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(54) **Title**: METHODS OF RECEIVING ENERGY FROM ROPES OF BIG HANG-GLIDERS OR KITES AND A WIND POWER PLANT USING THIS METHOD

(57) **Abstract**: The subject of invention is a method of receiving energy from preferably synthetic ropes to which are fastened hang-gliders and kites with large surfaces, which, rising alternately, drive electrical generators, and a wind power plant. What is characteristic of them is the fact that in order to receive energy from a preferably synthetic rope, poly-groove wheels, which work with one-way clutches (2), are made of light alloy and are assembled in pairs, are used. When the spinning speed of poly-grove wheels exceed synchronous speed and one of those wheels is shifted circularly from the other with a 1/2 width of a one groove, one-way clutches will automatically interconnect a rope with generators that have two-sided shafts, or with the other reception of energy start hang- gliders or kites alternately. A method of receiving energy from ropes of hang-gliders and kites is used in wind power plants, which are fitted with a rope on which endings are placed those hang-gliders and kites, which perform cyclical movement alternately. What is characteristic of them is the fact that in order to receive energy from a preferably synthetic rope, poly groove wheels (4), which power directly hydrostatic valve pumps (15), are used. Thanks to an accumulator of hydraulic energy and a proper transmission ratio of a hydrostatic transmission, one or two multiple, small piston hydrostatic engines and indirectly high-gear generators with a one-sided shaft are powered.

DESCRIPTION

METHODS OF RECEIVING ENERGY FROM ROPES OF BIG HANG-GLIDERS OR KITES AND A WIND POWER PLANT USING THIS METHOD.

The subject of invention is a method of receiving energy from preferably synthetic ropes to which are fastened hang-gliders and kites with large surfaces, which, rising alternately, drive electrical generators, and also a wind power plant driven by hang-gliders or kites using such method.

Wind is a clean and inexhaustible source of energy. In recent years there has been a ripple development of conventional wind turbines. Since typical windmills are placed on high heavy towers, they are limited by a relatively low range of wings, a large weight of the structure and, as a result, high investment cost. Development of conventional wind turbines, however, is close to the technological barriers, as the height of built structures is limited.

It is known that throughout Europe and in Poland the optimal wind height is the area 200 meters above the ground up to 10,000 meters and higher. Wind speed at the altitude of 200 meters is about two times, and at the altitude of 10,000 meters about five times greater than at the altitude of 5 meters in the ground-level zone. Since wind power increases with the cube of wind speed so wind energy calculated per square meter of area at those heights rises about 8 to 125 times in relation to the wind power at the ground level.

At high altitudes wind is steady, blows without interruption, although there is stillness by the ground.

There has been a rapid development of hang-gliding. Currently, there are available modern constructions of air wings and kites in different sizes showing high strength, load capacity, durability and ease of control. Technologies of producing synthetic ropes have also been developed. A leading product on the market is ropes of the company known as „Dyneema". Those ropes have a specific gravity which is eight time lower than those steel ones and with the similar section- durability for scarifying, resistance to multiple overloading and bending.

It is well-known that there are a lot of devices with a huge power working together with steel and synthetic ropes. A good example of usage of poly-groove wheels, which transfer a drive by mean of ropes, is an express, passenger and goods lifts (a drive and

braking). A drive wheel has several grooves due to the fact that one groove would not ensure an appropriate frictional contact of a rope with a wheel.

On this website (http://www.lr.tudelft.nl/live/pagina.jsp?id=fe263f84-29af-4010-82222f1112c8f223&lang=en&binary=/doc/Design%20and%20construction%20of%20the%204%20kW%20Laddermill%20groundstation_bas.pdf) there are results of research carried out by University of Delft in Holland on power plants prototypes powered by kites with oscillatory, up and down movement. In those researches a rope powered a generator by means of stretching machine, and from the moment a kite reaches an upper ceiling, a generator started to work as an engine that was taking down a kite parallel to a change in angle of incidence of a kite. During those researches it comes that there are technical problems with rolling a rope up. Different capstans were tested due to the fact that ropes in those capstans were rolled in several coils. On those coils capstans slide and rub against each other, which negatively influence on durability of ropes making this solution inappropriate. Rolling a rope up on a drum was also tested. It turned out that the mechanism arranging ropes is unreliable for the reason that ropes in uncontrolled way get stretched and change their thickness. When too much coils are rolled up on a drum, the system lose its synchronism and ropes crosses which has a great influence on reducing durability of those ropes. A negative point of this way of obtaining energy is the fact that during taking a kite down, a generator works for a long time as an engine. It not provides proper quality, continuity of energy production and negatively influence on a general efficiency of such a power station.

From an application for a patent US6555931 is known a way of receiving energy from two kites and parachutes that are put on both endings of ropes powering a generator, a pomp or the other mechanical device. In one of the execution example, energy is received through the capstans- stretching machine. When a rope of one kite is rolled up, the rope of the other kites is simultaneously reeled of the capstan with a large diameter. A drawback of that solution is that ropes have a low durability for the reason that overloaded ropes during their work rub against each other.

Taking into account a great number of former attempts to build a wind power plant powered by kites, it should be stated that no one has found an efficient and durable in exploitation way of receiving energy from highly overloaded synthetic ropes.

A method of receiving energy from ropes of hang-gliders or kites, used in wind power plants fitted with a rope to the ends of which those hang-gliders or kites are

fastened, which hang-gliders or kites perform alternately cyclic ascendant movements according to the invention is now proposed. What is characteristic of the method is the fact that in order to receive energy from a preferably synthetic rope, poly-groove wheels, which work with one-way clutches, are made of light alloy and are assembled in pairs, are used. When the spinning speed of poly-grove wheels exceed synchronous speed and one of those wheels is shifted circularly from the other with a 1/2 width of a one groove, one-way clutches will automatically interconnect a rope with generators that have two-sided shafts, or with the other reception of energy start hang-gliders or kites alternately.

A method of receiving energy from ropes of hang-gliders and kites is used in wind power plants, which are fitted with a rope on which endings are placed those hang-gliders and kites, which perform cyclical movement alternately. What is characteristic of them is the fact that in order to receive energy from a preferably synthetic rope, poly groove wheels, which power directly hydrostatic valve pumps, are used. Thanks to an accumulator of hydraulic energy and a proper transmission ratio of a hydrostatic transmission, one or two multiple, small piston hydrostatic engines and indirectly high-gear generators with a one-sided shaft are powered.

The way of receiving energy from ropes of wind power plants powered by hang-gliders or kites in which a ropes is closed by a loop and those hang-gliders and kites, which perform cyclical movement alternately. What is characteristic about it is the fact that in order to receive energy from a preferably synthetic rope, poly groove wheels, which power directly generators with one-sided shafts, are used. Units of poly groove wheels that are made of light alloys and which work with one-way clutches are placed under kites and power ropes. While two or more wings of kites work cyclically up and down in specified zones on the length of a rope, a driving units that interconnect with a rope when a kite descends couple together with ropes and pull ropes alternately. When they reach a high ceiling of their zone, a radio controlling system through servomotors change an angle of incidence of the wing, the pulling moment disappears, and a clutch disconnects a drive from a rope. After that the whole falls under the weight of the unit in the same time taking a kite from one to the other, to which a control impulse was sent by radio. Such a wind power plant in order to work stably requires additional kite or balloon that determines by means of appropriate roller position of the rope in the upper location.

What characterises a method of receiving energy from ropes of wind power plants powered by hang-gliders or kites as explained above is the fact that wind power plant has a

unit of rollers that are placed to each other on specified distance in bearings with large diameters. Kites that follow the path of the wind are placed on endings of ropes in bearing handgrips that enable free untying of a rope. Kites that are placed to a central unit of servo-motor or to a unit of servo-motors, which to an impulse that is radio beneficial, controls the angle of incidence and an inclination of kites' wings. They also create for a separated work of a wind power plant a stable, beneficial inclination of one kite toward left side and of the second one toward right side.

Besides, what is characteristic, is the fact that by means of contactor in stator of generators and in the version with hydraulic transmission and electric valve, it is possible to disconnect one of generators in periods when the wind is not strong. When it occurs, a rotor of a disconnected generator spins as a flywheel and has all the time synchronous speed, while a generator without the need of synchronization at any time can be started to work with.

The wind power plant according to the present invention as explained in details further below, is fitted with a rope on which endings are placed hang-gliders and kites. What is characteristic is the fact that with a preferably synthetic rope works a unit of devices such as wings of hang-gliders or kites placed by means of electronically controlled servo-motors on both sides of a rope. In this solution, thanks to roller units that are optimally distant from each other and put themselves automatically to the direction of wind, a huge masses e.g. of generators can stand motionless. After that two units of poly-groove wheels around which a rope is wrapped in such a way that pairs spins to each other conversely change a direction correspondingly to the ascending of kites, and thanks to one-way clutches they are interconnected with two generator that are asynchronous, which is made of units of guiding wheels and of a triple take-up reel.

The wind power plant according to one specific embodiment of the present invention has a units of poly-groove wheels that receive energy from rope and are directly interconnected with two hydrostatic, valve pumps, which during a low wind power together with a one high-speed asynchronous generator, and during a strong wind powers with two, it occurs by means of multiple, small- piston hydrostatic engines, electric valve that disconnects one of hydrostatic engines, hydraulic accumulator that provides smooth work of wind power plant, oil tank, filters and safety valve.

The wind power plant according to another embodiment of the present invention has a rope closed by a loop, there is a unit of poly-groove wheels that powers directly

asynchronous generators, and several units of poly-groove wheels placed under kites, which have their own preferably incorporated one-way clutches, which cyclically interconnect kites with a rope, and the whole is floated by means of additional kite or a balloon with a roller, keeping a rope on a optimal height.

The wind power plant according to another embodiment has a system of chassis of a lorry with two driving axles in which axes are blocked permanently, as a result to hubs are assembled poly-groove wheels in pairs spinning in different directions, while a one-way clutches through axles with a beneficial transmission ratio 6:1 powers a high-speed asynchronous generators, while a flywheel ensures that a wind power plant works smoothly.

The wind power plant according to another embodiment of the present invention, is characterized in that to a drive of wind power plant is used one large wing of hang-glider or kite, and with a rope that is preferably synthetic work units of poly-groove wheels and pairs of one-way clutches, which alternately interconnect with a rope and power asynchronous generators, but with a rope also works a unit of independent multiple rollers, and because one ending of a rope is blocked in a rolling drum, while a winding in two directions rope cause a cyclical increase of ballast and accumulation of half of energy that provided from a floating kite, whereas during falling of a kite, there is a return of cumulated energy.

The present new solution of receiving energy from highly overloaded synthetic ropes, according to the invention, solves all previous problems, while a wind power plant powered by kites' wings ensures long-lasting and efficient production of energy. It also works as a drive of different mechanical units such as pumps that use energy of wind from formerly unobtainable high altitudes.

Thanks to the work of kites' wings at a altitude of strong winds, it is possible to obtain masses of energy with a low financial outlay – due to its simple and light elements of a power plant. A wind power plant can be easily relocated, cover a small surface area and be a mobile device.

The wings of kites that are moving high are not visible from the ground. Due to the fact that during ascending and descending alternatively, kites works with not a great speed which is circa 5 m/sec, and they do not produce noise heard on the ground and they do not pose any danger for birds.

The present invention will be explained in details with reference to the accompanying drawings in which Fig. 1 illustrates operation of a wind power plant according to the first embodiment of the present invention and Figs. 2 to 5 illustrate operation of further embodiments of the invention.

As it results from the above description the essence of invention is the equipment of a wind power plant that is powered by kites' wings which work with synthetic ropes. This equipment consists of a unit of poly-groove wheels **4** made of light alloy which works with one-way clutches **2** and through them they power generators or directly multiple small piston pumps of hydrostatic transmission, which also works in powering generators. Those units are made of a pair of poly-groove wheels that are distant from each other optimally, but one of them is axially shifted from the other with a 1/2 width of a one groove for a rope. For the reason that a rope is several times wrapped or winded around two wheels that work with each other, a rope has pitch of a one groove for the period of passing to the other wheel. It ensures systematic and separation of passing of a rope that strongly links with ropes of other large wheels and powers them.

For the reason that a generator unit together with accessories has a huge weight, it is obvious that coping with it in a direction of wind would unnecessary overload synthetic ropes. According to the present invention, in those solutions were used optimally distant from each other roller bearings **7** that put themselves automatically to the direction of wind and positions of kites. A shift of a rope is corrected by means of appropriately bearing and turned construction of kites on both endings of a rope.

In the solution of a wind power plant based on the embodiment of the present invention shown in Fig. 1, there is a system of two kites that work cyclically up and down. In the above-mentioned example we have double drive units on both sides of generators' shafts. They power generators alternately with the same direction of spinning that is of rope's movement. Every poly-groove wheel **4** works with a one-way clutch **2**. In this case rope works in two directions, because kites pull each other alternately. When a kite falls, a drive unit that works with a kite is idling. While a kite comes to a lower ceiling, a steering system **8** that is regulated by radio and sensor starts a servomotor **11** and change the angle of incidence of kite's wing **12**, thanks to which a kite starts to ascend. When an ascending kite will reach an appropriate speed and that speed of spinning of poly-groove wheels will exceed synchronous speed of asynchronous generators, one-way clutches **2** will start automatically and give a drive to generators. When wind is low, it is possible to disconnect

using contactor, one of generators. In that case one generator works with an optimal load and uses circa half of the normal reactive power consumption. A drum of a second generator winds with a synchronous speed is always ready to start without any necessary synchronization. Such a solution is financially beneficial because it reduces the reactive power consumption. When kites change their places in their cyclical, up and down movements, appears a temporal break in driving. A spinning masses of drums of generators along with appropriately selected covers of one-way clutches **3**, make a flywheel keeping the continuity of a drive that enables smooth production of energy. According to a patent wind power plants have an appropriate and double drum **9** on which if it necessary a rope is rolled up and is possible to take down a kite.

Fig. 2 depicts the other solution of a power station that is based on invention, in which there is a single drive unit which directly powers a valve pump **15**. The pump works with one or two poly-groove hydrostatic engines **16** and together with other pumps make a hydrostatic transmission. Valve pumps **15** works in two directions and thanks to hydraulic accumulator **17**, it enables smooth work of hydraulic engines **16** that powers high-speed generators **1**. When there is a low wind in the version with two generators, it is possible to disconnect one of generators by means of solenoid valve **19** and contactor in a stator.

Fig. 3 describes the other solution of a power station based on the invention. It is a wind power plant in which a drive rope **10** (synthetically beneficial) is closed by a loop, while a drive system of generators with a one-sided drum is simplified by skipping one-way clutches. Those clutches along with light units of poly-groove wheels are used as a placed under the kites **12** units **22** that powers directly a rope. While two or more wings of kites works cyclically up and down in specified areas on the length of a rope, poly- groove wheels, which are part of unit **22**, works together with one-way clutches and when a kite descends couple together with ropes **10** and pull ropes alternately. When they reach a high ceiling of their area, a radio controlling system change an angle of incidence of the wing, the pulling moment disappears, and a clutch disconnects a drive **22** from a rope. The whole falls under the weight of the unit in the same time taking a kite from one to the other, to which a control impulse was sent by radio. In such a scheme of a wind power plant works additional kite or balloon that determines by means of appropriate roller **23** position of the rope in the upper location.

Fig. 4 presents another solution of a wind power plant based on an invention that uses chassis of a lorry, which has two back axles **25**. All semi-axis have to be blocked. A

pair of poly-groove wheels **4** from the right and a pair from the left side that are made of light alloys spin to each other in different directions, cyclically changing a direction of spinning. One-way clutches **2** that automatically start whenever it is necessary to power generators **1** using an axle with a transmission ratio 6:1. A flywheel **24** keeps smooth production of energy during kites' reversals.

Fig. 5 depicts a solution of a wind power plant with a one, large kite. In this solution a pulley bock **13** is used to cumulate a temporal surfeit of energy in ballast **14**. During kites' reversals on low ceiling, this energy returns to a driving generator.

The working examples describe in details the wind power plant according to the invention, that is powered by kites' wings:

Example I. Fig. 1 illustrates a wind power plant based on an invention that is powered by two wings of kites **12**, which produces cyclical ascending an descending alternately, attempting to keep the highest ceiling (cycle = minimum 60 seconds, but when the ceiling is higher, time is longer). Kites are secured to both endings of ropes **10** that are synthetically beneficial. They are also controlled by a radio and have a smoothly regulated angle of incidence of wings using servomotors **11**. According to an invention a wind power plant has two placed to each other, independent systems that receive ropes **7**, which are built of two rolls placed eccentrically on a bearing with a large diameter, which automatically come after kites. A system of wind power plant has a wide range of guide rollers **6**, which precisely guide a rope to separate elements of system e.g. to joined poly-groove drums **4** that are place on bearings shaft **5**. At least one axis of guide roller **6** has a sensor **8**, when axis is loaded with a sequence moment. Electronically converted signals control the angle of incidence of kites' wings. According to an invention a wind power plant that uses a ways of receiving energy from ropes that are synthetically beneficial has two units of poly-groove wheels **4** which work with one-way clutches **2**, and which are placed on both sides of generators **1**. Generators that are preferably asynchronous and are slow-speed (circ.740 rotation/min) have double-sided drive shafts with which works one-way clutches **2**. Covers **3** of these clutches have carefully selected weight and together with rotors of generators make flywheels of driving system that keeps a steady flow of energy production in the moment of kites' reversals. Poly-groove wheels **4** are jointed together and one of them is shifted circularly from the other with a 1/2 width of a one groove. Kites **12** ascend and descend alternately through a unit of poly-groove wheels **4** and one-way clutches **2**, couple together with a rope and transfer a drive to generators **1**. When there is a

low wind, it is possible to disconnect one of generators by means of contactor in stator. The whole system is supplemented by a double drum **9** that enables taking kites down. It is said that during average wind that equals e.g. 7 m/s, an optimal speed of ascending of kites is circa 5 m/s, and the minimal acceptable diameter equals 140 mm.

Example II. A wind power plant that is shown in Fig. 2 is powered by two wings of kites that are placed on both sides of a rope and are controlled by servomotors **11**. A wind power plant is fitted with two independent systems that receive ropes **7**, a wide range of guide rollers **6**, sensor **8** and a one system of poly-groove wheels **4** which works with one-way clutches **2** and a drum that takes a kite down **9**. Poly-groove wheels **4** powers directly hydrostatic valve pumps **15** which works in two directions and by means of hydraulic accumulator **17** enabling smooth work of hydrostatic engines that power high-speed generators **1**. Multiple, small piston, hydrostatic transmissions are also fitted with a oil tank **18**, filters **20** and a safety valve. When there is a low wind, it is possible to disconnect one of generators using solenoid valve **19** and contactor in a stator.

Example III. In Fig. 3 we have a wind power plant based on the invention in which a synthetically beneficial driving rope **10** is closed by a loop. It is fitted with two independent systems that receive ropes **7,** a wide range of guide rollers **6,** sensor **8** and a drum that takes a kite down **9.** A driving system of generators **1** with a one-sided shaft consists of poly-groove wheels **4** is simplified system in a way that there is no one-way clutches. Those clutches along with light units of poly-groove wheels are used as a placed under the kites **12** units **22** that powers directly a synthetic rope **10**. While two or more wings of kites works cyclically up and down in specified areas on the length of a rope, a driving units **24** that interconnect with a rope when a kite descends couple together with ropes **10** and pull ropes alternately. When they reach a high ceiling of their area, a radio controlling system through servomotors **11** change an angle of incidence of the wing, the pulling moment disappears, and a clutch disconnects a drive from a rope. The whole falls under the weight of the unit in the same time taking a kite from one to the other, to which a control impulse was sent by radio. In such a scheme of a wind power plant works additional kite or balloon that determines by means of appropriate roller **23** position of the rope in the upper location.

Example IV. Fig. 4 presents a wind power plant based on the invention that is powered by means of ascending alternately kites' wings in which chassis of a lorry with two back axles, a transmission ratio 6:1 and an option to block all semi-axes is used.

While poly-groove wheels **4** that are made of light alloys are placed to a strongly bearings wheel hub on both sides of semi-axes, one-way clutches **2** are carefully assembled between wheel hubs and chassis to shafts. Thanks to a large transmission ratio of shafts 6:1, in this solution were used high-gear, nominal generators (2800 rotation/min.) and larger diameters of poly-groove wheels that equal circa 300 mm. Due to the fact that the length of girding ropes increased three times, it is recommended to use wheels with ten grooves in order to transmit through frictional way appropriate moments. Between generators of highly bearing of machines, there is a flywheel that stabilizes the work of a wind power plant.

Example V. Fig. 5 depicts a solution of a wind power plant with a one, large kite. By means of independent multiple rollers, excess of energy is cumulated in ballast. When a kite comes back to a low ceiling, energy is returned in order to power a generator. In this system a ballast has to be regulated correspondingly to a change of wind's strength.

CLAIMS

1. A method of receiving energy from ropes of big hang-gliders or kites, used in wind power plants fitted with a rope on the ends of which those hang-gliders or kites are fastened, which hang-gliders or kites perform alternately cyclic ascendant movements, **characterized in that** in order to receive energy from a preferably synthetic rope (10) units of poly-groove wheels (4) assembled in pairs and working with one-way clutches (2) are used, the poly-groove wheels being made of light alloys and one of the wheels being axially shifted with respect to the other one by a 1/2 width of a one groove; and when the spinning speed of poly-grove wheels exceeds synchronous speed the one-way clutches automatically interconnect the rope with generators having two-sided shafts or with other mechanical energy reception systems, alternately engaging the hang-gliders or kites.

2. A method of receiving energy from ropes of big hang-gliders or kites, used in wind power plants fitted with a rope on the ends of which those hang-gliders or kites are fastened, which hang-gliders or kites perform alternately cyclic ascendant movements, **characterized in that** in order to receive energy from a preferably synthetic rope (10), one unit of poly-groove wheels (4) is used, which unit powers directly hydrostatic valve pumps (15) and thanks to an accumulator of hydraulic energy (17), as well as due to a proper transmission ratio of said hydrostatic transmission (15) one or two multiple small piston hydrostatic engines (16) are smoothly driven and indirectly high-gear generators having one-sided shafts are powered.

3. A method of receiving energy from ropes of wind power plant driven by hang-gliders or kites, wherein the rope forms a closed loop and the hang-gliders or kites (12) also perform alternately cyclic ascendant movements, **characterized in that** in order to receive energy from the preferably synthetic rope (10) one unit of poly-groove wheels (4) is used, which unit powers directly generators (1) having one-sided shafts, and units of poly-groove wheels (22) made of light alloys and working with one-way clutches are placed under kites (12) and power the rope, wherein two or more wings of kites move cyclically up and down within fixed zones on the length of the rope and are interconnected

with the rope (10) when the kites ascend alternately pulling-up the rope, while when a pulling-up wing reaches the upper ceiling of its corresponding zone a radio control system changes an angle of incidence of said wing, a pulling-up moment disappears, the clutch disconnects a drive (22) from the rope and subsequently - under the gravity of the unit, the whole descends down until the next control impulse is sent by radio, and additional kite or balloon is required to determine and fix by means of appropriate roller (23) a position of the rope in the upper location in order to ensure stable operation of said wind power plant.

4. A method of receiving energy from ropes of wind power plant driven by hang-gliders or kites according to claim 1 or 2, **characterized in that** the wind power plants have units of rollers (7) placed in bearings of large diameters, the units being spaced on a specified distance from each other and the kites (12) that follow the path of the wind are fastened on the ends of the rope (10) in bearing holders that enable free untying of the rope, where said kites are joint to units comprising servo-motors or servo-motor (11), which in response to an impulse - sent preferably by radio, control(s) an angle of incidence and an inclination of wings of the kites, causing a stable and beneficial inclination of one kite toward left side and of the second kite toward right side in order to ensure operation of said wind power plant without collisions.

5. A method according to claim 1 or 2 or 3, **characterized in that** by means of contactors in stator of generators (1), and in the embodiment with hydraulic transmission additionally by means of electric valve (19), one of said generators may preferably be disconnected during periods of low speed of wind, wherein simultaneously a rotor of the disconnected generator spins as a flywheel and has all the time synchronous speed, so that the generator may start to work again at any time without any need of synchronization.

6. A wind power plant shown in Fig. 1, according to claim 1, fitted with a rope on the end of which hang-gliders or kites are fastened, **characterized in that** a preferably synthetic rope (10) works with a set of devices such as wings of hang-gliders or kites (12) fastened through electronically controlled servo-motors (11) to both ends of the rope, self-aligning roller units (7) spaced apart at a respective distance from each other, orienting themselves according to the direction of wind, allowing huge masses e.g. of generators remaining motionless, and furthermore two units of poly-groove wheels (4) around which the rope is winded in such a way that the wheels spin in pairs in directions opposite to each other and in correspondence to cyclic ascendant movement of the kites change their spin direction and thanks to one-way clutches (2) the wheels are interconnected in turns with

two generators – being preferably asynchronous generators; and the set of devices includes also a unit of guiding wheels (6) and a double reel for take-up of the rope.

7. A wind power plant according to claim 2 or 6, shown in Fig. 2, **characterized in that** said power plant has one unit of poly-groove wheels (4) that receive energy from rope (10) and are directly interconnected with two hydrostatic valve pumps (15), which during periods of low speed of wind jointly power one high-speed asynchronous generator, and when the speed of wind increases - power two generators, whereas it is accomplished through multiple small piston hydrostatic engines (16), electric valve (19) that disconnects one of said hydrostatic engines, hydraulic accumulator (17) that provides smooth work of said wind power plant, oil tank (18), filters (20) and safety valve (21).

8. A wind power plant according to claim 3, shown in Fig. 3, wherein a rope forms a closed loop, **characterized in that** said power plant has one unit of poly-groove wheels (4) that powers directly asynchronous generators (1), and several units of poly-groove wheels (22) placed under kites (12) which have their own preferably incorporated one-way clutches, which cyclically interconnect kites with the rope (10), and additional kite or balloon with a roller (23) is employed to float the whole up and keep the rope on an optimal altitude.

9. A wind power plant according to claim 1 or 6, shown in Fig. 4, **characterized in that** said power plant has a system of chassis of a lorry with two driving axles (25) in which axes are blocked permanently and in result of such arrangement poly-groove wheels (4) assembled to hubs spin in pairs in opposite directions, while one-way clutches (2) through axles preferably having transmission ratio 6:1, power high-speed asynchronous generators (1), while a flywheel (24) ensures smooth operation of said wind power plant.

10. A wind power plant according to claim 1 or 6, shown in Fig. 5, **characterized in that** said power plant is driven by one large wing of a hang-glider or kite, and the preferably synthetic rope (10) works with two units of poly-groove wheels (4) arranged in pairs with one-way clutches (2), which alternately interconnect with the rope and power asynchronous generators, wherein the rope works also with a unit of independent multiple rollers (13), and since one end of the rope is blocked in a rolling drum (9), the rope (10) winding in two directions causes cyclic raising of ballast (14) and accumulation of half of the energy that is provided from the floating kite, whereas during descendant movement of the kite, thus cumulated energy is recovered.

Fig 1

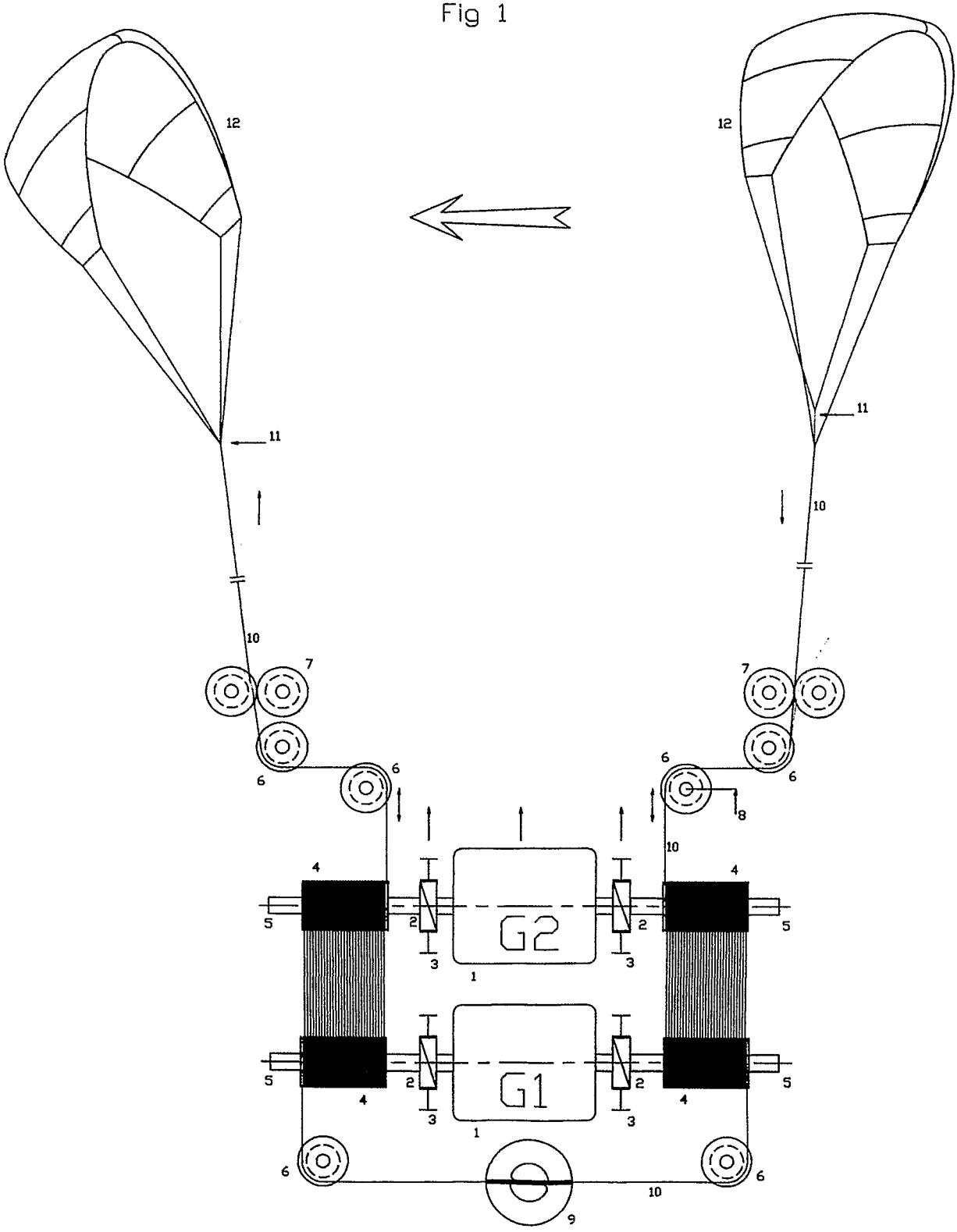

Fig 2

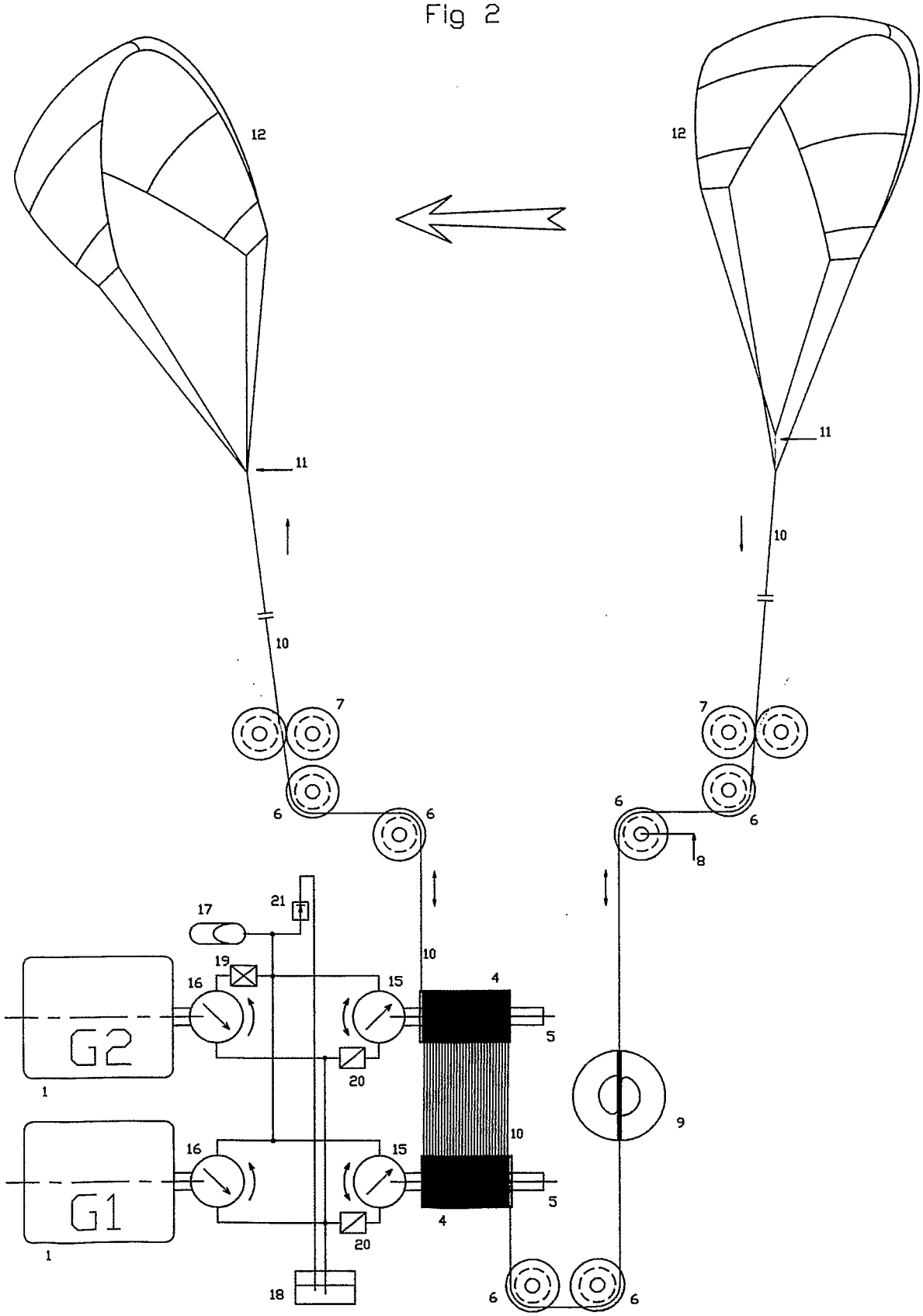
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Fig 3

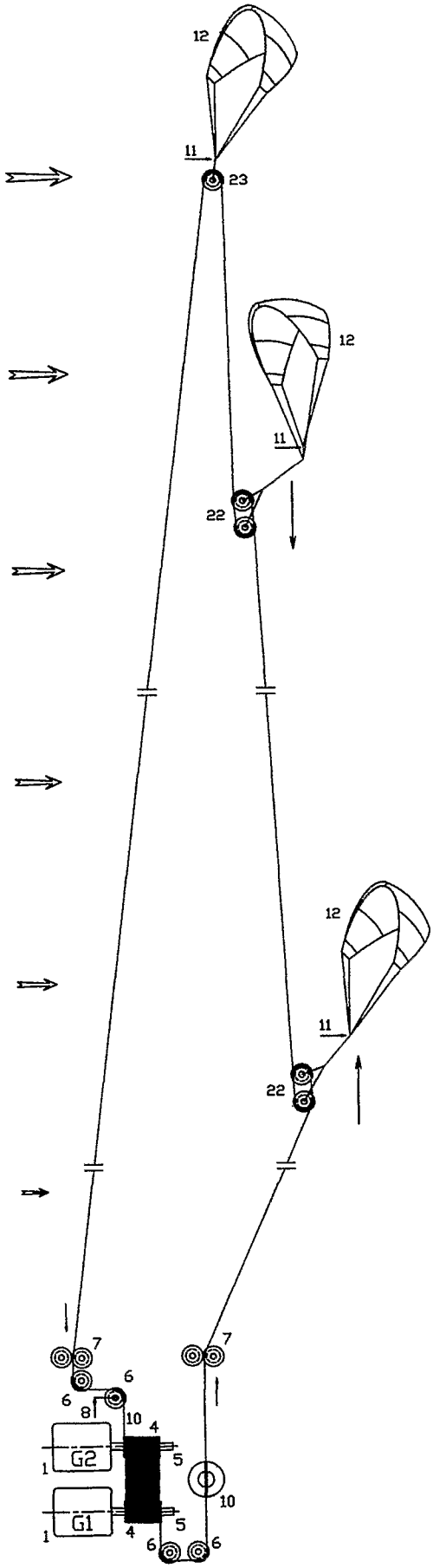

Fig. 4

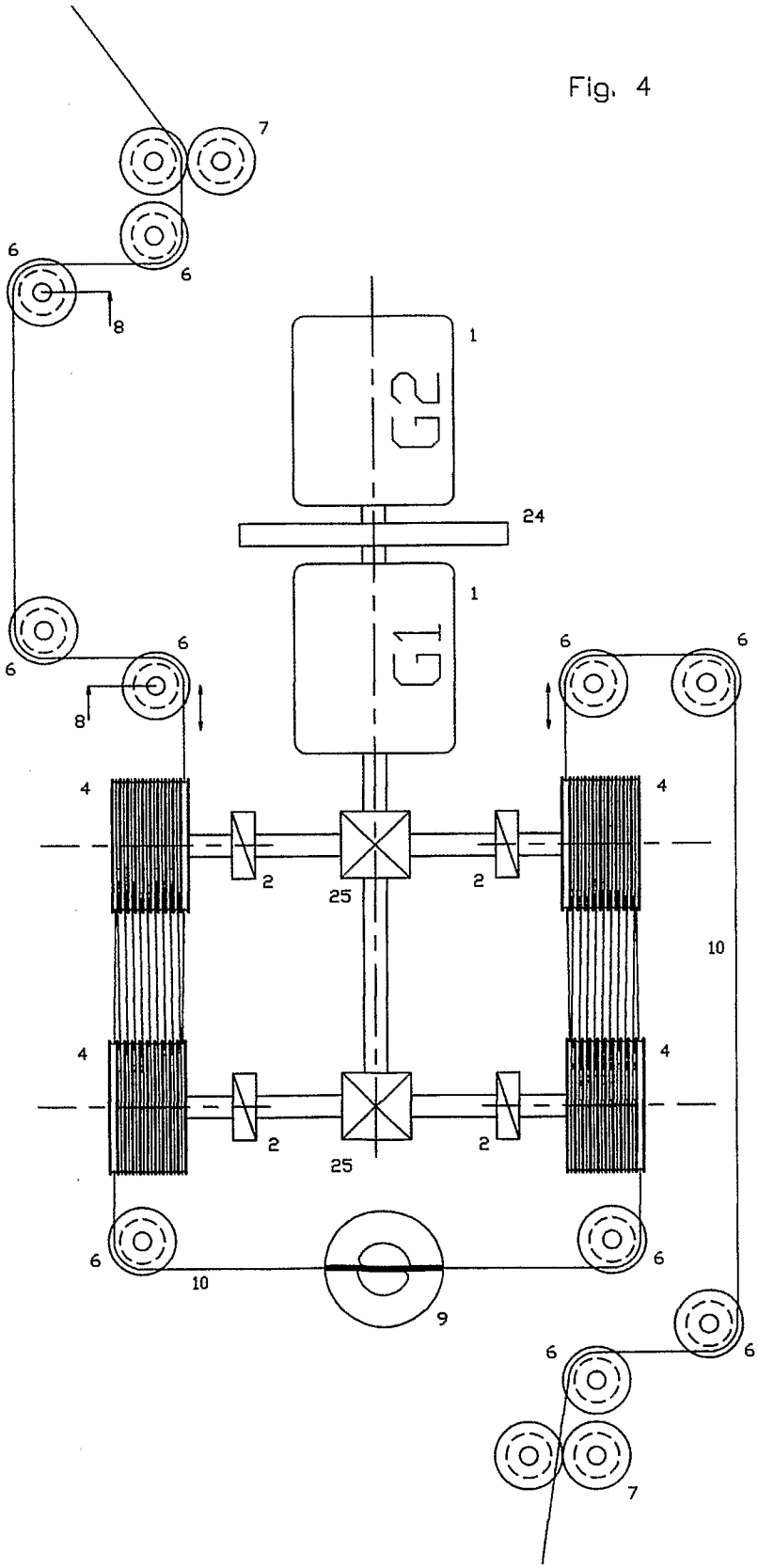

Fig 5