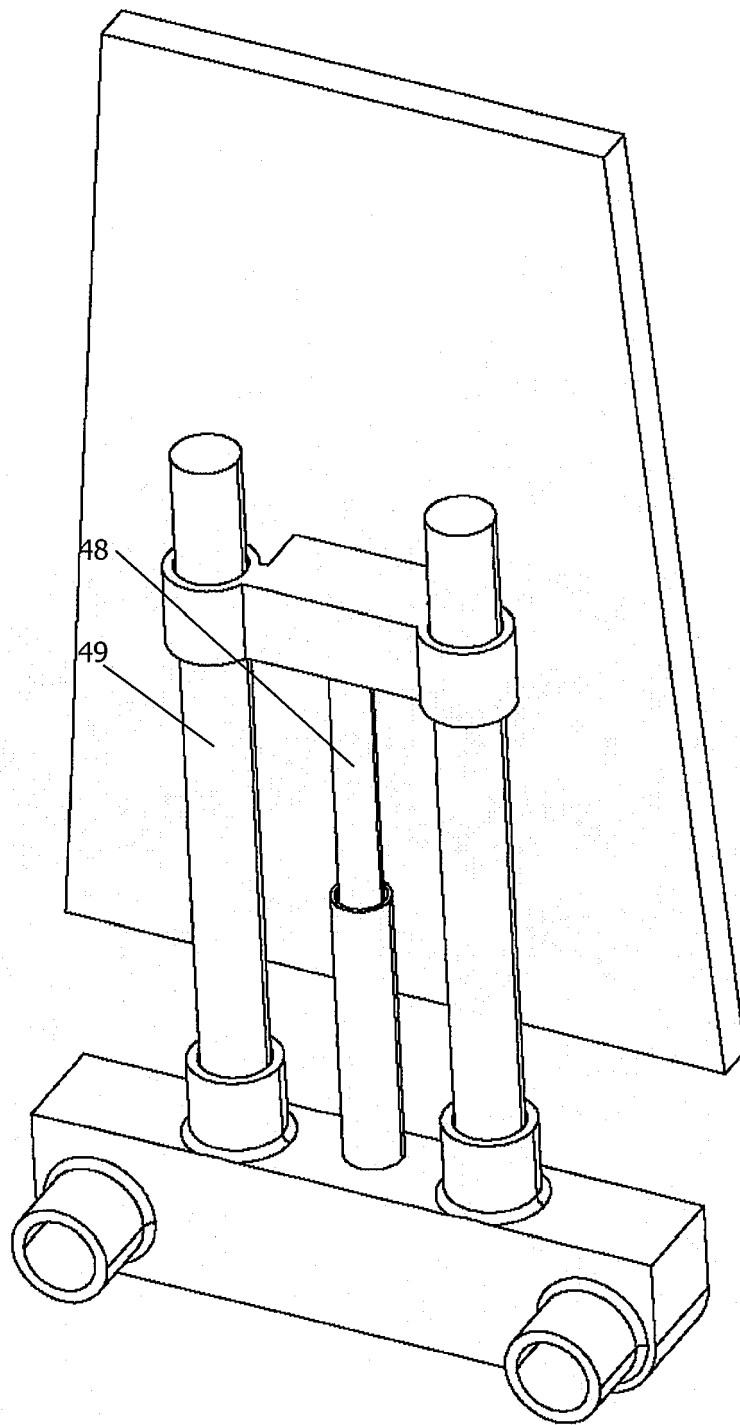


Fig. 16

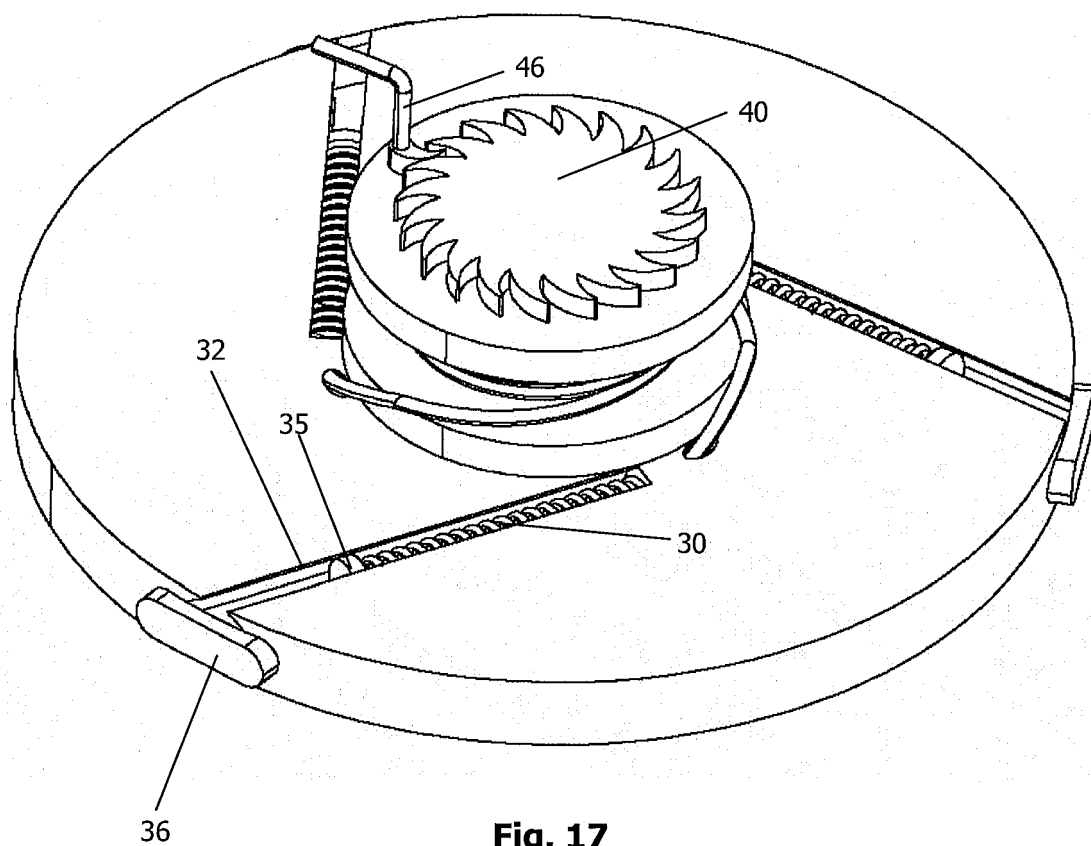


Fig. 17

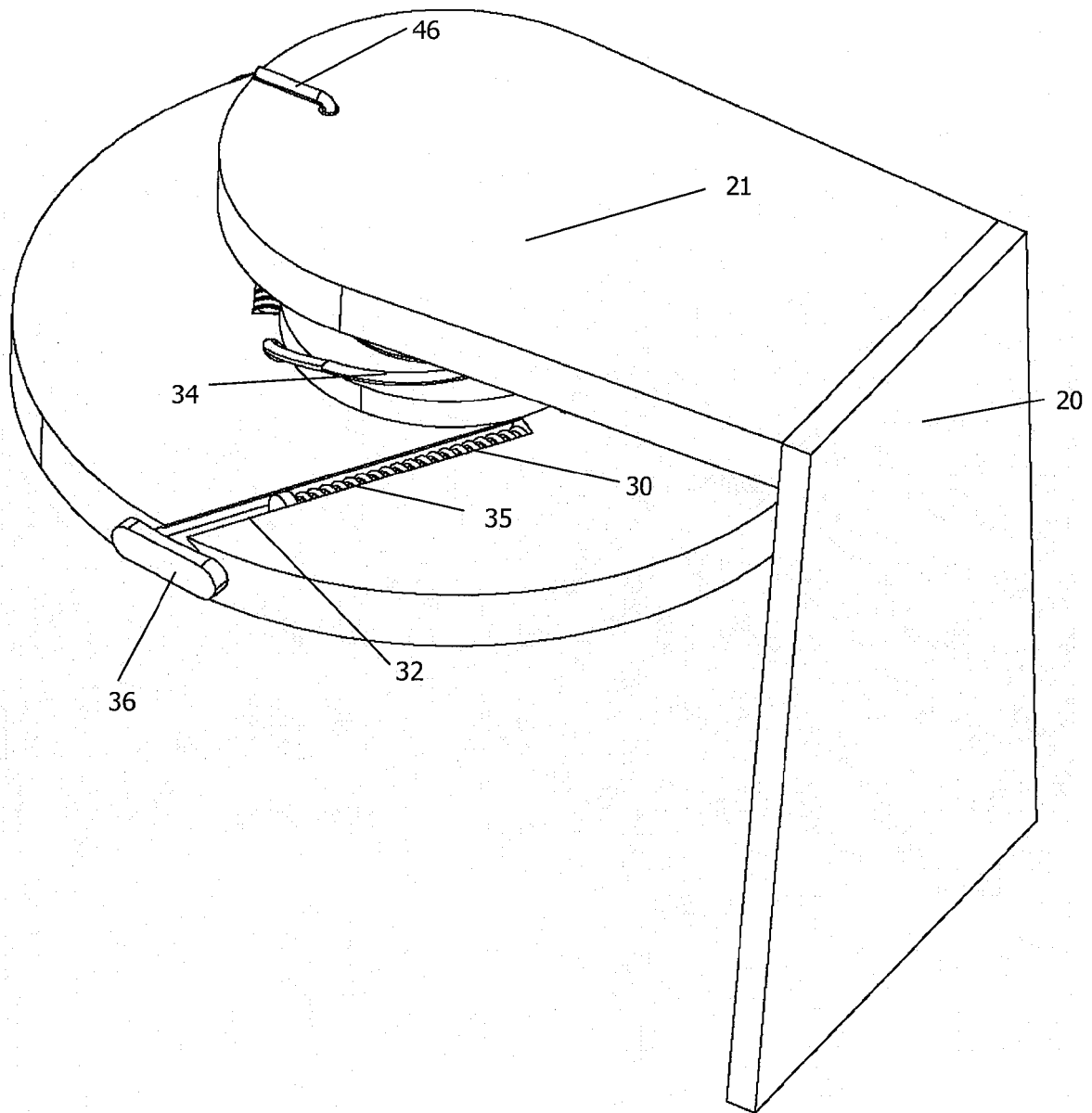


Fig. 18

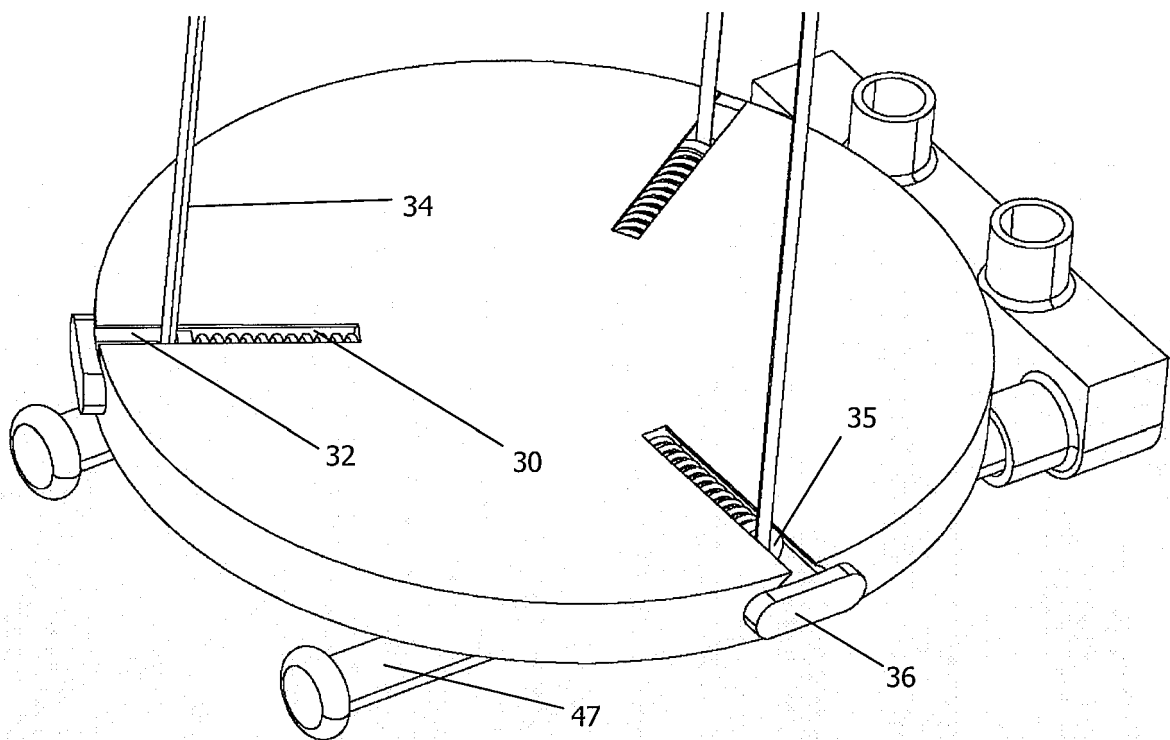


Fig. 19

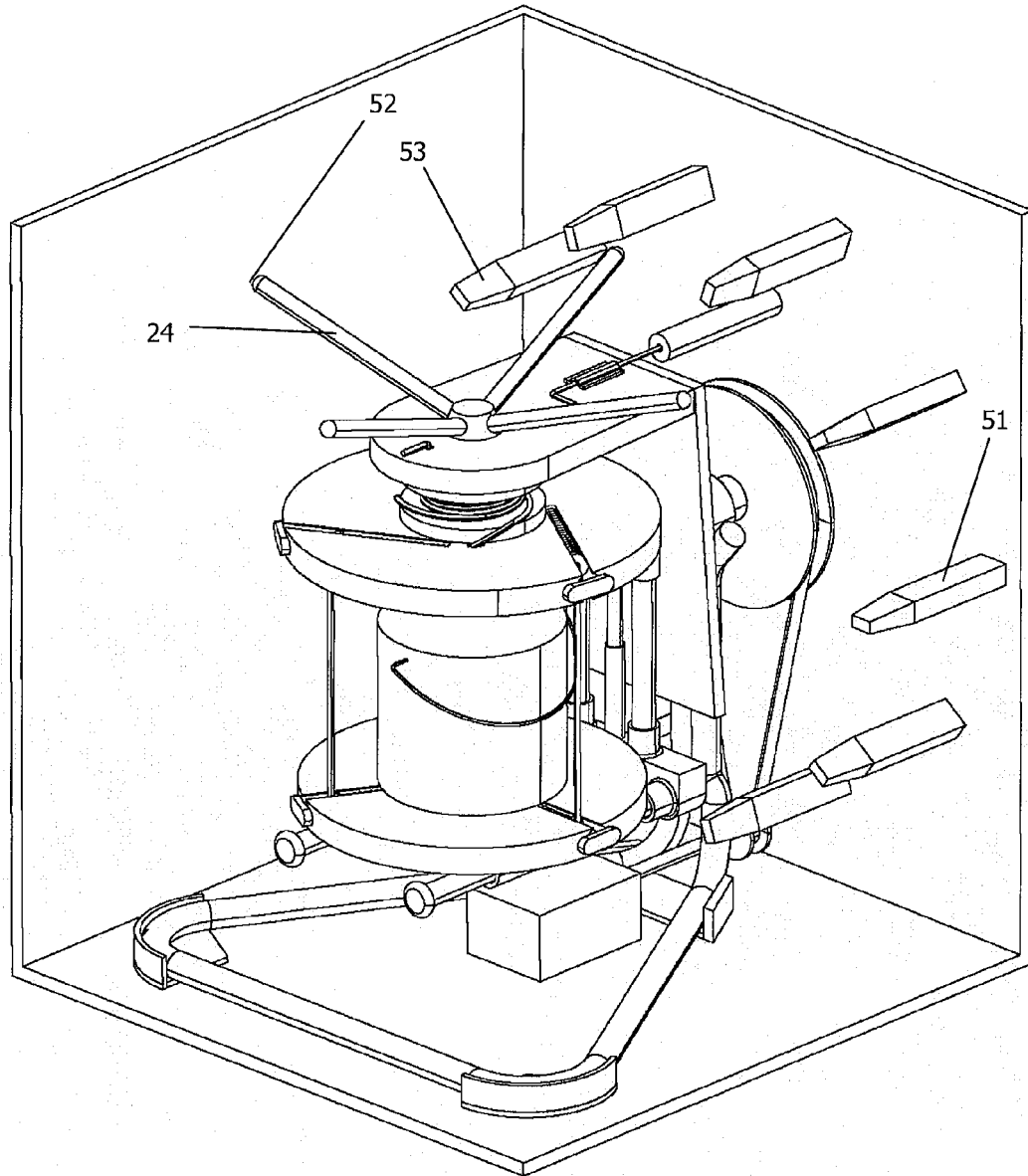


Fig. 20

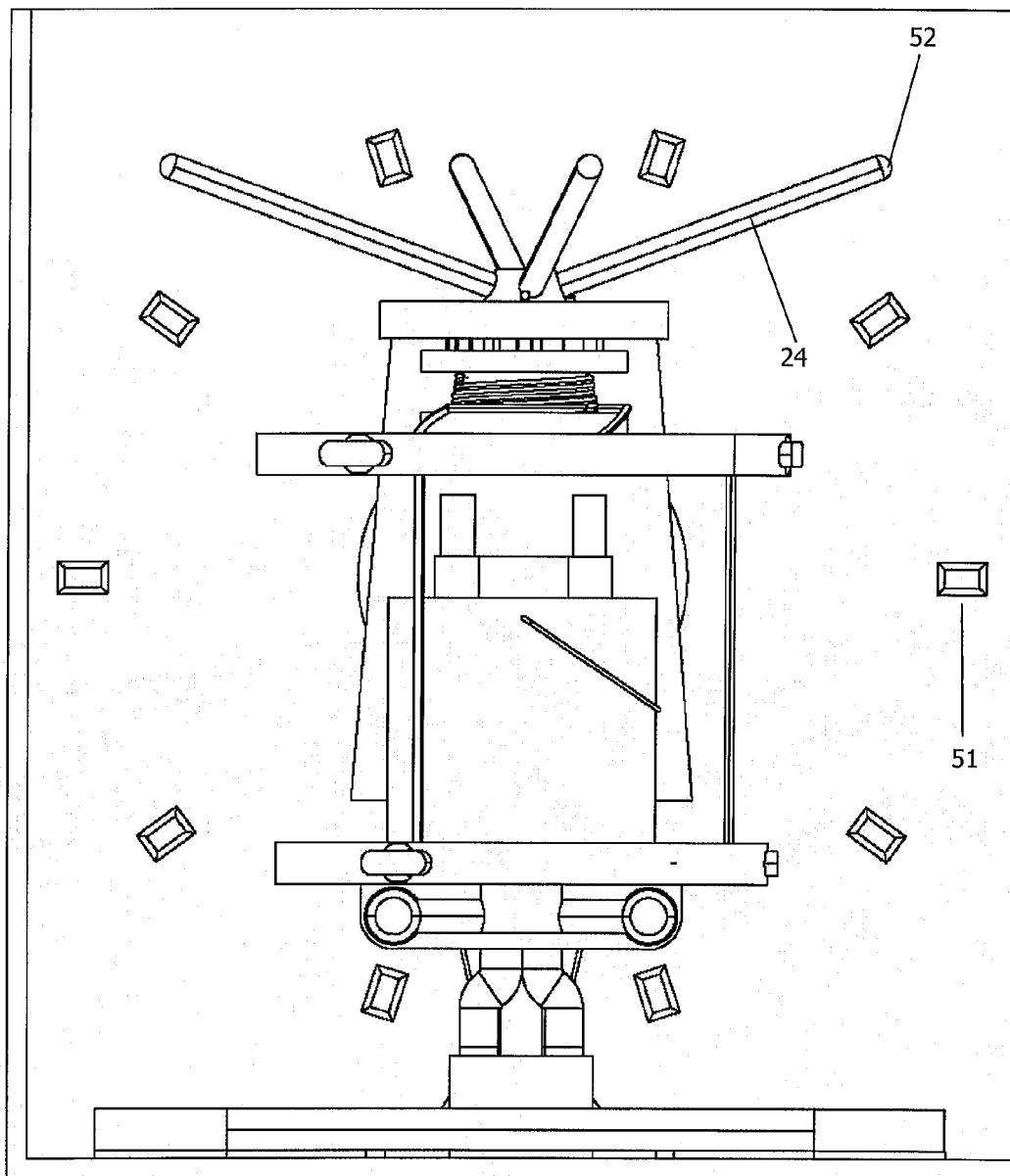


Fig. 21

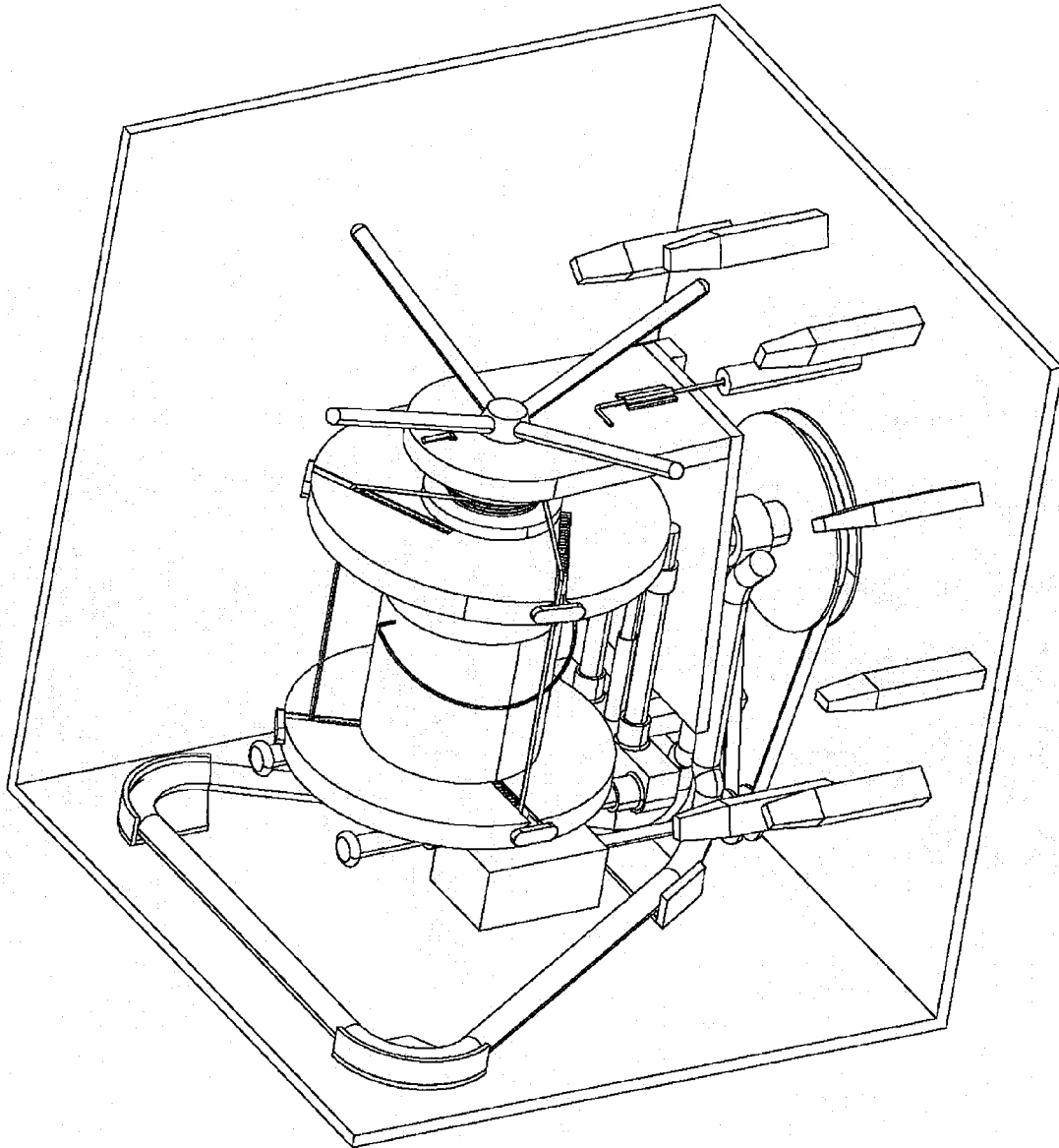


Fig. 22

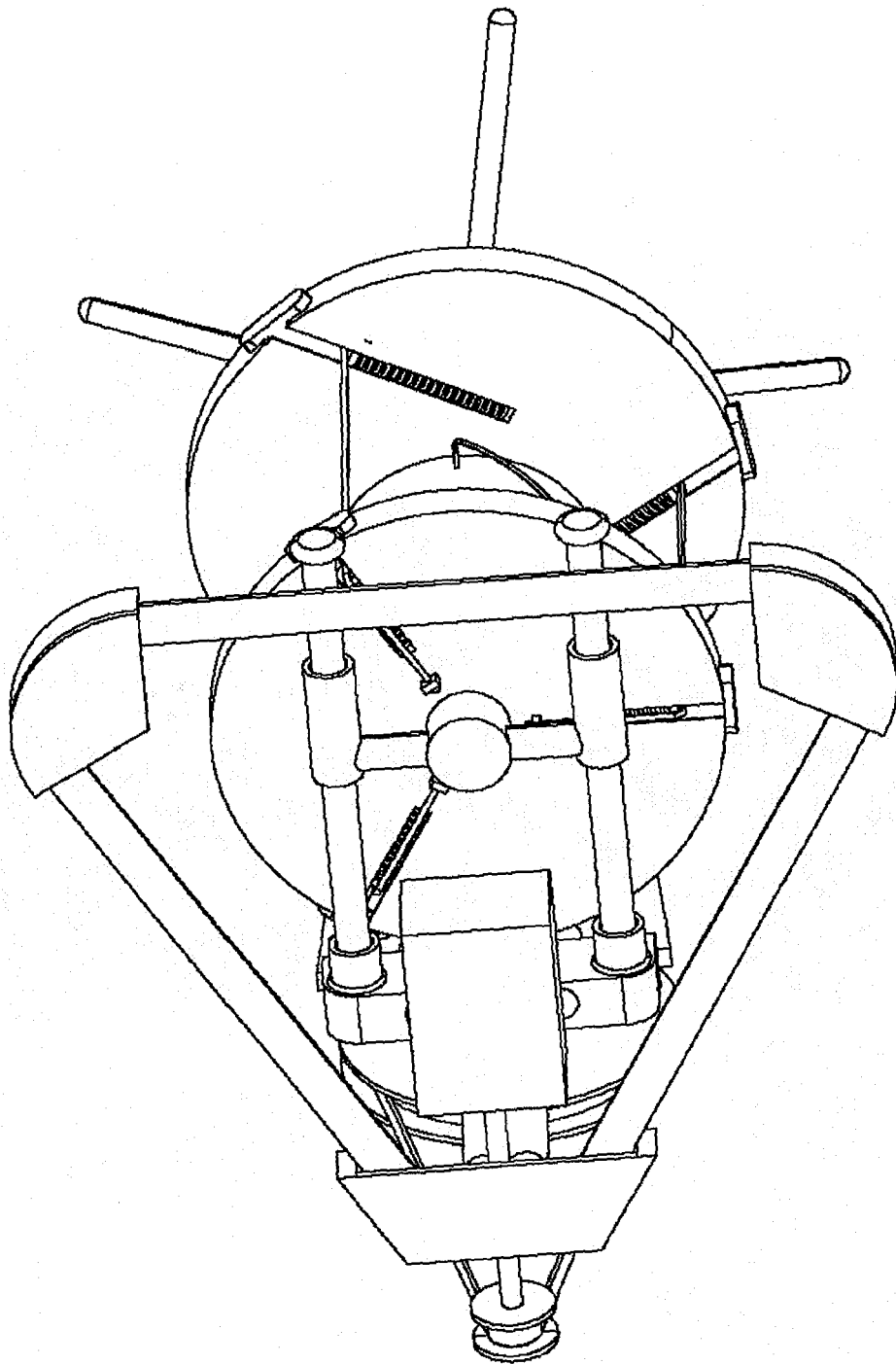


Fig. 23

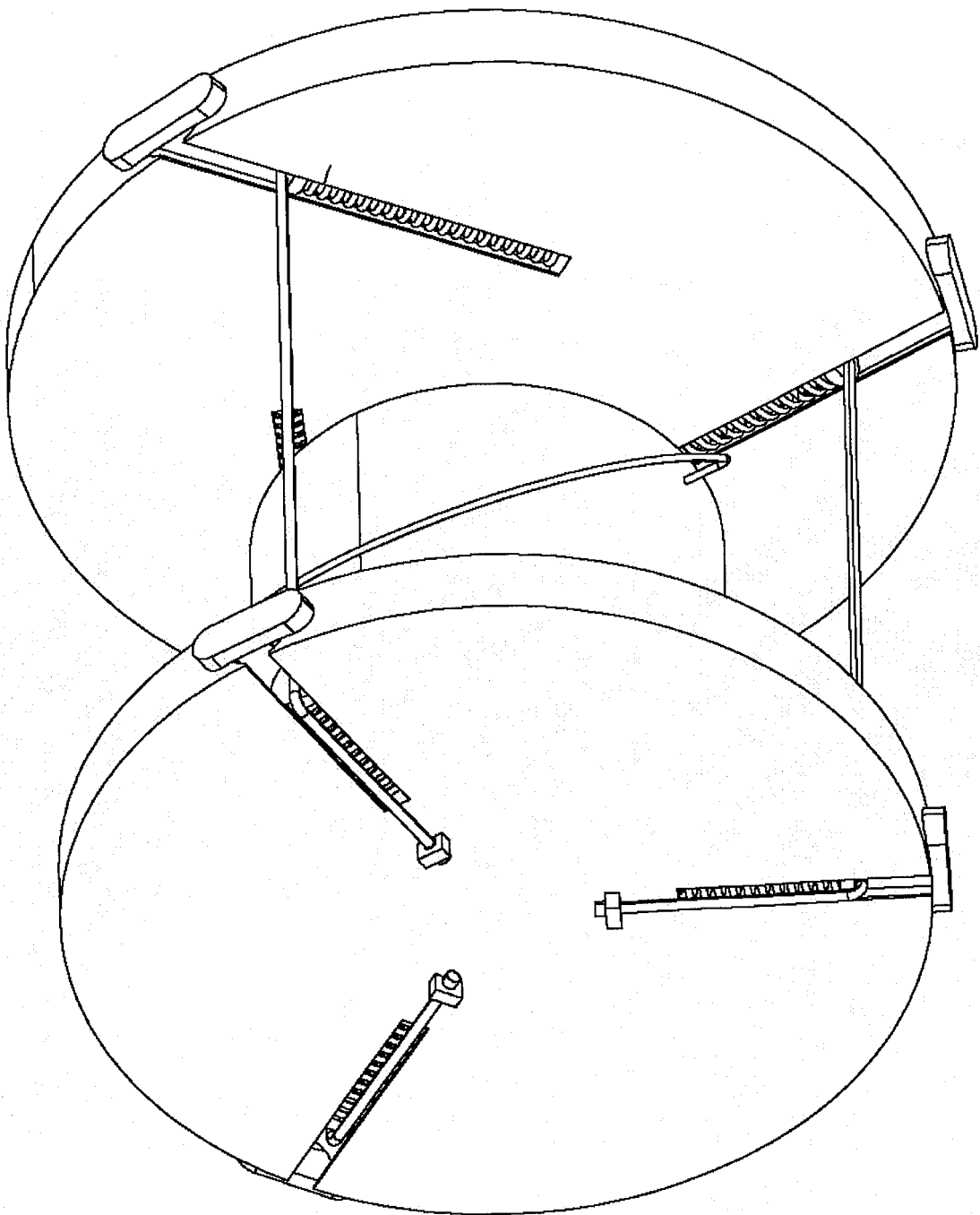


Fig. 24



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 0713

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A	----- US 5 788 371 A (NERI ET AL) 4 August 1998 (1998-08-04) * column 4, line 23 - line 26 * * column 4, line 32 - line 44 * * figures 2-3A *	1-11	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 June 2005	Examiner Real Cabrera, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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