



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.09.2011 Bulletin 2011/36

(51) Int Cl.:
F03B 17/04 (2006.01)

(21) Application number: **10386019.3**

(22) Date of filing: **28.12.2010**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Kalivas, Ioannis**
33100 Eleonas Amfissas Fokidos (GR)

(72) Inventor: **Kalivas, Ioannis**
33100 Eleonas Amfissas Fokidos (GR)

(30) Priority: **30.12.2009 GR 2009100721**

(54) **New engine and method of production of energy by means of buoyancy**

(57) The new engine and the method of production of energy by means of buoyancy comprises a group of Structural, Mechanical and Mechanic-hydraulic systems, which collaborate harmoniously for the achievement of production of energy without necessitating the assistance during operation thereof of any exterior factor (fuel matter, renewable energy source, solar, river, wind, etc). It produces more energy than what it needs for its operation thereby overcoming the Principle of Physics on the Conservation of Energy. A pair of double levers (A, B, - C, D) that form an (X) and their big arms (A, B-C, D) have at their ends interior airbags (56), that inflate and deflate very rapidly, are moved in the mode of a pendulum al-

ternately articulated at both sides (57) onto a wall within a reservoir of water or elsewhere. Whilst rising upwardly, with the airbags filled with compressed air (58,59) and by means of the force of buoyancy, they exert pressure, by means of small arms (1, 2, 3, 4-5, 6, 7, 8) via pistons of hydraulic cylinders (7,50), on mineral oil contained in a hydraulic circuit. The mineral oil thereby acquires a pressure which it transfers via pipes and other accessories in hydraulic motors (38, 46) which convert the pressure of the liquid into rotational power torque acting on a shaft. Energy for any use whatsoever is received from the shafts (45) of the hydraulic motors (38, 46) via motion transmission systems (39, 44).

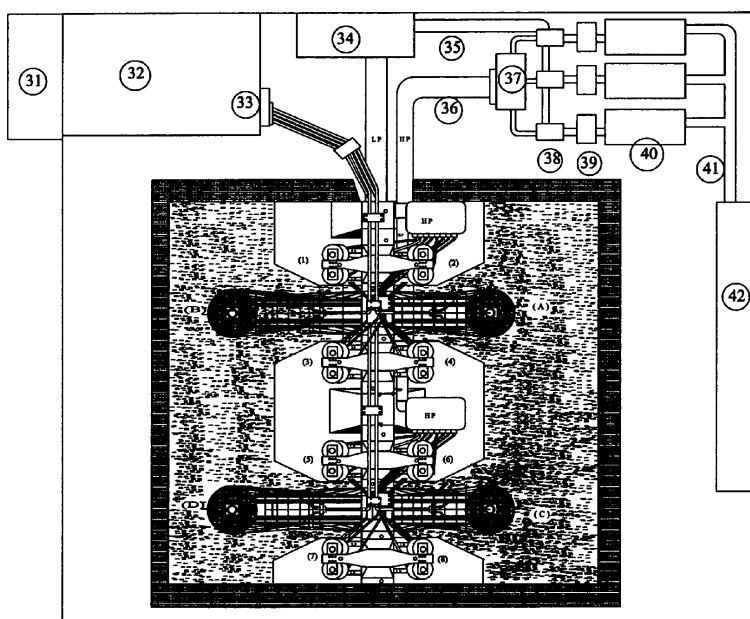


Figure 2

Description

[0001] The new engine and the method of production of energy that will be described hereinafter comes to contribute in the known methods of the prior art in coverage of the enormous demand of energy whilst providing an absolute protection of the environment and bringing up a novel breath in the quest of new sources of energy.

[0002] Up to today amongst the known methods and means being employed in the production of energy, the non pollutant ones are those methods that do not use fuel materials, but they make use of the natural sources of energy provided in our planet, i.e. sun, water, wind, geothermic energy, etc. and their multiplication would be welcomed.

[0003] With this hope in mind and in consideration of the insufficient outcome of the currently known solutions, which are either not sufficient because they are interrupted (night, clouds, calmness, but also impose large inactive areas) with the exception of hydro-turbines whose operation is continuous, however they require dams and waterfalls from a large height, something that apart from being costly requires a configuration of the ground, I hereby also put forward my own idea as one further solution that might contribute towards this goal.

[0004] In brief, the newly proposed engine comprises the following auxiliary configurations, structures and elements the combination of which will provide the final product:

A pair of levers constituted from four arms, two arms for each lever of this pair of levers, each lever of this pair in the form of an open (L) with an extension that constitutes the small arms of the lever (double beams) ending up into the form of (X). They are alternately moved in the mode of a pendulum and in different positions (alternatively) each part of the pair articulated in the middle thereof with two rings, the one independent from the other, coupled in a shaft, suspended from the point of intersection of the two lines of X. When they are in rest, they balance and viewed from the sides each lever resembles to an (X). Their movements are performed in synchronization controlled by electric and electronic mechanisms.

[0005] The big Arms have in their interior the airbags, which when found at the bottom dead-centre of their stroke are alternately being supplied with compressed air and are inflated displacing water from the interior of the arms.

[0006] Because of the force of buoyancy each arm moves upwardly at the surface of water, within which is always found a portion thereof, with a force equivalent to the weight of water that was displaced. During its upward movement, it drags along also the other portion of (X), via the ring onto which they are supported, the other portion moves downwardly, the beams which are the

above lines (V) of the (X) with their ends being connected with rods of pistons of hydraulic cylinders in a hydraulic circuit compress mineral oil.

[0007] The hydraulic circuit receives the force of buoyancy multiplied due to the mediation of the lever and converts the same into liquid pressure.

[0008] The mineral oil is by means of this pressure led, via pipes and other accessories, into hydraulic engines (hereafter motors) which convert it into a power torque exerted on a shaft. In the upper dead-centre of this stroke, the airbag is emptied, and the bag of the other arm of the same lever that has reached the bottom dead-centre of its stroke is being filled. The force of buoyancy acts also in this arm and it begins to rise thereby supplying with oil under pressure the circuit, whilst at the same time the previous arm moves downwardly with its bag emptied from air. The same process it also executed by the second system of lever comprising two arms that is provided immediately next to the first, at a different time, and together they constitute the pair. This rotational force of power torque is received via systems of transmission of motion by the torque outlet of one or more motors for any use whatsoever.

Analytically:

[0009] In a lake, in the sea in or in the beach, in an artificial reservoir or anywhere with ensured the conditions in order to set up this group, a source of energy can be created.

[0010] A wall powerfully armed with iron with a sufficient width at the bottom and with a powerful anchorage therein, with a height of 5-6 m and from dense reinforced concrete, with its width converging in the surface where from it will protrude at a height as long as necessary in order to protect the intermediate rotating part of the arms from rain, with intermediary crosswise intersecting walls and corridors of iron constructions will be the basements of support of the engines that will be described hereinafter.

[0011] A steel shaft of a large diameter so that it may withstand bending and shearing stresses and a length as long as necessary in order to allow functioning of the herein described mechanisms the number of which has no limits. The shaft is supported onto fixedly mounted steel basements in the above horizontal surface of the wall and outside the water at some height with durable screws and is extended along the wall. If the number of levers exceeds two, each shaft should have its own support. A long and strong lubricated ring mounted on the shaft is the articulation of the lever at the middle of which are mounted the two fork shaped arms, one of them at one side of the wall and the other at the other, which are concentric and one consecutive to the other in the form of an open (L).

[0012] The arms form two levers with the beams that oppositely protrude from the articulation and in continuation of the arms. That is to say each big arm after its

articulation continues with two small arms that are the beams, one beam at one side of the lever, (by lever we mean the two big arms with the two beams in each one of them), and a beam at the other side resembling to a pair of Y's at an X-form orientation. The manufacture of the big Arms is from strong stainless pipes interconnected to each other along the entire length of the arms so as to form in their interior an oblong orthogonal gap with the small basements of the rectangle lying above and below to ensure a higher strength and with the corners internally curved. At their end they are shaped in an empty sphere with its bottom obliquely shaped for the reason of saving of depth, in the approximate shape of a pear. At their upper small basement and throughout their length they have arc-shaped reinforcements with intermediate supports for damping bending forces acting in parallel with their length. In the interior of the arms we have placed bags made from rubber, plastic or any other flexible material available with more durable composition so as to withstand the requirements and stress conditions of the structure.

[0013] This bags take the form of the interior of the arms when they are inflated with the compressed air that will be supplied therein by the airbag of the compressor and will cover such a length of each arm so that, when the arm reaches the top dead-centre of its stroke, the airbag is under the surface of water at a depth higher than twenty cm so that it may be surrounded and pressed by water for the fast emptying thereof.

[0014] Outside the reservoir, wherein there is provided the control of the system and the auxiliary machinery, there initiate cables which are water tightly led at the upper part of the spherical slot within which the bag is being retained. Therein is being fixed in the arm within a waterproof basement from thick plastic, inside the bag a mechanism of automatic opening and closure, having a large diameter, that is to say a valve from which will be rapidly discharged the compressed air contained therein.

[0015] At the other point, approximately at the middle of the arm is located the other end whereupon is being retained the bag and there exists a connection with a flexible pressure pipe onto a similar basement which supplies the bag with compressed air from the system of the installed compressor with the airbag or airbags.

[0016] At both sides of the arms onto the ring are being adapted two beams on each side so as to form an (X) with the arms. At the ends of these beams are welded slides with STOP members and at the lower moving parts of the slides there are articulated the rods of the pistons of the hydraulic cylinders, two in each beam fixedly connected to each other with a powerful cast steel laminate which is moved together with the rods and the pistons in the arc-shaped course followed by the end of the beam during its operation. Thus we have a system of a **LEVER** comprising **two** arms that alternately move upwardly and downwardly into water, **four** beams that follow the course of the arms. When (A) moves upwardly the force of buoyancy is transferred to the **two** beams that form a (Y) with

the same and they move downwardly pressing their four pistons, being supplied with torque via the ring, while the **other two** beams that form a (Y) with arm (B), that moves downwardly with the airbag empty, move upwardly and together with them the **4** pistons of their cylinders effect suction and fill up with mineral oil from the pipe of low pressure of the circuit. And **eight** hydraulic cylinders which supply, in succession per four, with oil under pressure their collector.

[0017] In order to provide a continuous flow of oil under pressure in our engine, we should also have a **second similar System of LEVER** which will cover with pressure the circuit during the dead periods that are left by the first system.

[0018] These periods are those in which the change of movement of Arms from the top dead-centre to the bottom dead-centre and vice versa takes place.

[0019] Thus with regulation of the starting of the two Levers, when one of them is found at the phase of change (dead period), the other Lever must be at the middle of its active stroke and with an electronic control of the supply of the airbags with compressed air we can ensure a continuous supply of oil under pressure, also employing if necessary pressure regulating mechanisms, but also an electronic system of observation via commands of the coverage of dead intervals.

[0020] The engine functions at pairs that is to say it always comprises at least four airbags, four big arms, eight beams (small arms) and sixteen hydraulic cylinders. Also two rings with support in between, two collectors and a distributor for each pair.

[0021] This is the description of this system and it is obvious that we can have in the same source of energy as many similar systems as we wish.

Description of the operation of the engine

[0022]

1. A compressor (31) with a large flow rate of compressed air is initiated by means of fuel or installed electric power source and stores the compressed air into one or more air reservoirs located adjacently and outside the housing of the power plant. Arm (A) located at its bottom dead-centre within water (60) with the airbag empty, whilst arm (B) is located at the top dead-centre with the airbag full with air (inflated). Arms (C) and (D) are located at the middle of their stroke, (C) rising upwardly with the airbag full and (D) downwardly with the airbag empty. By means of a switch the engine starts off, valve (56) of airbag (B) opens and the air contained therein is discharged, whilst arm (A) is supplied with compressed air through (58) so that its airbag is filled with air and covers the interior spaces within the Arm thereby displacing the water contained therein.

[0023] Because of the force of buoyancy, arm (A) rises

towards the surface of water and it exerts pressure through ring (2) and beams (6,55) (1,3) onto the push-rods of the pistons of the four hydraulic cylinders (7,50) with which it is being connected, whilst at the same time arm (B) moves downwardly towards the bottom dead-centre thereby adding in its downward movement the force of its weight in the upward rising movement of (A). The same takes effect also for all arms (A, B - C, D) of the system, i.e. the active upward rising movement of the arms is not encumbered with their own weight because the other arms part of the same body are moving downwardly. A and B being incorporated in the same ring and C and D incorporated in another ring and onto the same shaft, (A) moving upwardly whilst (B) moves downwardly, while at the same time the two arms of the other lever in the other ring also move upwardly and downwardly, but at a different position. This offers the system economy of energy, i.e. less compressed air from the compressor. The same happens with all levers provided in the structure, always in pairs, no matter how many same levers are provided as long as they are provided in pairs of two levers.

[0024] When (A) reaches the surface, following an electronic signal, the valve of air discharge (54) opens and, on the basis of the Principle of Archimedes, because of the pressure being exerted onto the airbag by the surrounding water, it empties (it deflates) very rapidly (56), the buoyancy force ceases being exerted thereupon and, by means of the force of the upwardly rising arm (B) but also its own weight, it moves downwardly at the seabed whilst the valve closes by itself with the aid of a small resilient spring force it is fixedly secured therein.

[0025] Whilst rising upwardly towards the surface, arm (B) exerts pressure onto its own four push-rods of the pistons of the cylinders, thereby driving their content oil under pressure in the circuit.

[0026] The filling with compressed air of the airbag of this arm that is located at the bottom dead-centre takes place within fractions of a second following the emission of the signal for emptying the airbag of the other arm of the same lever that is located at the top dead-centre.

[0027] The signal for the entry - discharge of air from the airbags of the arms is implemented by means of signals activated by the arm itself through contacts provided at the rotating end of its ring, such contacts collaborating with sensors located at the fixed portion that supports the shaft and the system in two periods and which are adjustable.

2. A metallic pipe of high strength (28) is connected at the centre of the oval bottom end of each hydraulic cylinder, such pipe leading at the inlet of a collector (17) wherein are being assembled all the outlets of the cylinders of each system, eight cylinders in this particular system. A metallic pipe (1) having a diameter at least twice as large as that of the other is connected at the side and onto the cylindrical surface also of the bottom end, such metallic pipe being

equipped with a check valve that allows flow only towards the interior of the cylinder. This pipe is connected with the low pressure central pipe (12) that is located at a position parallel to the central shaft (57) of the system and underneath the same. In this pipe (12) are being connected all cylinders of the System and it ends at the reservoir of oil (34) that is located at a certain height such that the oil might have a hydrostatic pressure.

3. All high pressure pipes of the engine and from all collectors (two in the present system) converge at the portion prior to the entry of the motor/motors into a specially configured distributor (37) whereby via a special regulator of the continuous and constant discharge pressure of the oil, supply of the one or more motors (38, 46) of the system takes place.

4. Each motor is provided with a torque providing shaft (45) that incorporates a motion transmission system (39, 44). More than one motors can be connected.

[0028] This system or even a converter transfers the motion to H/V (40, 43) and we thereby have the required continuous energy supply.

The circle of operation of the engine.

[0029] 1st Stroke

[0030] The four arms of the engine (A, B, and C, D) are in balance and in position of the two levers (L L, or X X) with the airbags empty.

[0031] The compressors of the installation are initiated, the pressure of the air in the airbags rises at 7-8 bar and the start-off switch is opened.

1. The bag of arm (A) is supplied with compressed air and it rises upwardly towards the top dead-centre, while (B) is empty and moves downwardly towards the bottom dead-centre being drifted by (A). The beams (1 and 3) exert pressure on the pistons of their four cylinders and the flow of oil under pressure towards the motor or motors of the engine starts via the collector that receives the oil under pressure and closes the passage when the pressure from the four cylinders stops.

[0032] The corresponding pistons of beams (2, 4) move upwardly and fill their cylinders with oil of low pressure in the interior of their cylinders. The oil under the pressure from the Collector goes to the distributor and it is distributed in those motors which are connected and its return there from is driven at the oil reservoir (34).

[0033] The motors rotate and through their shafts (feather keys) initiate rotation of their motion transmission system and the latter rotates the one or more generator units connected thereupon.

2. When (A) reaches the top dead-centre of its rising stroke, the bag of arm (C) is being supplied with air and begins to rise thereby exerting pressure onto its own pistons via beams (5, 7), whilst the second Collector receives the oil and it functions in the same way as the first, sending the oil under pressure to the distributor, whilst arm (D) empty of air moves downwardly and the pistons of beams (6, 8) move upwardly and their cylinders are filled with oil.

2nd Stroke

[0034]

1. Arm (A) at the top dead-centre via its contact gives a command and the valve of discharge of air from its bag opens, whilst with a second signal the bag of (B) is being filled.

2. (B) starts moving upwardly and (A) downwardly, thereby respectively moving their beams by means of the pistons, etc.

3. Arm (C) reaches the top dead-centre, gives a command via its contact to the valve of its bag to empty and thereafter fill its bag (D). At the same time (A and B) are found at the middle of their stroke, (A) moving downwardly and (B) upwardly. (D) begins rising and (C) descending.

[0035] Thus the operation is continuous and the engine works on its own until the employee interrupts the supply of air from the airbag(s) of the air compressor(s) and thereby stops the operation of the system for maintenance, etc.

[0036] The value of pressure can be increased or decreased by means of regulators, as well as with the quantity of water that will be displaced by the volume of compressed air that will be provided during each stroke of the valve from the airbag of the compressor that is being controlled electronically, but also from the initial structure of the bag that can be replaced.

Explanation of Drawing 1, 2, 3, 4, 5)

Figure 1

[0037]

- 1) Pipes supplying the cylinders with oil of low pressure.
- 2) The ring of supporting the system of Lever.
- 3) The spherical concave portion of the arms.
- 4) Supports of the pipes of transfer of compressed air.
- 5) The cast steel laminates for mounting the slides and rods of the cylinders.
- 6) The beams also serving as the small arms of the

levers.

7) The hydraulic cylinders, in pairs of two for each beam.

8) One of the supports of the shaft and the lateral wall.

9) The point of fixedly mounting of the basement supporting the shaft.

10) Lubricator of slides.

11) The central pipe of supply of the cylinders.

13) The pipes supplying compressed air to the airbags.

14) The central pipe for the transfer of oil under pressure from the two collectors to the distributor.

15) Lubricator of the shaft.

16) Nerve of mounting of beams onto the ring.

17) One of the two Collectors.

18) The connection of the pipes of high pressure from the eight cylinders of the first lever to the collector.

19) The connection of the airbag with the pipe of supply of compressed air.

20) The airbag of arm (A).

21) The valve of discharge of compressed air from the airbag of (A).

22) Metal sheets supporting the pipes of compressed air.

23) The nerves of reinforcement of arm (A).

24) The intermediary lateral wall.

(1, 2, 3, 4-5, 6, 7, 8) the eight beams of the engine.

(HP) High Pressure.

(LP) Low Pressure.

Figure 2

[0038]

31) The compressor with airbags.

32) The central control panel of the engine.

33) The passage - management of compressed air.

34) The reservoir of oil.

35) The pipe of transfer of oils returned from the motors.

36) The pipe of high pressure of supply of the distributor.

37) Distributer.

38) Three motors connected in the circuit.

39) Three motion transmission systems.

40) Three generator units.

41) Conductors receiving and transferring Electric Current.

42) Electric sockets.

Figure 3

[0039]

43) Generator units.

44) Gearbox or motion transmission system.

- 45) Feather key at the torque providing shaft that initiates rotation of the motor.
- 46) Motor.
- 47) Distributor.

Figure 4

[0040]

- 48) The exterior wall of the reservoir.
- 49) The lateral wall.
- 50) One of the 16 hydraulic cylinders.
- 51) Reinforcement of the beams.
- 52) Reinforcement of the arms.
- 53) The central wall.
- 54) The valve of discharge of air from the airbag.
- 55) Exterior wall of the reservoir.

Figure 5

[0041]

- 56) The airbag empty of air.
- 57) The shaft and the centre of articulation of the levers.
- 58) The airbag full of air.
- 59) The valve of discharge of air.
- 60) The level of water.

Claims

1. **New engine for the production of energy** constituting the essential means for the application of the method for the production of energy for any use without the exploitation of any source of actual energy or of combustion, **characterized by** a pair of levers in the form of "X", (A, B) (C, D) and (1, 2, 3, 4-5, 6, 7, 8) (57) fixedly mounted onto a constructed housing (48, 49, 53, 55) that is a wall within the water of a reservoir or a coastal or lakeside structure or even a floating platform or whatever is possible for the operation of this group, wherein the large lever arms (A, B-C, D) in the shape of an open "L" function in pairs (AB)-(CD), each member of the pair required by the engine in order to be complete being manufactured from stainless pipes arranged so as to form a frame with gaps throughout the length of the arms whilst a spherical slot is formed at their ends, an airbag (56,58,59) being mounted within this slot, said airbag being durable and provided with a valve (54,59,21) for discharge at the superior point of the sphere on a plastic base.
The airbag (56) and the pipe of supply of compressed air to the airbag (19, 58) are also supported at approximately the middle of the arm on a base of the same kind.
At the centre of articulation and support of each lever

(57) where the two arms are connected, one consecutive to the other, they are supported on a ring (2) of large length, said ring being mounted onto a shaft (57) that is lubricated (15).

5

The shaft (57) of the pair is fixed along the wall.

The two arms (A, B - C, D) of each lever move in the mode of a pendulum, i.e. alternately up and down, supported by the articulation (57) of the shaft, with their ring (2) being rotated along an arc and their spherical ends (3) with a portion of the arms covered by the airbag (56, 58) being always under the surface of the water (60). When the spherical end (3) is at the bottom, the airbag (56, 58) is filled with compressed air, thereby displacing the water that surrounds the same, whilst the other airbag is emptied. Then, the force of buoyancy of the water acts onto the airbag (56) and accordingly onto the submerged arm and lifts the arm to the surface, consequently moving downwardly the other arm incorporated therewith, whose airbag (56) is empty of air. Simultaneously, the second member of the pair performs the same movements, but at different time so as to ensure that the hydraulic circuit is constantly under pressure. A pair of beams (1, 2, 3, 4-5, 6, 7, 8), (6) for each arm is incorporated onto the ring (2) on either side of each lever, so as to form an "X" with the oblong spherical ends. (Two "Y's" in "X"-forming arrangement).

10

15

20

25

30

A connecting mechanism (slides) is provided at the end of each beam, such mechanism being articulated with the rods of the pistons of two hydraulic cylinders (5,7,50,55) which exert pressure on a mineral oil circulating in a hydraulic circuit, whereby the force of buoyancy is transferred in the form of fluid pressure to hydraulic motors (38,46) which convert the same into torque acting on a shaft.

35

40

By means of one of the known motion transmission systems (39, 44), the rotational force (45) is transferred to generator units or to any other energy receiving mechanism available in the structure.

45

50

55

2. **New method for the production of energy** based on Pascal's Principle and in combination with Archimedes' Principle and other laws of Physics such as the lever, the flow of liquids, the incompressible nature of the same, the transfer of forces, Bernoulli's law, etc. in order to achieve quantities of Energy with the interposition of presently known hydraulic, mechanical and electric systems, **characterized by** at least one pair of two double levers in the form of "X", wherein each portion moves along an arc in the mode of a pendulum, the portions being articulated at the point of intersection of the X's lines (57) on a steel ring and articulated to a shaft via this ring (2). Their movement is created by compressed air that is supplied to airbags (56) at the ends of the interior of arms, (A, B-C, D) when they are situated at the bottom of the water within which they function.

With the force of buoyancy they rise to the surface of the water and thereby also drag the other parts of the device connected with them.

When one member (A, B-C, D) of the lever rises to the superior point of its stroke, it empties the air from the airbag (56) and via a compressor (31) the airbag (58) of the other member (A, B-C, D) of the lever is filled. The latter member also moves upwardly whilst the former moves downwardly.

Whilst moving upwardly, the arms (members) with the ends of the four incorporated small arms of their lever, which comprise the beams (1 to 8) and because of the articulation (57) two of them move downwardly while the other two move upwardly, compressing mineral oil in a hydraulic circuit during their downward motion via the rods of the pistons of hydraulic cylinders (7, 50) with which they are connected (55) and the oil acquires a pressure which it transfers via pipes and other accessories to hydraulic motors (38, 46) of a large flow rate that convert it into torque acting on a shaft and output the same from the shaft in the form of a rotational force. This force is used accordingly via a motion transmission system (39, 45, 44).

3. The new engine according to claim 1, **characterized by** its form of open "X" and the operation thereof and the balanced distribution of its weight so that the force that it provides after deducting any friction is a net force, because during the upward movement the weight of the arm is balanced by the weight of the other arm (A, B-C, D) that is connected with it and moves downwardly. This means less quantity of compressed air in the airbags and consequently a higher output of the engine.
4. The new engine according to claim 1, **characterized by** the capacity of adjustment of force of the pressure that it provides to the circuit whilst the flow in each cycle of operation is constant. This is implemented by increasing or decreasing the volume of the compressed air provided to the airbags (56) of the arms or by increasing or decreasing the structural concave portion in the interior of the arms (A, B-C, D) and correspondingly increasing or decreasing the size of the bags (56).
5. The new engine according to claims 1 and 2, **characterized by** the fact that starting thereof requires the assistance of an exterior source of compressed air and of electric current and thereafter it functions on its own, the energy produced thereby exceeding the energy required for the starting and operation thereof, thereby overcoming the Natural Principle of the Conservation of Energy.
6. The new method for the production of energy according to claim 2, **characterized by** the fact that it

has no limit in the production of energy since it functions with the same water without necessitating replacement thereof, besides the replenishment of the reservoir because of evaporation or because of renewal. This allows the installation of many engines in one or more reservoirs in the same place or even individually.

7. Use of the new engine and method for the production of energy by means of buoyancy according to Claims 1, 2, 3, 4, 5, 6 in all installations where electric current or energy in general is needed, starting from a small country house up to an entire Country, as long as there is a power distribution network available or a new one is made, or in any other application wherein it can be adapted.

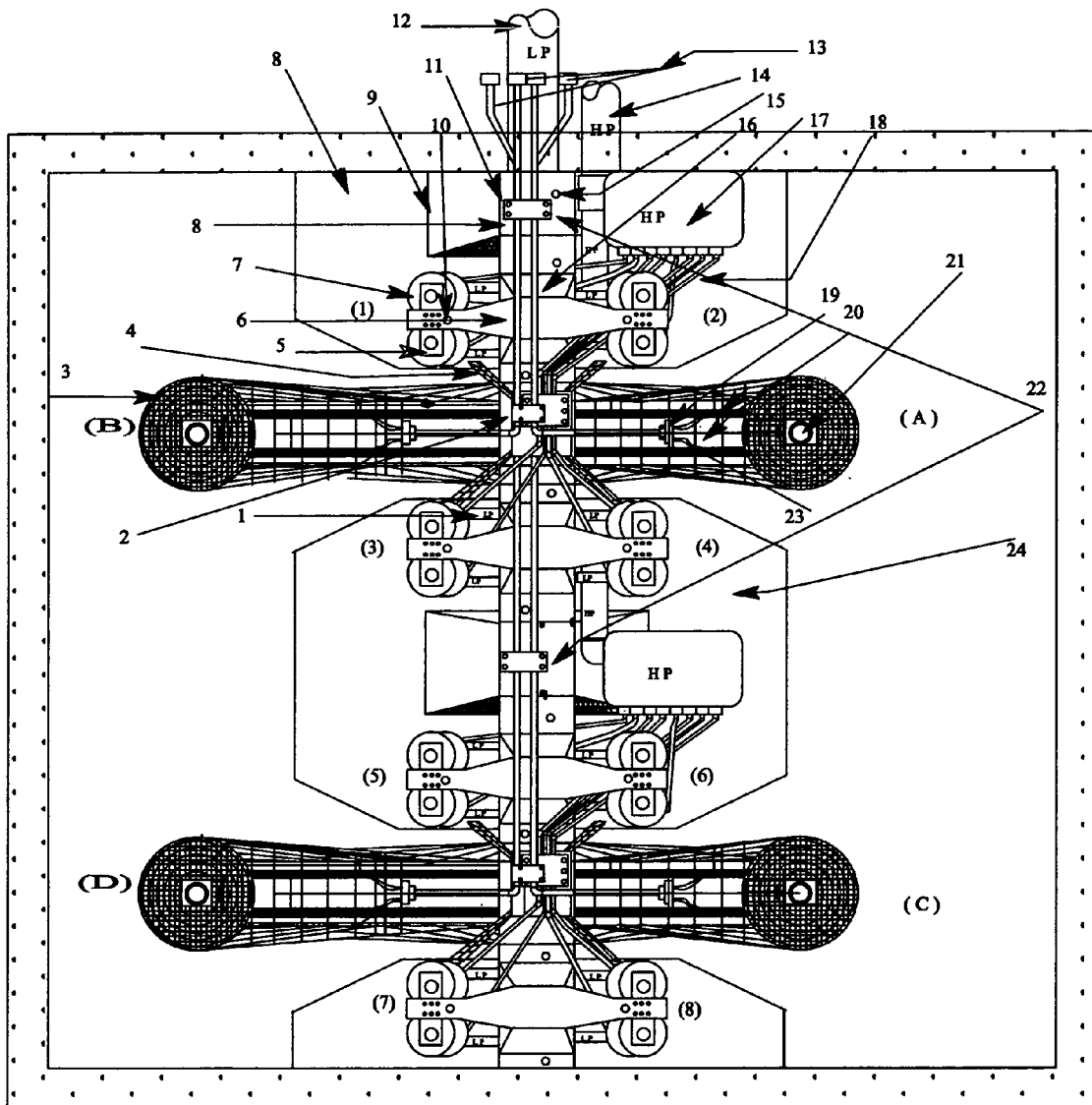


Figure 1

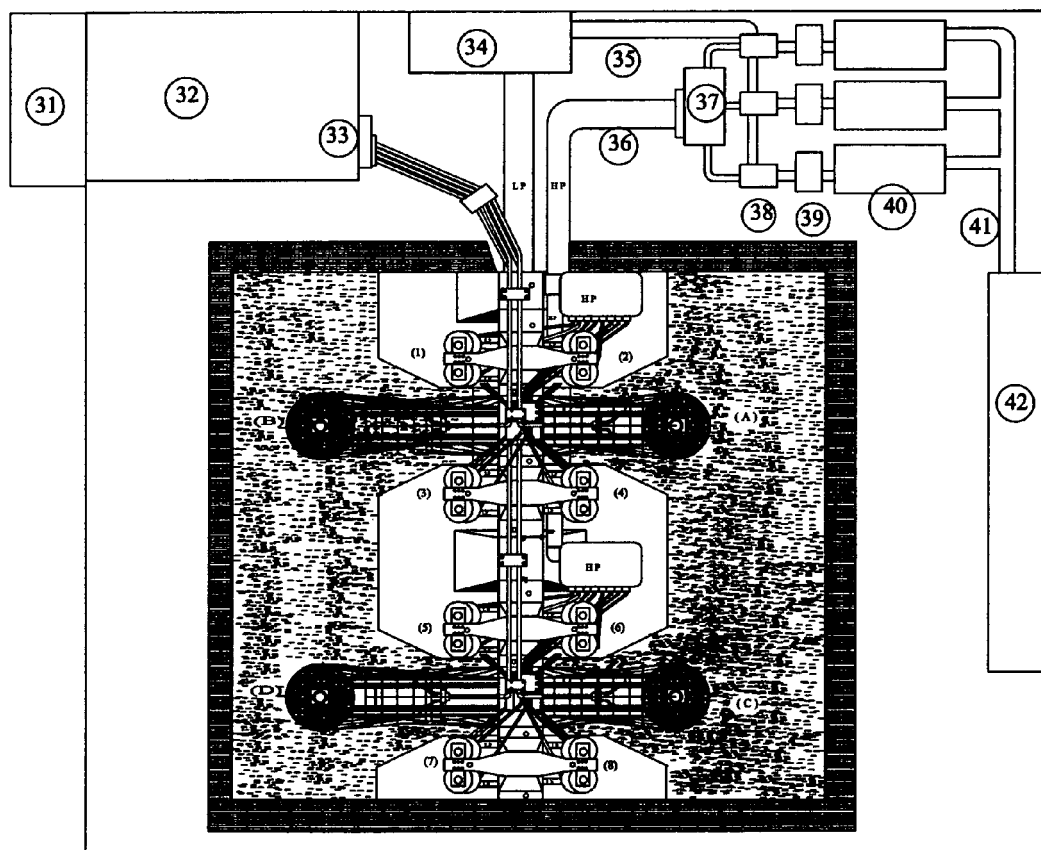


Figure 2

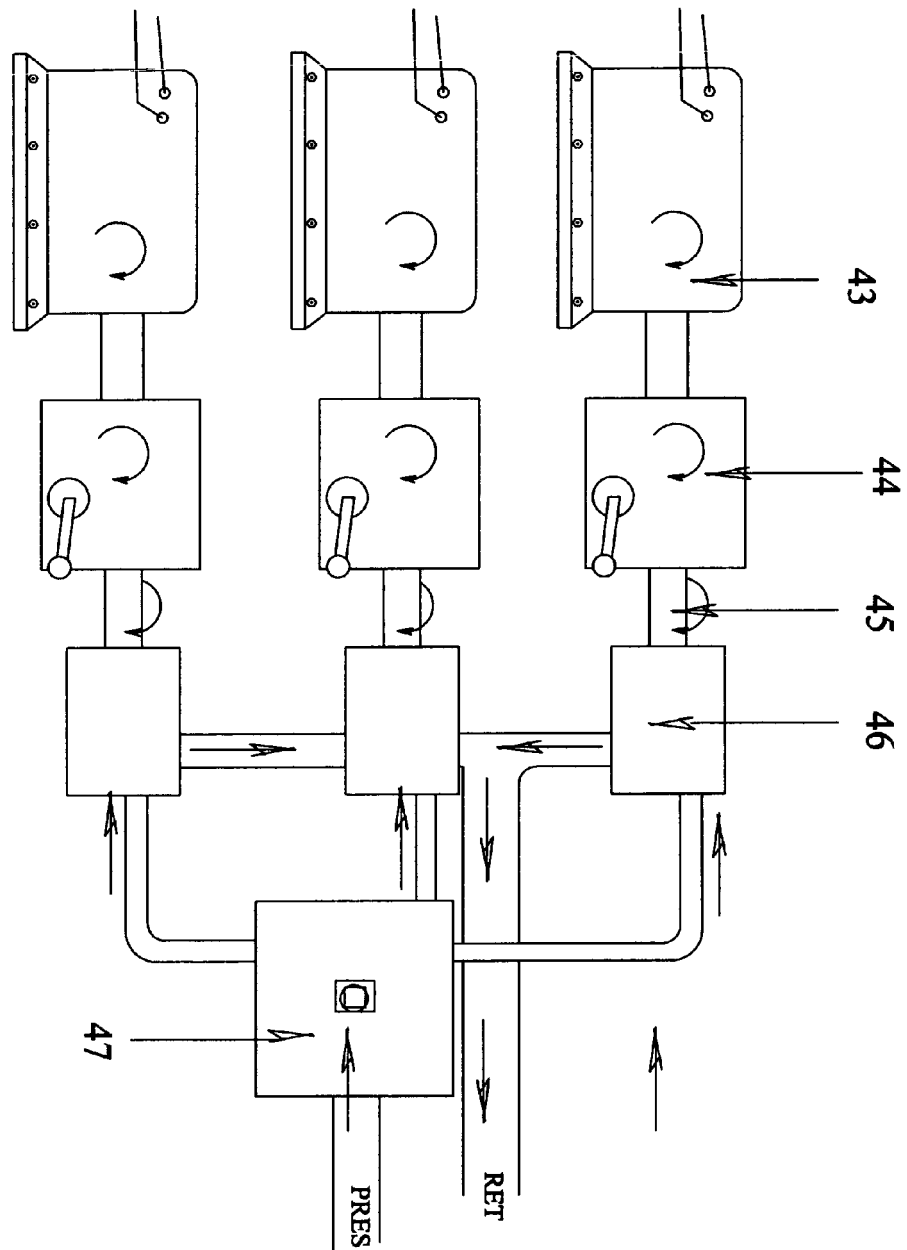


Figure 3

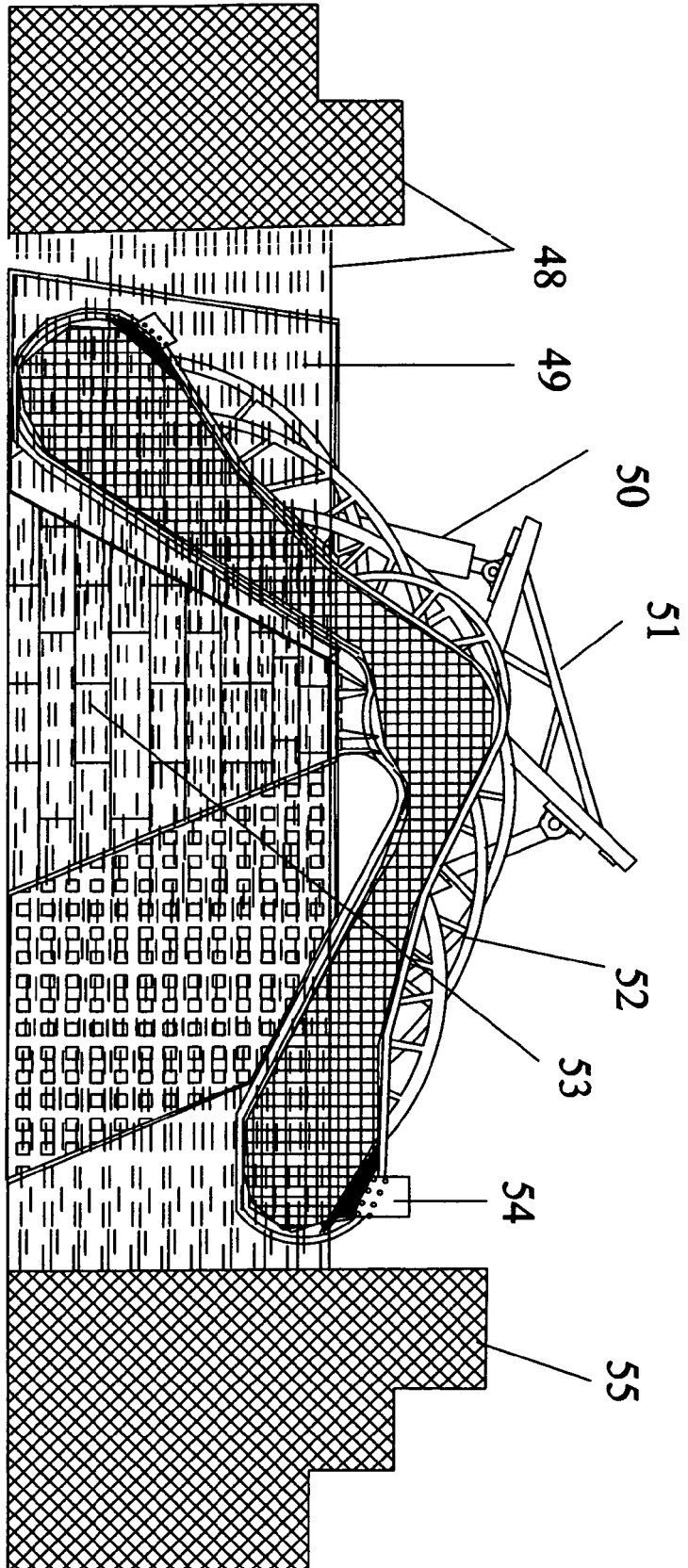


Figure 4

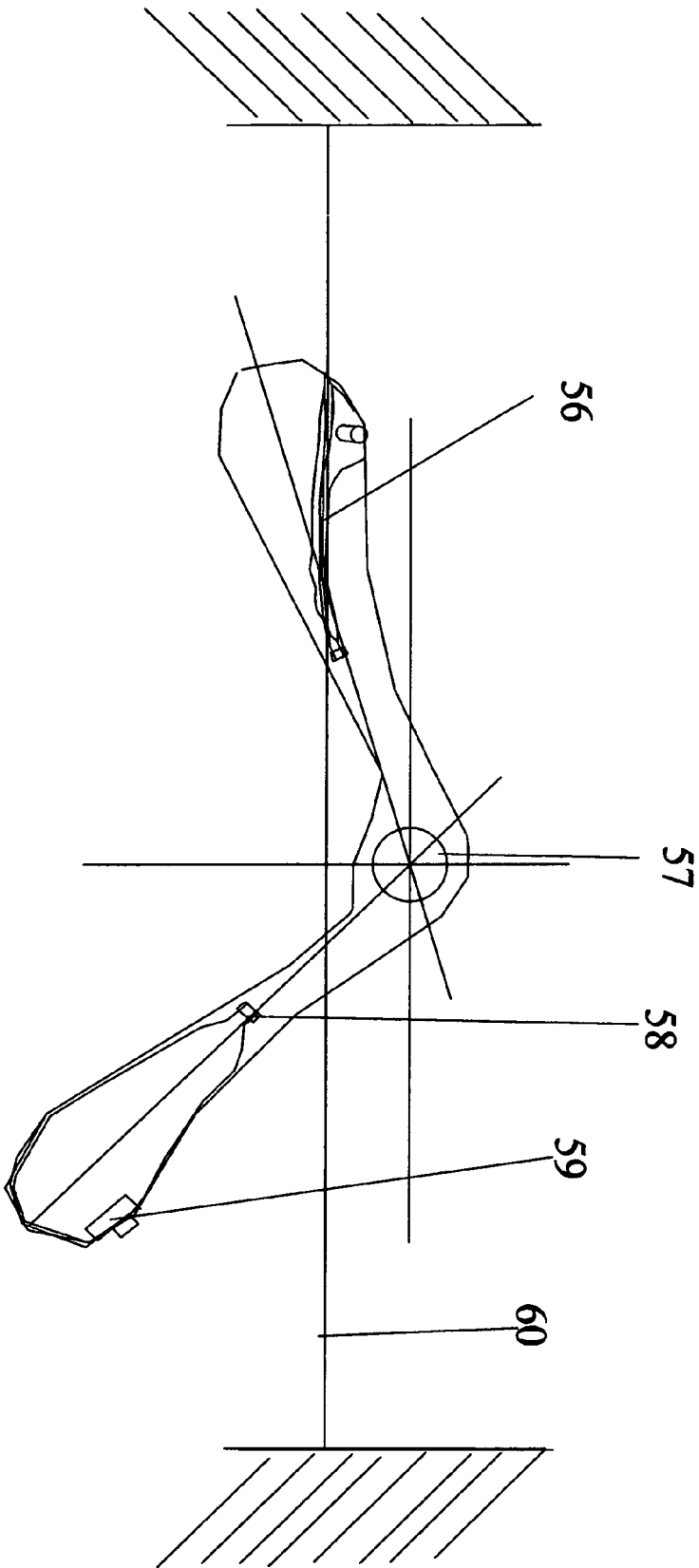


Figure 5