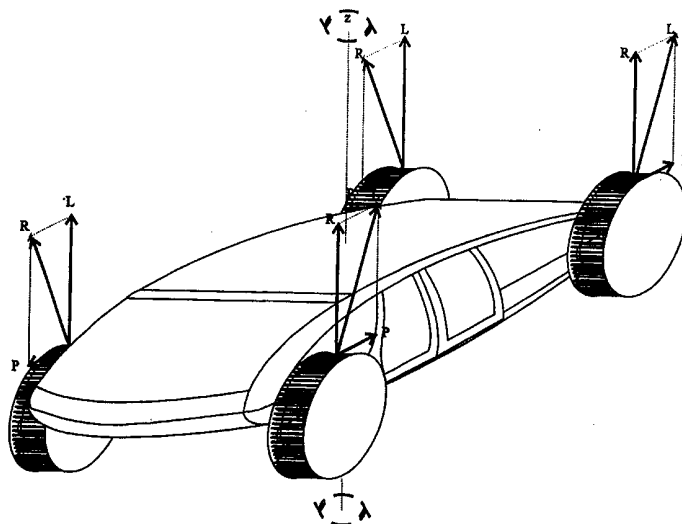


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(54) Title: FLYING VEHICLE WITH LIFT GENERATORS**(57) Abstract**

Aeromobil is a dynamic flying machine heavier than air which produces necessary aerodynamic force for lift, thrust and control moments in aerodynamic generators. Flying characteristics of Aeromobil are those which make it possible for it to lift and land vertically in its own characteristic way, to soar in big altitude range, to take any direction in space by its vertical axle while soaring, to get to translational motion in any direction from every soaring position, to get into soaring position from every direction of translational motion, to turn around all three space axes simultaneously while soaring (it can be turned around side axle x for 360 degree, around vertical axle z for 360 degrees), and the aircraft can be turned around vertical axle y for 360 degrees in order of horizontal progressive motion whether in motion ahead or back. All flying characteristics are controlled by hydraulic system over Distributor of group change of angle of attack, Distributor of control by direction, altitude and laterally, Distributor of thrust vector, and Distributor of brake vector.

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FLYING VEHICLE WITH LIFT GENERATORS

Technical Field

This invention is related to field of aerotechnique, aeromechanics and aerodynamics in general.

5 Background art

The invention solves problem of design of dynamic aircraft which should take off and land vertically; have possibility to soar in a big span of altitudes; intensity of aerodynamic force can be changed independently on work of engine; direction of aerodynamic force can be changed and tied to fuselage of the aircraft or set free from fuselage position; the aircraft has got great translational speed; its vertical axis can take up any direction in the space while aircraft soars; from every soaring position it can start translational motion in any direction; translational speed of the aircraft does not influence negatively work of its active aerodynamic surfaces; it has favorable ratio of total weight of the aircraft and useful load which is able to carry; control system that makes possible using of all aerodynamic, maneuvering and flying possibilities of the aircraft; control efficiency that does not depend on translational speed of the aircraft; simple, dependable, compact design of the aircraft; its production takes no complex and costly technologies; it is economical and generating of aerodynamic force demands no big fuel consumption.

Several kinds of aircraft heavier than air have been invented so far, such as: glider, hang glider, gyro din, convertoplan, colopter, airplane, and helicopter. However, among all these flying bodies only airplane and helicopter found use. But even these two aircraft have some major defects which make impossible their mass use as individual, family, private and cargo air means of transportation. Airplane's basic defect is dependence on its takeoff power upon translational speed of its motion. It is impossible for airplane to go upwards and downwards vertically or to soar.

For take off and landing airplane needs special infrastructural installations on land which are very expensive and take large area which can be find only in the outskirts of cities; so individual and family use of this aircraft, as mass means of transportation is out of question.

Great minimum speed of the airplane while flying takes large wings' surface during takeoff and landing; which, during greater speeds, becomes extra gravitational load and extra unnecessary aerodynamic resistance. This large wings' surface requires even extra strong point in fuselage of the plane which becomes more massive and heavier. All that gravitational load and increased streamlined resistance require big thrust; which requires big quantity and consumption of fuel, which causes larger wings' surface and so negative characteristics appear differently. In this case thrust intensity does not depend directly on translational motion of the aircraft like airplane but the way that helicopter produces aerodynamic force is much more ineffective than the way

how wing of the airplane does it. Therefore, surface and angle of attack of a rotor blade of a helicopter must be increased which brings about increasing of aerodynamic resistance which requires increase of engine power and increase of fuel consumption. This causes increase of gravitational load which can be
5 neutralized only by increasing of rotor blades' surface. However, this increase on one hand is limited by blade mass and it causes strong centrifugal load and bigger aerodynamic resistance; and on the other hand, it is limited by peak of rim speed which should not be faster than speed of sound. If thrust coefficient of three blades is also added to this, it comes to peak point of possible blade-
10 surface increase on rotor of helicopter and to a total thrust power. This all reflects negatively on possible peak gravitational load and maximum translational speed which is much lesser than translational speed of the airplane.

Design of helicopter is very complex beginning with necessity for powerful engines which are mainly gas turbines which take very complex
15 power transfer and low-range geared system. Very complex head of rotor undergoes great centrifugal, aerodynamic, and inerted loads and blades' production is great challenge in production system.

For all this helicopter is expensive, uneconomical, and complicated aircraft so it could not become mass means of transportation. Aeromobil unites
20 all positive characteristics of airplane and helicopter along with some genuine characteristics which neither has airplane nor helicopter nor any other known aircraft. Aeromobil generates necessary thrust power independently from its translational speed, so that its blade-surface of rotor is used totally in each phase while flying without any extra unneeded aerodynamic, centrifugal, and
25 gravitational loads. Thrust coefficient of its rotor blades is five times bigger than thrust coefficient of airplane wings, and even many times bigger than the thrust coefficient on rotor blades of a helicopter. This makes possible reduce of blades' surface on Aeromobil's rotor which results also in reducing of a total weight of the aircraft, which also has positive effects on necessary thrust power
30 and fuel consumption.

Rotor blades in aerodynamic generators do not only have big thrust coefficient but also low aerodynamic resistance-coefficient for these blades during work do not produce inductive aerodynamic resistance and practically they always act as a wing of an endless wave that results in very useful
35 consequences: necessary engine power and fuel consumption.

Aeromobil can develop translational speeds like a plane and this translational speed does not effect negatively work of its aerodynamic generators; moreover, speed is used as extra airstream in aerodynamic generators for produce of aerodynamic force. Streamlined shape of the fuselage
40 provides produce of lift force by itself during big translational speeds and so all aerodynamic power of generator is directed towards vector of lift force.

All control moments of this aircraft are completely independent of translational speed which makes impossible for aircraft to have equal control efficiency no matter which translational speed or direction is in question.

Aeromobil is simple, dependable, effective and economical aircraft. Its production does not requires any special or expensive technologies.

Disclosure of the Invention

5 Aeromobil is dynamic flying machine. It produces necessary force for lift, thrust and control moments, in aerodynamic generators. Aerodynamic generator is compound of two main parts, Aerodynamic Stator and Aerodynamic Rotor.

10 Stator has function to transform translational air speed (which occurs during translational motion of the aircraft) into secondary rotating air speed, which has same direction as well as primary rotating air speed of rotor. In that way, total rotating air speed in generator during translational motion is increased to value of secondary rotating speed which is proportional to translational motion of the aircraft.

15 Stator is round aerodynamic grid consisted of aeroprofile put parallelly in regard to drive shaft of rotor (pct.-2). Aeroprofiles of stator (10) are placed so that translational and parallel air stream (which occurs at entrance in stator's aeroprofiles) is transformed into rotating air stream at the exit of stator's aeroprofiles. Output air speed has direction of tangent line on circle orbit of
20 blades of rotor. Front resistance is lower and total aerodynamic force is positive or zero by putting blades of stator in this way. To achieve this, it is necessary to put two line of stator blades in the position of stator where lift is negative. It means upper-blades and down-blades of stator are reciprocally opposite. Only the part of stator which produces lift force has a line of blades
25 which are twice bigger proportionally than blades from double line. Besides, it is necessary that rotor rotates in direction of watch hand. Stator is immobile and attached to fuselage of the aircraft.

It is closed from lateral sides so that air can get inside stator only through fissure among stator blades.

30 Rotor of aerodynamic generator is the most important part of the aeromobil (pct. 4). Rotor generates necessary aerodynamic force for lift, thrust and control moments. It is consisted of Drive shaft (13), Blades' carriers 4), Blades' guide (5), and Control head.

35 Drive shaft (13) is placed horizontally and goes through center of rotor . This shaft has function to move rotor and in the same time accepts all aerodynamic and gravitational force of the aircraft.

40 Blades' carriers (4) have function to hold rotor blades (19) and they are firmly attached to Drive shaft and they rotate together with it. Guide (5) has function to guide guiding shaft of rotor blades and give them necessary eccentricity. It is not fixed with Drive shaft (13). It is connection between Control head and blades of rotor (19).

Rotor blades (pct. 5-6) are streamlined bodies of symmetrical aeroprofiles with constant vertical section. They have function to generate aerodynamic force necessary for lift, thrust and control.

Two shafts placed parallelly with its front and back edge are situated on them. These are Main shaft (8) and Guiding shaft (2). Main shaft (8) goes through rotor blade center of gravity and through center of aerodynamic lift which should go along with blade center of gravity (19). This shaft takes on all centrifugal and aerodynamic force from blade and transmits them to carriers of blade (4).

Blades generate aerodynamic force in the way that Main shaft (18) of rotor blade (19) rotates around Drive shaft, and Guided shaft (2) of blade (19) rotates around shaft of Eccentric bearing (21).

In that way, blades are placed in necessary angle of attack which is the biggest on that part of orbit where eccentricity of Guided shaft (2) is the biggest (pct. 7). Just on the same place intensity of aerodynamic force is the biggest as well. (This is intensity of its vertical component which presents Lift vector.) Direction of this vector coincides with direction of vector of eccentricity of Eccentric bearing (21) with initial point in the center of Drive shaft (13). During turning of this eccentricity or its increase, lift direction and its turning are also increased (pct. 8). All horizontal components are cancelled mutually in the way that horizontal component of aerodynamic force of blade (which is located in the first quadrant of circle orbit) is cancelled by horizontal component of neighbouring blade in second quadrant (pct.9). In any point of blade's orbit these components have same intensity and opposite direction. In the same way horizontal component of aerodynamic force (which is located in third and fourth quadrant of circle of orbit of rotor blade) are cancelled.

Every rotor has four blades put symmetrically in regard to Drive shaft (13), so that only one blade of rotor can be found in every quadrant each moment. Forming of angle of attack is done according to sinus law which provides constant value of total sum of Lift vector of all four blades, no matter in which point of circle orbit blades are found. Guided shaft (2) has function to put blades in necessary angle of attack. Also, this shaft transmits one lesser part of aerodynamic force to Drive shaft (13) across Guide and Eccentric bearing which is necessary for maintaining of lift direction independent from position of the aircraft body which happens in Extreme order of control.

Control head of rotor (pct. 10) is consisted of one Eccentric bearing (21), two Carriers of Eccentric bearing (25), three hydraulic Cylinders for change of angle of attack (CCAA) of rotor blades, two hydraulic Cylinders for change of lift direction (CCLD), Electromagnetic connection (32), rotating hydraulic connection (33) and rotor carriers (23).

Eccentric bearing (21) has function to carry guide (5) and gives it necessary eccentricity in relation to Drive shaft (13) of rotor. It is connected with pistons of hydraulic CCAA which can move up and down if necessary. During this, it increases and reduces eccentricity of Eccentric bearing (21), that is, increase and reduce of angle of attack of rotor blades (19), which, in the end, causes increasing reduce of total aerodynamic force. This eccentricity can be as positive as well as negative.

Hydraulic CCAA (pct. 11) are: Cylinder of group change of angle of attack (CGCAA) (20), Cylinder CMx (7) and Cylinder CMy (9). Mutual position of these cylinders is conditioned by function they do. Because of this, CGCAA (20) is put as a base for other two cylinders. Piston of this cylinder (6) is connected to CMy (9) cylinder body. Piston of this cylinder (36) is connected with Eccentric bearing (21) that is, with Guide (5).

During work of piston in CGCAA(38), other two cylinders are moved together with its pistons. It is further transmitted to Eccentric bearing (21) i.e. to change angel of attack of rotor blades (19) during work of piston in cylinder CMx (7), translational motion of piston and cylinders CMy (9) happens, and all this move Eccentric bearing (21) in direction of cylinder's piston CMx's motion. In this case, cylinder as well as piston CGCAA (20) are not moving. During activation of cylinder CMy (9) only its piston moves tighter with Eccentric bearing. During that time, piston CGCAA and CMx (97) are still.

Function of hydraulic CGCAA (20) is to bring about equal and simultaneous change of angle of attack of rotor blades (19) on all four (or even more) aerodynamic generators (40). Cylinder CMx (7) has function to produce equal but regarding to direction, opposite change of angle of attack of lateral generators.

Cylinders CMy (9) have the same function, only their effect is related to two front and two back generators.

Hydraulic cylinders for change of lift direction (CCLD) are: Cylinder for group change of direction of lift (CGCDL) (10) and cylinder CMz (12). These cylinders differ from CCAA by the thing that their pistons circle during work i. e. bring about rotation of object for which they are tied. These cylinders are mutually placed in the way that activation of piston in CGCDL brings about moving of cylinder and piston CMz (12). During activation of Piston CMz (16), motion of CGCDL does not happen because these two are not connected physically. CGCDL (10) has function to turn Eccentric bearing (21) around Drive shaft (13) and in this way change direction of Eccentricity, which means that lift direction has changed for the same angle value. These cylinders move direction of lift simultaneously and in the same direction on all four generators. Cylinders CMz (12) do the same only their effect is pointed to lateral generators so that angle of Thrust vector is equal on both sides of the aircraft but has opposite direction.

Electromagnetic connection (32) is located between Piston of CMz (12) and Carrier of CGCDL. This connection has function to separate these two bodies in order to stop physical contact between Control head of rotor and aircraft fuselage. This is necessary when the aircraft should be in order of work and when lift direction of all generators becomes independent from position of the aircraft.

Rotating hydraulic connection (33) is consisted of mobile disk on which are located receptacles for hydraulic cylinders and connection body which is tightly tied to Carrier of generator (31) and from which go receptacles to main

hydraulic distributors. This connection provides charge to cylinder with oil under pressure in those conditions when aircraft flies and it is necessary that lift direction is independent from position of aircraft.

- 5 Carrier of aerodynamic generator (23) has function to transmit all gravitational and aerodynamic loads from generator to fuselage of the aircraft. This is Bearing (13) through which goes drive shaft (13) of rotor on it.

- Basic concept of Aeromobil has four aerodynamic generators placed on angles of imagined rectangular base of aircraft (pict. 12). Depending on that
10 whether this imagined base goes through gravitational center, above, or below it, the aircraft takes position of indifferent, labile and stable balance, respectively. On pict. 10., this base goes through gravitational center and it is in position of indifferent balance.

- Aeromobil's fuselage has two basic shapes. One is family or cargo, (pict.
15 12.), and the other is sports version. Both fuselages are designed so that their frontal resistance force is lesser as much as possible. This fuselage should produce aerodynamic lift which provides increase of Thrust vector on aerodynamic generators during certain translational speed.

- That phenomenon is particularly expressed in family model of the
20 Aeromobil which is in fact aerodynamic profile similar to wing of airplane. Controls and flying instruments, motor group, fuel tanks and transmission are situated in it. This fuselage (aerodynamic profile) could be brought under favorable angle of attack during translational speed of the aircraft with the help of activation of hydraulic cylinders CM_y (9) i.e. bringing about M_y moment.

- 25 Thrust group (42) is situated in back part of the fuselage (pict. 14) and it is consisted of one or two engines or gas turbines which start Main drive shaft (46) which again, by transmission and conical gears, starts all four drive shafts of rotor (13). Transmission is classic, it is simple, for it demands little ratio of transmission. Pilot and space for passengers are situated in the front part of the
30 aircraft.

Controlling of the Aircraft

- All necessary control moments are generated on rotors of Aerodynamic generators of Aeromobil (pict. 15-19). Each Aeromobil has four aerodynamic
35 generators placed on angles of imagined rectangular base of the aircraft. By increasing and reducing of total value of Lift vector on each rotor or changing of its direction and course, it is possible to produce necessary moments around all three space axes initiating with center of gravity of the aircraft. This opposite-proportional change of intensity and direction of Lift vector on front
40 two generators in relation to back two brings about rotation around transverse axle y. This same change of intensity and direction of Lift vector on right two generators in relation to left generators brings about rotating moment round longitudinal axle x of the aircraft.

Opposite proportional change of direction of Lift vector on right in relation to left generators brings about rotating around vertical axle z of the

aircraft. Change of intensity of Lift vector of each Aerodynamic generator is done by Cylinders of change of angle of attack (CCAA) which increase or reduce eccentricity of Eccentric bearing. Eccentricity is transmitted to Guiding shaft of blades which changes angle of attack of blades that brings about change of Lift vector.

Change of direction of Lift vector is done by Cylinders for change of direction of lift (CCDL) which turns eccentricity of Eccentric bearing in relation to Drive shaft and brings about turning of direction of Lift vector in the same direction. In that way Lift vector gets translational component which is caused on all four generators in the same time and gives thrust force to aeromobil. This thrust force (Thrust vector) is proportional to angle of turn of Eccentric bearing and intensity of Lift vector. All these control moments are attained by specific hydraulic system of control.

This hydraulic system is consisted of cylinders which are on each generator in number of five. These are: CGCAA (20), Cylinder CMx (6), Cylinder CMy (9), Cylinder CMz (12) and CGCLD (10). These cylinders are connected to special hydraulic distributors by which work of cylinders is controlled.

In this system there are four distributors by which all aerodynamic forces on aeromobil are controlled (pct. 20). Those distributors are: Distributor of group change of angle of attack of rotor blades (47), Distributor of thrust vector (49), and Distributor of break vector (50).

Distributor of group change of angle of attack (47) has function to activate cylinders CGCAA (20) on all four generators simultaneously and equally. In this way, CGCAA causes change of angle of attack of blade (19) on all four generators. This brings about equal increase of lift on all four rotors. By this distributor, pilot controls with his right hand, and there is gas handle on its lever, so that work of engine and total value of lift can be controlled simultaneously by the right hand in the same time.

Its design is identical to design of Distributor of thrust vector (49), with the only difference that it is handle, not a foot pedal. Distributor of thrust vector (pct. 21) has function to activate cylinders CGCLD (10) simultaneously and equally on all four generators and brings about turn of eccentric bearing around thrust shaft which has equal turn of direction of lift on all generators as its consequence. This gives thrust vector to the aircraft, which coincides with its vertical axle and gives to the aircraft horizontal translational speed.

This distributor is consisted of Chamber of high pressure t1 (54), Chamber of low pressure t1 (53), Conductor of high pressure t1 (77), Hydraulic connection for CGCLD (55), Pedal axle (56), Receptacle of low pressure t1 (57), Carrier t1 (58), Border t1 (59), and Spring padel (60). Distributor functions in a way that oil (under pressure) gets into cylindrical Chamber of high pressure t1 (54) through axle (56) which goes through center of that chamber. By pressing on lever (51) this chamber (together with Conductor of high pressure t1 (77) and Breeches t1 (2), turns itself around axle (56), opens hydraulic coupling for CGCLD (55). Upper coupling is connected to

Conductor of high pressure t1 (77) through which oil is sent to CGCLD (10). From the other side of piston of that cylinder oil comes back to Chamber of low pressure t1 (53) and through Connection of low pressure t1 (57) goes to oil tank. By ceasing of effect of force on pedal under effects of spring, Chamber of high pressure, t1 together with Conductor t1 (77) and Breeches, gets to previous position in which Hydraulic connections for CGCDL (55) are closed, which provides the piston to preserve attained position and Lift vector by itself.

Distributor for Brake vector (50) has function to annul Thrust vector and gives it opposite direction which it has in progressive translational motion ahead. Result of that is occurrence of negative thrust which put aircraft in soaring position, and according to wish, the aircraft can get into progressive motion backwards.

Distributor for control of direction, altitude and laterally (pct. 22) has function to provide to the pilot setting of the aircraft in any position in space whether it is in order of soaring or translational motion in any direction. Distributor is consisted of : Chamber of high pressure (63), Chamber of Low pressure (70), Joint ball (71), Conductor of high pressure (64), Distributor cap for Cylinders CMz (65), Breech (68), Hydraulic connection for CMx (74), CMY (67), CMz (62), and Control lever (61). During effect on Control lever (61), which has two handles (for left and right hand), starts rotating of Chamber of high pressure (63) around Joint ball (71). During that conductor of high pressure (64) is connected to Hydraulic connection, which conditions pass of oil under pressure to hydraulic cylinder on Control head of Aerodynamic generator with simultaneous coming out of oil, on the other side of cylinder's piston into Chamber of Low pressure (70) and from this over to Connection of low pressure (75) and into oil tank. Oil comes from oil tank into Chamber of high pressure (63), over oil pump, Connection of High pressure (72), Carrier (73), Joint ball (71), respectively, and through Stopper (69) gets into Chamber of low pressure (63). In this place wall of Chamber of low pressure (70) keeps it, until lever of control and connection of conductor of High pressure (64) affects hydraulic connections.

During effect on lever of control (61) forward there is rotating of Chamber of high pressure (63) around lateral Stopper (69) and connecting of Conductor of high pressure (64) with Hydraulic connections CMY (67) which are situated on the outside of the wall of Chamber of low pressure (70). In that moment there is connecting of conductor (64) on the lower Hydraulic connections CMY (67), and from back outside of this distributor there is connection with upper Connection CMY. This brings about moving of the piston in Cylinders CMY (9) so that pistons in front two generators go down and reduce angle of attack of blades i.e. lift, until pistons in two back generators go up and increase angle of attack of rotor blades i.e. lift. This control brings about occurrence which results in turning of the aircraft around transverse axle. Bringing of lever (61) into initial position there are turning

off and ceasing of turning of the aircraft around this axle for immediate putting in the same level of the pressure on the both side of Piston of CM_y. This makes possible for springs, which are situated in cylinders, to get piston back to the initial position which leads to putting on the same level of lift on all four aerodynamic generators.

5 During effect on lever (61) in opposite direction, there is occurrence of the same but in opposite direction. This turns itself off by bringing Lever (61) into neutral position. If Lever for control (61) moves itself right, there is connecting of lateral Conductors of high pressure on lower Hydraulic connections CM_x 10 (74), which is situated on the right side of the wall of Chamber of low pressure (70) and there is connection of upper coupling on the left side, too. By this, oil gets into CM_x (7) on Control head of generators in the way that pistons in CM_x (7), on the left side, go up and increase angle of attack of blades i.e. Lift vector on the left side of the aircraft but Lift vector is reduced for the same 15 value on generators on the right side of the aircraft. This brings about occurrence of lateral moment which turns the aircraft around longitudinal axle of the aircraft. Bringing the lever back into neutral position this turns itself off.

During bringing of lever into opposite side, there is turn of the aircraft into opposite direction. If Lever of control (61) turns itself around vertical axle 20 which goes through poles of Chamber of high pressure (63), there is connecting of Hydraulic Coupling CM_z (62); which is situated on Distributor cap (65); with Conductor of high pressure. This provides pass of oil from Chamber of high pressure (63) into Cylinders CM_z (12) on Control head of rotor. That causes turning of pistons of Cylinder CM_z (12) around Drive shaft 25 (13) of rotor which brings about turn of Lift vector. This also brings about occurrence of Lift vector which is according to intensity equal on right as well as on left generators, but their direction is opposite. This process turns the aircraft around vertical axle z. Direction of turn of the aircraft is equal to direction of turn of Lever of control. By bringing of this lever into 30 neutral position there is putting of pressure on both sides of piston of cylinders CM_z (12) on the initial level. Under effect of springs (39) which are on both sides of pistons within these cylinders there is bringing of lift of direction to initial position. By this, provoked coupling is off and turning of the aircraft around vertical axle is ceased.

35 Total scheme of hydraulic control system of aeromobil is presented on (pct. 23). All controls of aeromobil are independent from each other so they can be switched on individually or all in the same time but their effect will be totally preserved and independent. It means that aeromobil can turn simultaneously around all three space axles and it can go up and move 40 translationally in any direction.

Aeromobil has two orders of control: Optimal order of control and Extreme order of control.

Optimal order of control is condition of control when direction of force of lift of aerodynamic generators is tied to position of the aircraft in space (it

means that if the aircraft turns itself into any direction i.e. around any of its space axes), for the same angle and into same direction is direction of lift force turned. However, in order of extreme control direction of lift force is not tied to position of the aircraft in space; therefore, in this condition, control of the aircraft can be turned and even rotated around its transverse axle y. And during this, lift direction of the aircraft will stay the same as in the moment when the aircraft gets into this order of control. It means that the aircraft (if it was in the soaring position on constant height) in the moment before getting into Extreme order, preserves that soaring state (condition) and the height, and if it turns itself for 180 degrees, it is turned itself totally upside down. This order makes possible for the aircraft that its vertical axle x can take any direction in space, and in the same time, the aircraft soars and changes height. Aeromobil can also have translational speed in direction of its cross (transversal) axle y. During this motion it can turn itself or even rotate for full circle around its cross axle x; and during motion of the aircraft neither height nor direction is changed.

Extreme order of control is activated by pressing electric switch (78) which is located in the top of lever of Distributor of control to direction, height and laterally (48).

By pressing this button electromagnetic coupling is activated (32) which separates hydraulic cylinders CGCAA (20) from hydraulic cylinders CGCLD (10). That separates physically cylinders of angle of attack, together with Eccentric bearing (21), and Guide (5), Eccentric bearing (21), Hydraulic cylinders CGCLD (20), and in this way transmits grip of this vector to center of Drive shaft (13) which direction is identical with direction of lift vector. In this way, lesser part of aerodynamic force is transmitted to Drive shaft (13) not only over Main axle of blade (18) and carrier of blades (4) but over Guide axle of blade (2), Guide (5) and Hydraulic cylinders CGCAA (20). So aerodynamic force of rotor blades (19) maintains direction of aerodynamic force. As fuselage of the aircraft is separated from cylinders CGCAA (20), Eccentric bearing (21), and Guide (5); it provides to Eccentric bearing (21) to maintain direction of its eccentricity regarding Drive shaft (13) although fuselage itself turns around that axle.

In Extreme order of control of aeromobil, only cylinders of change of angle of attack (Cylinder CGCAA (20), Cylinder CMx (7), and Cylinder CMy (9)) are active, until cylinders of change of direction of lift (Cylinder CMz (12), and Cylinder (10)) are excluded (switched off), for their work in that order have no sense. By repeated press on switch (78) of Extreme order, effect of electromagnet on electromagnetic coupling (32) stoops, and under influence of springs there is connecting of Cylinders of change of angle of attack with cylinders of lift-direction-change so that aircraft gets into optimal order of control.

Brief description of draft pictures

Picture 1.

Lateral view to section of aerodynamical generator with section of hydraulic cylinders for control of work of generator .

- 5 (1. Stator blades, 2. Guiding shaft, 3. Crevice for guiding , 4. Girder of blades, 5. Guide, 6. Piston of cylinder CMx, 7. Cylinder Cmx, 8. Hydraulic links, 9. Cylinder Cm_y, 10. Cylinder CGCLD, 11. Cylinder piston CGCLD, 12. Cylinder CM_z, 13. Drive shaft, 14. Counterweight, 15. Ball bearing, 16. Piston of cylinder CM_z, 18. Main shaft, 19. Rotor blade, 20. Cylinder CGCAA, 21. Eccentric bearing)

Picture 2.

Aerodynamic generator with Control head and drive shaft.

- 15 (22. Stator blade girder, 23. Aerodynamic generator girder).

Picture 3.

Presentation of transformation of translational speed at the entrance of stator into tangential speed at the exit from stator in regard to way of rotor blade. (Translational speed of aircraft).

20

Picture 4.

Rotor of aerodynamic generator together with hydraulic Control head and drive shaft.

25 *Picture 5.*

Blade of rotor.

(26. Guiding shaft bearer, 27. Blade body).

Picture 6.

- 30 Cross-section of rotor blade.

Picture 7.

Presents periodic change of angle of attack of rotor blades in period of one rotation.

- 35 (Lift vector (L), Aerodynamcal force (R), Aerodynamical resistance force (Rx), Drive shaft center (Op), Center of Eccentric bearer (Oe), Main shaft center (Og), Guiding shaft center (Ov).

Picture 8.

- 40 Presents periodic change of angel of attack of rotor blades in the state of produce of Lift and Propulsion's vector (P).

Picture 9.

Presents constant value of horizontal component of Lift Vector. (N) Horizontal

component of Lift Vector. (Lr) Radial component of Lift Vector.

Picture 10.

Control head of Lift Vector.

- 5 (28. Cylinders' carrier, 29. Cylinder carrier CGCLD, 30. Cylinder's carrier CMz, 31. Carrier of rotating hydraulic link, 32. Electromagnetic link, 33. Rotating hydraulic link, 34. Drive shaft bearing, 35. Cylinder piston CMz)

10 *Picture 11.*

Lateral section of hydraulic cylinders on control head of aerodynamical generator . (36). Piston of cylinder CMy, 37. Spring, 38. Piston of cylinder PNU, 39. Spring for piston CMz)

15 *Picture 12.*

Aeromobil, family version

Picture 13.

Aeromobil , sports version.

20

Picture 14.

Basic parts of Aeromobil.

(Aerodynamic generator, 41. Fuel tank, 42. Engine group, 43. Seats, 44. Rotor of aerodynamical generator, 45. Stator of aerodynamical generator, 46.

25 Main drive shaft)

Picture 15.

Disposition of Lift vector in order of soaring or vertical translational motion.

30 *Picture 16.*

Disposition of Lift vector and Thrust vector within horizontal translational motion.

Picture 17.

- 35 Disposition of Thrust vector and Lift vector during production of turn around axis z.

Picture 18.

Disposition of Lift vector during production of turning moment around axis y.

40

Picture 19.

Disposition of Lift Vector during production of turning moment around axis x.

Picture 20.

Steering controls of Aeromobil.

(47. Distributor for group change of angle of attack, 48. Distributor for control of direction, altitude and laterally, 49. Thrust Vector pedal, 50. Brake Vector pedal.

5

Picture 21.

Lateral section of Thrust Vector control .

(51. Pedal, 53. Low pressure chamber t1. 54. High pressure chamber t1. , 55. Hydraulic connection for CGCLD, 56. Pedal axle , 57. Low pressure connection t1., 58. Carrier t1. 59. Stopper t1, 60. High pressure chamber body).

10

Picture 22.

Section of Distributor of control direction, altitude and by lateral.

15 (61. Lever, 62. Hydraulic connection for CMz, 63. High pressure chamber, 64. High pressure conductor , 65. Distributor cap for cylinders CMz, 66. Low pressure chamber body d1, 67. Hydraulic connection for CMy, 68. Breech , 69. Stopper , 70 Low pressure chamber , 71. Joint bowl, 72. High pressure connection, 73. Carrier , 74. Hydraulic connection for CMz 75. Low pressure connection, 76. Shaft of distributor cap CMz).

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CLAIMS

1. Patent requests are related to invention of Aeromobil characterized by its all main design parts and aerodynamic functions described in description of invention which main parts are Aerodynamic generators which produce aerodynamical force necessary for lift, thrust and control moments .
- 5 2. Design and characteristics of aerodynamic generator, as mechanical and aerodynamic separate unity, (pct.2) which is characterized by two main parts: aerodynamic stator and aerodynamic rotor which produce aerodynamic force necessary for lift, thrust and control moments.
- 10 3. Design and function of aerodynamic stator (pct. 1), which is round grid, compounded of aeroprofiles put parallelly regarding drive shaft of rotor axle characterized by transforming translational and parallel air stream (at the entrance of stator) into rotating air stream (at the exit of stator) wich means that
- 15 outing air speed has direction of tangent on round circular orbit of rotor blades and in that way transforms translational air speed which occurs during translational motion of the aircraft), into secondary tangential air speed wich has the same direction and course as primary tangential air speed of rotor blades, so that total tangential air speed of generator during translational motion
- 20 would be increased for the value of secondary tangential speed.
4. Design and function of aerodynamic rotor (pct 4), which generates aerodynamic force for lift, thrust and control moments, is compounded of Drive shaft, Carrier of blades, four symmetrical aeroprofiles, Main axle of blade,
- 25 Guided axle of blades, Guide, Eccentric bearing and Control head characterized by aeroprofiles which rotate around horizontal drive shaft and produce periodical change of angles of attack which during one rotation produce necessary aerodynamic force.
- 30 5. Design and way of Guide characterized by seting of rotor blades periodically in necessary angle of attack; and transmits value and direction of eccentricity from eccentric bearing on Guided axle of rotor blades and sets them in necessary angle of attack which changes, according to direction and intensity, along circular orbit of blade in a way that each blade generates
- 35 necessary aerodynamic force in the same way and for the same value and Aerodynamic force is proportional to value of eccentricity of Eccentric bearing and its total value does not depend on single position of blades on its circular orbit.
- 40 6. Basic concept of Aeromobil characterized by four aerodynamic generators set on angles of rectangular base of the aircraft (pct. 10) and depending on

whether this imagined base goes through gravitational center, above, or below it, the aircraft takes state of indifferent, unstable and stable balance respectively.

- 5 7. Load version of Aeromobil characterized by more than two aerodynamic generators on lateral sides of aircraft fuselage which generators could be set on imagined rectangular or trapezoidal base of the aircraft which means that generators should be set in a way that distance between first two generators is lesser regarding last two ones.

10

8. Fuselage of Aeromobil is characterized by two basic designs from which can be derive all other suitable designs which is family or transport design, and the other is sports (pct. 11) which fuselages are designed in a way that its frontal resistance is as lesser as possible and in the same time, they should produce
15 aerodynamic lift which provides increase of thrust vector on aerodynamic generators which occurrence is particularly striking in family model of the aircraft, because its fuselage is in fact aerodynamic profile in which are situated useful space of the aircraft, controls and flying instruments, drive group, fuel tanks, and transmission and this fuselage (aerodynamic profile) can be brought
20 under favorable angle of attack during translational motion of the aircraft by the help of activation of hydraulic cylinders CMy i.e. bringing about My moment.

9. Drive group, which is situated in back part of fuselage (pct. 12) and has one or two engines (piston engines or gas turbines) which start Main drive shaft
25 characterized by starts all four drive shafts of rotor in the same direction by transmission and conical toothed gears and during this, transmission is classic, simple, because it requires little ratio of transmission while pilot and suitable space for passengers is located in the front part of the aircraft.

- 30 10. The way of control of Aeromobil characterized by all necessary control moments which are generated on rotors of aerodynamic generators (pct. 13-17) where each aeromobil has at least four aerodynamic generators put on angles of imagined rectangular base of the aircraft and by increase or reduce of total value of aerodynamic force on single rotors or change of its course and
35 direction, it is possible to produce necessary moments round all three space axles with initial point in center of gravity of the aircraft and in this way inverse proportional change of intensity and direction of aerodynamic force of front two generators in relation to back two, brings about rotating around axle y and same change of intensity and direction of aerodynamic force on right
40 aerodynamic generators in relation to left causes turn moment around vertical axle x of the aircraft, while inverse proportional change of course of aerodynamic force on right in relation to left aerodynamic generators brings about rotation around lift axle x of the aircraft.

11. The way of change of intensity of aerodynamic force on each aerodynamic generator characterized by Cylinders of change of angle of attack (CCAA) which increase or reduce eccentricity of eccentric bearing which is further transmitted over guide to guided axles of blades which brings about change of angle of attack of blades and this causes change of intensity of aerodynamic force of rotor or change of direction of lift if eccentricity is caused in opposite direction.
12. Change of direction of aerodynamic force on each aerodynamic generator characterized by turn of eccentricity of eccentric bearing (over hydraulic Cylinders for change of direction of lift (CCDL)) in relation to drive shaft and this leads to turn of direction of aerodynamic force in the same direction and in that way Lift vector gets translational component which, if it is caused on all four generators simultaneously, gives thrust force to aeromobile and this force is proportional to angle of turn of eccentric bearing and intensity of aerodynamic force i.e. lift.
13. Hydraulic system of control of the aircraft (pct. 21) characterized by separate control unit which controlling all control moments of the aircraft which is composed of : Distributor of change of angle of attack, Distributor of thrust vector, Distributor of brake vector, and Distributor of change of control by direction, height, and laterally and it provides total independence, the same meaning and function to all control commands in all phases of fly and providing that intensity of change of control moments is proportional to change of intensity of force on control levers by pilot.
14. Design and work of hydraulic control command system characterized by Cylinders of change of angle of attack (CCAA) which are: Cylinder of group change of angle of attack CGCAA, Cylinder CMx and Cylinder CMy which work of their pistons is mutually connected and conditioned by function which they conduct and pistons themselves have always translational motion which is done in a way that Cylinder of group change of angle of attack (CGCAA) is set as base to other two cylinders and piston of this cylinder is connected to cylinder CMx and its piston is connected to body of cylinder CMy and its piston is connected to eccentric bearing i.e. to guide which finally result of this is that during work of piston in cylinder CGCAA, the other two cylinders move together with their pistons which is transmitted to eccentric bearing i.e. to change of angle of attack of rotor blades which during work of piston in cylinder CMx there is translational motion in direction of motion of piston of cylinder CMx while in the moment of activation of cylinder CMy, only its piston moves together with eccentric bearing, while in the same time pistons and cylinders CGCAA and CMx are still.
15. Design and work of hydraulic control command system characterized by

Cylinders of change of direction of lift (pct. 9) which are: Cylinders CGCLD and Cylinders CMz which pistons circle during work and bring about rotation of object for which are tied and set mutually, so that activation of piston in cylinder CGCLD leads to motion of cylinder CGCAA for they are not joined while working, cylinder CGCLD has function to turn eccentric bearing round drive shaft and by this to change direction of eccentricity; and direction of lift is changed for the same angle simultaneously and in the same direction on all four generators while cylinders CMz do the same but their effect is pointed to lateral generators in a way that angle of turn is equal on both sides of the aircraft but in opposite direction.

16. Design and principle of work of hydraulic Distributor of thrust vector (pct. 19), Distributor of brake vector and Distributor of group change of angle of attack characterized by switching on hydraulic cylinders on principle of round valves for which they are tied while in the same time, speed of work of piston in cylinder can be regulated by increase or reduce of intensity of force on control levers of these distributors.

17. Design and principle of work of hydraulic Distributor of change for direction, height and laterally has characteristic characterized by that its each move of control lever of this distributor around any space axle is copied into turn of the aircraft itself with the same meaning and speed of turn of the aircraft round any space axle is proportional to intensity of force on control lever of this distributor and simultaneously by the help of this distributor more hydraulic cylinders with various functions in the same time can be switched on and off.

18. Commands of Aeromobil characterized by : commands by direction, height and laterally (Distributor by direction, height and laterally), commands for horizontal motion ahead (Distributor of thrust vector), command for stopping of the aircraft in translational motion (Distributor of brake vector), command for total increase of aerodynamic force on the aircraft (Distributor of group change of angle of attack); they have characteristic to be independent of each other so they can be switched on individually or all in the same time, and their functions will stay totally preserved and independent no matter in which position in space the aircraft is, or no matter in which translational speed it is, they all have completely preserved function and meaning.

19. Two orders of control of Aeromobil characterized by Optimal order of control and Extreme order of control, while optimal order has characteristic of direction of aerodynamic force tied to position of the aircraft in space, in Extreme order of control direction of aerodynamic force is not conditioned by position of the aircraft in space.

20. Flying characteristics of Aeromobil characterized by: to lift and land

- 5 vertically in its own way, to soar in big altitude range, to take any direction in space by its vertical axle during soaring, to get into translational motion in any direction from every soaring position, to get into soaring position in any direction from every direction of translational motion, it can be turned simultaneously around all three space shafts and to soar while doing that (it can be turned round side axle for 360 degrees, and 360 degrees round vertical axle) the aircraft can be turned around axle y for 360 degrees in order of horizontal progressive motion, whether in direction forward or back.

AMENDED CLAIMS

[received by the International Bureau on 24 November 1998 (24.11.98);
original claim 4 amended; remaining claims unchanged (5 pages)]

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30

35

- 5 5. Design and way of Guide characterized by setting of rotor blades periodically in necessary angle of attack; and transmits value and direction of eccentricity from eccentric bearing on Guided axle of rotor blades and sets them in necessary angle of attack which changes, according to direction and intensity, along circular orbit of blade in a way that each blade generates
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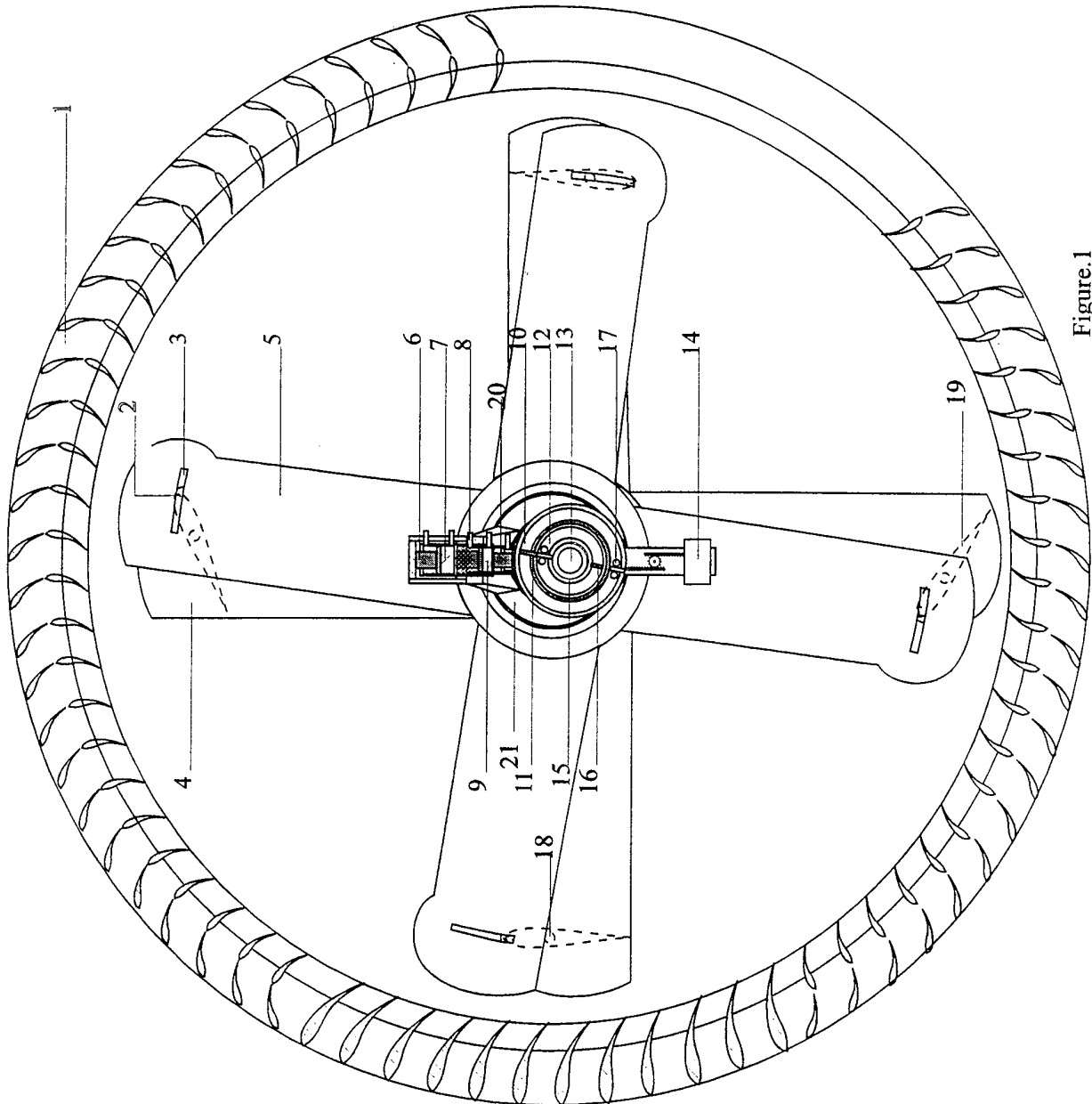
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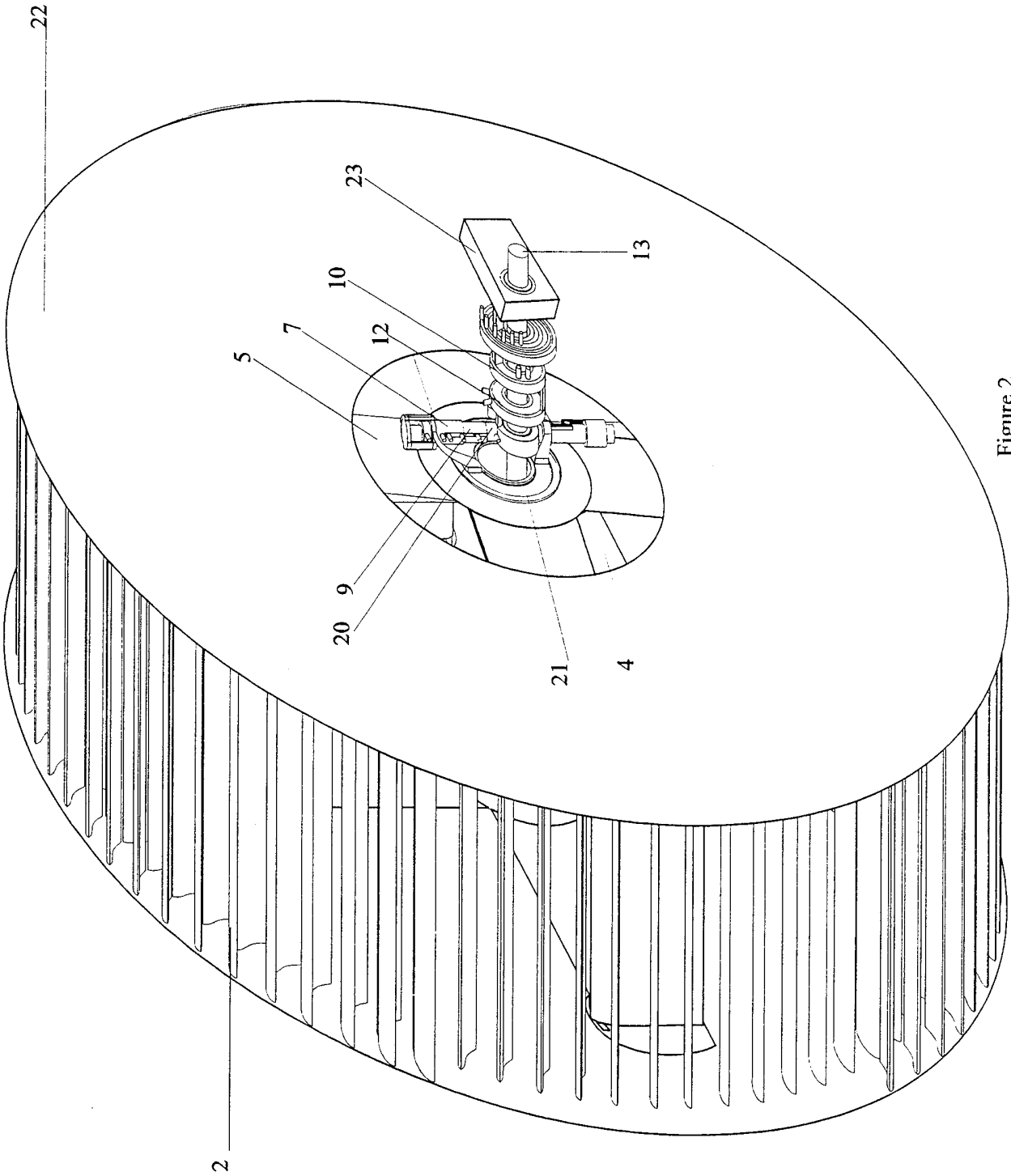


Figure.2

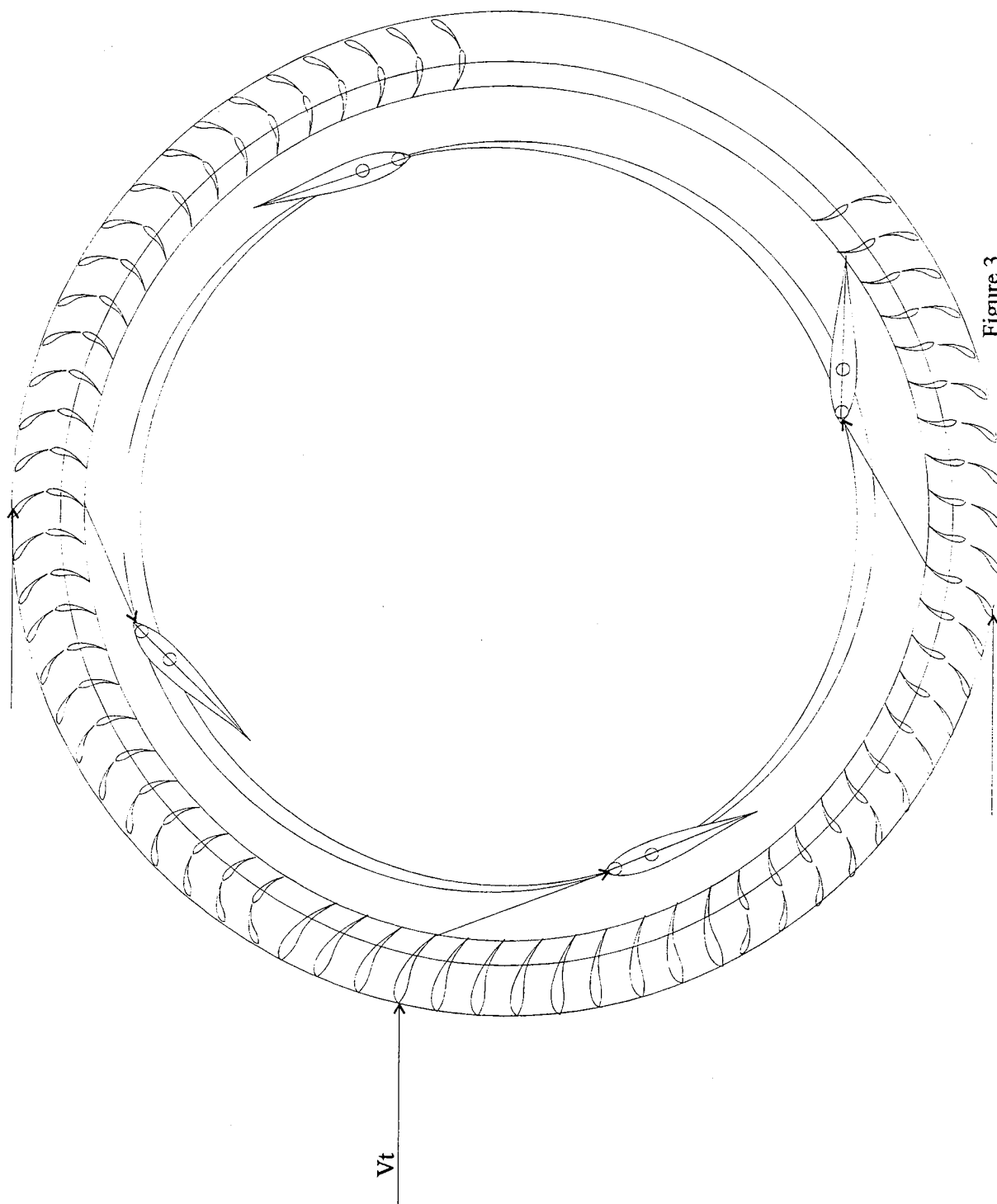


Figure.3

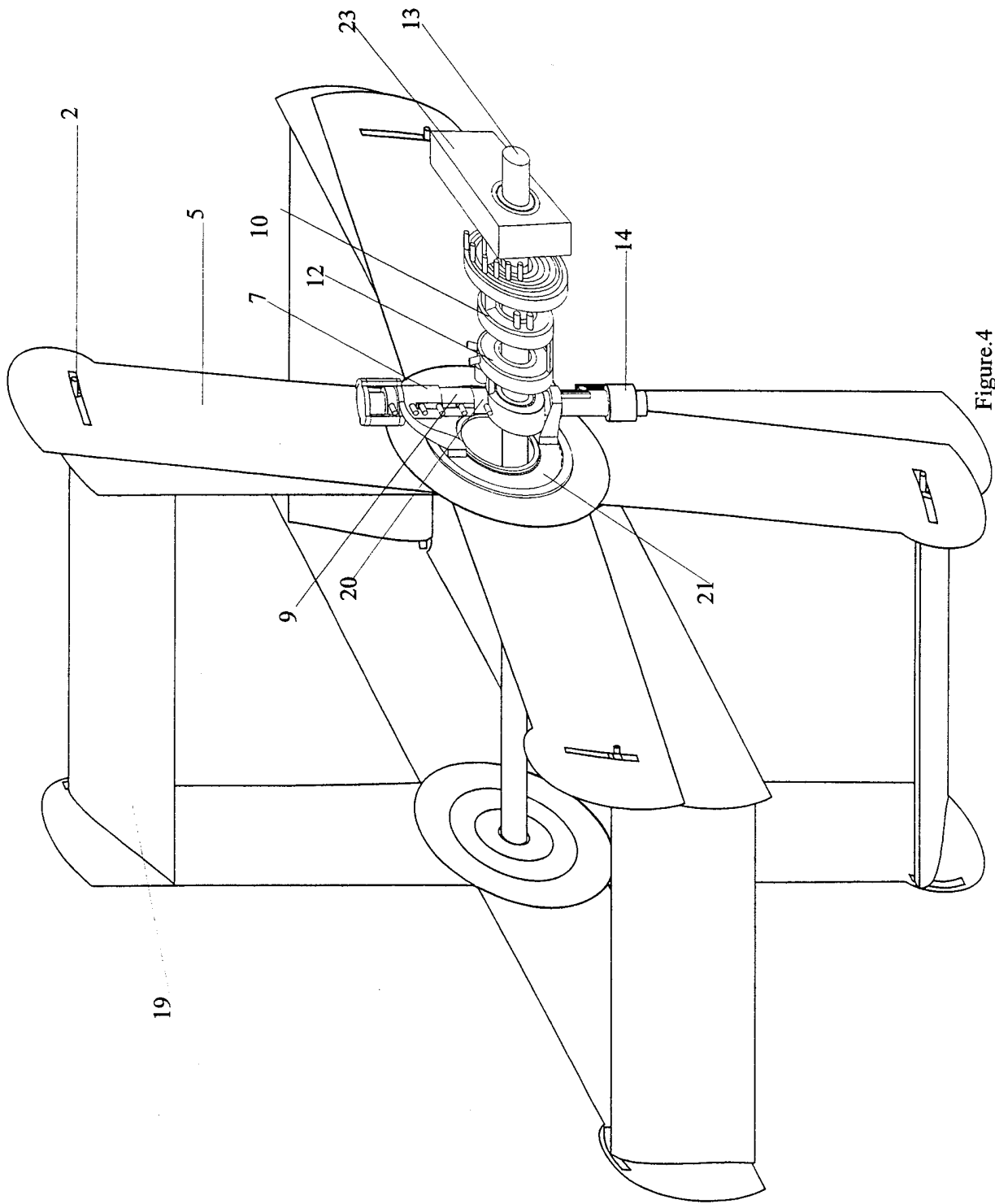


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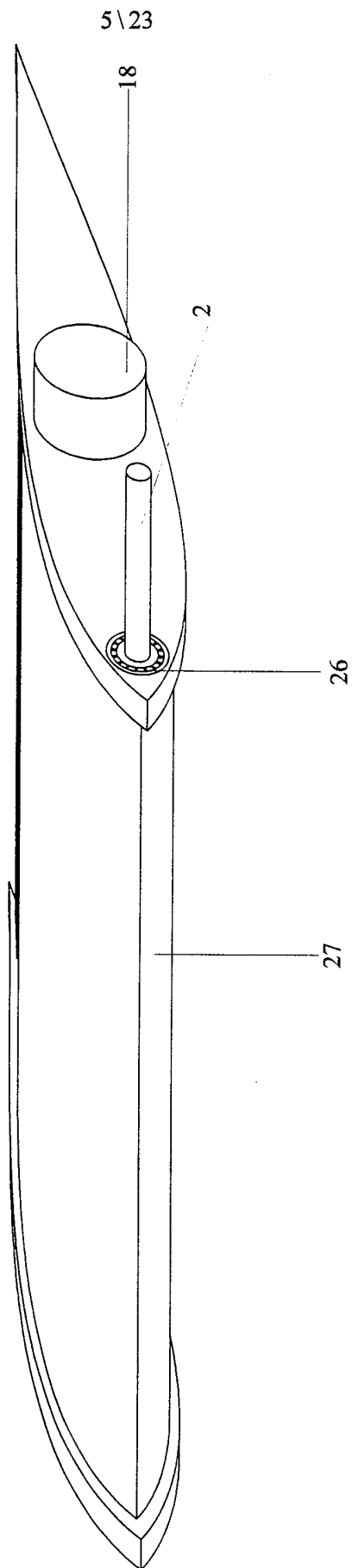


Figure.5

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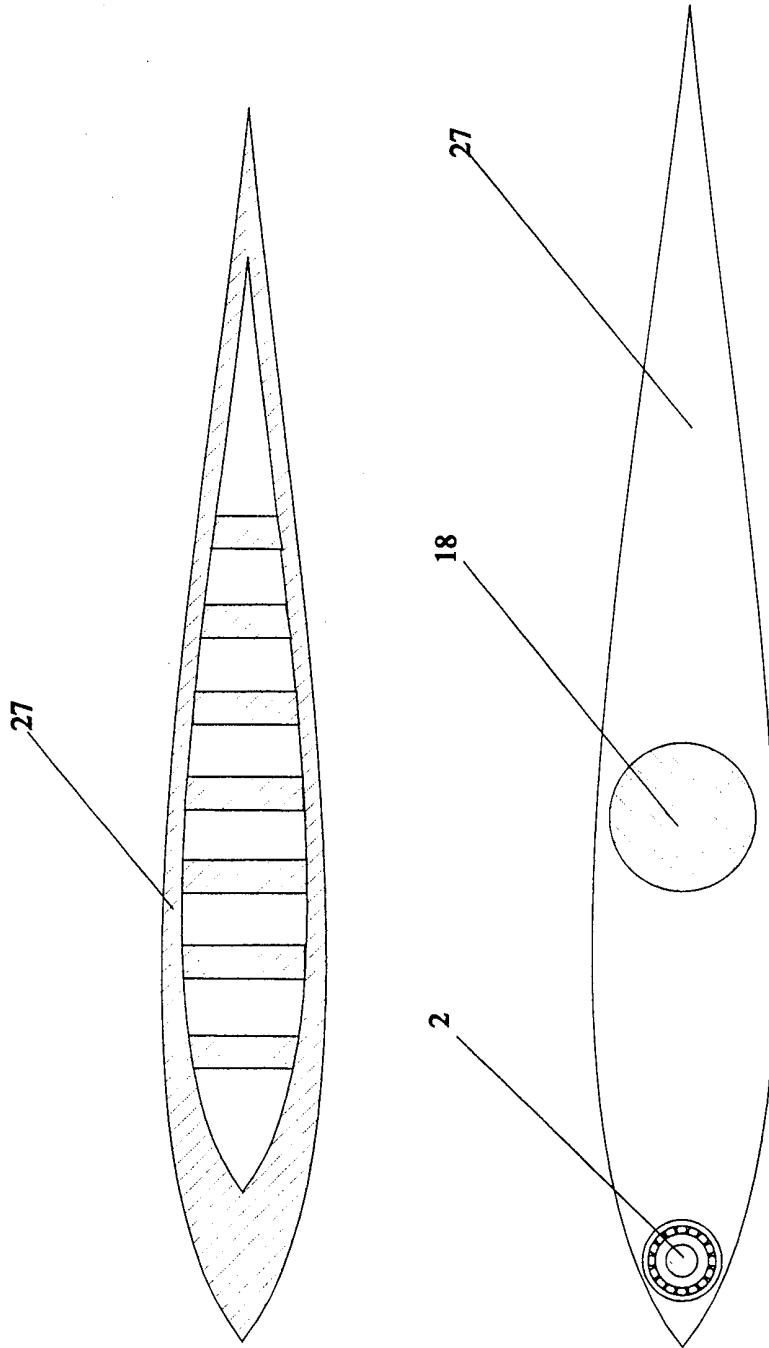


Figure.6

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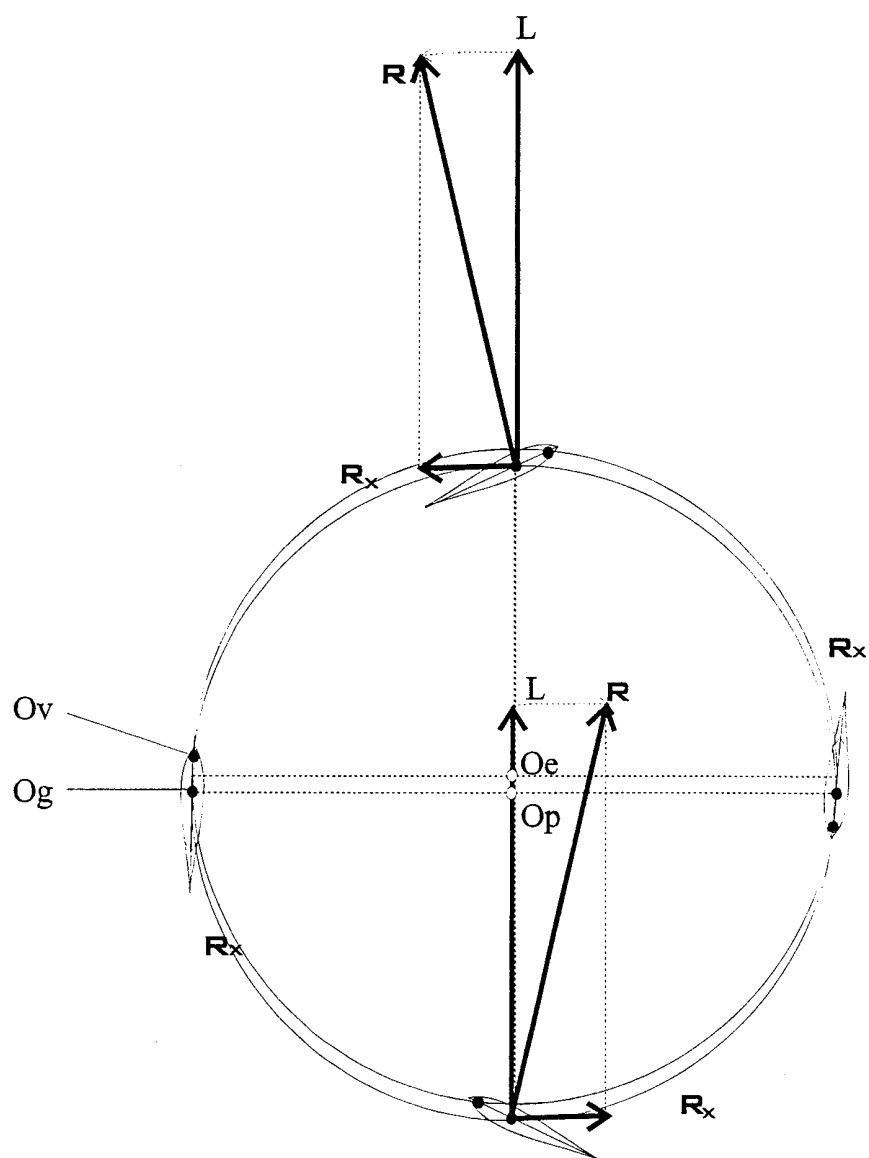


Figure.7

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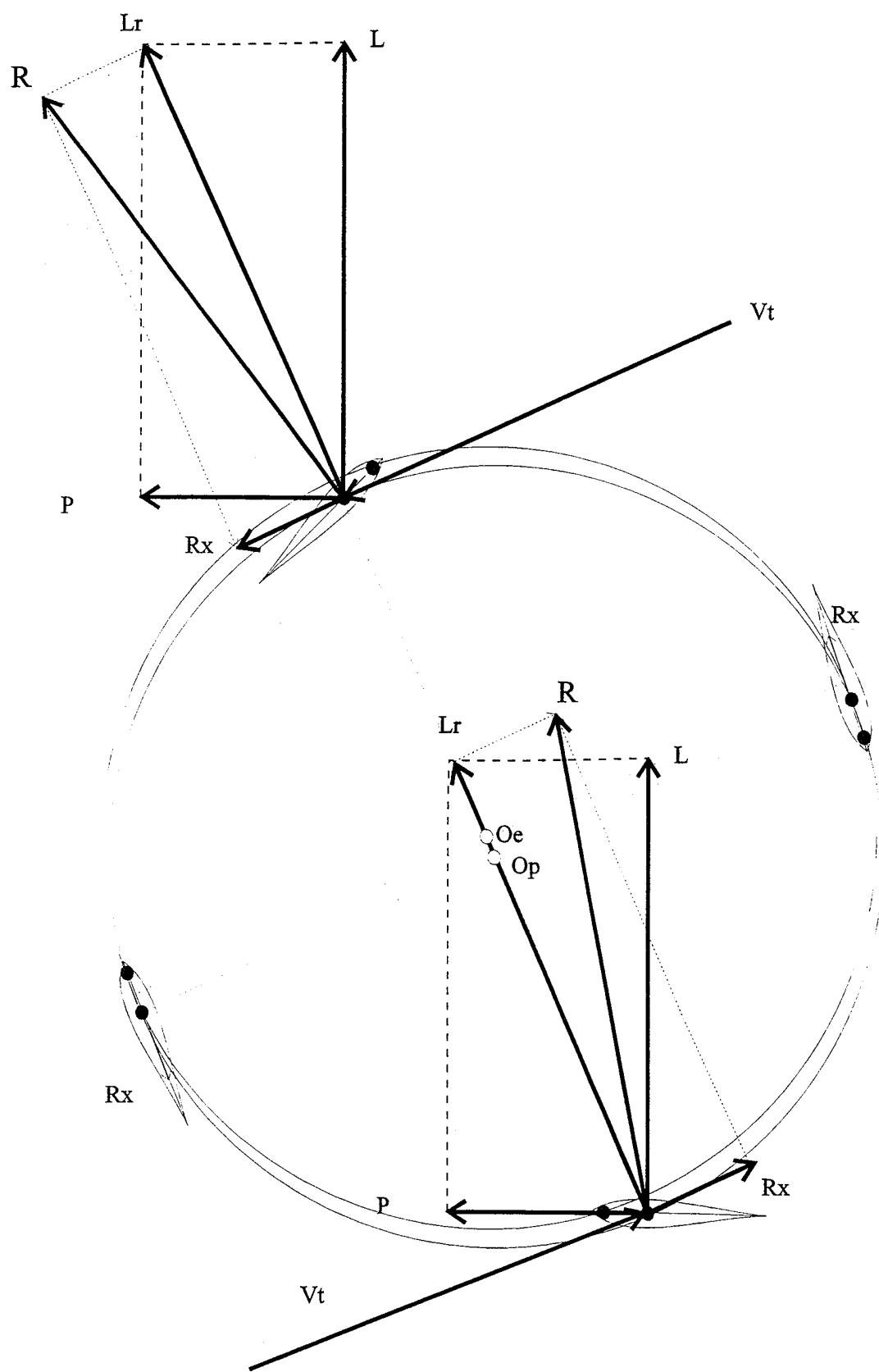


Figure.8

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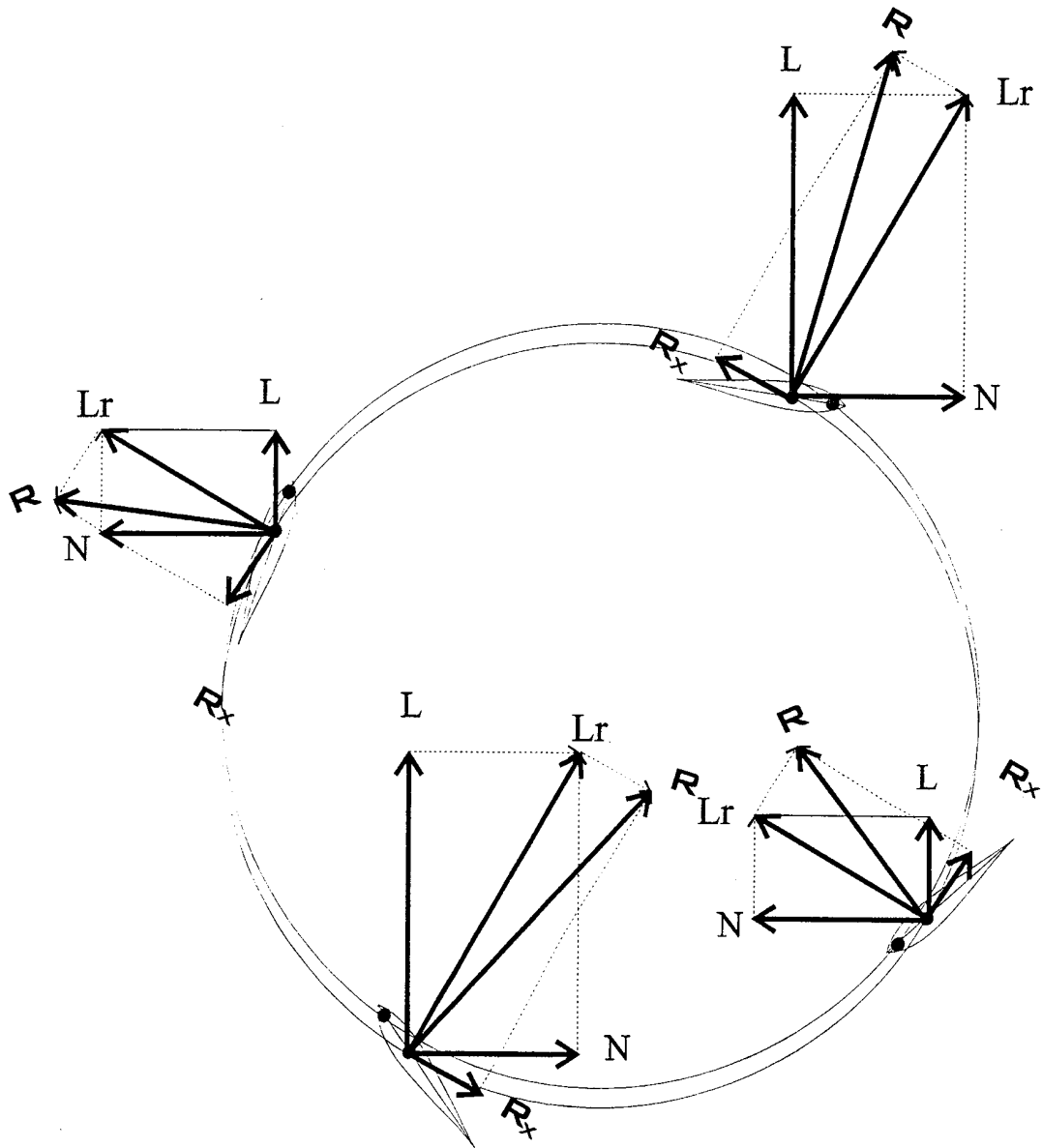


Figure.9

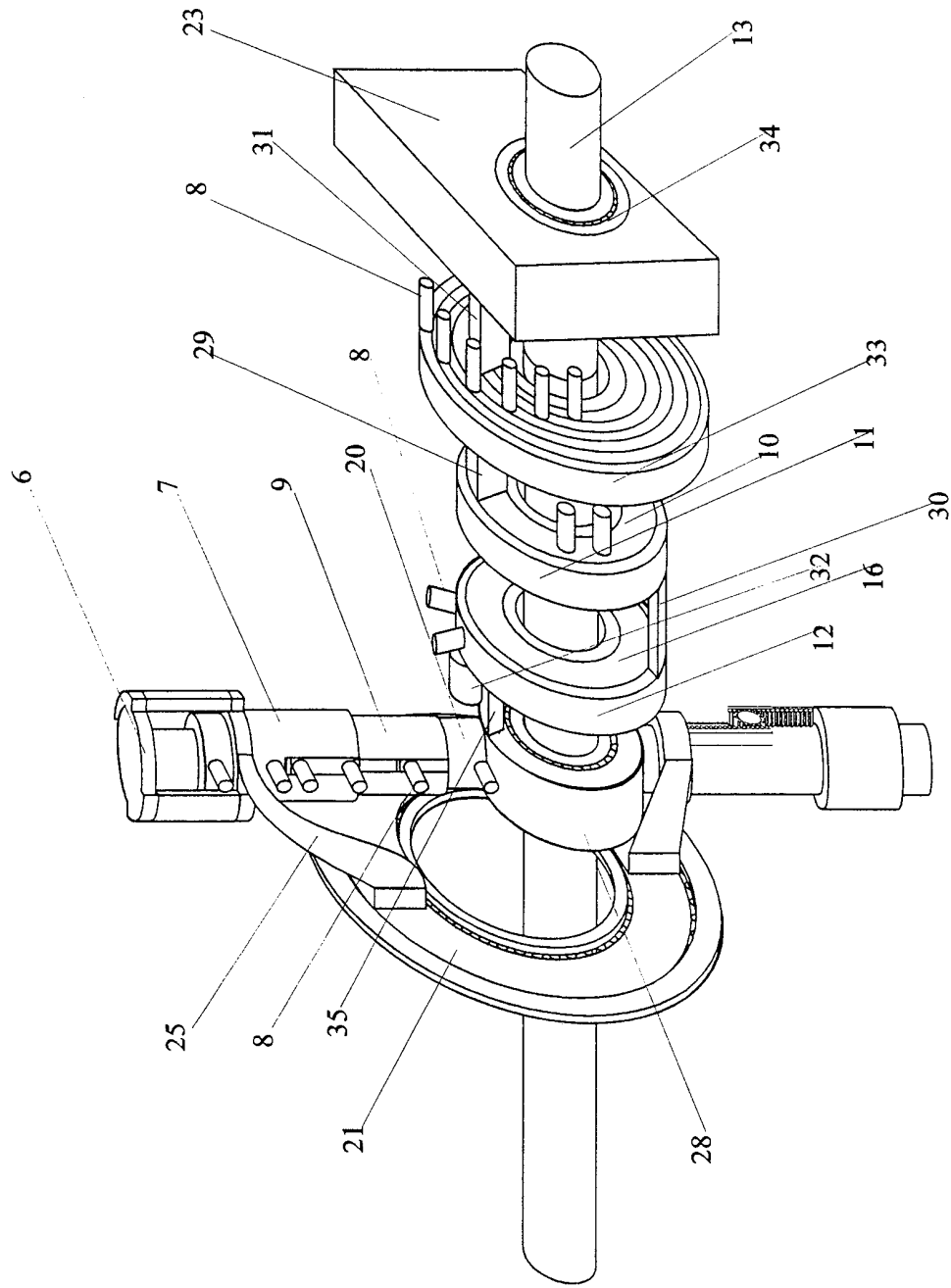


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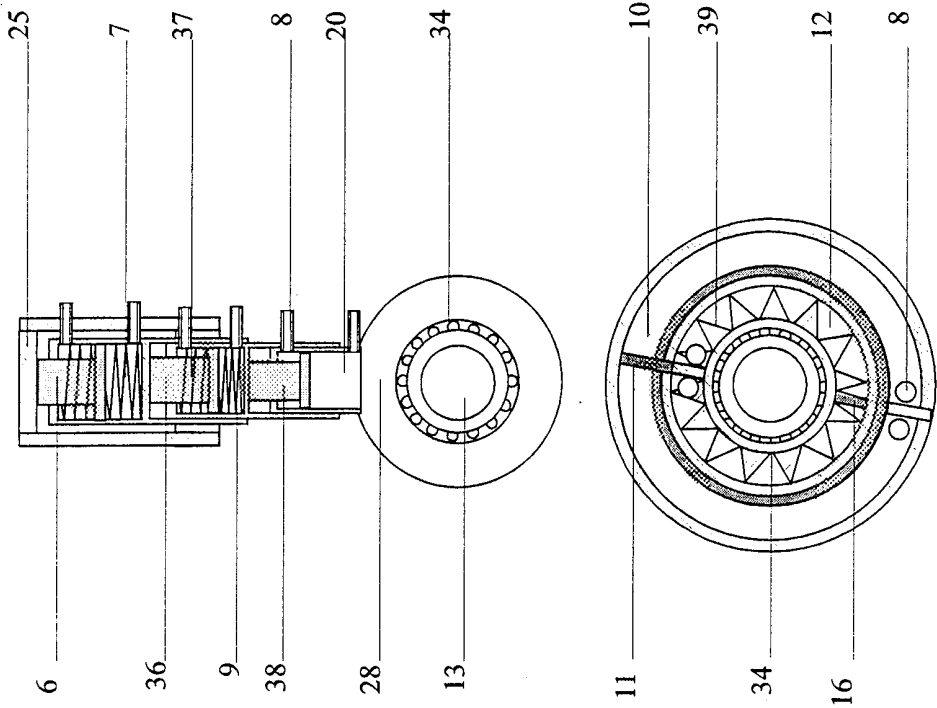


Figure.11

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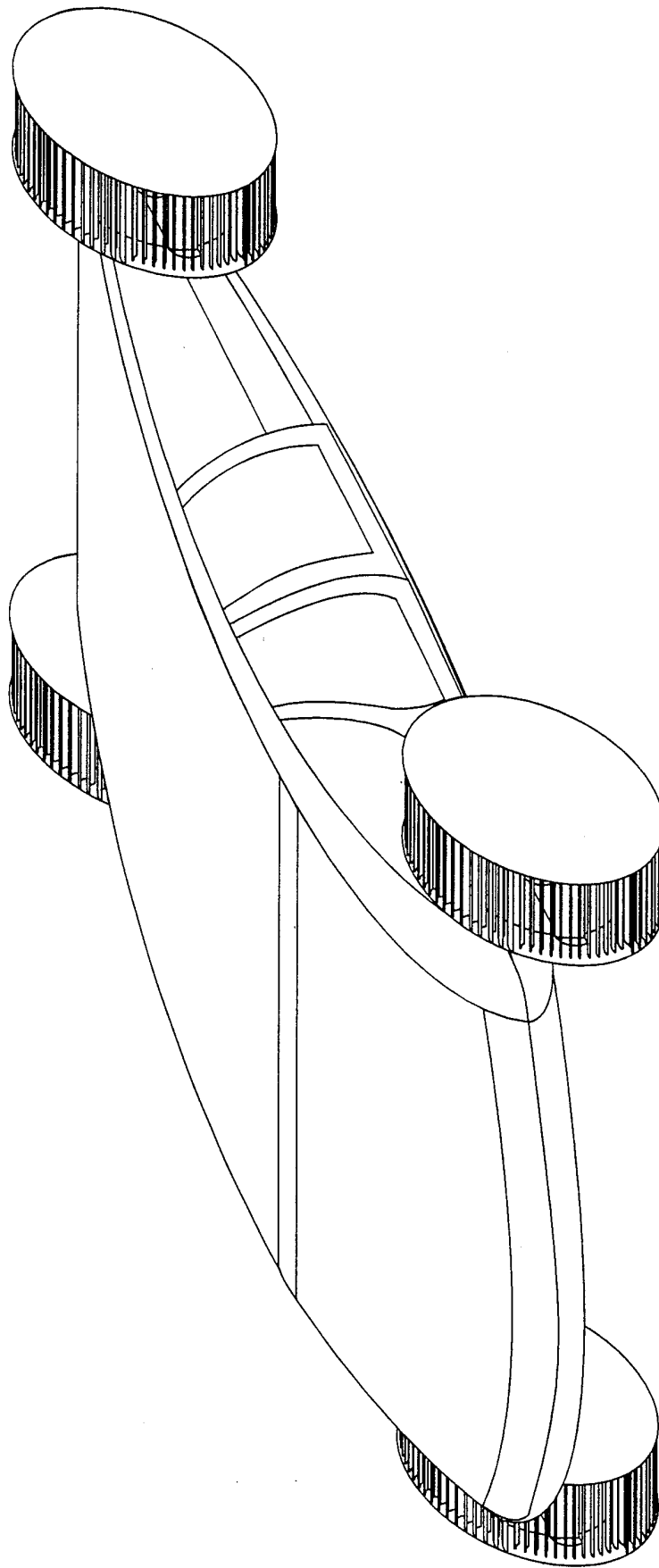


Figure.12

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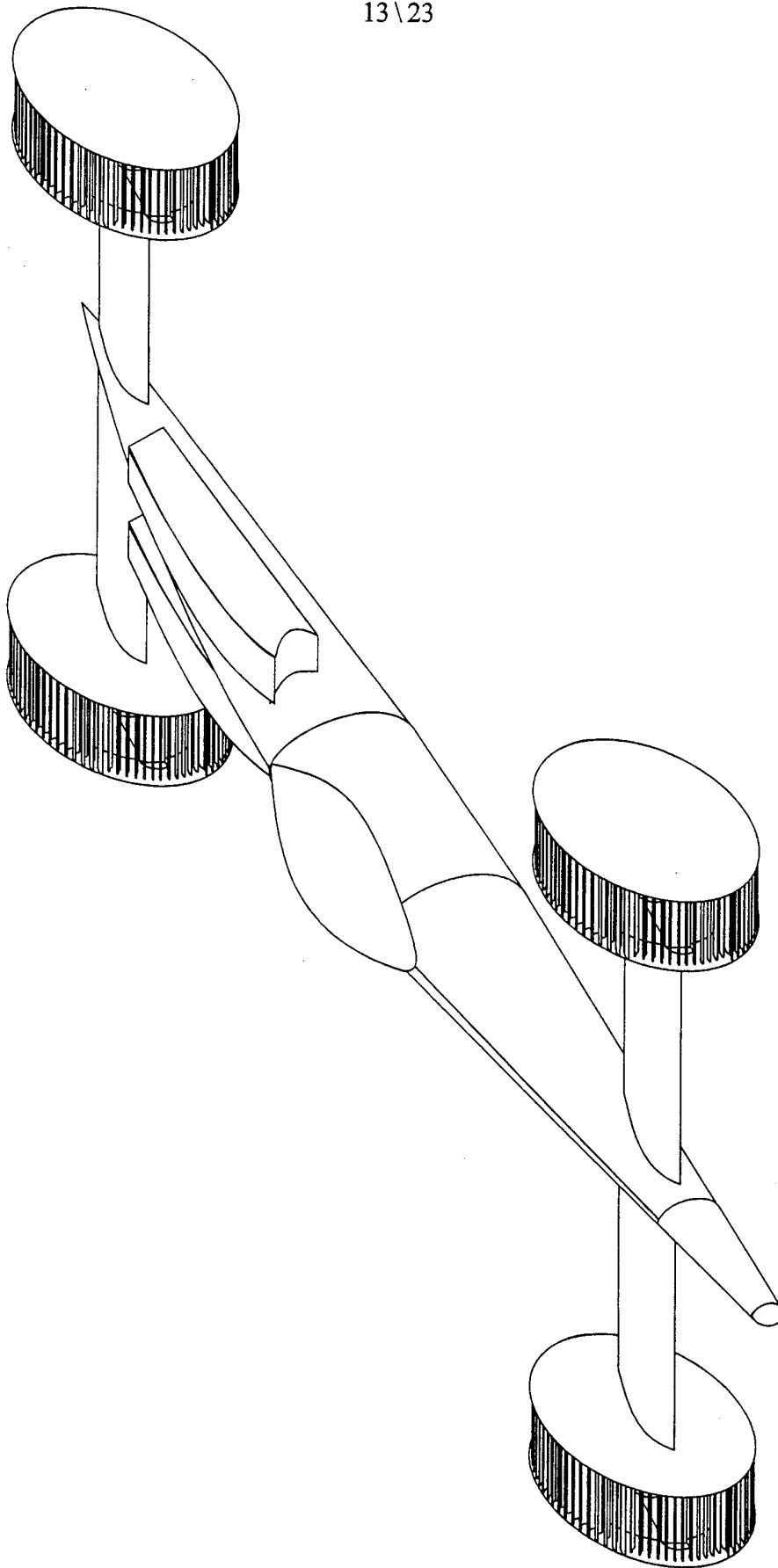


Figure.13

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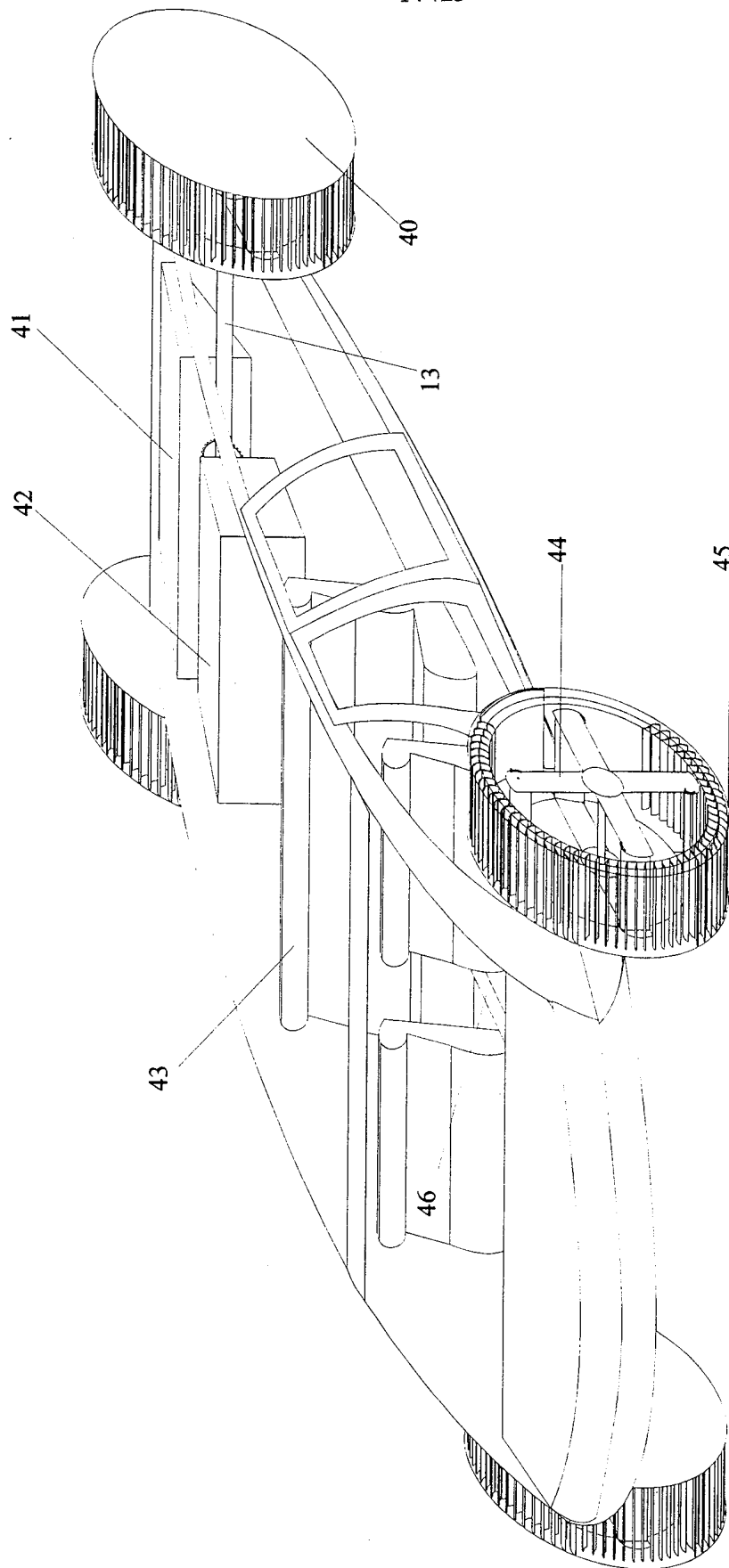


Figure.14

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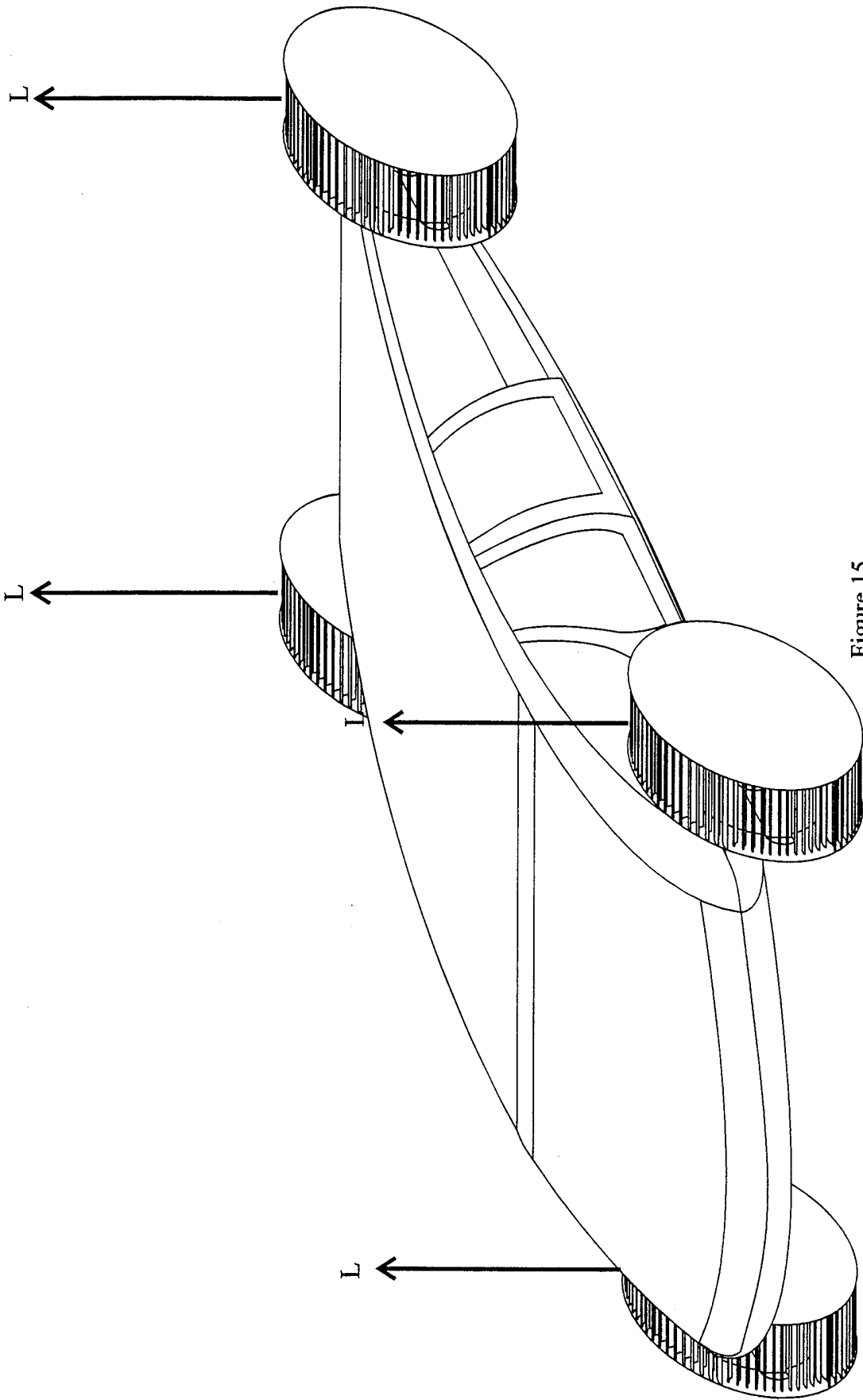


Figure.15

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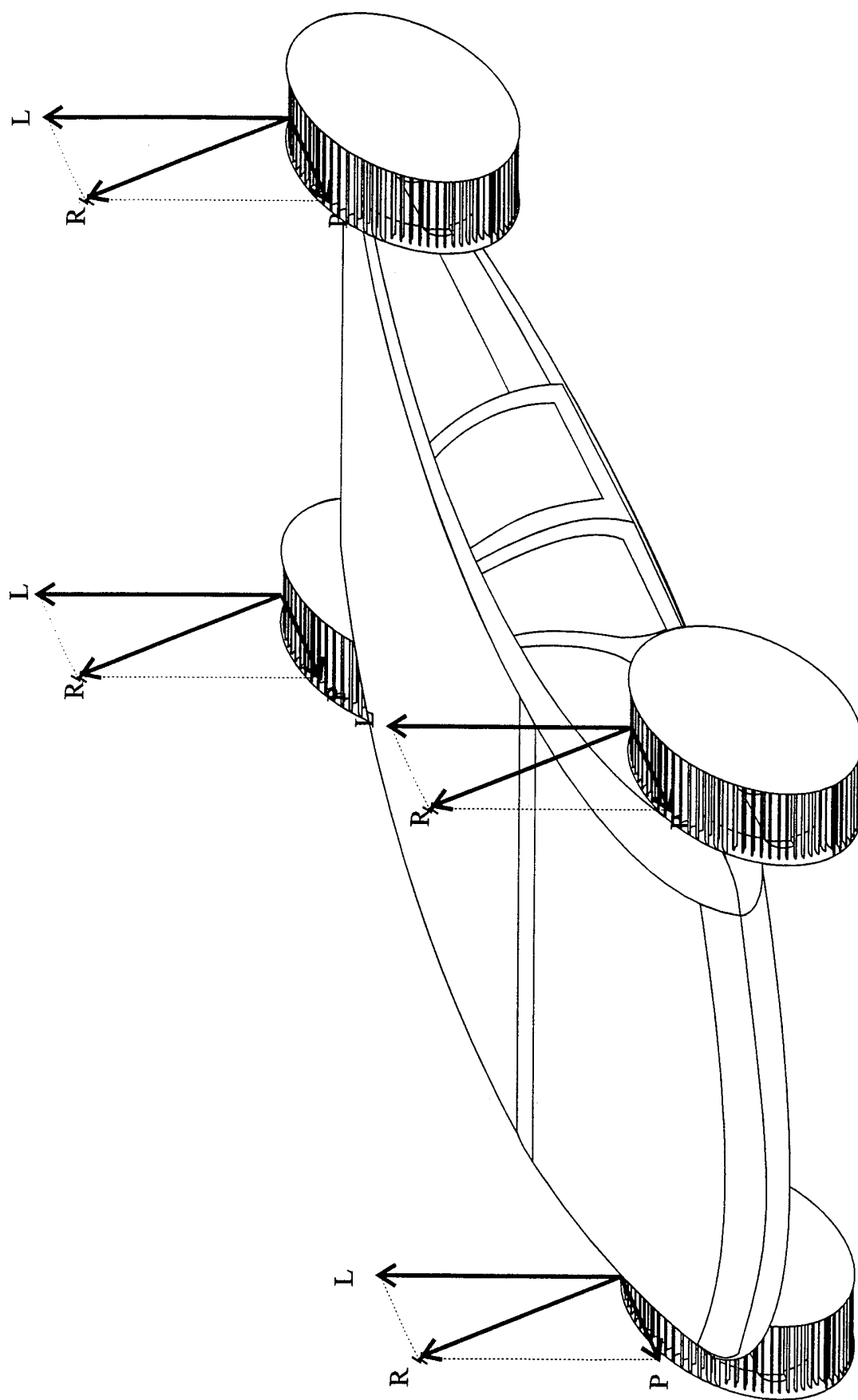
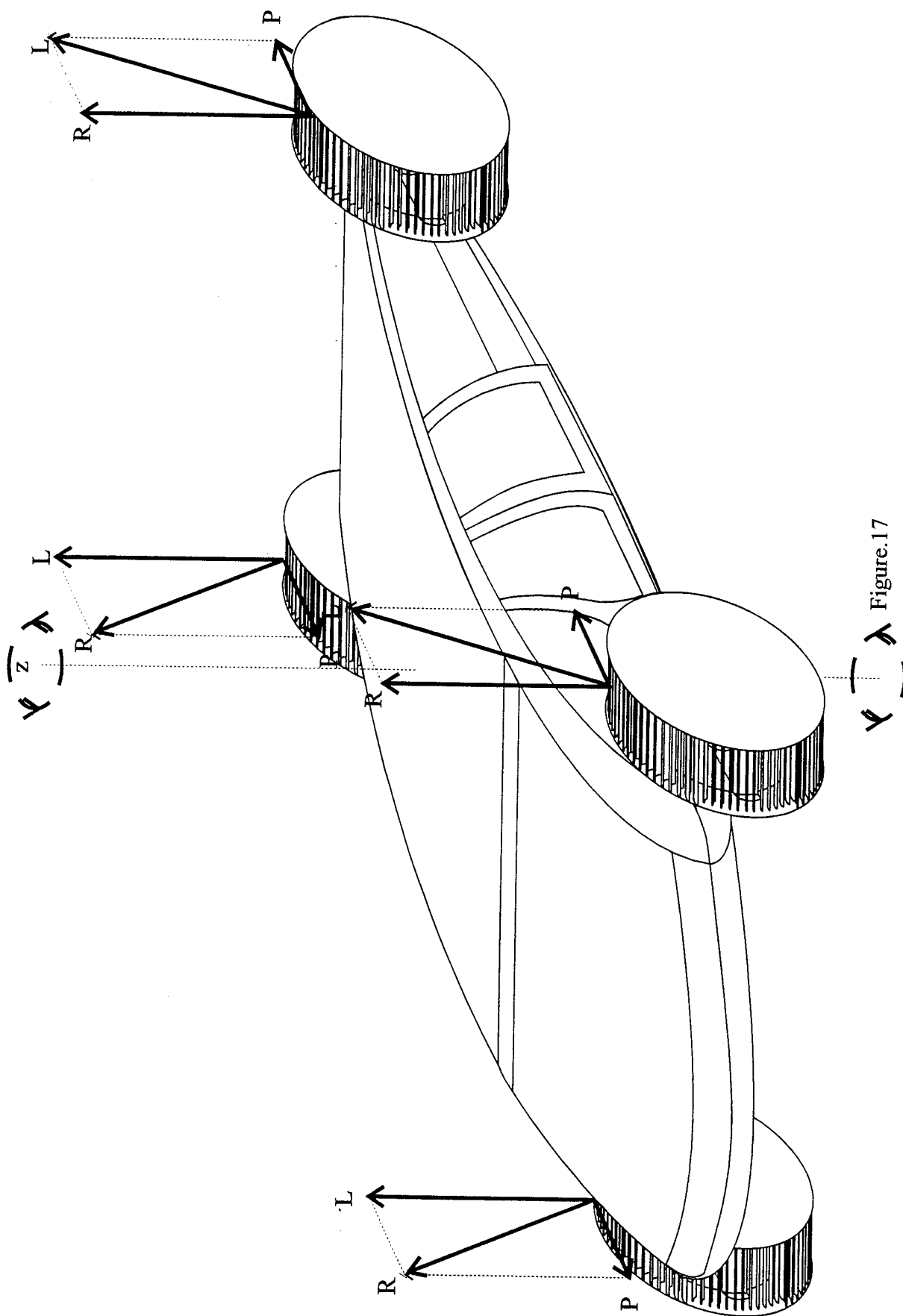


Figure.16

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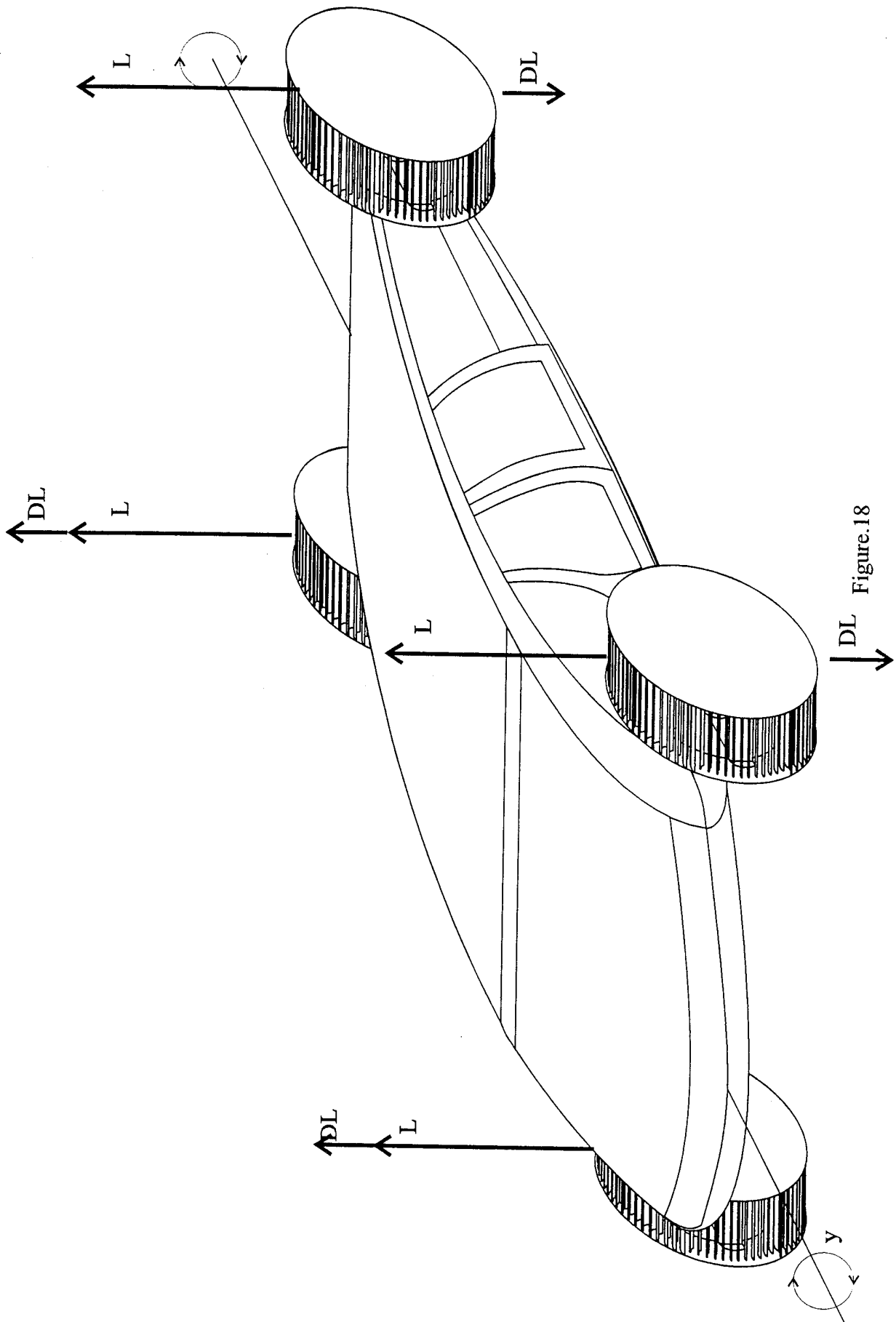


Figure.18

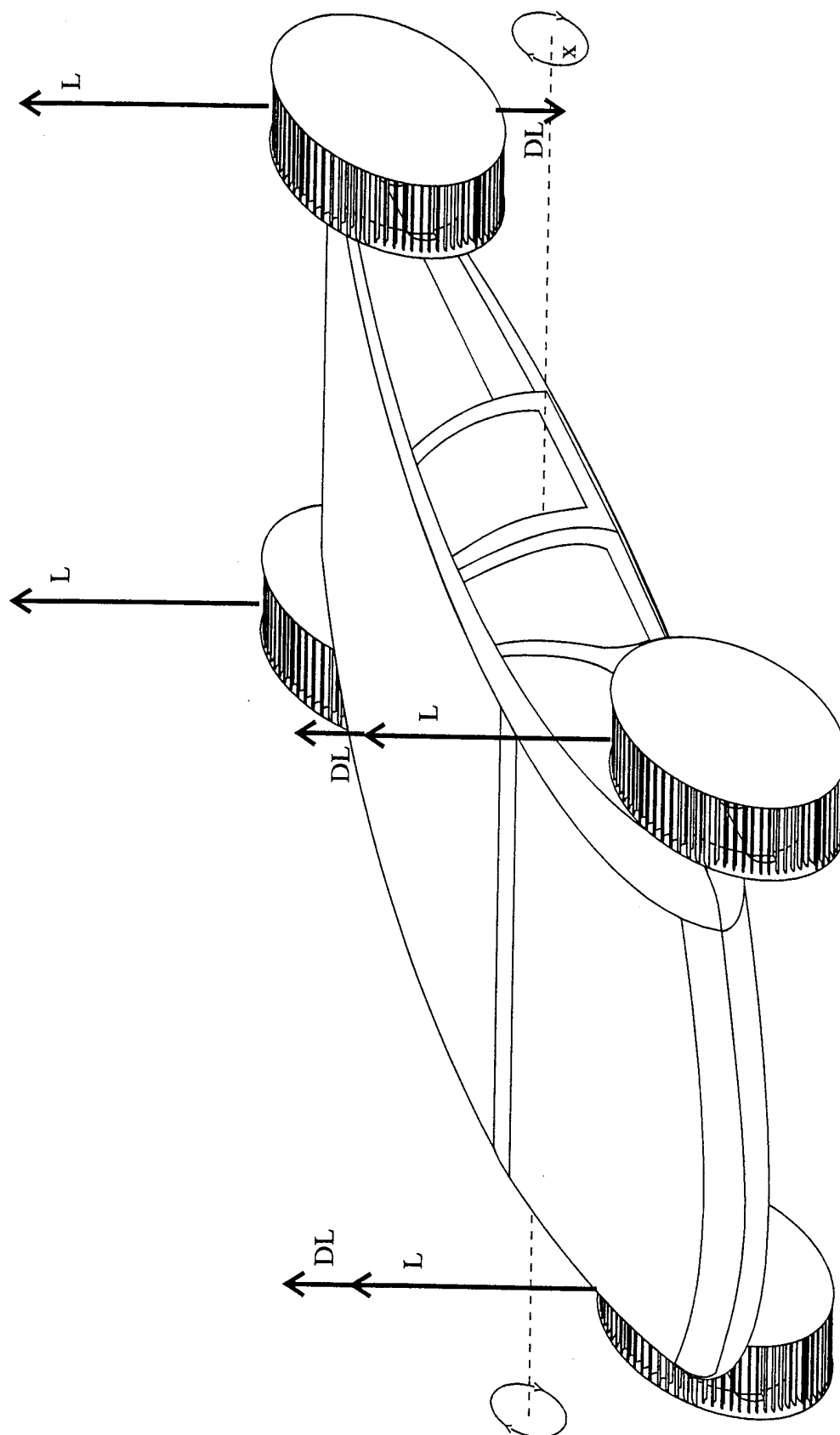


Figure.19

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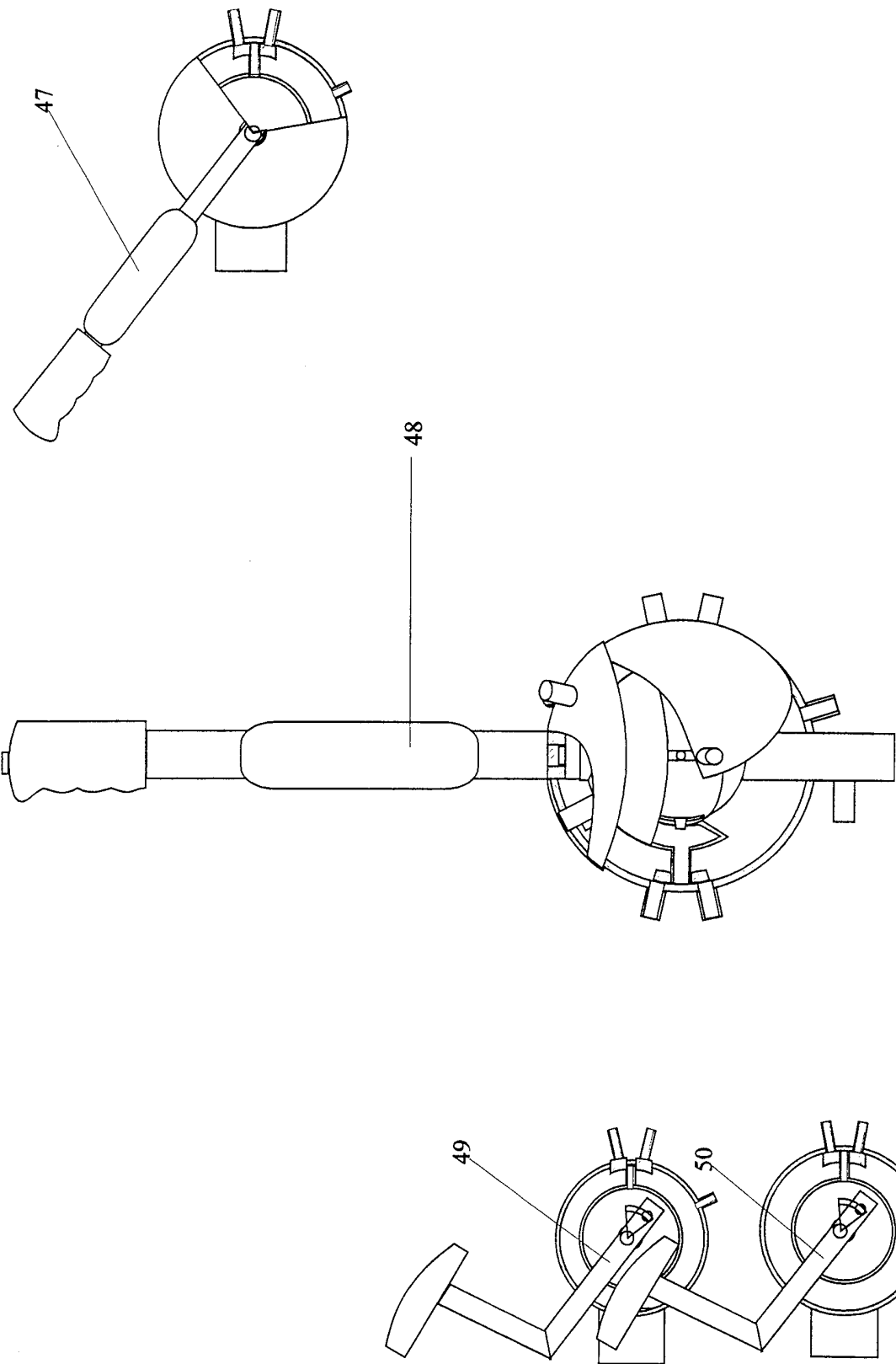


Figure.20

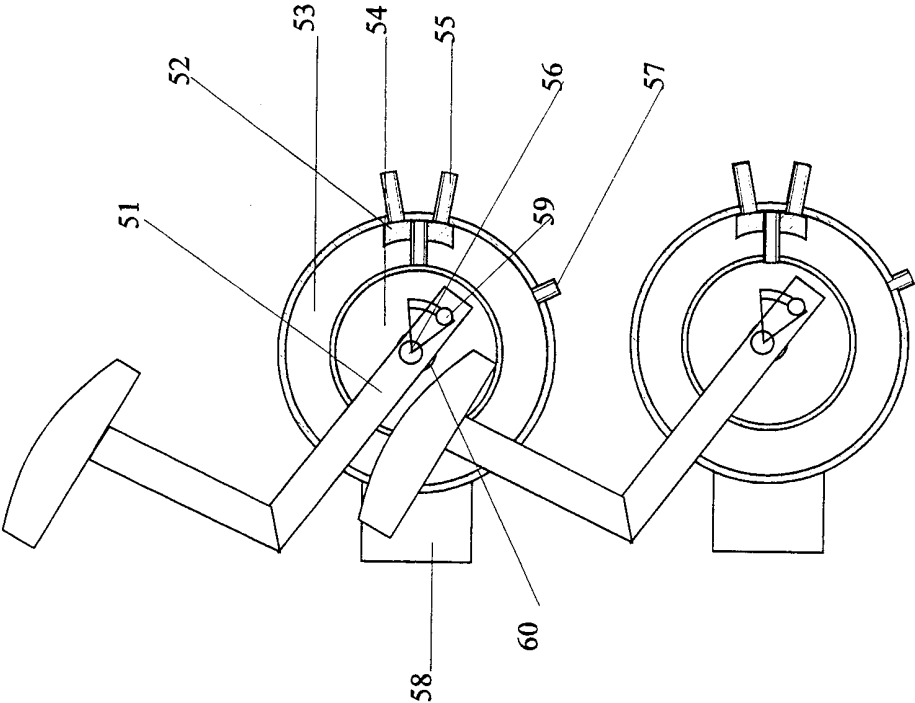


Figure.21

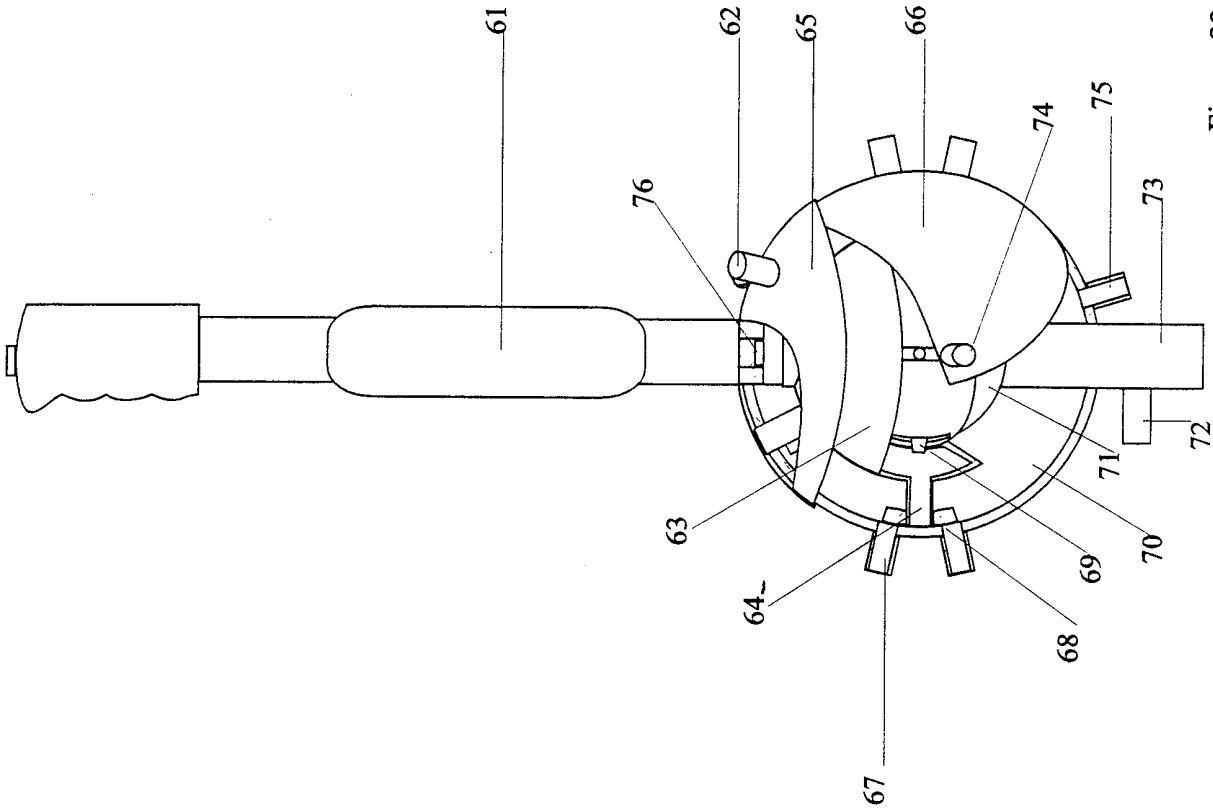


Figure.22

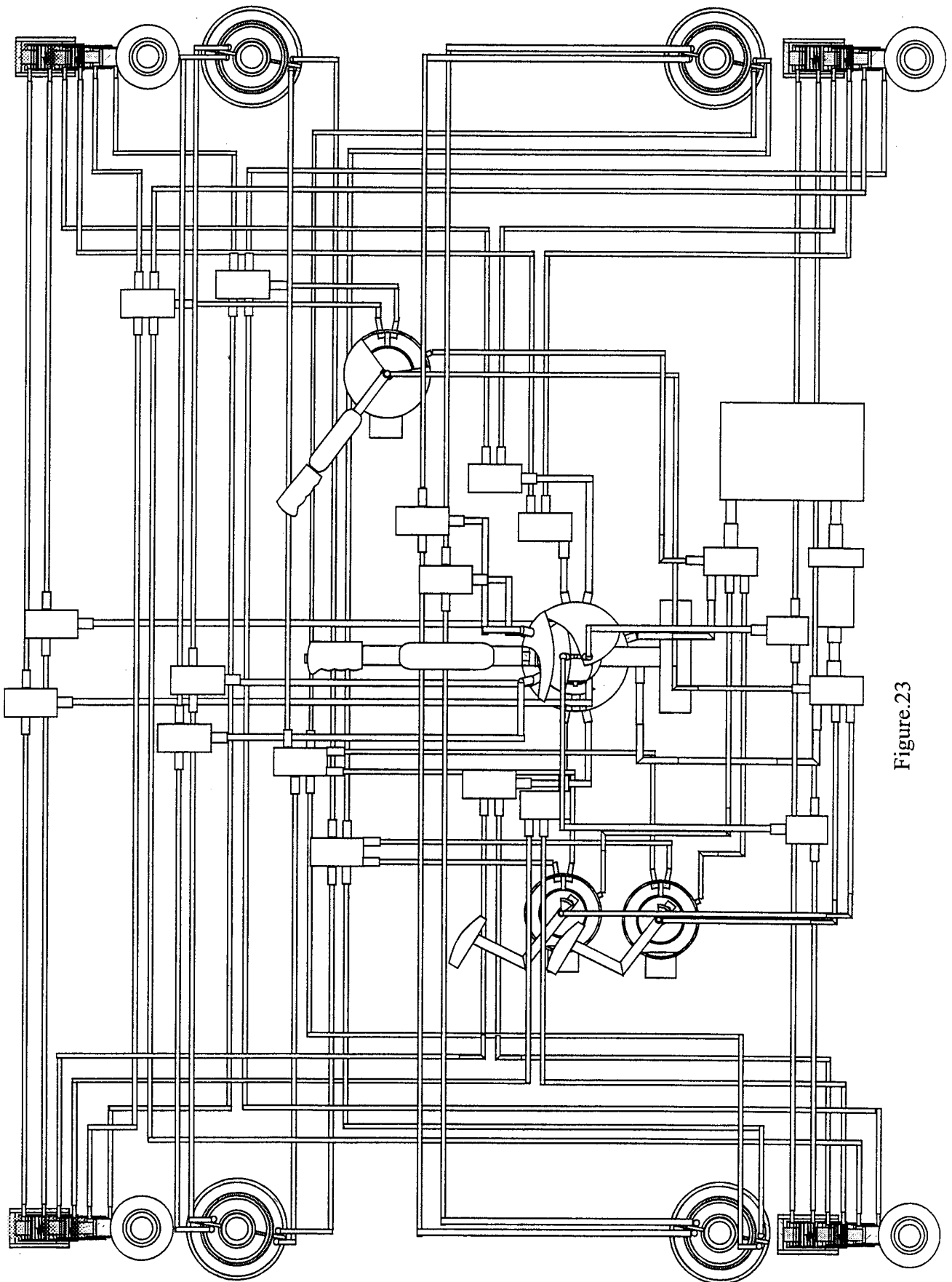


Figure.23

INTERNATIONAL SEARCH REPORT

International Application No

PCT/BA 98/00001

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B64C39/00 B64C11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B64C B60V B63H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 966 317 A (TIBERIU J. RAMNICEANU) 27 December 1960	1, 2, 6, 8-10, 20
Y	see the whole document	3-5, 11, 12
Y	DE 633 496 C (CARL VETTER ET AL.) 28 July 1936	3
A	see the whole document	1, 2, 4, 5
Y	GB 747 172 A (C.F. BYRON POWLE) 28 March 1956 see page 1, line 14 - line 41 see page 2, line 34 - line 78 see page 2, line 95 - page 3, line 26 see page 3, line 72 - line 129 see figures	4, 5
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

4 August 1998

Date of mailing of the international search report

17/08/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Estrela y Calpe, J

INTERNATIONAL SEARCH REPORT

Ir. ational Application No

PCT/BA 98/00001

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 008 452 A (BRUMMER FRIEDRICH) 23 January 1970 see figures see page 12, line 1 - line 24 see page 5, line 6 - line 9 see page 4, line 31 - line 39 see page 4, line 11 - line 13 ---	1,6,7, 18,20
A	---	8
X	DE 43 20 625 A (BACH EBERHARD) 5 January 1995 see figures see column 3, line 9 - column 4, line 9 ---	1,8,10, 18,20
X	US 2 990 139 A (TIBERIU J. RAMNICEAU) 27 June 1961 see figures see column 3, line 39 - line 57 see column 2, line 7 - line 34 ---	1,2,6,9
Y	US 4 957 413 A (REICH RONALD S ET AL) 18 September 1990 see figures see column 4, line 40 - line 50 ---	11,12
A	DE 623 356 C (C. KÖIG ET AL.) 19 December 1935 see the whole document -----	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/BA 98/00001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2966317 A	27-12-1960	NONE	
DE 633496 C		NONE	
GB 747172 A		NONE	
FR 2008452 A	23-01-1970	BE 732834 A DE 1756372 A NL 6907104 A DE 1915130 A	16-10-1969 29-01-1970 18-11-1969 01-10-1970
DE 4320625 A	05-01-1995	DE 4217374 A	02-12-1993
US 2990139 A	27-06-1961	NONE	
US 4957413 A	18-09-1990	NONE	
DE 623356 C		NONE	