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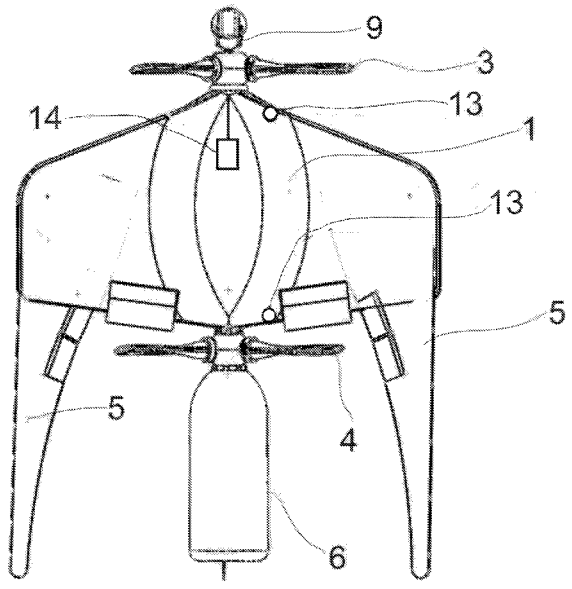
(54) Title: AUTONOMOUS UNMANNED AERIAL VEHICLE

Figure 1



(57) Abstract: The invention is related to an autonomous unmanned aerial vehicle for land, sea and air use. The invention is more specifically related to an unmanned aerial vehicle which can vertically take off and land, fly with fixed wings (5) and stay in the air silently for a long time my means of a balloon (7) inflated behind it.

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DESCRIPTION

AUTONOMOUS UNMANNED AERIAL VEHICLE

Technical Field

This patent application has been filed as an additional patent application to the patent application numbered 2017/10000 filed on 06 June 2017 in Turkey.

The invention is related to an autonomous unmanned aerial vehicle for land, sea and air use.

The invention is more specifically related to an unmanned aerial vehicle which can vertically take off and land, fly with fixed wings and stay in the air silently for a long time by means of a balloon inflated behind it.

Prior Art

At present manned/unmanned aerial vehicles comprise vehicles with rotary blades (helicopter), vehicles with fixed wings (airplanes) and balloons. They can be manned or unmanned, and those classified as fixed wing and balloon type air vehicles which can also fly without an engine.

Unmanned aerial vehicle (UAV), commonly known as drone (ground-controlled aerial vehicle) is a kind of airplane controlled by a remote control. Unmanned aerial vehicles are divided into two categories: The first one are those remotely controlled, and the second one are those which can automatically move according to a certain flight plan. Previously intended for exploration, unmanned aerial vehicles are also used for many assault missions at present.

Various developments have been carried out in the art in relation with unmanned aerial vehicles.

The United States patent document US2013206915 in the prior art describes an unmanned aerial vehicle which can vertically take off and land. The aerial vehicle

comprises an upper drive train which provides vertical thrust and which can be adjusted according to three axes, single or counter-rotating propeller, central body with 3D articulation at a variable flexibility level to realize stabilization of the vehicle's configuration and support function, and a balloon installed in the center of the upper drive train. This balloon is inflated with helium or hydrogen gas. The vertical rise of the drive unit is provided by the thrust generated by the upper drive train and the lower drive train. The vertical rise of the drive unit is provided by the thrust generated by the upper drive train which is an engine blade or turbine or spiral turbine, and the lower drive train. The articulation function with 3D ball enables changing direction of the drive trains to allow for going towards a certain direction.

The International patent document WO2014076403 in the prior art describes an aerial vehicle which comprises a body extending through a longitudinal main axis, two wings on both sides of the body, and two drive units. In the invention, the angle between the front edge of the wings and the long edge is equal to 90°. In other words, the wings have a triangular form in the aerodynamic flight position. The end of each wing's longitudinal edge creates a leg which rests on the vehicle. Besides, the wings comprise an interlocking mechanism to fix the wings on the body during the aerodynamic flight position.

The International patent document WO2017043980 in the prior art describes an unmanned aerial vehicle. The rotor mechanism of the invention comprises a first rotation axis and a first propeller connected to the engine, and a second propeller connected to the second engine. The length of the second propeller is smaller than that of the first propeller.

The US patent document US2008006743 in the prior art describes an unmanned aerial vehicle which runs on hydrogen. The aerial vehicle may include all combined or partially combined structural properties for lightness and resistance and wide wing clearances compared to the body (3.0 or larger). According to one embodiment of the airplane, one or more internal combustion engines are used for burning hydrogen; each engine runs a propeller. The hydrogen fuel is stored as a

cryogenic liquid in the containers on the body, and it is evaporated in a heat exchanger before being charged to an internal combustion engine.

The Turkish patent document 2017/05836 of the prior art describes internal combustion explosion engine primarily and fundamentally for unmanned aerial vehicles as well as any vehicles, generators, compressors and pumps. The mechanical power transmission organs are simplified and made lighter with the engine included in the invention.

However, unmanned aerial vehicles with fixed wings cannot stay in the air for a long time and they always need to move. They cannot stay in a suspended position in the air like a helicopter or balloon and they need a track for take-off and landing.

Multicopters, among unmanned aerial vehicles, can vertically take off and land, move in three axes, take off, fly and stay in the air by means of the air generated by the propellers connected to the engine(s). These systems, which are generally used with fixed angle propellers, move with the lifting force generated by the engines and the generated rotation force. However, the time for staying in the air is very short for multicopters and they have very limited load bearing capacities and they fly at very low altitudes.

Another unmanned aerial vehicle which is a balloon, moves slowly and it cannot remain constant at the desired point without anchoring due to the effect of the wind. It is easy to identify, shoot/take down balloons at low altitude and they have short ranges and it is difficult to control them.

In order to resolve the foregoing problems, the invented double propeller, engine and balloon containing autonomous unmanned aerial vehicles are required to be developed.

Objectives and Brief Description of the Invention

The objective of this invention is to provide an unmanned aerial vehicle which can vertically take off and land, fly with fixed wings and stay in the air silently for a long time my means of a balloon inflated behind it.

Another objective of this invention is to provide unmanned aerial vehicles which do not need a track for take-off and landing.

Another objective of this invention is to provide an unmanned aerial vehicle with an eco-friendly engine, which consumes hydrogen as fuel.

The autonomous unmanned aerial vehicle rises with an internal combustion engine, and after reaching the target point, it can stay in the air for a long period of time and silently by means of the electrical engine and the balloon. Detailed images can be taken during this period. The vehicle which completes its duty, ejects the inflated balloon and begins landing.

Detailed Description of the Invention

The unmanned aerial vehicle provided to achieve the objective of this invention is shown in the attached figures.

According to the figures:

Figure 1: is a front view of unmanned aerial vehicle subject to the invention during the takeoff position.

Figure 2: Perspective view of the position of the unmanned aerial vehicle subject to the invention before being positioned at a lateral axis.

Figure 3: Perspective view of the position of the aerial vehicle subject to the invention before being positioned at a lateral axis at a different angle.

Figure 4: Lateral view of the unmanned aerial vehicle subject to the invention while flying at a lateral axis.

Figure 5: Lateral schematic view of the unmanned aerial vehicle subject to the invention when the balloon is inflated.

Figure 6: Lateral schematic view of the unmanned aerial vehicle subject to the invention when the balloon is ejected.

Figure 7: Lateral view of the unmanned aerial vehicle subject to the invention when it is floating at a lateral axis during landing.

Figure 8: View of the position of the unmanned aerial vehicle subject to the invention before the landing position.

Figure 9: Front view of the landing position of the unmanned aerial vehicle subject to the invention.

Figure 10: Side view of the unmanned aerial vehicle having a moving wing while gliding on a lateral axis.

Figure 11: Perspective view of the unmanned aerial vehicle having a moving wing while gliding on a lateral axis.

Figure 12: Front view of the unmanned aerial vehicle having a moving wing while gliding on a lateral axis.

Figure 13: Front schematic view of the unmanned aerial vehicle subject to the invention when the balloon is inflated.

Figure 14: View of the pitch control mechanism of the propellers on the unmanned aerial vehicle subject to the invention shown at a different angle.

Figure 15: Lateral schematic view of the pitch control mechanism of the propellers of the unmanned aerial vehicle subject to the invention.

Figure 16: Lateral view of the load balancing mechanism of the unmanned aerial vehicle subject to the invention while gliding on a lateral axis.

Figure 17: Lateral schematic view of the load balancing mechanism of the unmanned aerial vehicle subject to the invention.

Figure 18: Schematic view of the load balancing mechanism of the unmanned aerial vehicle subject to the invention from a different perspective.

Figure 19: Schematic view of the body of the unmanned aerial vehicle subject to the invention.

Figure 20: Front view of the heat exchanger of the unmanned aerial vehicle subject to the invention.

Figure 21: Schematic view of the heat exchanger of the unmanned aerial vehicle subject to the invention.

Figure 22: Schematic view of the body on the unmanned aerial vehicle subject to the invention.

Figure 23: Perspective view of the outer cylinder of the invented unmanned aerial vehicle.

Figure 24: Schematic view of the outer cylinder of the unmanned aerial vehicle subject to the invention.

Figure 25: Schematic view of the outer cylinder of the unmanned aerial vehicle subject to the invention, shown from a different angle.

Figure 26: Partial sectional view of the body on the unmanned aerial vehicle subject to the invention from a different angle.

Figure 27: Perspective view of the supercharger of the unmanned aerial vehicle subject to the invention.

Figure 28: Perspective view of the supercharger of the unmanned aerial vehicle subject to the invention from a different angle.

Figure 29: Perspective view of the four-lobe rotary piston of the unmanned aerial vehicle subject to the invention.

Figure 30: Perspective view of the three-lobe rotary piston of the unmanned aerial vehicle subject to the invention.

Figure 31: Perspective view of the two-lobe rotary piston of the unmanned aerial vehicle subject to the invention.

The parts on the figures have each been numbered, and these numbers refer to the following items:

1. Body
2. Engine assembly
3. Front propeller
4. Rear propeller
5. Wing
6. Liquid hydrogen tank
7. Balloon
8. Balloon ejection unit
9. Platform
10. Stabilizer
11. Wing body
12. Wing end
13. Microphone
14. Gyroscope unit
15. Internal combustion engine

16. Propeller power transmission shaft
17. Control rack
18. Rack power transmission hub
19. Rack gear train
20. Rotary body bearings
21. Conic cam
22. Conic cam follower
23. Cam follower shaft
24. Cam follower gear
25. Propeller closing gear
26. Rack linear actuator
27. Conic cam linear actuator
28. Slide bearing
29. Internal cylinder
30. External cylinder
31. Engine retainer
32. DC engine
33. Coupler
34. Screw shaft
35. Screw shaft nut
36. Screw shaft nut socket
37. Load balancing mechanism
38. Hydrogen fuel tube
39. Hydrogen inlet valve
40. Hydrogen outlet valve
41. Engine fuel inlet valve
42. Engine fuel outlet valve
43. Helical coiled tube
44. Heat exchanger
45. Balloon cover
46. Supercharger

47. Two-lobe rotary piston
48. Three-lobe rotary piston
49. Four-lobe rotary piston
50. Main driving shaft
51. Transfer gears
52. Air inlet orifice
53. Air outlet orifice
54. Rotary piston drive shaft
55. Air passage clearance

The invention is an unmanned aerial vehicle and it comprises;

- an engine group (2) which is located in the body (1), and provides motion to the front propeller (3) and rear propeller (4),
- a front propeller (3) which is located in front of the body (1) which is connected to the engine group (2),
- a rear propeller (4) which is connected to the engine assembly (2) and is located at the rear of the body (1), which can rotate in the same or opposite direction to the front propeller (3),
- 3 wings (5) which enable vertical take-off and landing of the aerial vehicle, the sharp ends of which are used as landing gear, and which are installed on the body (1) with constant 120 ° spacing,
- a liquid hydrogen tank (6) installed in the center of the rear propeller (4),
- a balloon (7) which is wrapped around the liquid hydrogen tank (6), which is inflated with the hydrogen in the liquid hydrogen tank (6), and enables suspension of the unmanned aerial vehicle in the air,
- a balloon ejection unit (8) which is located at the end portion of the liquid hydrogen tank (6) which releases the balloon (7) during the landing of the unmanned aerial vehicle.

The invention is an unmanned aerial vehicle which comprises a stabilized platform (9) that carries a multispectral camera which is installed in the center of the front propeller (3).

The invention is an unmanned aerial vehicle, which comprises equivalent and symmetrical lateral-vertical stabilizers (10) on the wings (5) which primarily increase the lift and partially the friction by increasing wing (5) hump.

The invention comprises an engine assembly (2), an internal combustion engine (15) and electrical engine in an unmanned aerial vehicle. The fuel supply of the engine assembly (2) is the hydrogen stored in the liquid hydrogen tank (6).

In the unmanned aerial vehicle subject to the invention, the engine assembly (2) comprises a monoblock hybrid engine which runs with both internal combustion and electricity.

The invention is an unmanned aerial vehicle, in one embodiment of which the wing (5) comprises;

- a wing body (11) fixed on the body (1) and placed with 120° spacing,
- a wing end (12) which is mounted on the end of the wing body (10), which is positioned in the same direction as the wing body (11) while the vehicle takes off and gains altitude, expands during gliding and increases the gliding capability of the vehicle by turning 180° in the opposite direction.

The unmanned aerial vehicle which can vertically take-off and land is positioned in such a manner that its wings (5) will touch the ground during take-off (Figure 1) and the vehicle gains altitude during take-off and when it is in the friendly zone, by means of the internal combustion engine (15) included in the vehicle engine assembly (2). As the vehicle gains altitude, the front propeller (3) and the rear propeller (4) rotate in reverse directions. As a result, by means of the angular moment, the vehicle will not turn around its own axis while take-off. Movement in

reverse directions of the front propeller (3) and rear propeller (4) of the engine assembly (2) is ensured with a suitable transmission system located in the body (1).

The direction is changed with the remote control for the rising unmanned aerial vehicle to glide in the lateral axis. During this redirection process, the unmanned aerial vehicle reaches a slope position in a manner to create a narrow angle with the lateral axis first, and then it continues flying horizontally. (Figure 2, Figure 3 and Figure 4)

The unmanned aerial vehicle which rises in the vertical axis and reaches the lateral axis, takes a completely reverse position against the take-off position at the target point. At this position, the vehicle runs with an electrical engine in the engine assembly (2) and the balloon is inflated with the hydrogen in the liquid hydrogen tank (6) (Figure 5). As a result, the vehicle maintains its position for a long time and it works by remaining in the air for 24 to 48 hours. The front propeller (3) and the rear propeller (4) of the vehicle suspended in the air operate idle. As a result, the volume of the balloon (7) decreases, it becomes difficult to notice and it remains in the air more stably. The control of with which one of the engines in the engine assembly (2) the front propeller (3) and the rear propeller (4) are to operate is carried out quickly by means of a remote control and/or an inertial navigational system located in the vehicle.

As the unmanned aerial vehicle remains stable in continuously suspended position, it captures very precise images with the multispectral camera located on the stabilized platform (9) that is mounted in the middle section of the front propeller (3). A Gyro unit (14) attached to the front propeller (3) provides reference to the inertial navigational system of the unmanned aerial vehicle, and enables its correct position without support from GPS-like external reference elements.

The rear propeller (4) which runs in the reverse direction to the front propeller (3) rotates in a manner to create 180 degrees phase different sound which has an equal rotation by means of the MEMS microphones (13) located on the unmanned aerial

vehicle to eliminate the engine group's (2) noise when desired, thus eliminating and/or reducing the front propeller's (3) noise with acoustic interference. As a result, the invention can move silently even with an internal combustion engine (15).

After the duty of the unmanned aerial vehicle is completed, first the balloon (7) is further inflated with the remaining hydrogen and then the autonomous unmanned aerial vehicle takes off silently. At an altitude where the engine assembly's (2) sound cannot be heard, the balloon ejection unit (8) releases the balloon (7) and the vehicle begins descending. (Figure 6)

During the landing of the vehicle, similar to the take-off motion, the vehicle is redirected by means of the remote control for gliding in the lateral axis. During this redirection process, the unmanned aerial vehicle reaches a slope position in a manner to create a narrow angle with the lateral axis first, and then it continues flying horizontally (Figure 7). During landing, the wings (5) touch the ground, they reach the initial take-off position and they complete landing (Figure 8 ad Figure 9).

In the event the wings (5) of the unmanned aerial vehicle are wing ends (12) which are installed on the end of the wing body (11) placed with 120° spacing, stably on the body (1) of the vehicle, in other words, if the wings (5) are moveable, the wing ends (12) open while gliding and the gliding capability of the vehicle is increased. (Figure 10 and Figure 11)

In the unmanned aerial vehicle,

- the power of the vehicle reduces when the monoblock hybrid engine of the engine assembly (2) runs with the electric engine only. Therefore, the single electric engine is run for maintaining the position at the point of duty when the balloon (7) is inflated or when it glides downward using the wings of the unmanned aerial vehicle wings (5),
- the liquid hydrogen in the liquid hydrogen tank (6) may be dropped as a bomb or it may be dropped in the event of an emergency,

- during its return, the liquid hydrogen tank (6) is discharged at a minimum level against accidents such as unintended explosion.

Furthermore, the invention is an unmanned aerial vehicle and it operates as follows;

- said autonomous unmanned aerial vehicle can be operated with a remote control or can be operated autonomously,
- the unmanned aerial vehicle takes off by means of the internal combustion engine (15) located in the engine assembly (2),
- while working with an electric engine, the ends of the wings (12) are opened 20-60° and the vehicle takes off,
- the wing ends (12) extend 180° in the lateral axis while the vehicle continues to operate with the electric engine,
- after reaching the target point, the wing ends (12) are retracted and the autonomous aerial vehicle is reversed,
- the balloon (7) is inflated with hydrogen which is stored in the liquid hydrogen tank (6),
- the unmanned aerial vehicle ascends together with the balloon (7) that is inflated with hydrogen,
- the balloon (7) is ejected after the unmanned aerial vehicle rises to an altitude where the sound of the internal combustion engine (15) in the engine assembly (2) cannot be heard,
- the internal combustion engine (15) is operated and the vehicle is returned back to its original location.

Images are captured with the camera located on the platform (9) when the unmanned aerial vehicle reaches the target point.

During the operation of the unmanned aerial vehicle as suspended in the air with the balloon (7), only the rear propeller (4) runs on electricity and by activating the stabilizers (10) it maintains its position with light wind.

The unmanned aerial vehicle can land and take off on any rough surface and on water and can operate in a limited range there when desired in cases of emergency, extreme wind or bad weather conditions and/or where required by the mission.

In cases of attack or danger, the hydrogen in the liquid hydrogen tank (6) can be used as a bomb and it can be exploded.

The invention is an unmanned aerial vehicle which comprises;

- a hollow cylindrical power transmission shaft (16) connected at the hub of the internal combustion engine's (15) shaft and the rotary body bearings (20), and which transfers the torque received from the output shaft of the internal combustion engine (15) to the front propeller (3) and rear propeller (4), and which is located in the engine assembly (2),
- a control rack (17) which consists of three non hollow cylindrical shafts born linearly on the rotary body bearings (20), which transmits the motion received from the rack linear actuator (26) to the rack geartrain (19), and is connected to the rack power transmission hub (18),
- a rack power transmission hub (18) in cylindrical form, which is born in a manner to allow for radial movement in the engine assembly (2) which is in the form of a disk connected with a hollow cylindrical shaft to the rack linear actuator (26) and which can both rotate with the front propeller (3) and rear propeller (14) and can move linearly for pitch control, which provides the movement of the gears that enable pitch control of the front propeller (3) and rear propeller (4) blades by transmitting the linear movement received from the rack linear actuator (26) along the control rack (17),
- a rack geartrain (19) which consists of three rack gears on the shaft connected to the control rack (17), and 3 cogwheels which are connected to the front propeller (3) and positioned to act together with them,
- cylindrically rotating body bearings (20) which are mounted in a manner to allow the radial movement of the engine assembly (2) and which acts

rotationally only, transfers the torque received from the rack power transmission hub (18) to the front propeller (3) and rear propellers (4), on which the control rack (17) that advances linearly when the rack power transmission hub (18) acts linearly is supported,

- conic cam (21) in the form of a hollow shaft with a conic cam at its end, which is supported to allow for linear movement according to the engine assembly (2), which moves linearly as a result of the movement received from the conic linear actuator (27), allows for the movement of the conic cam follower (22) in an axis vertical to its axis of movement, and connected to the rotary body bearings (20) so as to turn together with said bearings,
- a conic cam follower (22) which moves on the vertical axis with the linear movement of the conic cam (21) piece, and moves the gear mechanism that enables opening and closing of the front propeller (3) and rear propeller (4) wings, that are in contact with the conic cam (21) and has balls at its end to enable movement,
- a cam follower shaft (23) which is supported to move linearly in the conic cam follower (22), advances upward as the conic cam follower (22) moves towards the greater diameter on the conic cam (21), and acts downward towards the part of the conic cam (21) with smaller diameter, and which is connected to the conic cam follower (22), and which is supported so as to allow for the linear movement to the cogwheel of the rack geartrain (19) connected to the front propeller (3),
- cam follower gear (24) in the form of a cogwheel connected to the cam follower shaft (23) which rotates the propeller closing gear (25) and acts linearly together with the cam follower shaft (23),
- a propeller closing gear (25) which enables turning off the front propeller (3) and rear propeller (4) when they are not in use, and turning them on when they are to be used, which rotates with the upward and downward movement of the cam follower gear (24) on the diameter created by the by the axial offset.

- a rack linear actuator (26) connected to the body, which drives the mechanism that provides the pitch control of the front propeller (3) and the rear propeller (4), transmits linear movement from the inside of the internal combustion engine (15) output shaft to the rack power transmission hub (18), and a hollow cylindrical shaft connected to the body (1) through the hub,
- a conic cam linear actuator (27) connected to the body (1), which drives linearly the conic cam (21) element, and provides this movement with a different shaft passing through the inner side of the hollow internal combustion engine's (15) output shaft.

The front propeller (3) and rear propeller (4) on the body (1) are pitch-controlled. In other words, pitch angles can be changed.

The front propeller (3) operates during vertical take-off and landing of the unmanned aerial vehicle. Furthermore, in the high altitude model, it can also be operated at the higher layers of the atmosphere.

The front propeller (3) is larger than the rear propeller (4) in width (X:1 ratio) and in length (Y:1 ratio). (X and Y are numbers greater than 1)

During lateral constant flight or gliding of the unmanned aerial vehicle, in order to reduce the resistance of air which occurs during the operation of the front propeller (3), the angle of each one of the front propellers (3) is turned in flight direction ideally by 90 degrees but practically at the maximum angle that is allowed by the geometry the front propeller (3) is dependent on and by the pitch control. In other words, the sharp edges of the front propeller (3) look forward as much as possible. This movement is provided with the pitch control mechanism.

On the unmanned aerial vehicle, when the front propeller (3) is not turning, it remains folded downward with gravity as much as the mechanical limits allow for that. However, when the front propeller (3) begins turning, it takes its normal position with centrifugal effect.

The invention is an unmanned aerial vehicle which comprises a load balancing mechanism (37) which includes;

- an inner cylinder (29) which constitutes the inner portion of the mechanism and has linear slide bearings (28) and which is located on the liquid hydrogen tank (6),
- an outer cylinder which acts on the inner cylinder (29) and helps changing the position of the center of gravity, acts on the inner cylinder to shift the center of gravity towards the front side of the vehicle and approaches the body (1) and moves away from it in a completely reverse situation,
- DC engine (32) which is fixed with the engine arrester (31) to the outer cylinder (30) and drives the screw shaft (34) and determines the reciprocal position of the inner cylinder (29) and the outer cylinder (30),
- a coupler (33) which minimizes radial space and transmits torque between the DC engine (32) and the screw shaft (34),
- screw shaft nut (35) which enables translating the movement of the rotationally moving screw shaft (34) to linear movement,
- a screw shaft nut socket (36) which bares the screw shaft nut (35) in the inner cylinder (29).

In the load balancing mechanism (37), DC engine (32) is connected to the screw shaft (34) by means of a coupler (33). A screw shaft nut (35) and a screw shaft nut socket (36) is provided at the end of said screw shaft (34). The DC engine (32) is fixed on the outer cylinder (30). The screw shaft socket (36) is fixed on the inner cylinder (29). The concentric inner cylinder (29) and the outer cylinder (30) are connected to each other with linear slide bearings (28), thus reciprocal rotation of the inner cylinder (29) and the outer cylinder is avoided.

On the load balancing mechanism (37), when the DC engine (32) rotates the screw shaft (34), the rotational movement of the screw shaft nut (35) transforms rotational

movement to linear movement; as a result, the inner cylinder (29) and the outer cylinder (30) move on the linear slide bearings (28).

The invention is an unmanned aerial vehicle which comprises;

- a high pressure leak-proof hydrogen input valve (39) fixed to the notch carved at the end of the helical coiled tube (43), which stores hydrogen cryogenically in liquid form at low temperatures and high pressure, provides hydrogen supply as fuel to the internal combustion engine (15), and enables liquid hydrogen feeding from the hydrogen fuel tube (38),
- a high pressure leak-proof hydrogen output valve (40) fixed with a notch opened at the end of the helical coiled tube (43), and through which the hydrogen transforms from liquid to gas form to become a fuel-air mixture,
- high pressure leak-proof oil inlet valve (41) fixed in the internal combustion engine (15) with a screw on the heat exchanger (44), where the oil that reaches high temperature enters,
- a high pressure leak-proof oil output valve (42) that is fixed with a screw onto the heat exchanger (44) where the high temperature lubricant enters through the engine oil input valve (41) and transfers its heat to the liquid hydrogen and which then exits as cooled oil and is then returned to circulation to re-lubricate the internal combustion engine (15),
- a helical coiled tube (43) which enables the exchanging of heat between the hydrogen and the lubricant having a high temperature, where said tube's surface area is high, and which consists of a leak-proof tube welded in a coiled form in the heat exchanger (44),
- heat exchanger (44) in the form of a hollow cylinder that is connected to the body (1) inside the engine assembly.

Hydrogen as the fuel of the internal combustion engine (15) is stored in a hydrogen fuel tube (38) which can cryogenically resist high pressure in liquid form. Heat exchange occurs between the lubricant at high temperatures in liquid form, which

assists reducing the friction force during the movement of the radial pistons in the internal combustion engine (15) by means of a heat exchanger (44) before taking the form of an air-fuel mixture, and the hydrogen in liquid form at low temperature. The temperature of the lubricant at high temperature decreases while the hydrogen gasifies with the heat of the lubricant. The heat exchanger (44) used here is in a tube-like form which enables the flow of hydrogen, and has a coil form in which the lubricant travels spirally.

The invention is an unmanned aerial vehicle which comprises balloons (7) compressed and piled successively under the balloon covers (45) to be opened when the balloons (7) are to be activated.

The invented unmanned aerial vehicle comprises

- a supercharger (46) connected to the body (1) on the engine assembly (2) and which enables the internal combustion engine (15) to have sufficient air-fuel mixture while working at high altitude, thus which compresses and accelerates the intake air to mix it in the hydrogen,
- a main drive shaft (50) in cylindrical form having a cogwheel at the ends installed such that it allows radial movement of the supercharger (46) and drives the supercharger transmission gears (51) that move the two-lobe rotary piston (47), three-lobe rotary piston (48) and four-lobe rotary piston (49) located in the supercharger (46),
- air inlet orifice (52) having a notch on the supercharger (46), which allows the air received from the outside to enter the first chamber to be compressed inside the supercharger (46),
- supercharger transfer gears (51) which is formed of a cogwheel coupled to the piston drive shaft (54) and which is placed in a manner to allow different rotational directions but with same rotation speed, which is driven by the main drive shaft (50), and moves the two-lobe rotary piston (47), three-lobe rotary piston (48) and four-lobe rotary piston (49),

- an air discharge orifice (53) which a notch on the supercharger (46), where the air compressed in the last compression chamber of the supercharger (46) is released with the highest compression rate and discharged to be mixed with the hydrogen fuel,
- a piston drive shaft (54) in the form of a cylindrical shaft which is mounted to allow its radial movement into the supercharger (46), and which rotates the elements that conduct the compression function together with itself, and to which torque is transmitted from the main drive shaft (50) via the transmission gears (51),
- a four-lobe rotary piston (49) connected to the piston drive shaft (54) which consists of four lobes in the chamber at the highest layer, which has the highest air pressure in the supercharger (46),
- a three-lobe rotary piston (48) connected to the piston drive shaft (54) which consists of three lobes in the chamber at the second layer in the supercharger (46),
- a two-lobe rotary piston (47) connected to the piston drive shaft (54) which comprises two lobes at the inlet layer of the supercharger (46), an air passage opening (55) with a certain diameter on the chambers along the same axis in the supercharger (46), through which the air passes in the direction at which the compression rate increases among the chambers where the air is compressed; the air compressed in the first chamber is urged to go to the second chamber by means of the two-lobe rotary pistons (47), and similarly, the air passes to the third chamber with four-lobe rotary pistons (49).

CLAIMS

1. The invention is an unmanned aerial vehicle **characterized in that** it comprises;

- **an engine group (2)** which is located in the body (1), and provides motion to the front propeller (3) and rear propeller (4),
- **a front propeller (3)** which is located in front of the body (1) which is connected to the engine group (2),
- **a rear propeller (4)** which is connected to the engine assembly (2) and is located at the rear of the body (1), which can rotate in the same or opposite direction to the front propeller (3),
- **3 wings (5)** which enable vertical take-off and landing of the aerial vehicle, the sharp ends of which are used as landing gear, and which are installed on the body (1) with constant 120 ° spacing,
- **a liquid hydrogen tank (6)** installed in the center of the rear propeller (4),
- **a balloon (7)** which is wrapped around the liquid hydrogen tank (6), which is inflated with the hydrogen in the liquid hydrogen tank (6), and enables suspension of the unmanned aerial vehicle in the air.

2. An unmanned aerial vehicle according to Claim 1; **characterized in that** it comprises a **balloon ejection unit(8)** which is located at the end portion of the liquid hydrogen tank (6) which releases the balloon (7) during the landing of the unmanned aerial vehicle.

3. An unmanned aerial vehicle according to any of the preceding claims; **characterized in that** it comprises a mono block hybrid engine which operates the engine group (2) with an internal combustion engine (15) during the lift off and when the vehicle is operated in the friendly zone, and which operates with electricity without noise in the mission area.

4. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises a **wing body (11)** that is mounted on the body (1) with 120° spacing.

5. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises a **wing end (12)** that is mounted on the end portion of the wing body (11), and that is positioned in the same direction as the wing body (11) when the vehicle is taking off and when it is gaining altitude, and which expands when the vehicle is gliding which turns 180° in the opposite direction to increase the gliding capacity of the vehicle.

6. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises a **Gyro unit (14)** attached to the front propeller (3), which provides reference to the inertial navigational system of the unmanned aerial vehicle, and enables its correct positioning and autonomous flight without support from GPS-like external reference elements.

7. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises MEMPS **microphones (13)** located on the unmanned aerial vehicle to eliminate and/or reduce the engine group's (2) noise by means of an acoustic interference method as the rear propeller (4) rotates with the same rotations speed as the front propeller (3) but with 180 degrees phase so as to create a different noise.

8. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it operates as follows,

-said autonomous unmanned aerial vehicle can be operated with a remote control or can be operated autonomously,

-the unmanned aerial vehicle takes off by means of the internal combustion engine (15) located in the engine assembly (2),

-while working with an electric engine, the ends of the wings (12) are opened 20-60° and the vehicle is takes off,

-the wing ends (12) extend 180° in the lateral axis while the vehicle continues to operate with the electric engine,

-after reaching the target point, the wing ends (12) are retracted and the autonomous aerial vehicle is reversed,

-the balloon (7) is inflated with hydrogen which is stored in the liquid hydrogen tank (6),

-the unmanned aerial vehicle ascends together with the balloon (7) that is inflated with hydrogen,

-the balloon (7) is ejected after the unmanned aerial vehicle rises to an altitude where the sound of the internal combustion engine (15) in the engine assembly (2) cannot be heard,

-the internal combustion engine (15) is operated and the vehicle is returned back to its original location.

9. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises a liquid hydrogen tank (6), the hydrogen in which can be exploded as a bomb in the event of an attack or danger.

10. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it operates by means of,

- a hollow cylindrical power transmission shaft (16) connected at the hub of the internal combustion engine (15) output shaft and the rotary body bearings (20) in the engine assembly (2) of the body (1),
- a control rack (17) which comprises three non hollow cylindrical shafts born linearly on the rotary body bearings (20) that is connected to the rack power transmission hub (18),

- a rack power transmission hub (18) in cylindrical form, which is born in a manner to allow the radial movement in the engine assembly (2) which is in the form of a disk connected with a hollow cylindrical shaft to the rack linear actuator (26),
- a rack geartrain (19) which comprises 3 rack gears on the shaft connected to 3 control racks (17), and 3 cogwheels which are connected to the front propeller (3) and positioned to act together with said cogwheels,
- cylindrical rotary body bearings (20) that are mounted to the engine assembly (2) to allow their radial movement,
- conic cam (21) in the form of a hollow shaft having the conic cam at its end portion, which is mounted to allow for linear movement relative to the engine assembly (2), and that are connected to the rotary body bearings (20) so as to rotate together with said bearings,
- a conic cam follower (22) which contacts the conic cam (21) and has a moveable ball at its end to enable movement,
- a cam follower shaft (23) as a cylindrical shaft mounted linearly moveable to the cogwheel of the rack geartrain (19), that is connected to the front propeller (3) which in turn is connected to the conic cam follower (22),
- cam follower gear (24) in the form of a cogwheel connected to the cam follower shaft (23),
- a propeller closing gear (25) which is placed as axially offset compared to the rack follower gear (24) which is connected to the front propeller (3),
- a rack linear actuator (26) connected to the body (1), which has a hollow cylindrical output shaft connected through the hub of the rack power transmission hub (18),
- conic cam linear actuator (27) connected to the body (1), which has a cylindrical output shaft connected through the hub to the conic cam (21).

11. An unmanned aerial vehicle according to any of the preceding claims, which comprises

- an inner cylinder (29) which constitutes the inner portion of the mechanism and has linear slide bearings (28) and which is located on the liquid hydrogen tank (6),
- an outer cylinder (30) which acts on the inner cylinder (29) and enables to change the position of the center of gravity, and moves towards the body (1) by moving on the inner cylinder (29) in order to shift the center of gravity towards the front section of the vehicle and moves away from the body in order to shift the center of gravity back.
- DC engine (32) which is fixed with the engine arrester (31) to the outer cylinder and drives the screw shaft (34) and determines the position of the inner cylinder (29) and the outer cylinder (30) relative to each other,
- A coupler (33) which minimizes the radial space and transmits torque between the DC engine (32) and the screw shaft (34)
- a screw shaft nut (35) which enables translating the movement of the rotationally moving screw shaft (34) into linear movement,
- a screw shaft nut socket (36) having a screw shaft nut (35) mounted into the inner cylinder (29),

characterized in that it comprises a load balancing mechanism (37).

12. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises

- a heat exchanger (44) in the form of a hollow cylinder connected to the body (1) in the engine assembly (2),
- a helical coiled tube (43) which comprises a welded leak-proof tube in helical form inside the heat exchanger (44),
- a high pressure leak-proof hydrogen input valve (39) fixed to the notch opened at the end of the helical coiled tube (43),
- a high pressure leak-proof hydrogen output valve (40) fixed to the notch opened at the end of the helical coiled tube (43),

- an oil input valve (41) which is leak-proof at high pressures and which is fixed with the screw onto the heat exchanger (44),
- an oil output valve (42) which is leak-proof at high pressures and is fixed with the screw onto the heat exchanger (44).

13. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises balloon covers (45) which will be opened when the balloons (7) are to be activated, where said covers are located between the balloons (7) that have been compressed and folded and successively stacked.

14. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it comprises

- a supercharger (46) connected to the body (1) in the engine assembly (2),
- a cylindrical main drive shaft (50) with a cogwheel at the ends thereof which is mounted to the supercharger (46), to allow radial movement of said shaft,
- air inlet orifice (52) with an opened notch located on the supercharger (46),
- supercharger transmission gears (51) which are formed of a cogwheel coupled to the piston drive shaft (54),
- air outlet orifice (53) with an opened notch located on the supercharger (46),
- a piston drive shaft (54) in the form of a cylindrical shaft attached to the supercharger (46), such that it can move in a radial motion,
- a four-lobe rotary piston (49) connected to the piston drive shaft (54) which consists of four lobes in the chamber at the highest layer, which has the highest air pressure in the supercharger (46),
- a three-lobe rotary piston (48) connected to the piston drive shaft (54) which consists of three lobes in the chamber at the second layer in the supercharger (46),
- a two-lobe rotary piston (47) connected to the piston drive shaft (54) which consists of two lobes in the chamber at the entrance layer in the supercharger (46),

- an air passage opening (55) having a certain diameter located on the chambers along the same axis in the supercharger (46).

15. An unmanned aerial vehicle according to any of the foregoing claims, **characterized in that** it can maintain its position under light wind conditions during its operation when it is suspended in the air by means of the balloon (7), by running the rear propellers (4) with electricity and by activating the stabilizers (10).

16. An unmanned aerial vehicle according to any of the preceding claims, **characterized in that** it can land and take off on any rough terrain and water and can operate in a limited range there when desired in cases of emergency, extreme wind or bad weather conditions and/or where required by the mission.

Figure 1

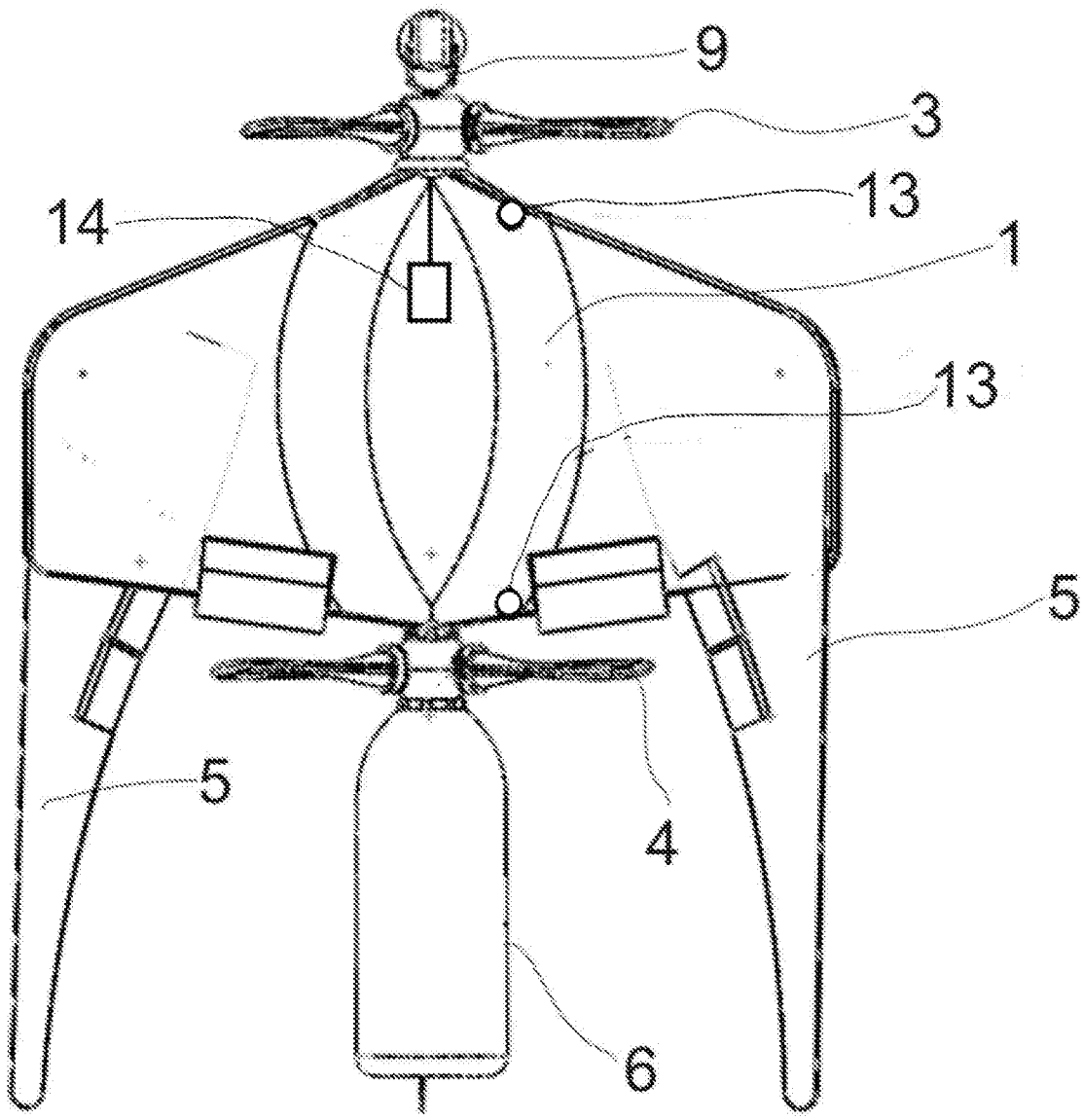
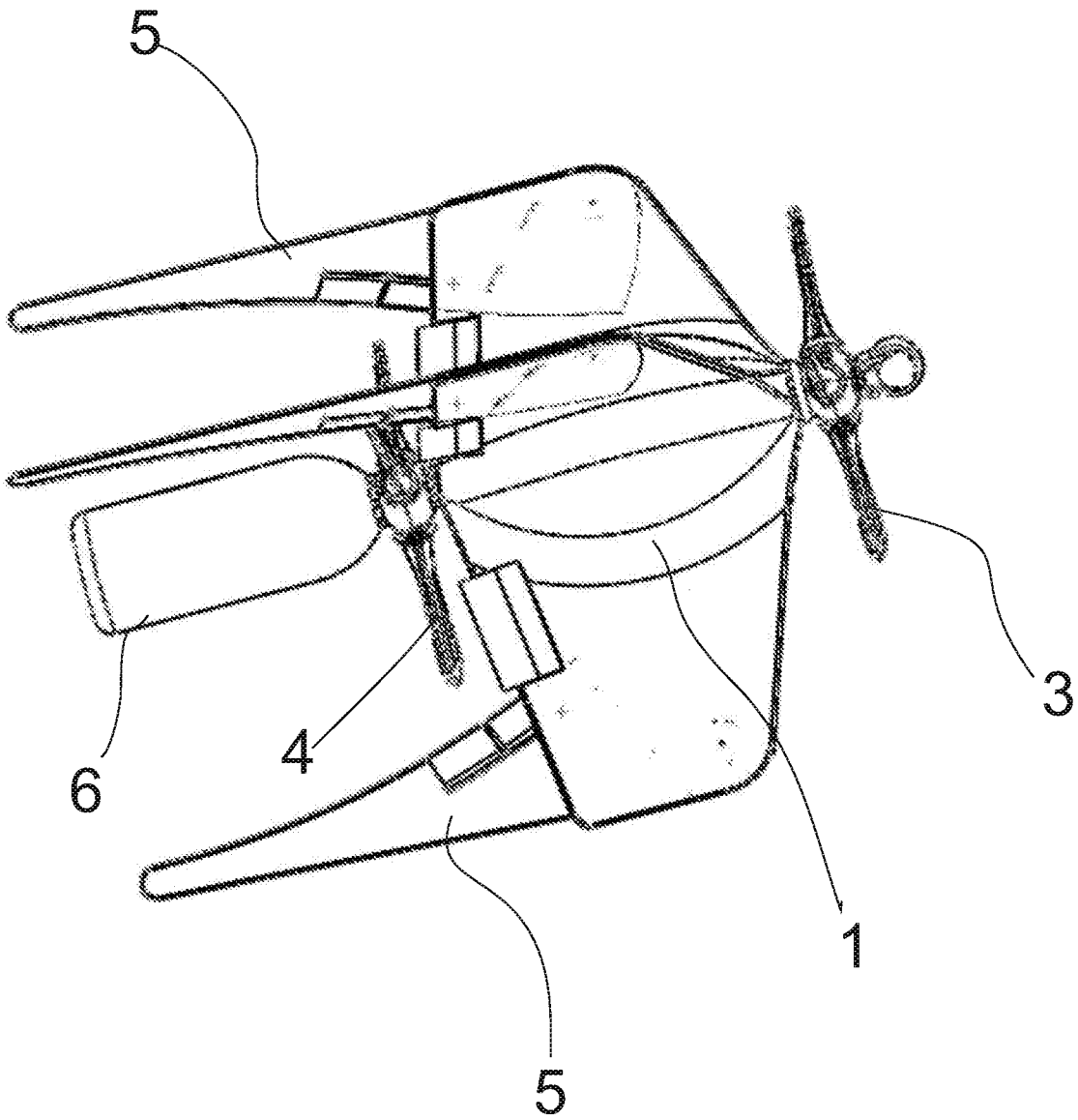


Figure 2



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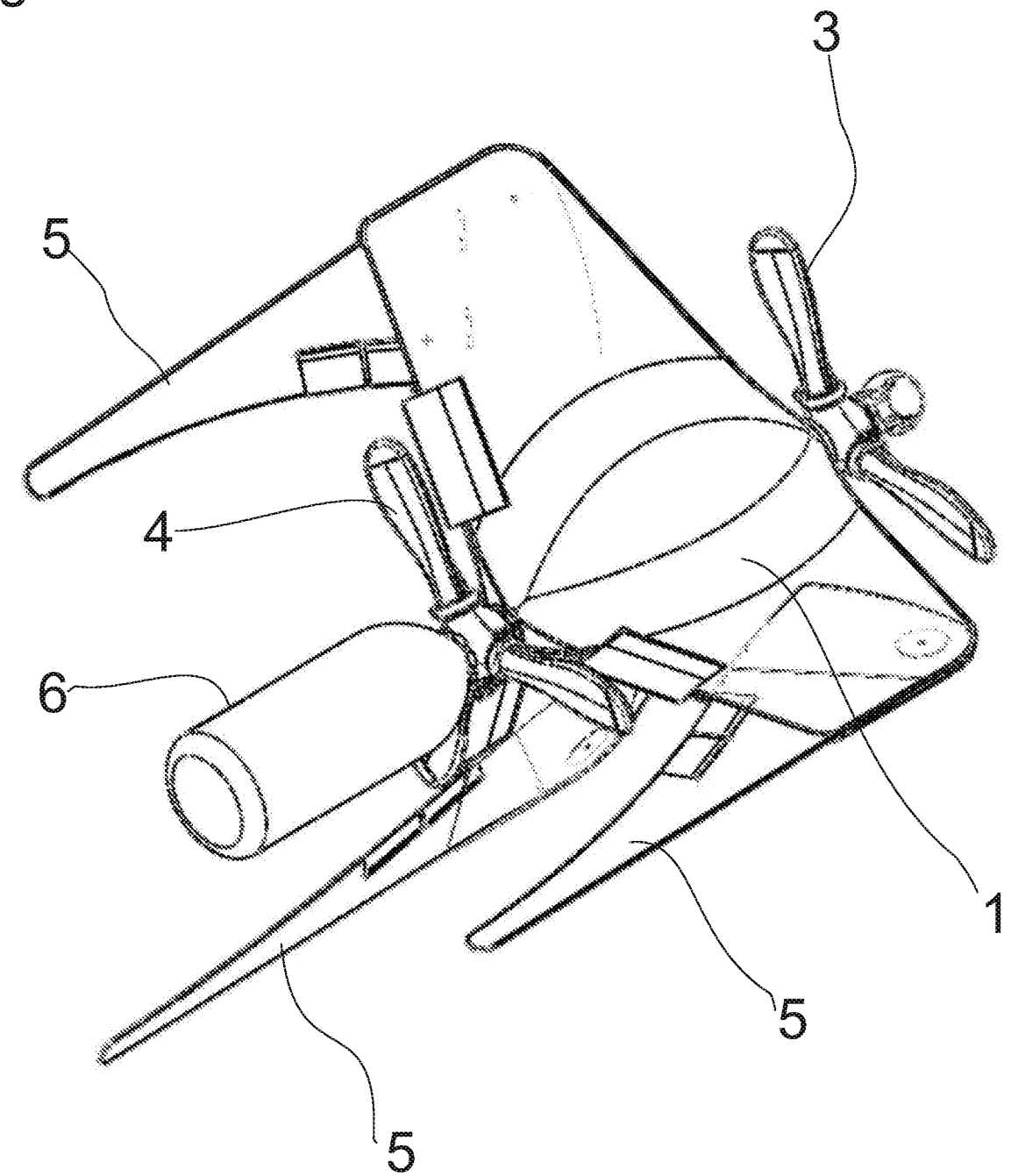

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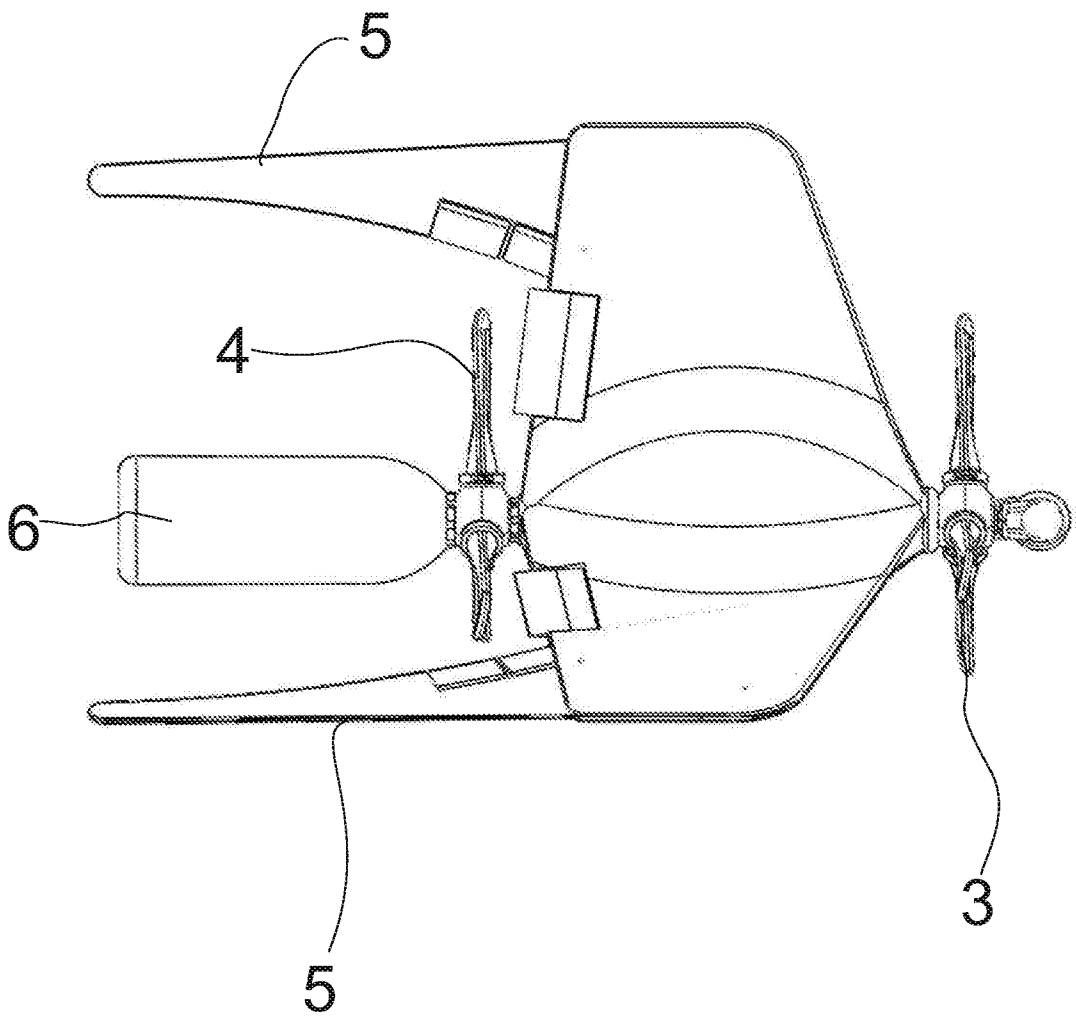


Figure 5

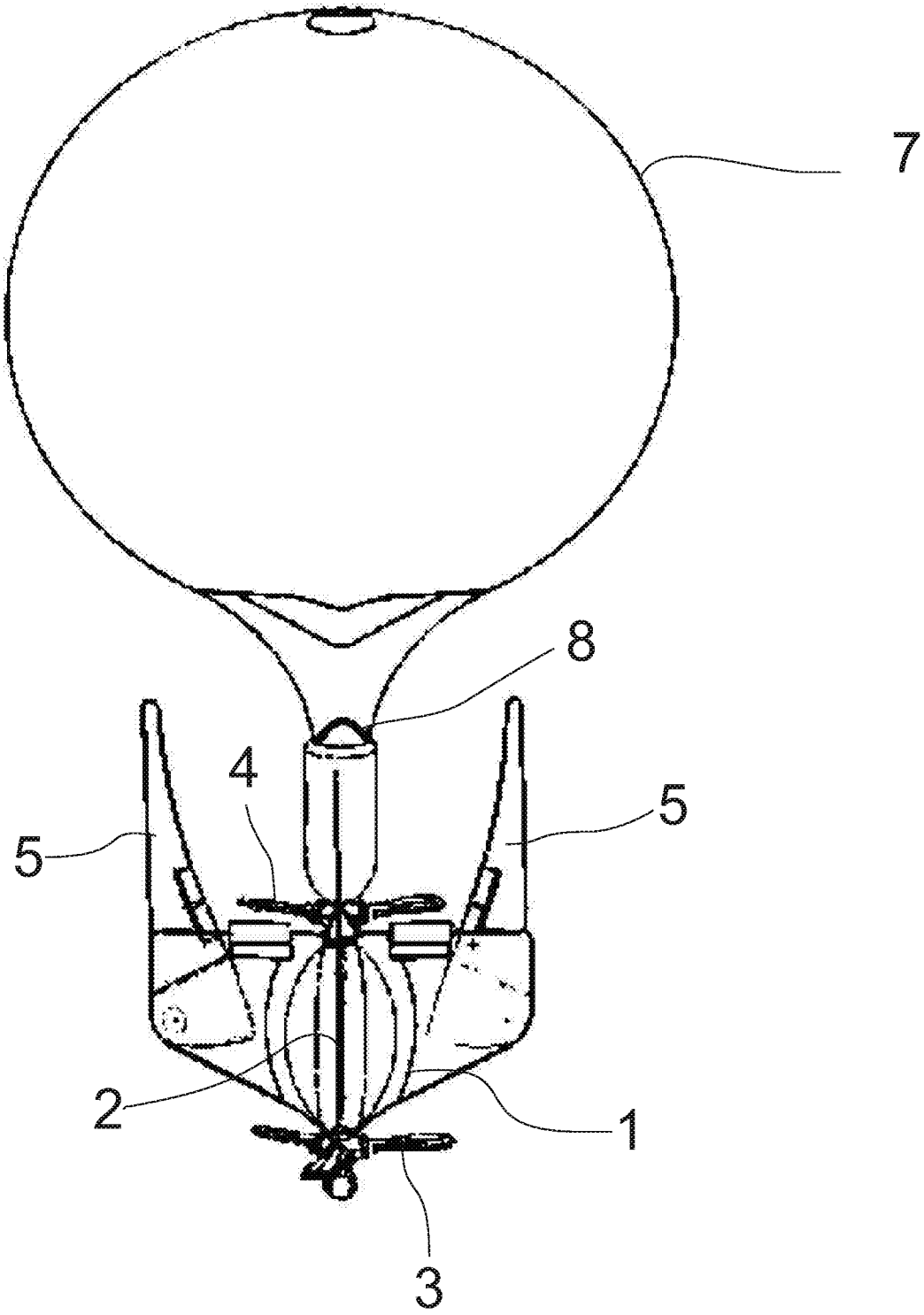
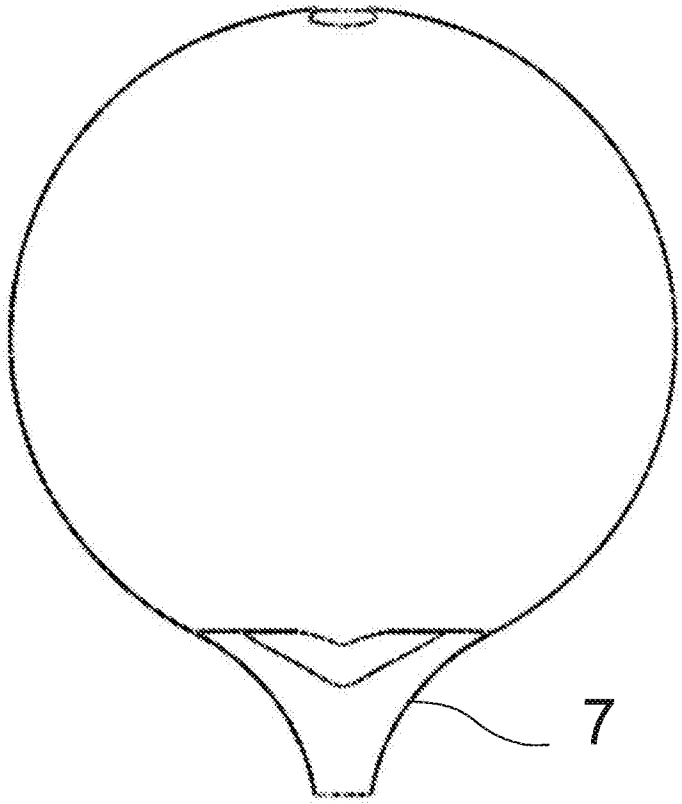


Figure 6



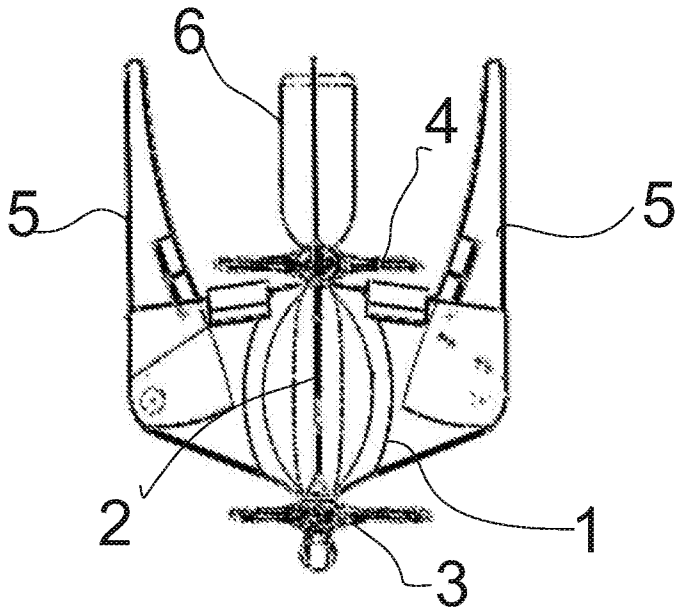
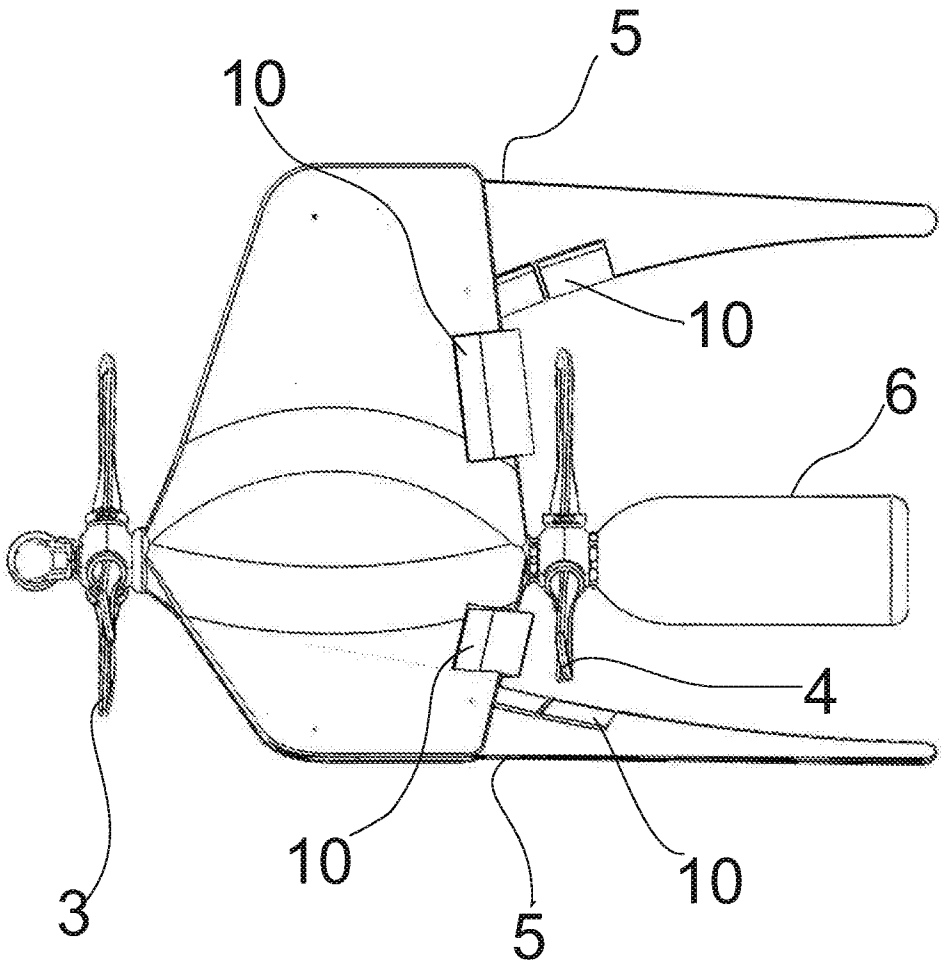


Figure 7



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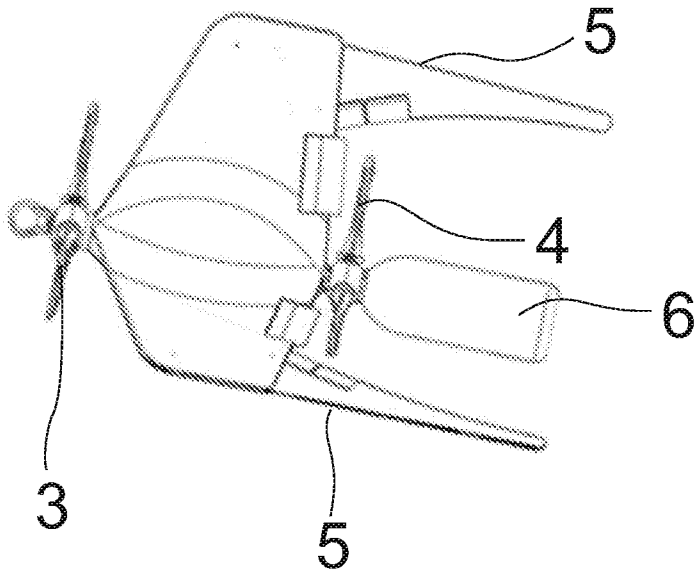


Figure 9

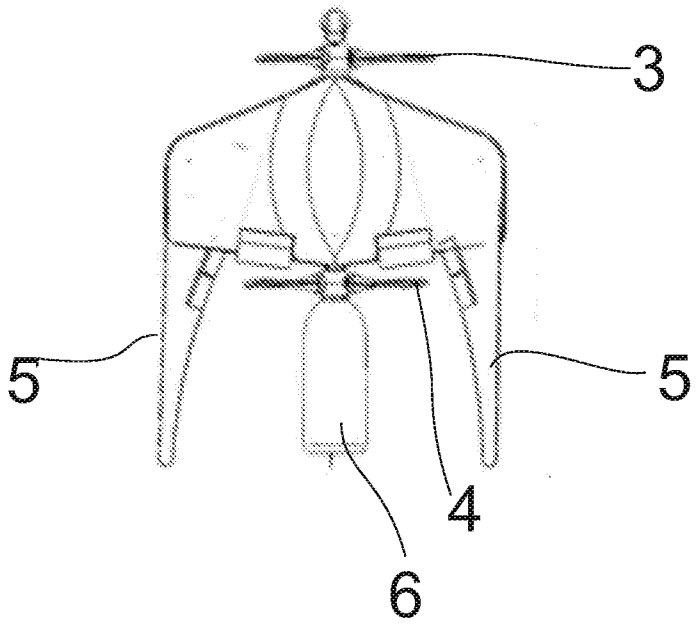


Figure 10

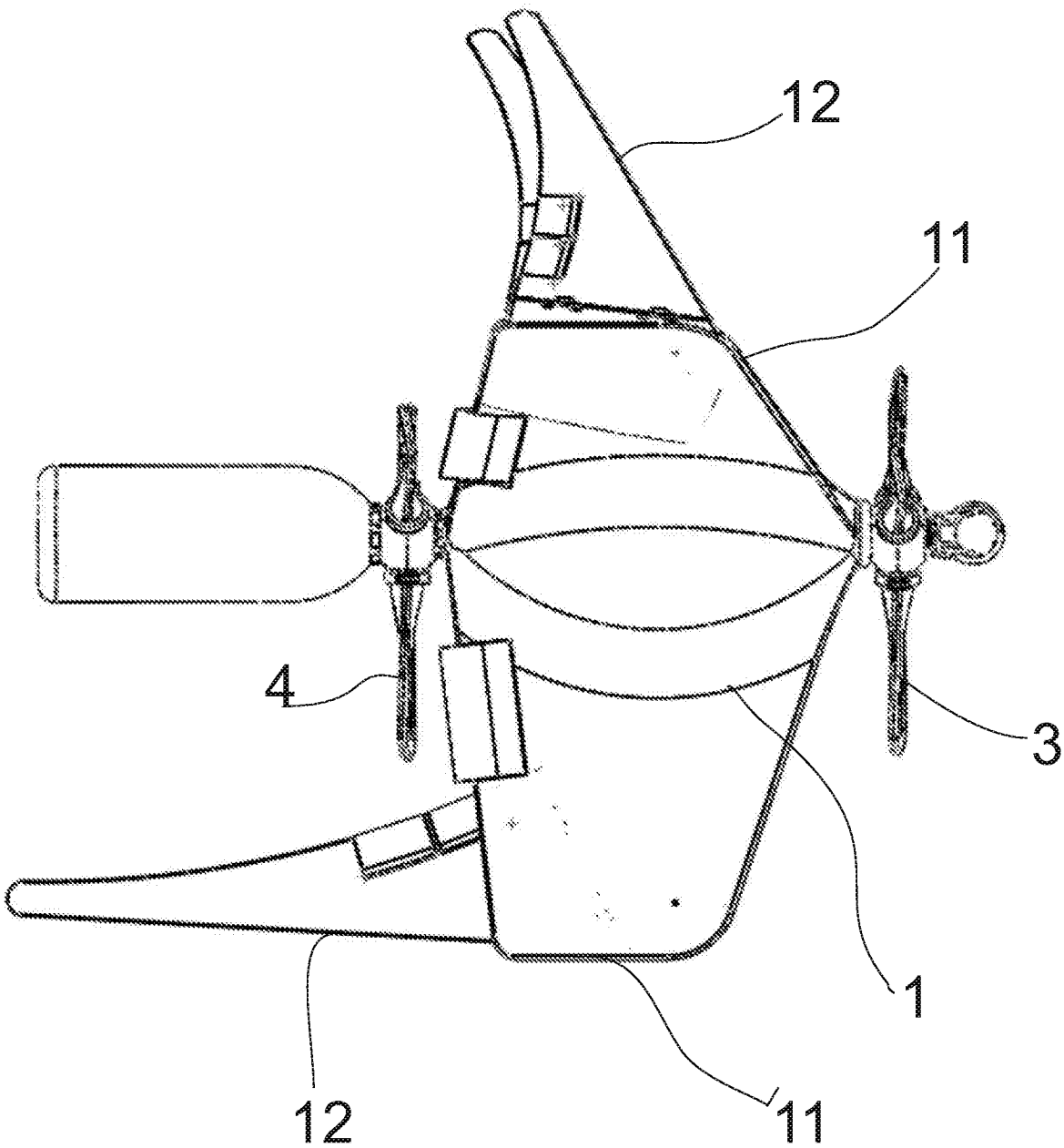
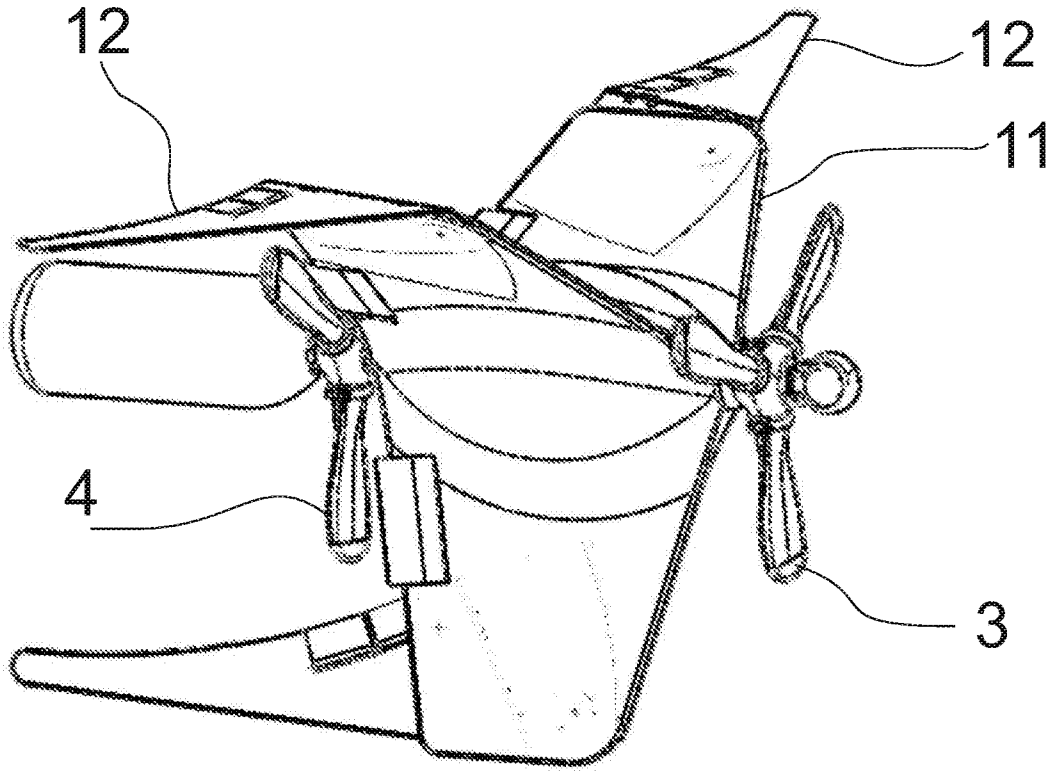


Figure 11



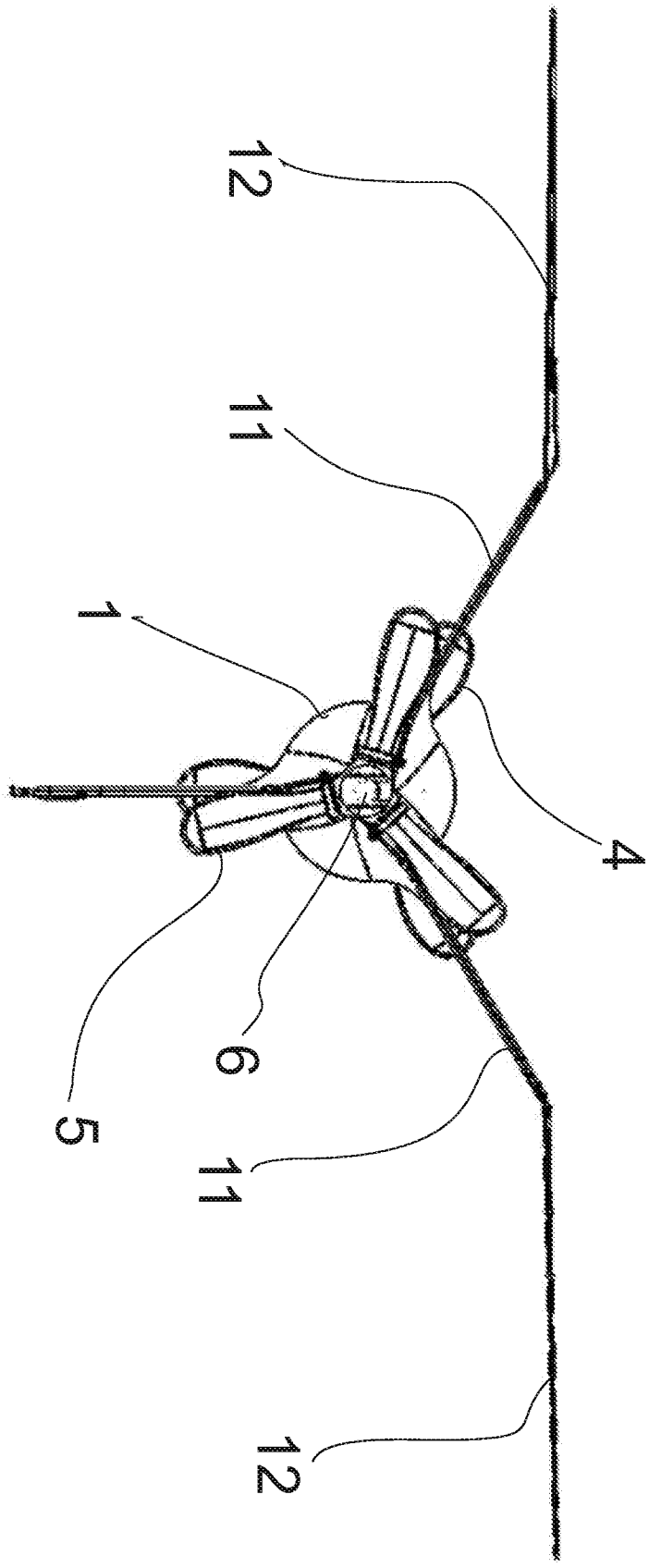
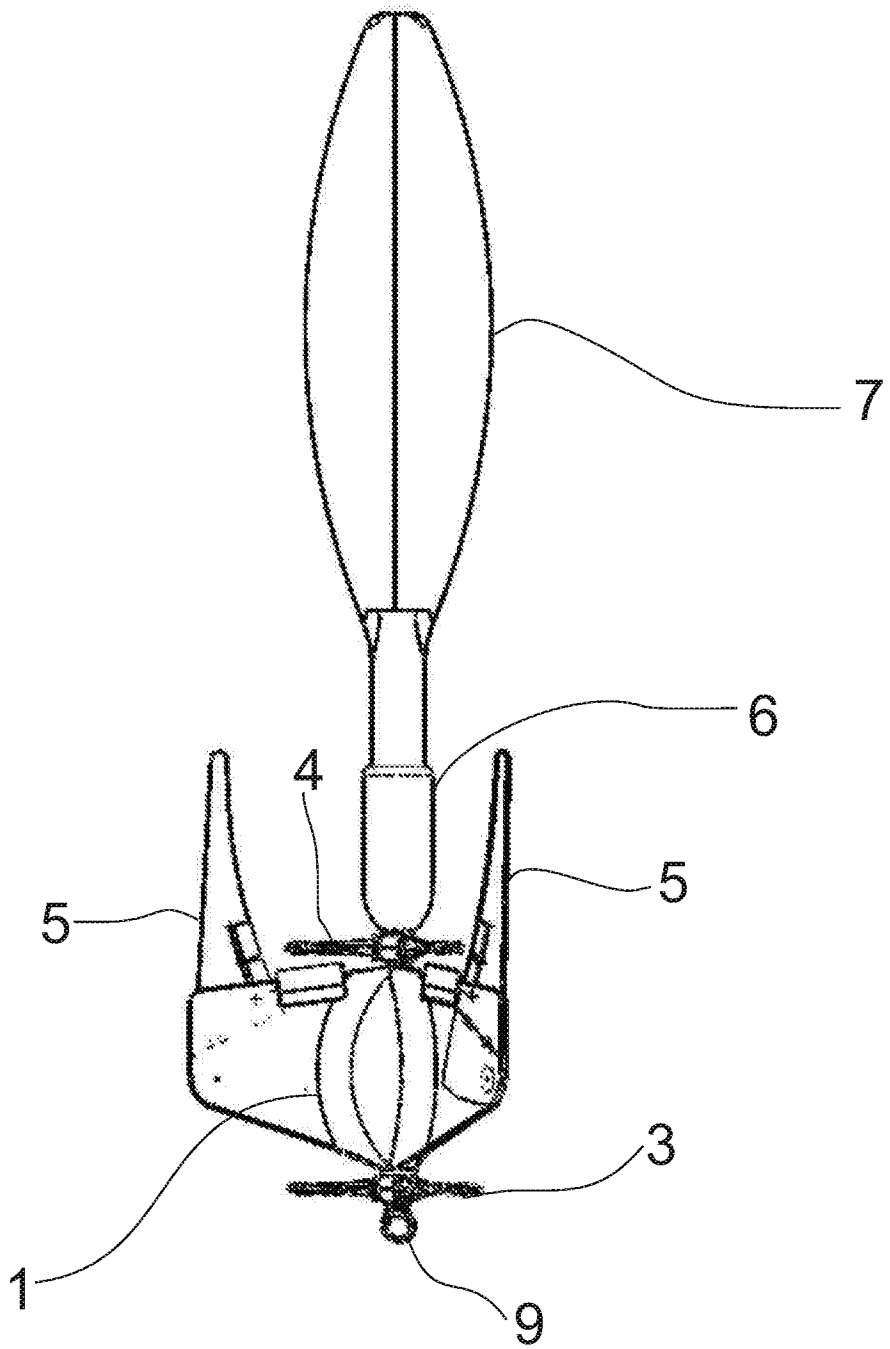


Figure 12

Figure 13



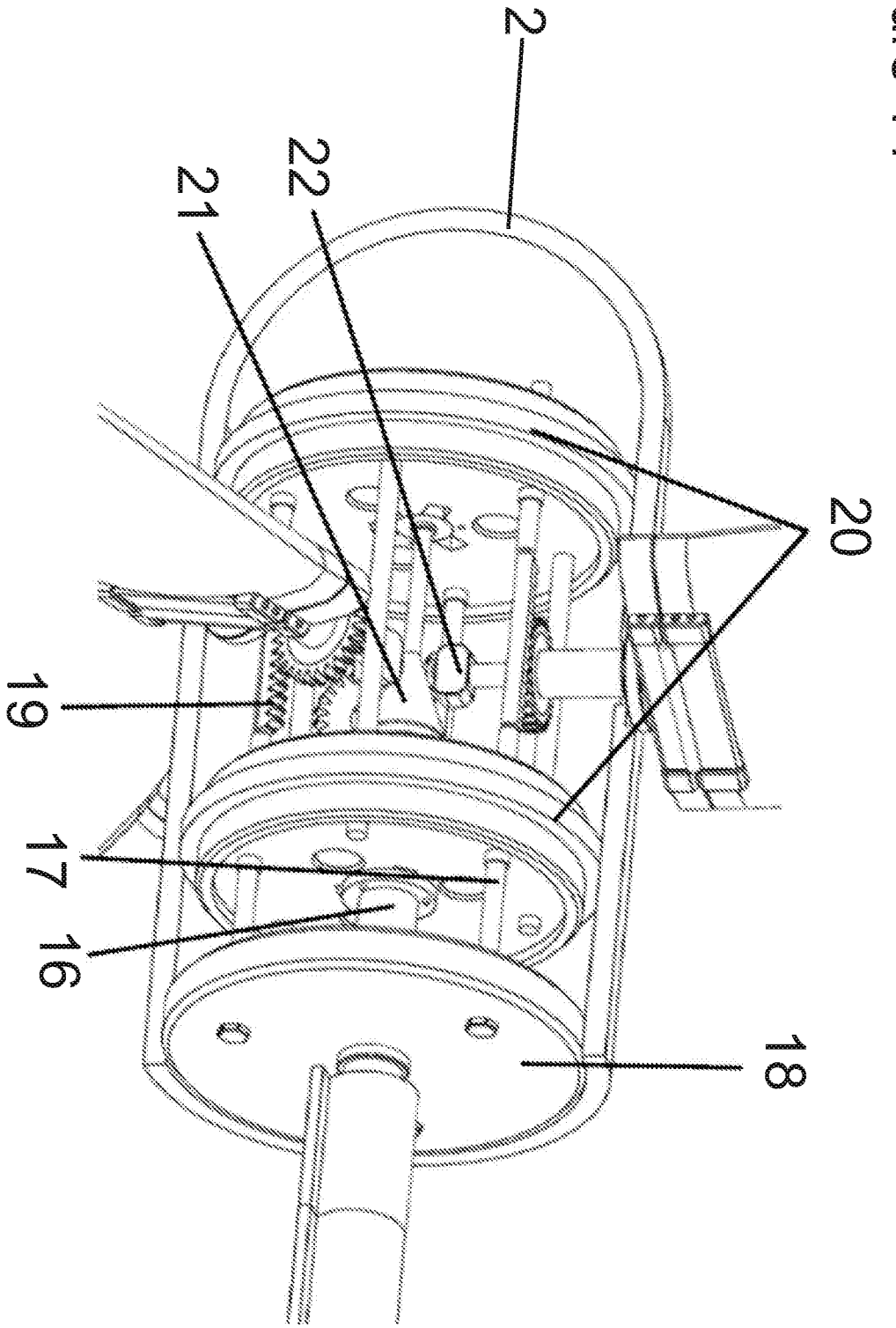


Figure 14

Figure 15

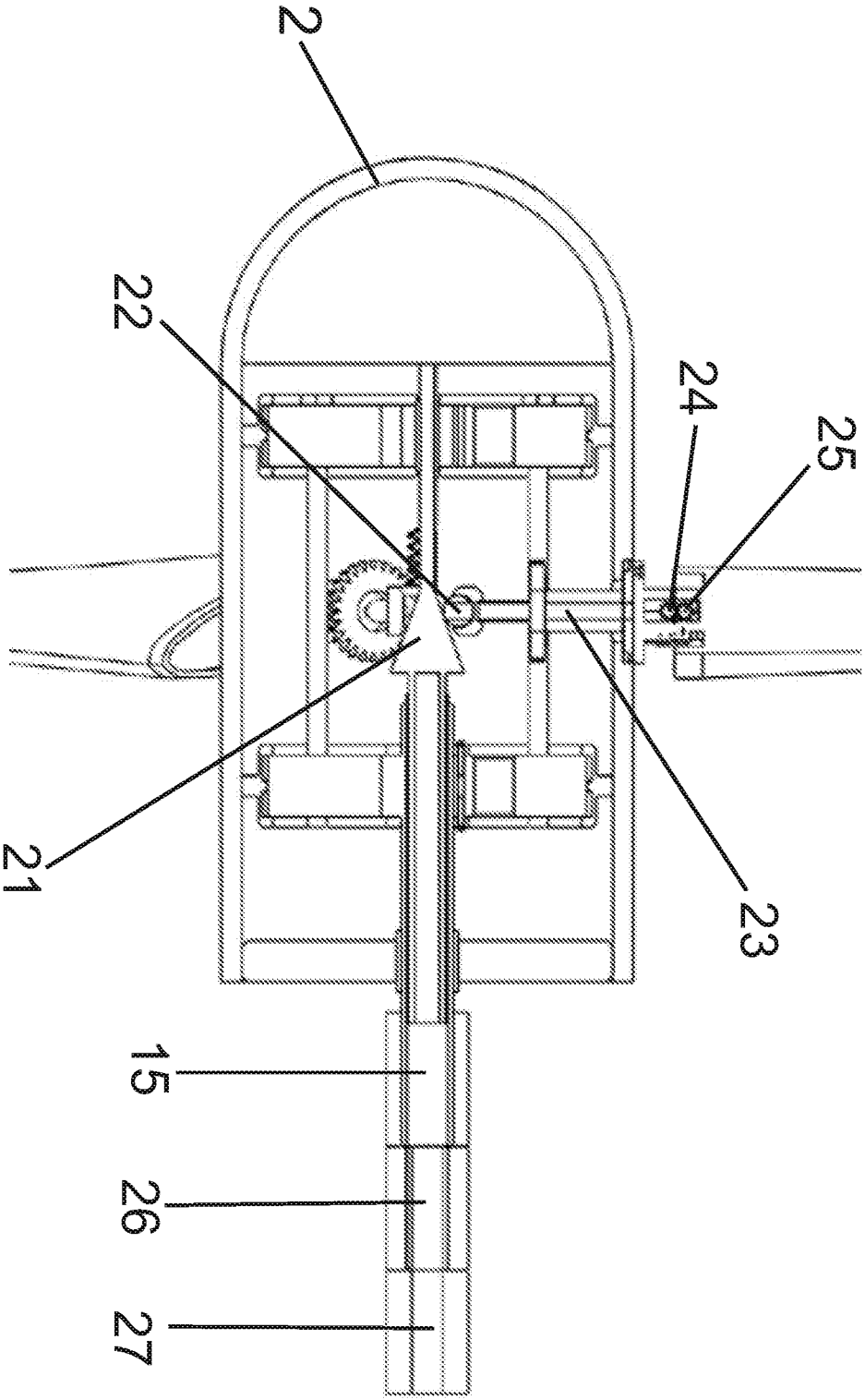
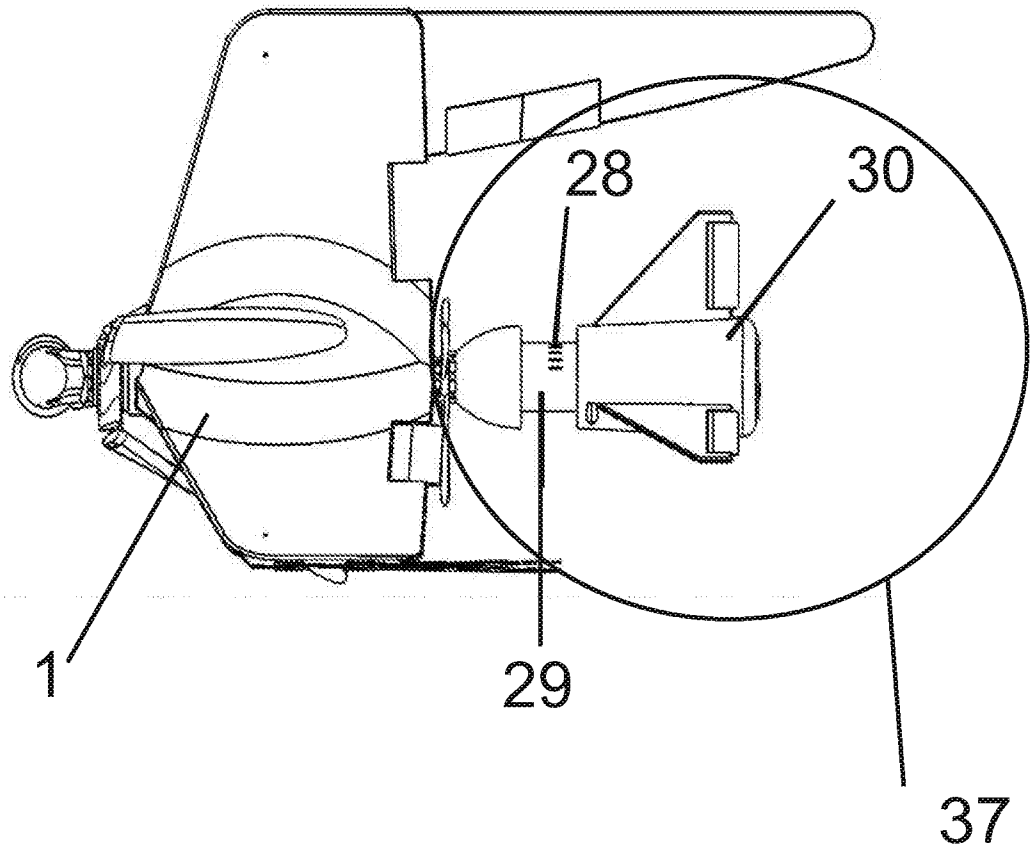


Figure 16



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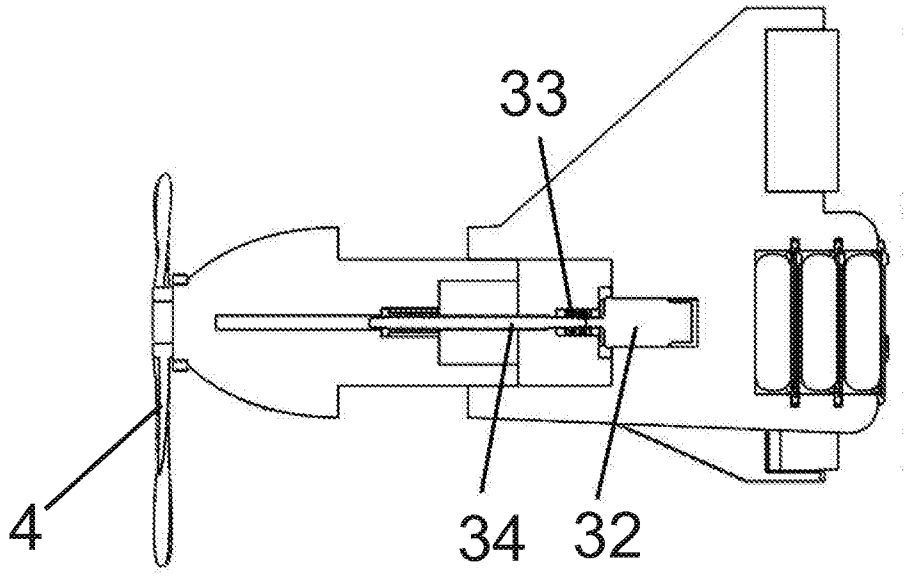

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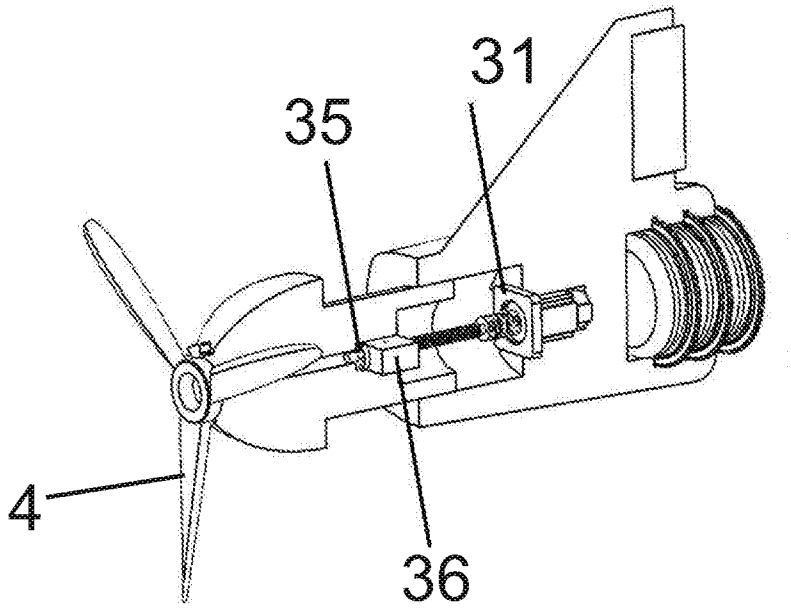

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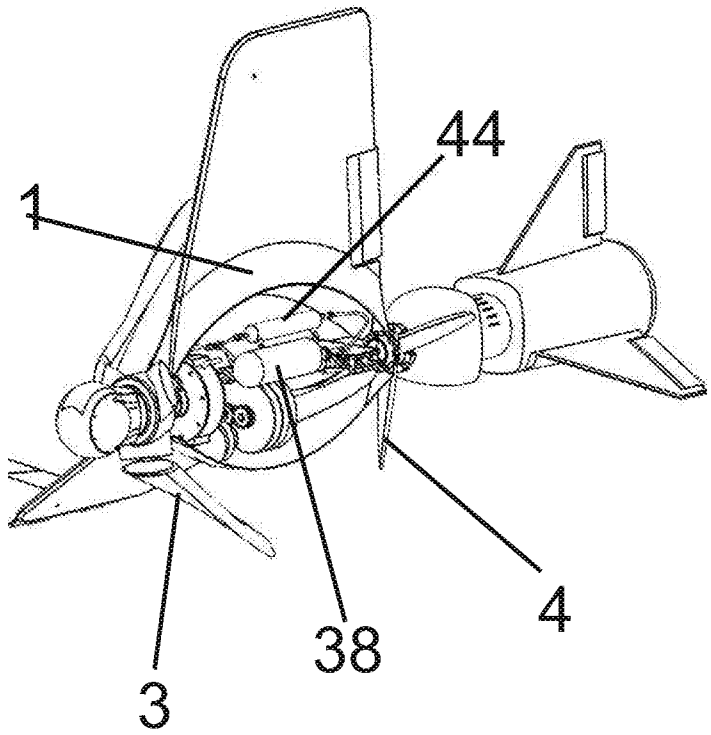

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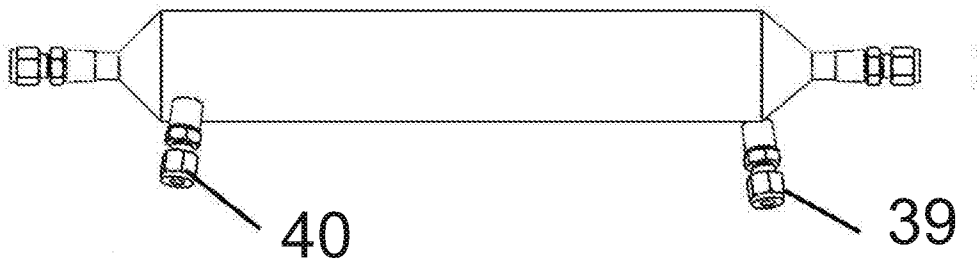

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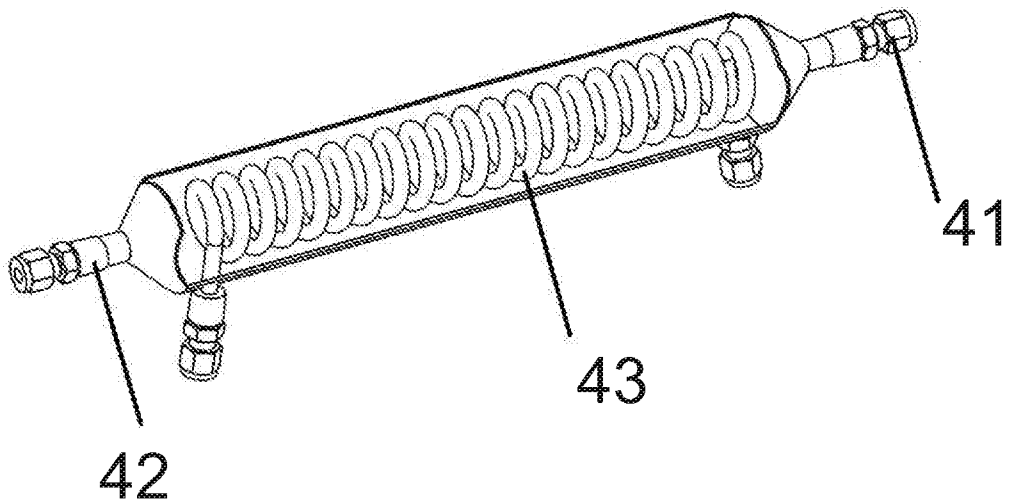


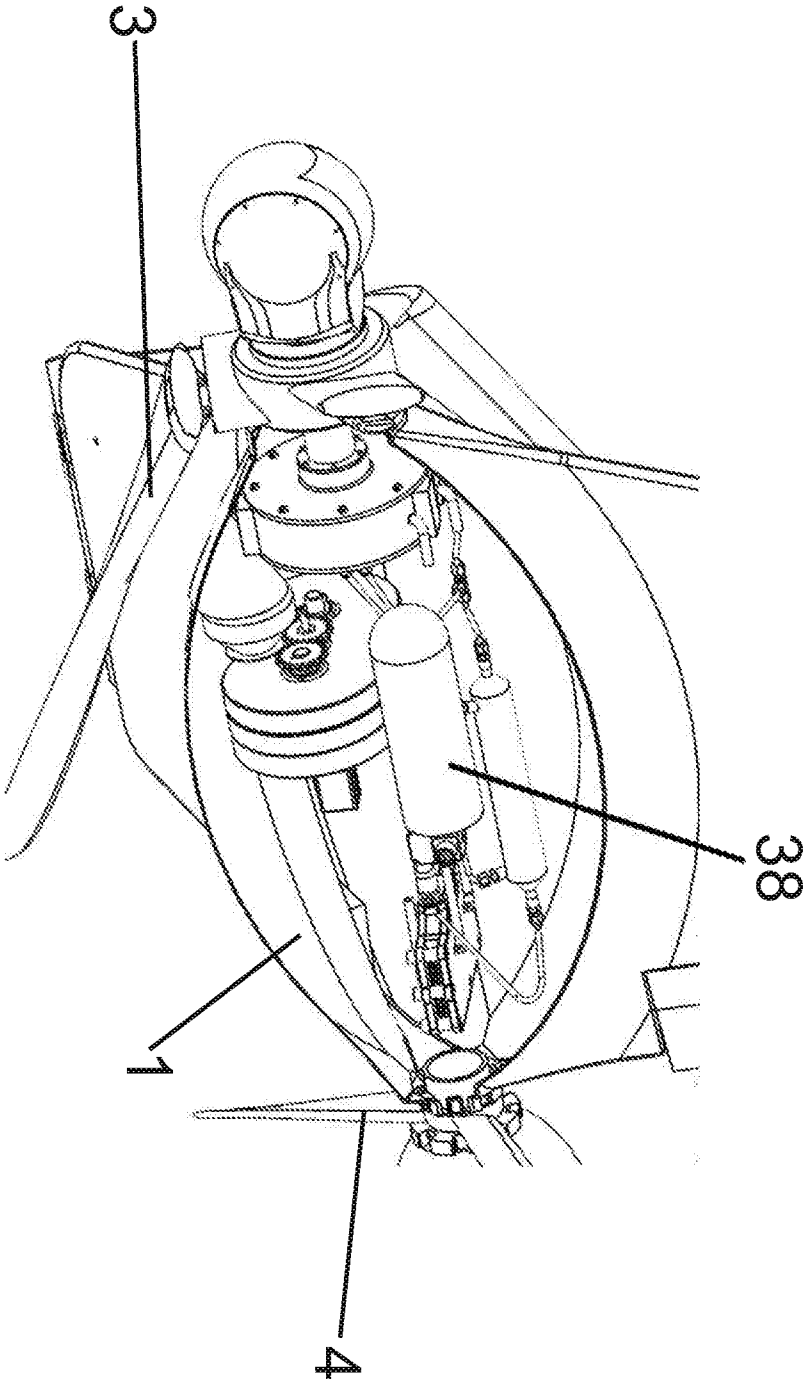
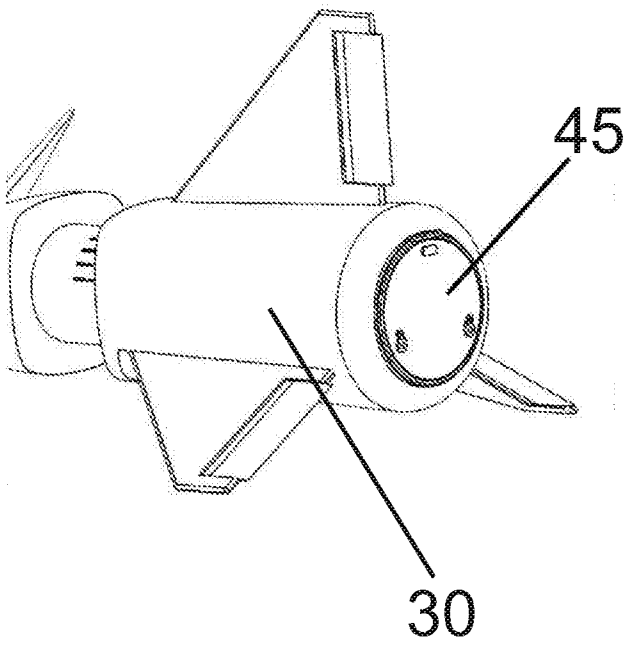


Figure 22

Figure 23



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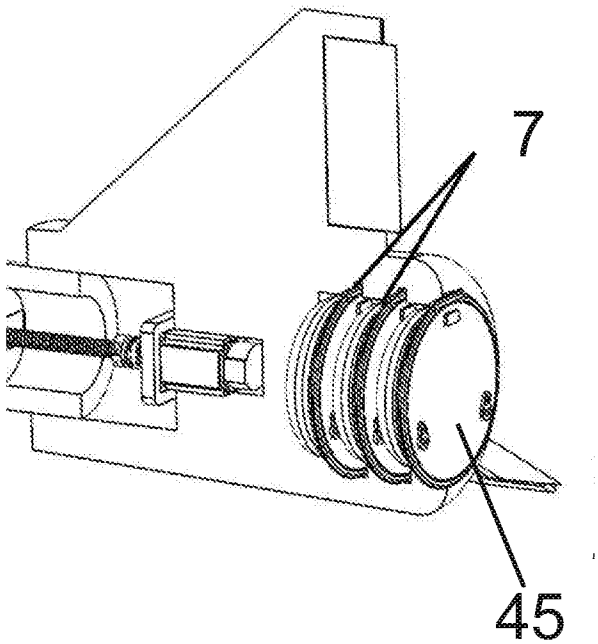

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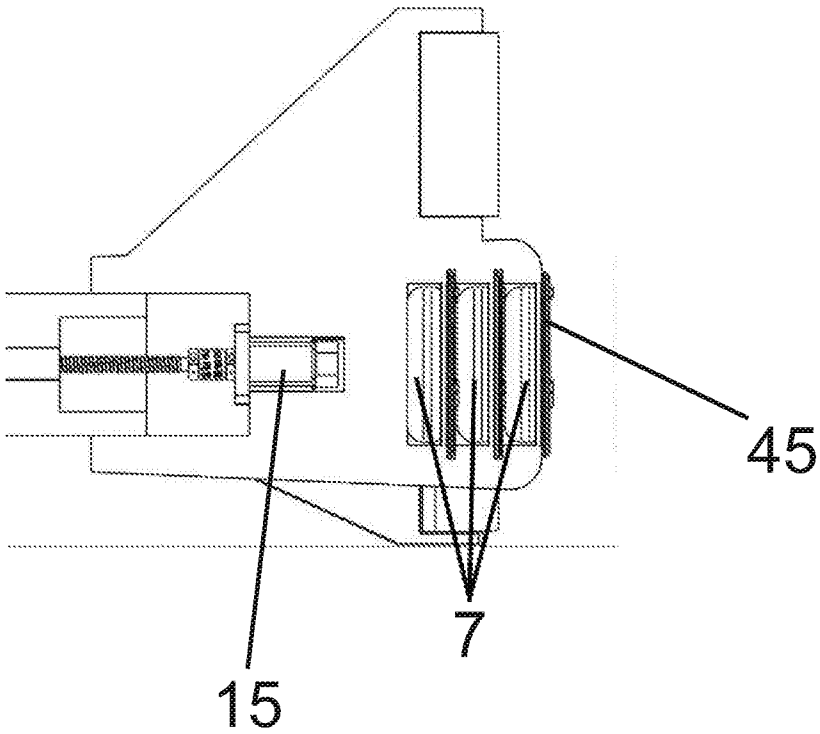
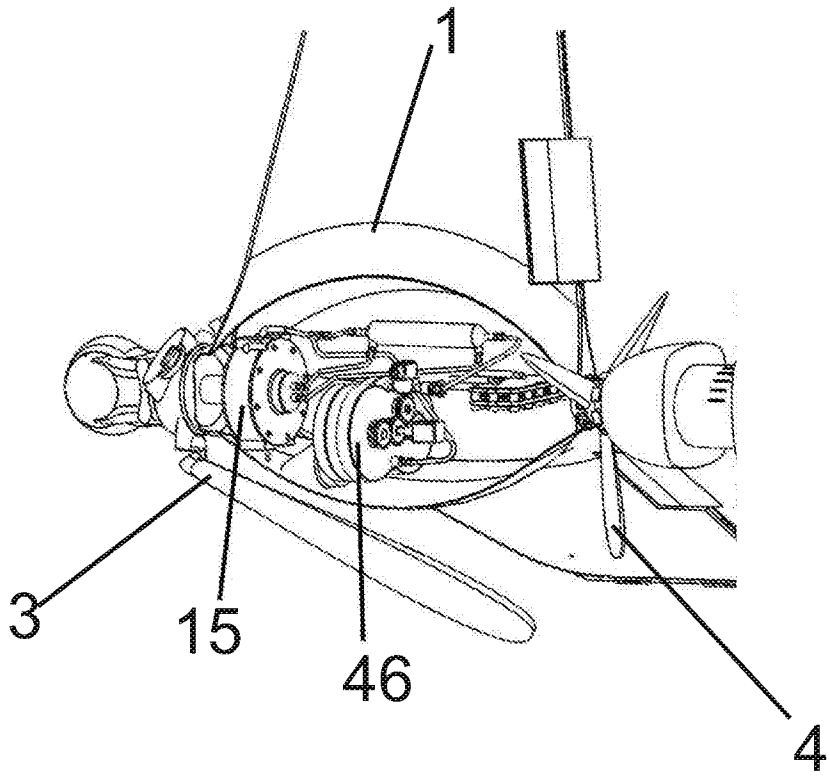
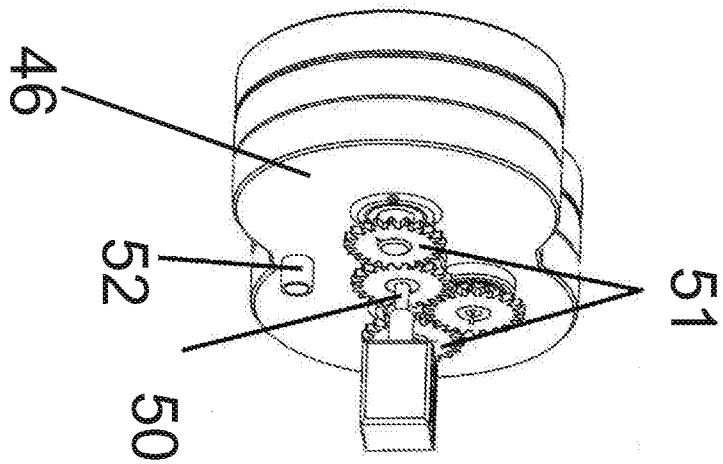


Figure 26





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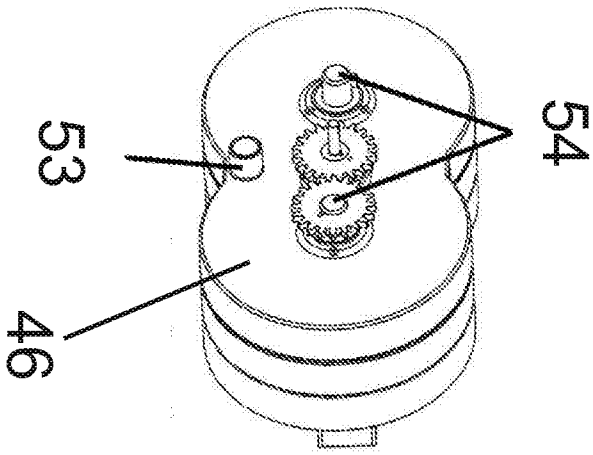
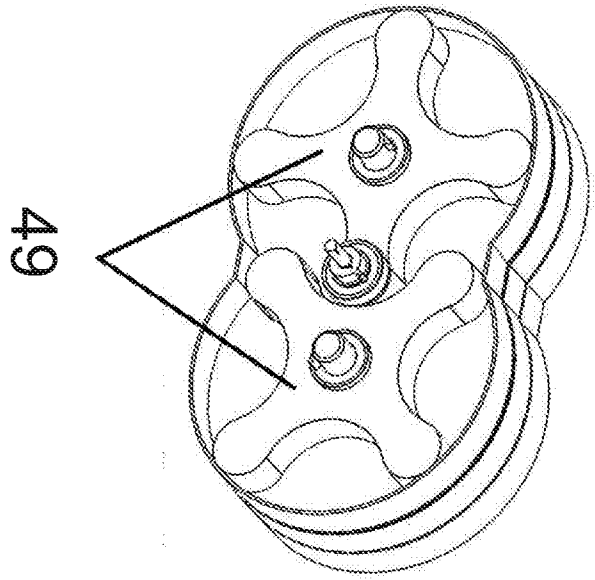


Figure 28



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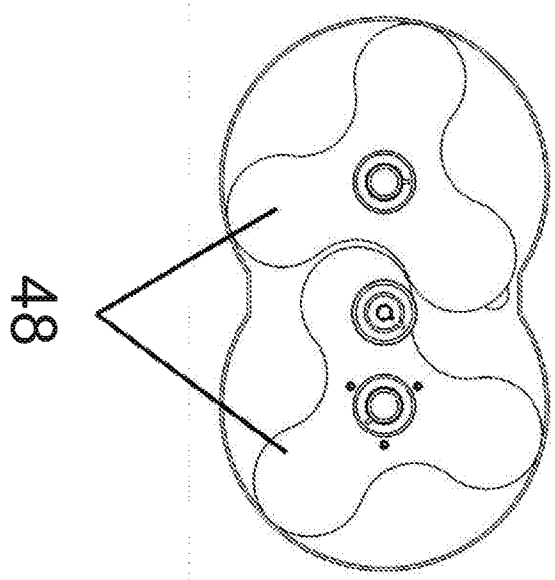

Figure 30

Figure 31