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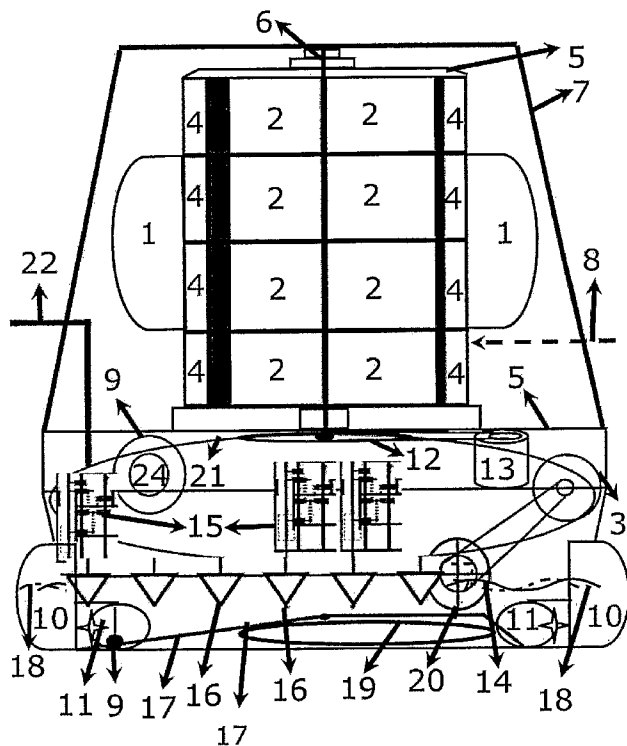


Fig. 1

(57) Abstract: Joint conversion system of wind, solar, sea waves and marine currents energies into electric energy, hydrogen, compressed air or any other sort of energy. The system achieves production levels identical to the ones of the hydroelectric dam, thermoelectric power plants and others with inferior direct economical costs of construction and exploration. Applicable on oceans, seas, rivers, lakes and dam lagoons.

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## Description

### **“Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”**

#### **Technical scope of the invention:**

The invention falls within the scope of the so-called renewable energies and more specifically in the wind energy, as well as the sun, sea waves' and marine currents'.

The present invention produces electric energy, hydrogen, compressed air or any other sort of energy through the simultaneous convergence of the energetic renewable resources of the wind, the sun, the sea waves and the marine currents, at competitive prices face to those of the hydroelectric dams, thermoelectric power plants and others. Applicable on oceans, seas, rivers, lakes and dam lagoons.

#### **The previous technique:**

From the previous technique, the various types of energy generators of wind, solar, sea waves and marine currents are well-known. The several converting systems, of these four renewable energy sources, present diverse problems that hinder a true competitiveness face to the traditional means of electric energy production, among which the following are outlined:

- Subordination to the minimum power of energy: in other words, if there is no wind at a certain speed, if there are no waves with a certain height and volume, if the sky is covered with clouds or if the marine currents are few, there will be no production of energy or, if there is, it will be highly scarce.

- The systems work independently from one another and the mixed systems that start to emerge (sea waves energy generators with wind generators) still persist on wasting the energy of the sun as well as of the marine currents, hence taking little benefit from the built infra-structures;

One of the advantages of the present invention is that no large amounts of money will have to be spent in expropriations, leasing, population displacement; moreover, this system does not emit gases or polluting substances and the possible location of the energetic production nearest to the high power consumptions (the sea coast) decreases the losses of the transport of energy, as well as the consequential maintenance costs of the network.

The present invention is characterized by the fact of producing compressed air, hydrogen, electric energy or any other energy through the concurrent convergence of the renewable energetic resources of the wind, solar energy, sea waves and marine currents.

The wind energy is obtained with the help of a multidirectional eolic turbine, with an aerodynamic shield for the rotor blades return.

The sea waves energy is converted by several machines that profit from the up and down undulation of the ocean waves.

The solar energy is collected through photovoltaic panels (already existing).

The energy produced by the wind, sea waves and the sun is converted with the help of generators, into compressed air, electricity, hydrogen and other kinds of energy that are

stored in common reservoirs and will feed the propulsion engines of the mobile unit, a sort of a catamaran boat, in the dislocation in reverse sense of the marine currents. The attrition resulting there from is collected by a turbine, placed at the centre, in order to generate compressed air, electricity, hydrogen or other sorts of energy, storing it in reservoirs until its removal, which is made with the help of receiving structures placed along the sea coast.

This invention may also be adapted as Energy Producing Boat. In fact, with an identical way of operating and with the necessary adaptations, it will simultaneously convert the energies of the wind, the sun (photovoltaic panels already existing) and of the sea waves, which will be used to propel the boat in the dislocation in reverse sense of the marine currents; the resulting attrition will be used, with the increase of the discharge duly controlled, by a turbine placed at the centre and submerged in 50%, in order to feed the generators of compressed air, electricity, hydrogen and any other sort of energy, storing it in reservoirs and making its transfer on to a seaport prepared to receive, convert and distribute this stored energy.

This invention may be adapted into a floating boat, energetically self-sufficient, that may produce hydrogen, carry passengers, transport loads, supply energy to other vessels, supply with energy and drinking-water to bring help and support to zones of humanitarian catastrophes.

This invention may be adapted as a fixed platform to produce and generate energy, producing and converting the energy of the wind, the sun, the ocean waves and of the marine currents; duly adapted, it may elevate water from the Ocean, Sea, Rivers, Lakes, and Dam Lagoons into a reservoir placed at a higher level of the turbine that captures the energy to drive the generators of electricity, compressed air, hydrogen or any other sort of energy. The transfer of energy is done with the help of submerged cables or pipes until it reaches safe land, in order to be ejected into the distribution network system. The control of the operation can be done automatically or by remote control.

This invention may also be adapted as a joint action of one Production Fixed Platform that receives the energy produced by several mobile units that operated automatically or remotely in its vicinity. Producing or converting energy from the wind, sun, sea waves and marine currents, in the same way and with the necessary adaptations and receiving the energy produced by the several mobile units, of the catamaran type, through various reception "cones". The transfer of the energy up to safe land is done through submerged cables and pipes to be injected into the distribution network system.

This invention may yet be adapted, with the necessary alterations, as a system of energy production and unlevelling of water, through the joint combination of several mobile units and a fixed platform. Sea water or fresh water, when elevated at a higher level of collection and because of the gravitational force, is to be transported in pipes up to safe land or any other location, with reservoirs for the energetic resource management. After the production of electric energy, compressed air, hydrogen or any other sort of energy, the water will be used for desalination, aquaculture, beaches, pools, channels, renewal of river estuaries or to carry water from humid zones into dry zones.

### Description of the Figures

The drawings do not imply any limitations whichever in what regards dimensions or forms.

Fig. 1 and 2 represent the "Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies", also mentioned as mobile unit, seen through the side cut of the drawing and plan, respectively.

The wind energy is collected by the multidirectional eolic turbine shown on Fig. 3 and 4, which has been designed to generate power from a wind low speed. It consists of one rigid turbine of light composite material, cylindrical and with large rotor blades, disposed vertically, fixed on its axle-shaft to the centre (n° 6 of figures 3 and 4) and supported on its lower and upper end (n° 7 of figures 3 and 4). The wind power will make the turbine and the half-moon aerodynamic shield roll (n° 4 of figures 3 and 4) up to the ideal position, which must be the radius of the shield's outer centre, 90° perpendicular to the direction of the wind, thus using its 2 steering gears (n° 1 of figures 3 and 4). We obtain then the maximum aerodynamic protection of the return of its 3 hollow blades (n° 2 of figures 3 and 4) each separated by an angle of 120°. The wind energy is then transmitted (n° 12 of figures 3 and 4) through its central shaft (n° 6 of figures 3 and 4) to an air compressor, electric generator, water elevating pump, electricity generator, hydrogen or any other sort of energy (n° 13 of figures 3 and 4).

The sea waves energy is collected by the sea waves generator, shown on Fig. 5 and 6. The sea waves energy is collected from a minimum movement of 5 cm, offering a permanent gain instead of medium energetic picks or elevated energetic picks however of lower frequency. Its small individual capacity is compensated with a set in large number. The systems is composed by one buoy (n° 16 of figures 5 and 6) with an adjustable weight to 250 kg minimum, submerged at 1/2 or 2/3, that will transform into energy the up and down movement of the marine waves passing by, coming from all possible directions. The collection buoy (n° 16 of figures 5 and 6) is hold to a cable (n° 30 of figures 5 and 6), having a higher distance than the sea tides, to a counterweight of 250 kg (n° 27 of figures 5 and 6). The cable will roll one polis of support (n° 26 of figures 5 and 6) to the counterweight and 2 collection/reception polis disposed in "S" (n° 25 of figures 5 and 6), making a reduction of -10 times the weight into +10 times the distance. This movement is transmitted to a unidirectional receiver (n° 29 of figure 6), which, on is turn, will transfer the movement, in one single direction, to the air compressor, electric generator, water elevating pump, hydrogen generator or any other sort of energy (n° 43 of figures 5 and 6).

The solar energy is collected through photovoltaic panels (already existing) that they will cover the maximum surface, including the top of the aerodynamical shield and of the wind turbine (n° 5 of fig. 1, fig. 2, fig. 3 and fig. 6).

The energy produced by the wind, sea waves and the sun is converted with the help of generators, into compressed air, electricity, hydrogen and other kinds of energy that are stored in common reservoirs (n° 19 of figures 1 and 2) and will feed the propulsion engines (n° 11 of figures 1 and 2) of the mobile unit (Fig. 1 and Fig. 2), a sort of a catamaran boat, in the dislocation in reverse sense of the marine currents, the attrition resulting there from, with the increase of the discharge controlled (n° 9, 17, 24 of fig. 1 and fig. 2), is collected through a turbine (n° 20 of fig. 1) placed in its centre, in order to generate compressed air, electricity, hydrogen or other sorts of energy (n° 3 of Fig. 1 and Fig. 2), storing it in reservoirs (n° 21 of figures 1 and 2) until its removal, which is made with the help of receiving structures placed along the sea coast.

Composed by the following main elements:

- 1 Steering gear of the aerodynamical shield of the eolic turbine;
- 2 Eolic turbines blade;
- 3 Water pump, air compressor, hydrogen generator, electricity or any other energy;
- 4 Aerodynamic shield of the blades return of the eolic turbine;
- 5 Cover of the eolic turbine, from the deck of the mobile unit and the fixed platform with photovoltaic panels;
- 6 Eolic turbines shaft;
- 7 Eolic turbines structure;
- 8 Direction of the wind;
- 9 Transmission of the adjustment of the marine currents discharge, mobile units and boats;
- 10 Marine steering gear;
- 11 Propulsion engine;
- 12 Transmission of the eolic turbine;
- 13 Generator / eolic energy converter;
- 14 Transmission of the energy collected from the currents turbine;
- 15 Set of the elements of the sea waves energy generators;
- 16 Buoy to absorb the sea waves undulation;
- 17 Adjustment plate of the marine currents turbine's discharge – mobile units and boats;
- 18 Sea waves and/or water;
- 19 Fuel deposit of the propulsion;
- 20 Collecting turbine of sea waves currents;
- 21 Deposit of compressed air or any other fuel;
- 22 Flowing off of compressed air, hydrogen, electricity or any other sort of energy;
- 24 Engine of the mobile adjustment platform of the sea waves turbine's discharge, and of the mobile units and boats;

Fig. 3 and 4 represent the Multidirectional Eolic Turbine of "Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies", seen through the side cut of the drawing and plan, respectively.

Has been designed to generate power from a wind low speed. It consists of one rigid turbine of light composite material, cylindrical and with large rotor blades. The multidirectional wind turbine is disposed vertically, fixed on its axle-shaft to the centre (n° 6 of figures 3 and 4) and supported on its lower and upper end (n° 7 of figures 3 and 4). The wind power will make the turbine and the half-moon aerodynamic shield roll (n° 4 of figures 3 and 4) up to the ideal position, which must be the radius of the shield's outer centre, 90° perpendicular to the direction of the wind, thus using its 2 steering gears (n° 1 of figures 3 and 4). We obtain then the maximum aerodynamic protection of the return of its 3 hollow blades (n° 2 of figures 3 and 4) each separated by an angle of 120°. The wind energy is then transmitted (n° 12 of figures 3 and 4) through its central shaft (n° 6 of figures 3 and 4) to an air compressor, electric generator, water elevating pump, electricity generator, hydrogen or any other sort of energy (n° 13 of figures 3 and 4).

The top of the aerodynamical shield and of the eolic turbine will be covered by photovoltaic solar panels.

Composed by the following main elements:

- 1 Steering gear of the aerodynamical shield of the eolic turbine;
- 2 Eolic turbines blade;

- 4 Aerodynamic shield of the blades return of the eolic turbine;
- 5 Cover of the eolic turbine, from the deck of the mobile unit and the fixed platform with photovoltaic panels;
- 6 Eolic turbines shaft;
- 7 Eolic turbines structure;
- 8 Direction of the wind;
- 12 Transmission of the eolic turbine;
- 13 Generator / eolic energy converter;

Fig. 5 and 6 represent the sea waves energy generator of “Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”, seen through the side cut of the drawing and plan, respectively.

The sea waves energy is collected from a minimum movement of 5 cm, offering a permanent gain instead of medium energetic picks or elevated energetic picks however of lower frequency. Its small individual capacity is compensated with a set in large number.

The systems is composed by one buoy (n° 16 of figures 5 and 6) with an adjustable weight to 250 kg minimum, submerged at 1/2 or 2/3, that will transform into energy the up and down movement of the marine waves passing by, coming from all possible directions.

The collection buoy (n° 16 of figures 5 and 6) is hold to a cable (n° 30 of figures 5 and 6), having a higher distance than the sea tides, to a counterweight of 250 kg (n° 27 of figures 5 and 6). The cable will roll one polis of support (n° 26 of figures 5 and 6) to the counterweight and 2 collection/reception polis disposed in “S” (n° 25 of figures 5 and 6), making a reduction of -10 times the weight into +10 times the distance. This movement is transmitted to a unidirectional receiver (n° 29 of figure 6), which, on is turn, will transfer the movement, in one single direction, to the air compressor, electric generator, water elevating pump, hydrogen generator or any other sort of energy (n° 43 of figures 5 and 6).

Composed by the following main elements:

- 15 Set of the elements of the sea waves energy generators;
- 16 Buoy to absorb the sea waves undulation;
- 18 Sea waves and/or water;
- 25 Receiving polis of the sea waves movement of the sea waves generators;
- 26 Connecting polis to the sea waves generator counterweight;
- 27 250 kg counterweight of the sea waves generator;
- 28 Bearings to fix the rotary shafts of the sea waves generator;
- 29 Transmission unidirectional polis of the sea waves generator;
- 30 Buoy's connecting cable to the sea waves generator's counterweight;
- 43 Water pump, air compressor, hydrogen generator, electricity's and any other sort of energy of the sea waves generator;

Fig. 7 and 8 represent energy generator of marine currents of “Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”, seen through the side cut of the drawing and plan, respectively.

The energy generator of marine currents described on figures 7 and 8, which is composed by a turbine placed horizontally (n° 20 of figures 7 and 8), with three hollow blades (n° 37 of figures 7 and 8) separated from one another by an angle of 120°, whose shaft is submerged 50%, one steering gear in its lower end (n° 42 of Fig. 7) that positions

the turbine in such a way that the radius of its horizontal centre remains 90° perpendicular to the direction of the sea current, so optimizing energetic production.

The energy is transmitted (n° 14 of figures 7 and 8) to a water pump, air compressor, electric generator, water elevating pump, hydrogen generator or any other sort of energy (n° 3 of figures 7 and 8).

The marine currents power generator installed in the “**Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies**”, also identified as mobile unit, and its adaptation as boat, does not have a steering gear of the marine current.

Composed by the following main elements:

- 3 Water pump, air compressor, hydrogen generator, electricity or any other energy;
- 14 Transmission of the energy collected from the currents turbine;
- 20 Collecting turbine of sea waves currents;
- 33 Direction of the marine current;
- 37 Turbine blade of the sea waves current's generator;
- 38 Sea water level;
- 39 Set of components of the marine currents generators;
- 42 Steering gear of the generators/converters of marine currents;

Fig. 9 and 10 represent an adaptation of the “Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”, as “Energy Producing Boat”. Seen through the side cut of the drawing and plan, respectively.

It is characterized by producing compressed air, hydrogen, electric energy or any other type of energy, through the simultaneous convergence of the renewable energetic resources of the wind, sun, sea waves and marine currents.

The wind energy is collected by the multidirectional eolic turbine with a aerodynamic protection shield of the return of the rotor blades shown on the Fig. 3 and 4.

The sea wave energy collected by several machines gaining the up and down movement of the waves, from a minimum movement of 5 cm as shown on the figures 5 and 6.

The solar energy is collected through photovoltaic panels (already existing) that they will cover the maximum surface, including the top of the aerodynamical shield and of the wind turbine (n° 5 of figures 9 and 10).

The energy produced by the wind, sea waves and the sun is converted with the help of generators, into compressed air, electricity, hydrogen and other kinds of energy that are stored in common reservoirs (n° 19 of figure 9) and will feed the propulsion engines (n° 11 of figures 9 and 10) of the boat (Fig. 9 and Fig. 10), a sort of a catamaran boat, in the dislocation in reverse sense of the marine currents, the attrition resulting there from, with the increase of the discharge controlled (n° 9, 17, 24 of fig. 1 and fig. 9), is collected through a turbine placed in its centre (n° 20 of fig. 9), in order to generate compressed air, electricity, hydrogen or other sorts of energy (n° 3 of Fig. 9), storing it in reservoirs (n° 21 of figure 9) until its removal, which is made with the help of receiving structures placed along the sea coast.

Composed by the following main elements:

- 1 Steering gear of the aerodynamical shield of the eolic turbine;
- 2 Eolic turbines blade;
- 3 Water pump, air compressor, hydrogen generator, electricity or any other energy;
- 4 Aerodynamic shield of the blades return of the eolic turbine;

- 5 Cover of the eolic turbine, from the deck of the mobile unit and the fixed platform with photovoltaic panels;
- 6 Eolic turbines shaft;
- 7 Eolic turbines structure;
- 8 Direction of the wind;
- 9 Transmission of the adjustment of the marine currents discharge, mobile units and Boats;
- 10 Marine steering gear;
- 11 Propulsion engine;
- 12 Transmission of the eolic turbine;
- 13 Generator / eolic energy converter;
- 14 Transmission of the energy collected from the currents turbine;
- 15 Set of the elements of the sea waves energy generators;
- 16 Buoy to absorb the sea waves undulation;
- 17 Adjustment plate of the marine currents turbine's discharge – mobile units and boats;
- 18 Sea waves and/or water;
- 19 Fuel deposit of the propulsion;
- 20 Collecting turbine of sea waves currents;
- 21 Deposit of compressed air or any other fuel;
- 22 Flowing off of compressed air, hydrogen, electricity or any other sort of energy;
- 23 Bridge and passengers cabin;
- 24 Engine of the mobile adjustment platform of the sea waves turbine's discharge, and of the mobile units and boats;
- 33 Direction of the marine current;

Fig. 11 and 12 represent the variation of the “Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies” into a Fixed Platform Producer of Energy, seen through the side cut of the drawing and plan, respectively.

It produces energy through the simultaneous convergence of the renewable energetic resources of the wind, the sun, the sea waves and the marine currents and which may also receive the energy produced by the Joint Conversion System of wind energy, solar, sea waves and marine currents, also designated by mobile unit, described on the figures 1 and 2.

The wind energy is generated/produced according to what is described on the figures 3 and 4.

The solar energy is collected through photovoltaic panels (already existing) that they will cover the maximum surface, including the top of the aerodynamical shield and of the eolic turbine (n° 5 of figures 11 and 12).

The sea wave energy is generated/produced according to what is described on the figures 5 and 6.

The marine current energy is generated/produced according to what is described on the fig. 7 and 8.

The energy produced by the various mobile units is transferred (n° 22 of figures 1 and 2) through the connection to several reception “cones” (n° 35 of figures 11 and 12) and the power generated on the fixed platform will be used to elevate the water from the ocean, sea, river, lake, or dam lagoon, into a deposit (n° 32 of figure 11) placed at a higher level of the one of the turbine (n° 36 of figure 11). The energy, the flowing off of the water, is collected by the turbine and used to set in motion the generators (n° 44 of figure 12) of electricity, compressed air, hydrogen or any other sort of energy.



The energy produced is transported through cables or submerged tubes (n° 51 of figure 13) up to the coast in order to be ejected into the distribution network (n° 47 of figure 13).

The control of the whole operation may be done automatically or by remote control.

It is composed by the following parts:

- 1 Steering gear of the aerodynamical shield of the eolic turbine;
- 2 Eolic turbines blade;
- 4 Aerodynamic shield of the blades return of the eolic turbine;
- 5 Cover of the eolic turbine, from the deck of the mobile unit and the fixed platform with photovoltaic panels;
- 6 Eolic turbines shaft;
- 7 Eolic turbines structure;
- 8 Direction of the wind;
- 12 Transmission of the Wind turbine;
- 13 Generator / wind energy converter;
- 15 Set of the elements of the sea waves energy generators;
- 16 Buoy to absorb the sea waves undulation;
- 31 Tubes of the water elevating pumps of the fixed platform;
- 32 Reservoir of the water elevated by pumping from the fixed platform;
- 33 Direction of the marine current;
- 34 Water pump of the mobile units.
- 35 Connection cone of the mobile units;
- 38 Sea water level;
- 39 Set of components of the marine currents generators;
- 40 Bottom of the sea;
- 41 Sustaining piers of the fixed platform;
- 42 Steering gear of the generators/converters of marine currents;
- 44 Main generator of electricity and fixed platform:

Fig. 13 represents the adaptation of the “Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies” in the joint action of one fixed platform and several mobile units, seen by the cut plan.

The several “Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”, also designated as mobile units, will produce energy according to what is shown on the figures 1, 2 and n° 45 of figure 13.

The fixed platform of energy production will produce energy according to what is shown on the figures 11, 12 and n° 46 of figure 13.

The mobile units close to the fixed platform of energy production (n° 46 of figure 13) will produce and store the energy (n° 45 of figure 13). When the storage deposits of the mobile units are full (n° 49 of figure 13), they will displace to the fixed platform so that the energy is transferred (n° 50 of figure 13).

The energy produced by the several mobile units and by the fixed platform will be used to elevate water from the Ocean, Sea, River, Lake, Dam Lagoon, into a deposit (n° 32 of figure 11) placed at a higher level of that of the turbine (n° 36 of figure 11). The energy, the flowing off of the water, is collected by the turbine and used to drive the electricity generators (n° 44 of figure 12), compressed air, hydrogen or any other sort of energy.

The energy produced is transported through cables or submerged tubes (n° 51 of figure 13) up to the coast in order to be ejected into the distribution network (n° 47 of figure 13).

The control of the whole operation may be done automatically or by remote control.

It is composed by the following parts:

- 45 Mobile unit to produce and store energy;
- 46 Fixed platform to produce energy and to receive the energy coming from the mobiles units;
- 47 Central on safe land to receive the energy and inject into the distribution network system;
- 48 Safe land;
- 49 Mobile unit moving towards the fixed platform in order to transfer the stored energy;
- 50 Fixed generator producing energy and receiving energy from the mobile generators;
- 51 Central on safe land of receiving and injecting into the distribution network system;
- 52 Safe land;

### **Detailed Description of the Invention:**

The “**Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies**” invention is shown on the figures 1 and 2. It produces compressed air, hydrogen, electricity or any other sort of energy through the simultaneous convergence of renewable energetic resources, such as the wind, the solar energy, sea waves or marine currents.

The wind energy, collected by the multidirectional eolic turbine, described on the figures 3 and 4. Has been designed to generate power from a low wind speed. It consists of one rigid turbine of light composite material, cylindrical and with large rotor blades. The multidirectional wind turbine is disposed vertically, fixed on its axle-shaft to the centre (n° 6 of figures 3 and 4) and supported on its lower and upper end (n° 7 of figures 3 and 4). The wind power will make the turbine and the half-moon aerodynamic shield roll (n° 4 of figures 3 and 4) up to the ideal position, which must be the radius of the shield's outer centre, 90° perpendicular to the direction of the wind, thus using its 2 steering gears (n° 1 of figures 3 and 4). We obtain then the maximum aerodynamic protection of the return of its 3 hollow blades (n° 2 of figures 3 and 4) each separated by an angle of 120°. The wind energy is then transmitted (n° 12 of figures 3 and 4) through its central shaft (n° 6 of figures 3 and 4) to an air compressor, electric generator, water elevating pump, electricity generator, hydrogen or any other sort of energy (n° 13 of figures 3 and 4).

The sea waves energy is collected from the sea waves energy generator, represented in figures 5 and 6. Catching the energy of the waves a minimum movement of 5 cm, offering a permanent gain instead of medium energetic picks or elevated energetic picks however of lower frequency. Its small individual capacity is compensated with a set in large number.

The systems is composed by one buoy (n° 16 of figures 5 and 6) with an adjustable weight to 250 kg minimum, submerged at 1/2 or 2/3, that will transform into energy the up and down movement of the marine waves passing by, coming from all possible directions.

The collection buoy (n° 16 of figures 5 and 6) is hold to a cable (n° 30 of figures 5 and 6), having a higher distance than the sea tides, to a counterweight of 250 kg (n° 27 of figures 5 and 6). The cable will roll one polis of support (n° 26 of figures 5 and 6) to the

counterweight and 2 collection/reception polis disposed in "S" (n° 25 of figures 5 and 6), making a reduction of -10 times the weight into +10 times the distance. This movement is transmitted to a unidirectional receiver (n° 29 of figure 6), which, on its turn, will transfer the movement, in one single direction, to the air compressor, electric generator, water elevating pump, hydrogen generator or any other sort of energy (n° 43 of figures 5 and 6).

The solar energy is collected through photovoltaic panels (already existing) that they will cover the maximum surface, including the top of the aerodynamical shield and of the eolic turbine (n° 5 of figures 1, Fig. 2, Fig. 3 and Fig. 4).

The energy produced by the wind, sea waves and the sun is converted with the help of generators, into compressed air, electricity, hydrogen and other kinds of energy that are stored in common reservoirs (n° 19 of figures 1 and 2) and will feed the propulsion engines (n° 11 of figures 1 and 2) of the mobile unit (Fig. 1 and Fig. 2), a sort of a catamaran boat, in the dislocation in reverse sense of the marine currents, the attrition resulting there from, with the increase of the discharge controlled (n° 9, 17, 24 of fig. 1 and fig. 2), is collected through a turbine (n° 20 of fig. 1) placed in its centre, in order to generate compressed air, electricity, hydrogen or other sorts of energy (n° 3 of Fig. 1 and Fig. 2), storing it in reservoirs (n° 21 of figures 1 and 2) until its removal, which is made with the help of receiving structures placed along the sea coast.

The multidirectional Eolic Turbine, represented in figures 3 and 4. Has been designed to generate power from a wind low speed. It consists of one rigid turbine of light composite material, cylindrical and with large rotor blades. The multidirectional eolic turbine is disposed vertically, fixed on its axle-shaft to the centre (n° 6 of figures 3 and 4) and supported on its lower and upper end (n° 7 of figures 3 and 4). The wind power will make the turbine and the half-moon aerodynamic shield roll (n° 4 of figures 3 and 4) up to the ideal position, which must be the radius of the shield's outer centre, 90° perpendicular to the direction of the wind, thus using its 2 steering gears (n° 1 of figures 3 and 4). We obtain then the maximum aerodynamic protection of the return of its 3 hollow blades (n° 2 of figures 3 and 4) each separated by an angle of 120°. The wind energy is then transmitted (n° 12 of figures 3 and 4) through its central shaft (n° 6 of figures 3 and 4) to an air compressor, electric generator, water elevating pump, electricity generator, hydrogen or any other sort of energy (n° 13 of figures 3 and 4).

The top of the aerodynamic shield and the eolic turbine will be covered by photovoltaic panels.

The sea waves energy generator of marine currents described on figures 5 and 6 is collected from a minimum movement of 5 cm, offering a permanent gain instead of medium energetic picks or elevated energetic picks however of lower frequency. Its small individual capacity is compensated with a set in large number. The systems is composed by one buoy (n° 16 of figures 5 and 6) with an adjustable weight to 250 kg minimum, submerged at 1/2 or 2/3, that will transform into energy the up and down movement of the marine waves passing by, coming from all possible directions.

The collection buoy (n° 16 of figures 5 and 6) is hold to a cable (n° 30 of figures 5 and 6), having a higher distance than the sea tides, to a counterweight of 250 kg (n° 27 of figures 5 and 6). The cable will roll one polis of support (n° 26 of figures 5 and 6) to the counterweight and 2 collection/reception polis disposed in "S" (n° 25 of figures 5 and 6),

making a reduction of -10 times the weight into +10 times the distance. This movement is transmitted to a unidirectional receiver (n° 29 of figure 6), which, on its turn, will transfer the movement, in one single direction, to the air compressor, electric generator, water elevating pump, hydrogen generator or any other sort of energy (n° 43 of figures 5 and 6).

The energy generator of marine currents described on figures 7 and 8, which is composed by a turbine placed horizontally (n° 20 of figures 7 and 8), with three hollow blades (n° 37 of figures 7 and 8) separated from one another by an angle of 120°, whose shaft is submerged 50%, one steering gear in its lower end (n° 42 of Fig. 7) that positions the turbine in such a way that the radius of its horizontal centre remains 90° perpendicular to the direction of the sea current, so optimizing energetic production.

The energy is transmitted (n° 14 of figures 7 and 8) to a water pump, air compressor, electric generator, water elevating pump, hydrogen generator or any other sort of energy (n° 3 of figures 7 and 8).

The marine currents power generator installed in the **“Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”**, also identified a mobile unit, and its adaptation as boat, does not have a steering gear of the marine current.

The Boat producing energy, which with the necessary working-over, may also transport passengers, loads, supply energy to other vessels, supply electricity and fresh water to help in humanitarian catastrophes, as shown on figures 9 and 10:

It distinguishes itself by producing compressed air, hydrogen, electricity or any other sort of energy, through the simultaneous convergence of renewable energetic resources, such as the wind, the solar energy, sea waves or marine currents.

The wind energy is collected by the multidirectional eolic turbine with an aerodynamic shield of protection of the blades return represented on the figures 3 and 4.

The sea wave energy collected by several machines gaining the up and down movement of the waves, from a minimum movement of 5 cm as shown on the figures 5 and 6.

The solar energy is collected through photovoltaic panels (already existing) that they will cover the maximum surface, including the top of the aerodynamical shield and of the wind turbine (n° 5 of figures 9 and 10).

The energy produced by the wind, sea waves and the sun is converted with the help of generators, into compressed air, electricity, hydrogen and other kinds of energy that are stored in common reservoirs (n° 19 of figure 9) and will feed the propulsion engines (n° 11 of figures 9 and 10) of the boat (Fig. 9 and Fig. 10), a sort of a catamaran boat, in the dislocation in reverse sense of the marine currents, the attrition resulting there from, with the increase of the discharge controlled (n° 9, 17, 24 of fig. 1 and fig. 9), is collected through a turbine (n° 20 of fig. 9) placed in its centre, in order to generate compressed air, electricity, hydrogen or other sorts of energy (n° 3 of Fig. 9 and 10), storing it in reservoirs (n° 21 of figure 9) until its removal, which is made with the help of receiving structures placed along the sea coast.

The fixed platform of energy production. It produces energy through the simultaneous convergence of the renewable energetic resources of the wind, the sun, the sea waves and the marine currents, represented on the figures 11 and 12, and which may also receive the energy produced by the Joint system for conversion of eolic, solar, sea

waves and marine currents energies, also designated by mobile unit, described on the figures 1 and 2.

The wind energy is generated/produced according to what is described on the figures 3 and 4.

The solar energy is collected through photovoltaic panels (already existing) that they will cover the maximum surface, including the top of the aerodynamical shield and of the wind turbine (n° 5 of figures 11 and 12).

The sea wave energy is generated/produced according to what is described on the figures 5 and 6.

The marine current energy is generated/produced according to what is described on the figures 7 and 8.

The energy produced by the various mobile units is transferred (n° 22 of figures 1 and 2) through the connection to several reception "cones" (n° 35 of figures 11 and 12) and the power generated on the fixed platform will be used to elevate the water from the ocean, sea, river, lake, or dam lagoon, into a deposit (n° 32 of figure 11) placed at a higher level of the one of the turbine (n° 36 of figure 11). The energy, the flowing off of the water, is collected by the turbine and used to set in motion the generators (n° 44 of figure 12) of electricity, compressed air, hydrogen or any other sort of energy.

The energy produced is transported through cables or submerged tubes (n° 51 of figure 13) up to the coast in order to be ejected into the distribution network (n° 47 of figure 13)

The control of the whole operation may be done automatically or by remote control.

The adaptation of "**Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies**" as a joint action for the use of several mobile units and of one fixed platform that produce energy according to what is described on the figure 13.

The several Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies, also designated as mobile units, will produce energy according to what is shown on the figures 1, 2 and the n° 45 of figure 13.

The fixed platform of energy production will produce energy as shown on the figures 11, 12 and n° 46 of figure 13.

The mobile units close to the fixed platform of energy production (n° 46 of figure 13) will produce and store the energy (n° 45 of figure 13). When the storage deposits of the mobile units are full (n° 49 of figure 13), they will displace to the fixed platform so that the energy is transferred (n° 50 of figure 13).

The energy produced by the various mobile units and (Fig. 2, n° 45, 49 and 50 of Fig. 13), and by a fixed platform (Fig. 11, Fig. 12 and n° 46 of Fig. 13) will be used to elevate the water from the ocean, sea, river, lake, or dam lagoon, into a deposit (n° 32 of figure 11) placed at a higher level of the one of the wind turbine (n° 36 of figure 11). The energy, the flowing off of the water, is collected by the turbine and used to set in motion the generators (n° 44 of figure 12) of electricity, compressed air, hydrogen or any other sort of energy.

The energy produced is transported through cables or submerged tubes (n° 51 of figure 13) up to the coast in order to be ejected into the distribution network (n° 47 of figure 13)

The control of the whole operation may be done automatically or by remote control.

With the necessary adaptations, this joint system may elevate water, salted or fresh, higher than the level of collection. And with the gravitational force it may transport it through piping until (n° 51 of figure 13) safe land or any other place, with reservoirs that will manage the energetic resources. The water will be used for desalination, aquaculture, the beaches, swimming pools, channels, renewal of river estuaries or to carry water from humid zones into dry zones.

The great versatility of applications and remaining advantages above mentioned, will turn possible the decrease of production costs of electric power down to values lower than those charged nowadays. Without bearing in mind the costs referring to emissions of carbon dioxide, sulphur dioxide and other polluting agents, which tend to become more and more costly.

## CLAIMS

1. **“Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”** characterized by the fact of producing compressed air, hydrogen, electricity and any other sort of energy through the simultaneous renewable convergence of the energetic resources of the wind, the sun, the sea waves and marine currents (Fig. 1, Fig 2, n<sup>os</sup> 45, 49 and 50 of Fig. 13), the wind energy, collected by the multidirectional eolic wind turbine with an aerodynamic shield of protection of the blades return (Fig. 3 and Fig. 4), the energy of the sea waves collected by several machines gaining from the up and down movement of the waves, from a minimum movement of 5 cm (Fig. 5 and Fig. 6), the solar energy collected through the photovoltaic panels (already existing) that will cover most part of the unit's surface, including the top of the eolic turbine (n<sup>o</sup> 5 of Fig. 1, Fig. 2, Fig. 3 and Fig. 6), the energy produced by the wind, sea waves and the sun is converted, with the help of the generators, into compressed air, electricity, hydrogen or any other sort of energy, this energy will then be stored in common reservoirs (n<sup>o</sup> 19 of Fig. 1 and Fig. 2), and will feed the propulsion engines (n<sup>o</sup> 11 of Fig. 1 and Fig. 2) of the mobile unit (Fig. 1 and Fig. 2), a sort of catamaran kind of boat, in the displacement in a reverse sense to the marine currents. The attrition resulting from there, with the increase of discharge controlled (n<sup>os</sup> 9, 17, 24 of Fig. 1 and Fig. 2), is collected by the turbine, placed at the centre (n<sup>o</sup> 19 of Fig. 1), in order to generate compressed air, hydrogen, electricity or any other sort of energy (n<sup>o</sup> 3 of Fig. 1 and Fig. 2), storing it in reservoirs (n<sup>o</sup> 21 of Fig. 1 and Fig. 2), until it is transferred with the help of receiving structures placed on the sea coast.
2. **“Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”** according to Claim n<sup>o</sup> 1, characterized by being a boat producer of energy (Fig. 9 and Fig. 10) which, with identical form and operation, will convert the energies of the wind (Fig. 3 and Fig. 4), the sun (photovoltaic panels already existing) and of the sea waves (Fig. 5 and Fig. 6), the energy is stored in common reservoirs (n<sup>o</sup> 19 of Fig. 9) and will feed the propulsion engines (n<sup>o</sup> 11 of Fig. 9 and Fig. 10) of the boat, a sort of catamaran, which will be used to propel the boat in the displacement in reverse sense of the marine currents, and whose resulting attrition is used with the increase of the discharge controlled (n<sup>os</sup> 9, 17, 24 of Fig. 9), through a turbine placed at its centre and submerged by 50% (n<sup>o</sup> 20 of Fig. 9), in order to feed the generators (n<sup>o</sup> 3 of Fig. 9 and Fig. 10) of compressed air, electricity, hydrogen and any other sort of energy, storing the energy in reservoirs (n<sup>o</sup> 21 of Fig. 9) and transferring it on to a seaport prepared to receive it, convert and distribute.
3. **“Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”** according to Claim n<sup>o</sup> 1, characterized by being a Fixed Platform producer or generator of energy, with the necessary adaptations (Fig. 11, Fig. 12 and n<sup>o</sup> 46 of Fig. 13), it may produce or convert the energy of the wind (Fig. 3 and Fig. 4), the sun (photovoltaic panels already existing), the sea waves (Fig. 5 and Fig. 6), marine currents (Fig. 7 and Fig. 8) and may also receive the energy produced by the several mobile units (n<sup>o</sup> 22 da Fig. 1 and Fig. 2, n<sup>os</sup> 45, 49 and 50 of Fig. 13) through various reception “cones” (n<sup>o</sup> 35 of Fig. 11 and Fig. 12) in order to elevate water from the Ocean, River, Lake, Dam Lagoon, into a reservoir placed

at a level higher than the turbine (n° 36 of Fig. 11) that collects the energy, in order to activate the generators (n° 44 of Fig. 12) of electricity, compressed air, hydrogen or any sort of energy, the transference of energy is made through cables or submerged pipes (n° 51 of Fig. 13) until reaching safe land, in order to be ejected into the distribution network system (n° 47 of Fig. 13), the control of the operation may be done automatically or by remote control.

4. **“Joint system for conversion of Eolic, Solar, Sea Waves and Marine Current energies”** according to **Claims n° 1 and n° 3**, is characterized by being a system producing energy and unlevelling of water through the joint use of several mobile units (Fig. 2, n° 45, 49 and 50 of Fig. 13), and by a fixed platform (Fig. 11, Fig. 12 and n° 46 of Fig. 13), which, with the necessary adaptations, elevates the water, salted or fresh, higher than the collecting level and with the gravitational force transports it, by piping (n° 51 of Fig. 13), until safe land or any other places, with reservoirs that manage the energetic resources, which after the electric energy, compressed air, hydrogen and any other energy, the water will be used for desalination, aquaculture, the beaches, pools, channels, renewal of river estuaries or to carry water from humid zones into dry zones.



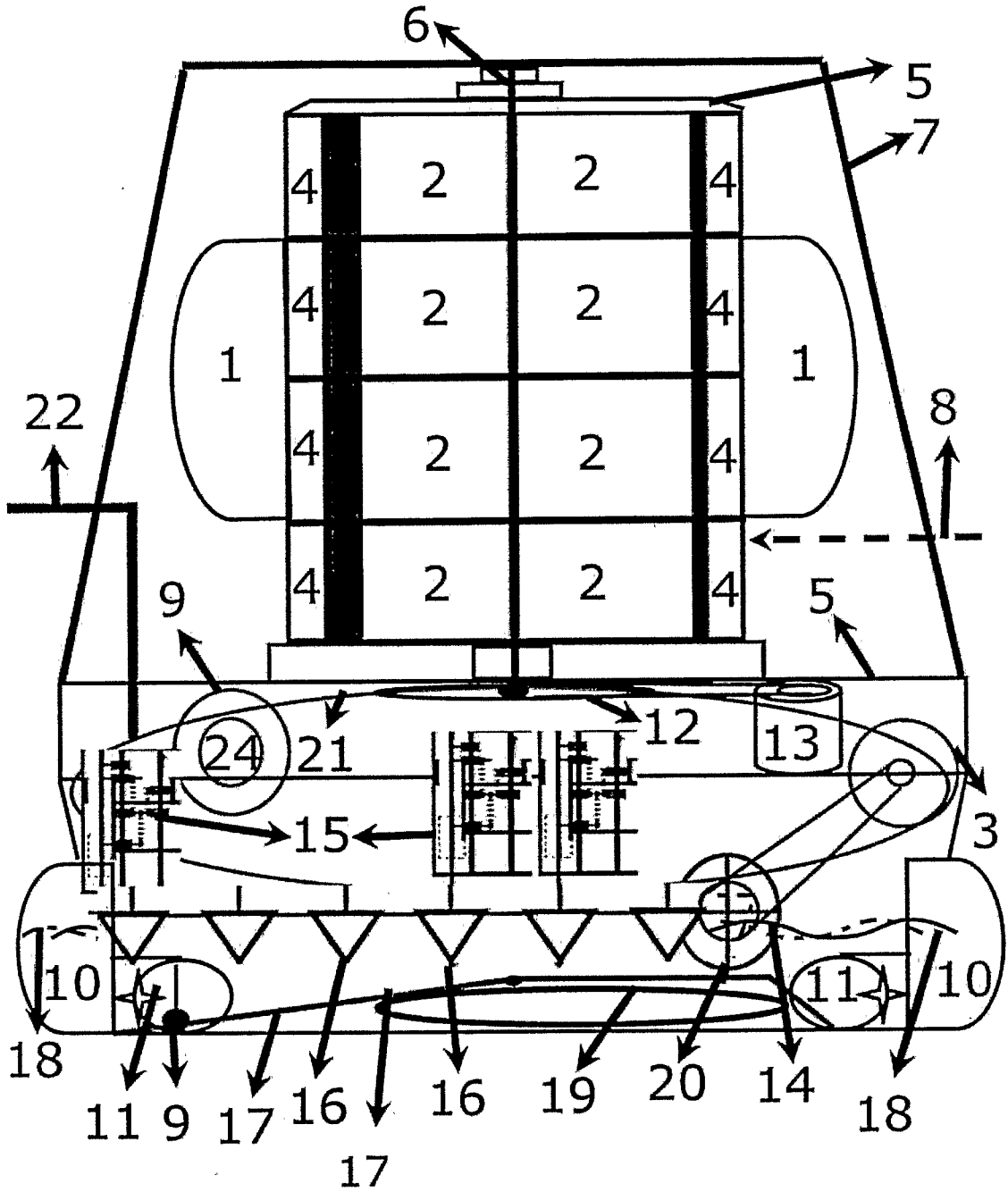


Fig. 1

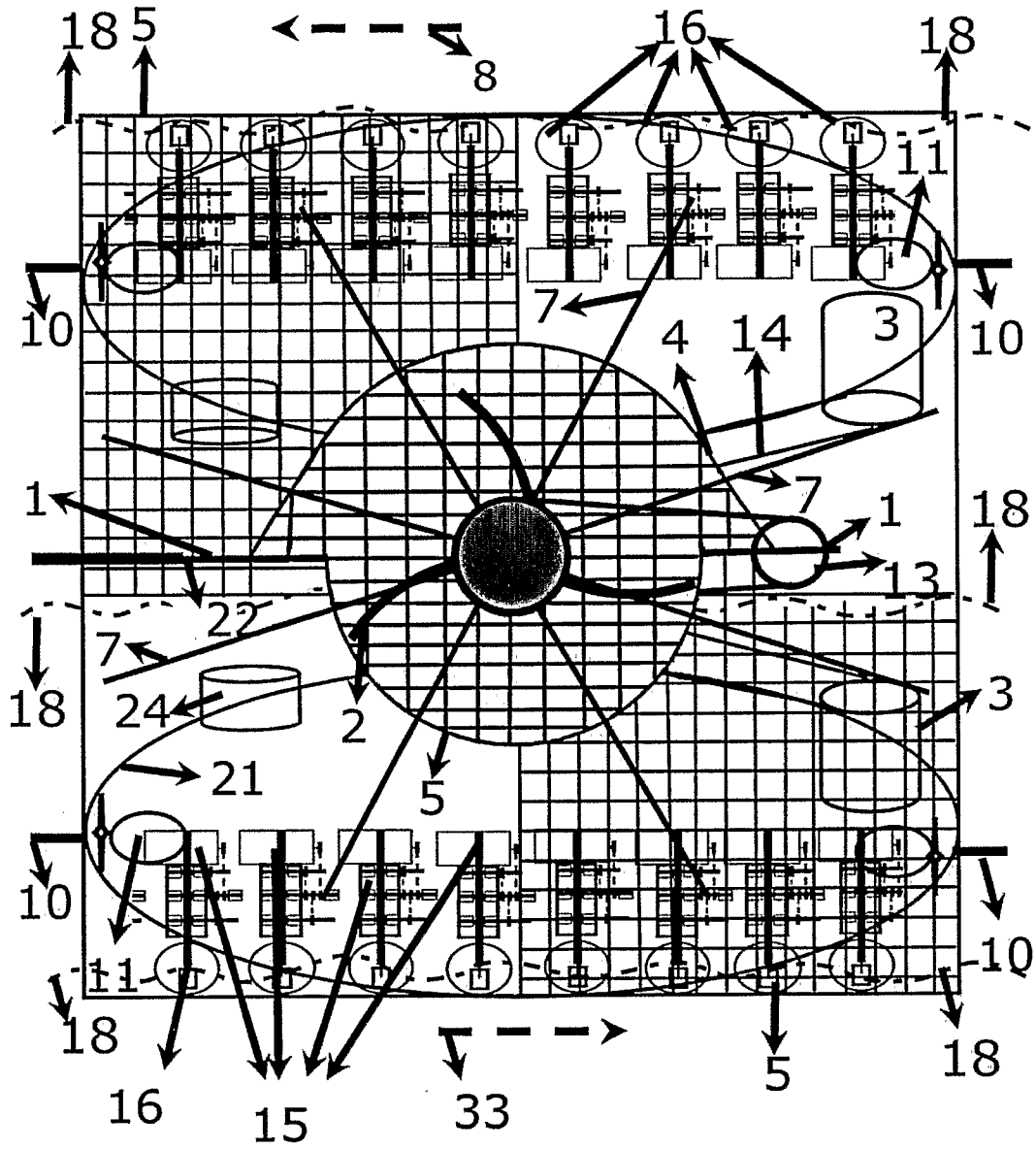


Fig. 2

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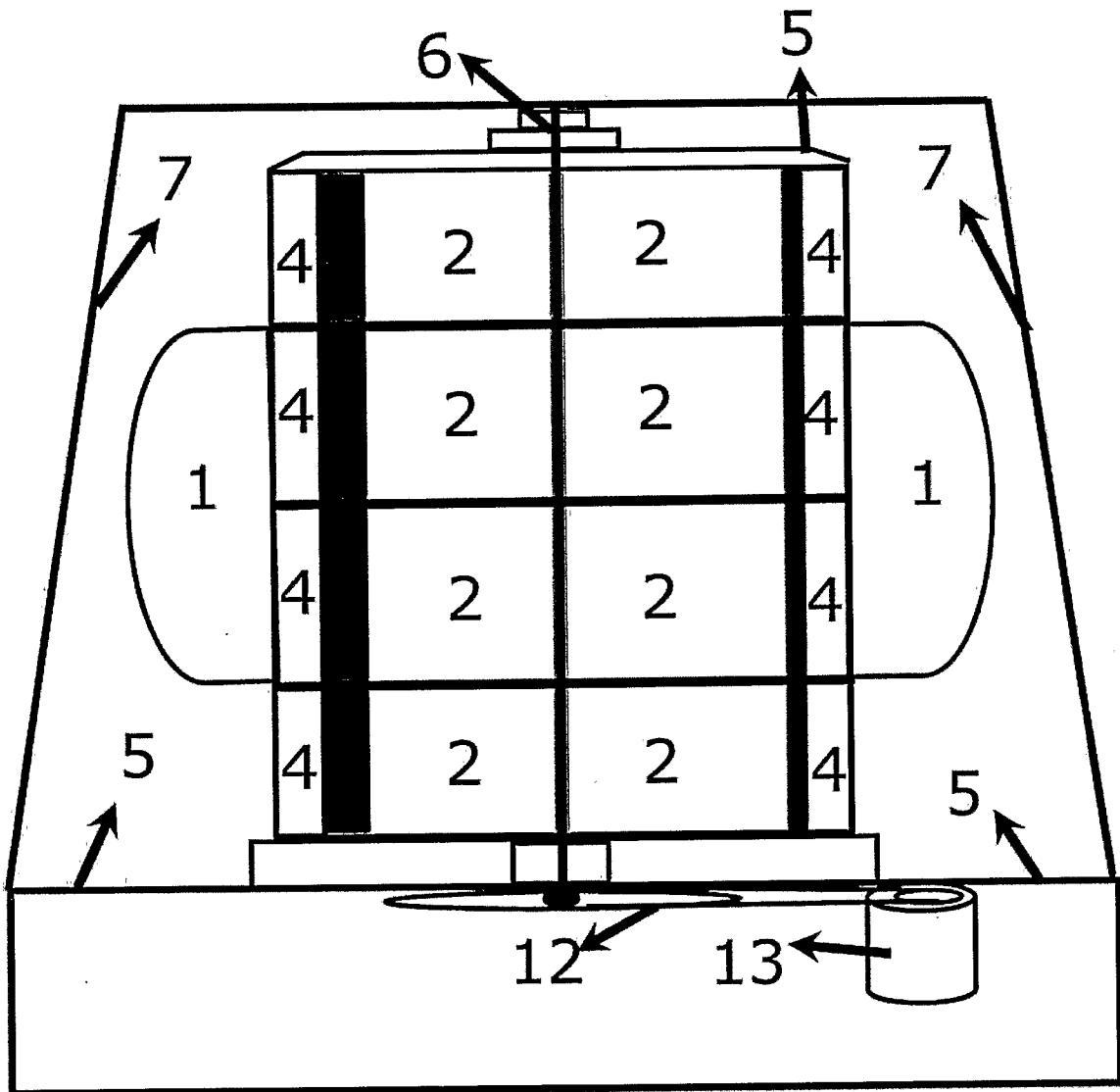


Fig. 3

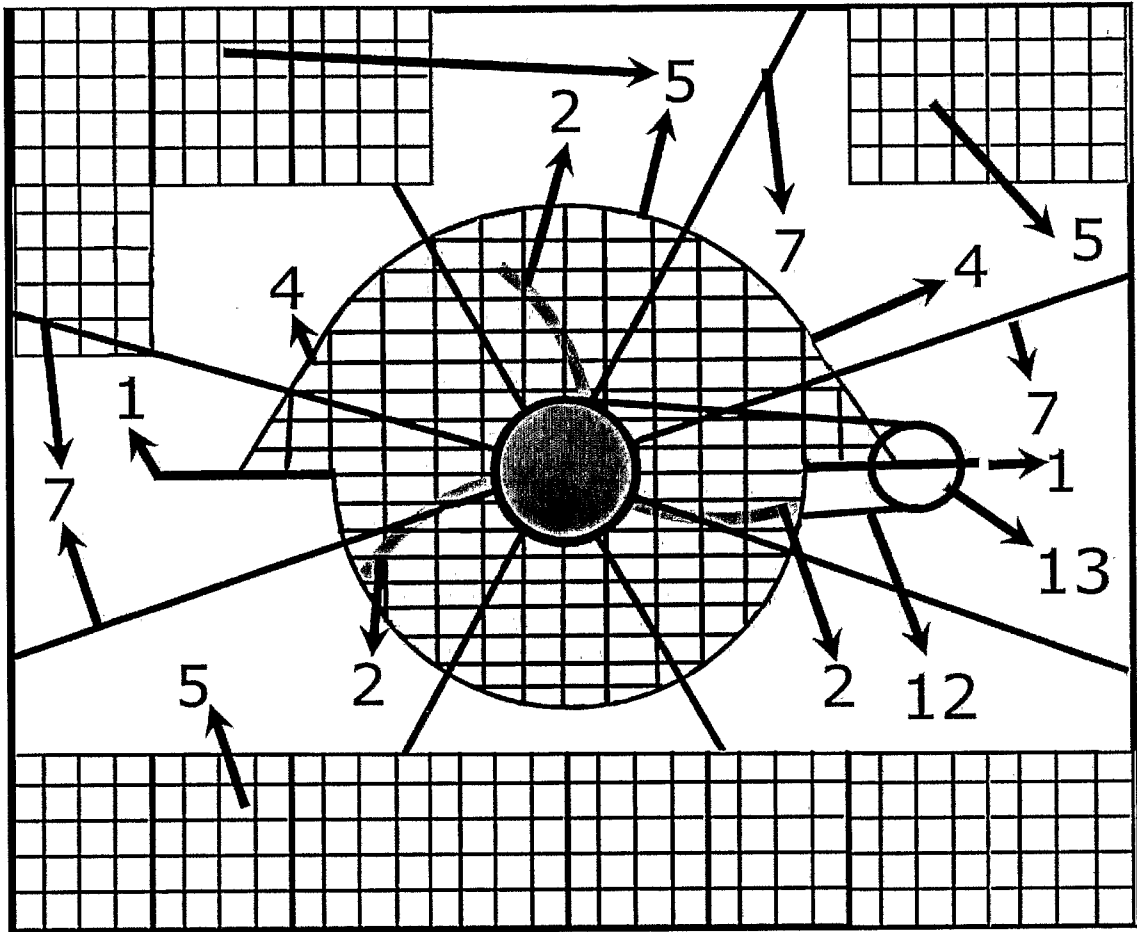


Fig.4

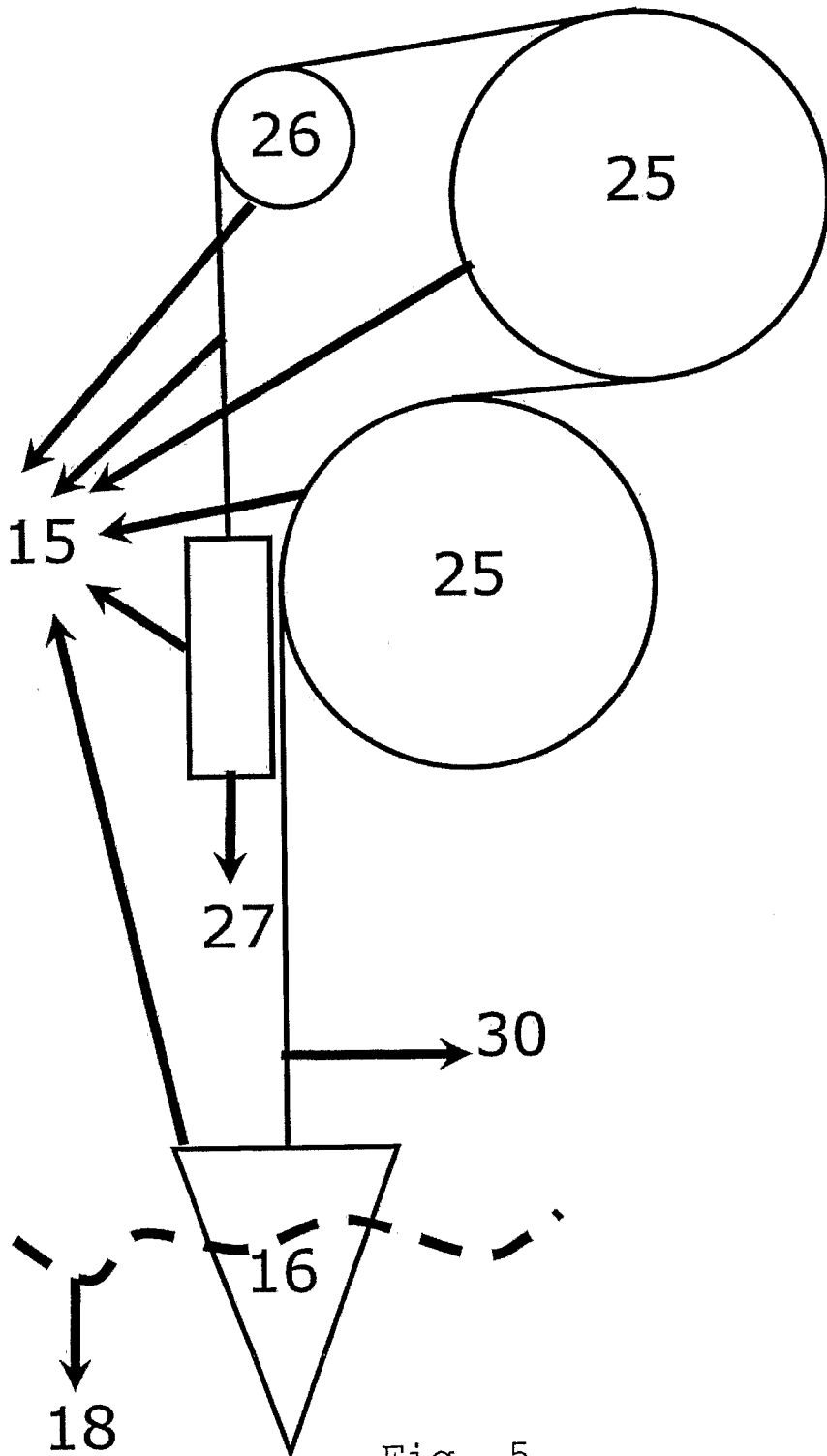


Fig. 5

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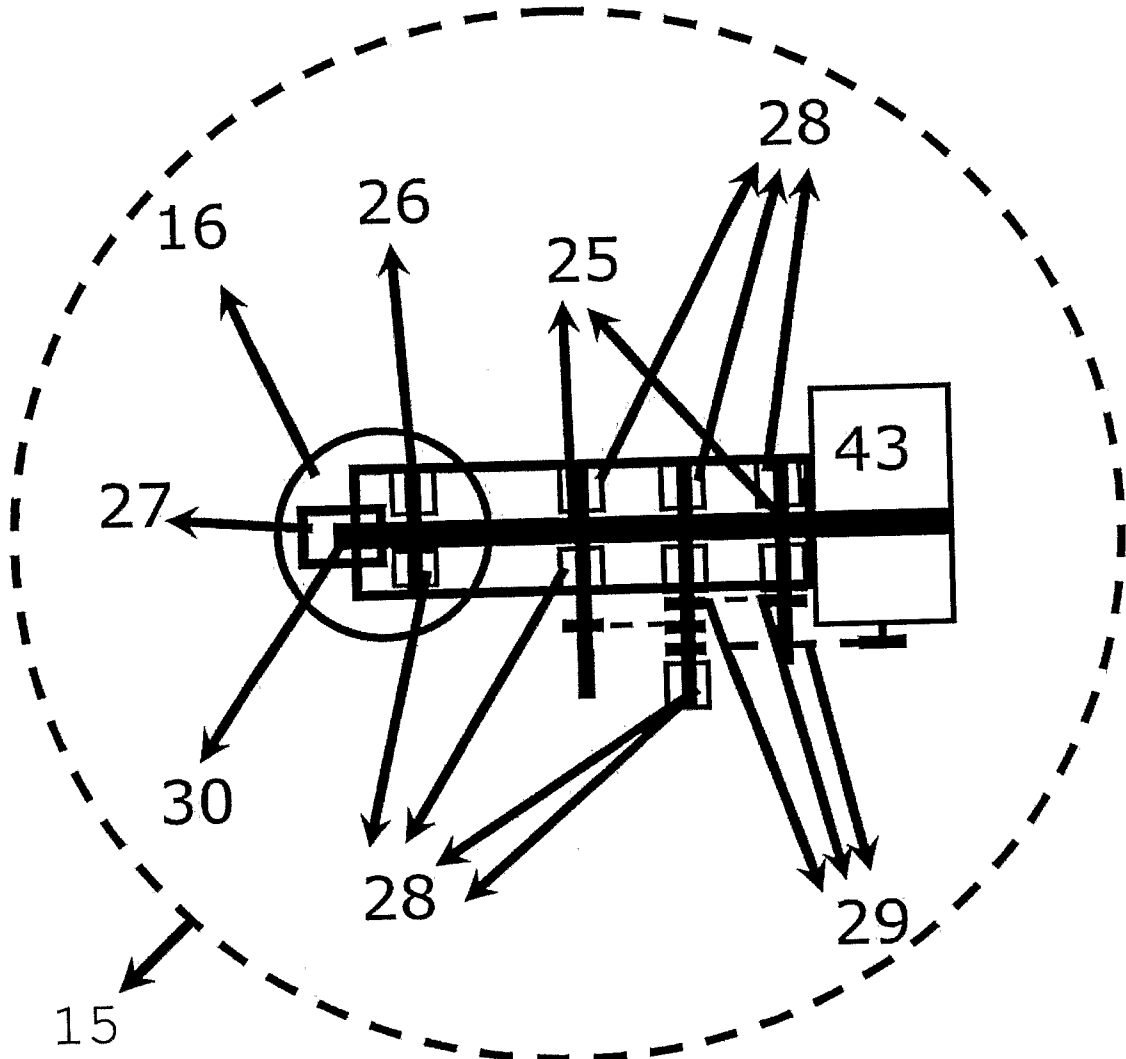


Fig. 6

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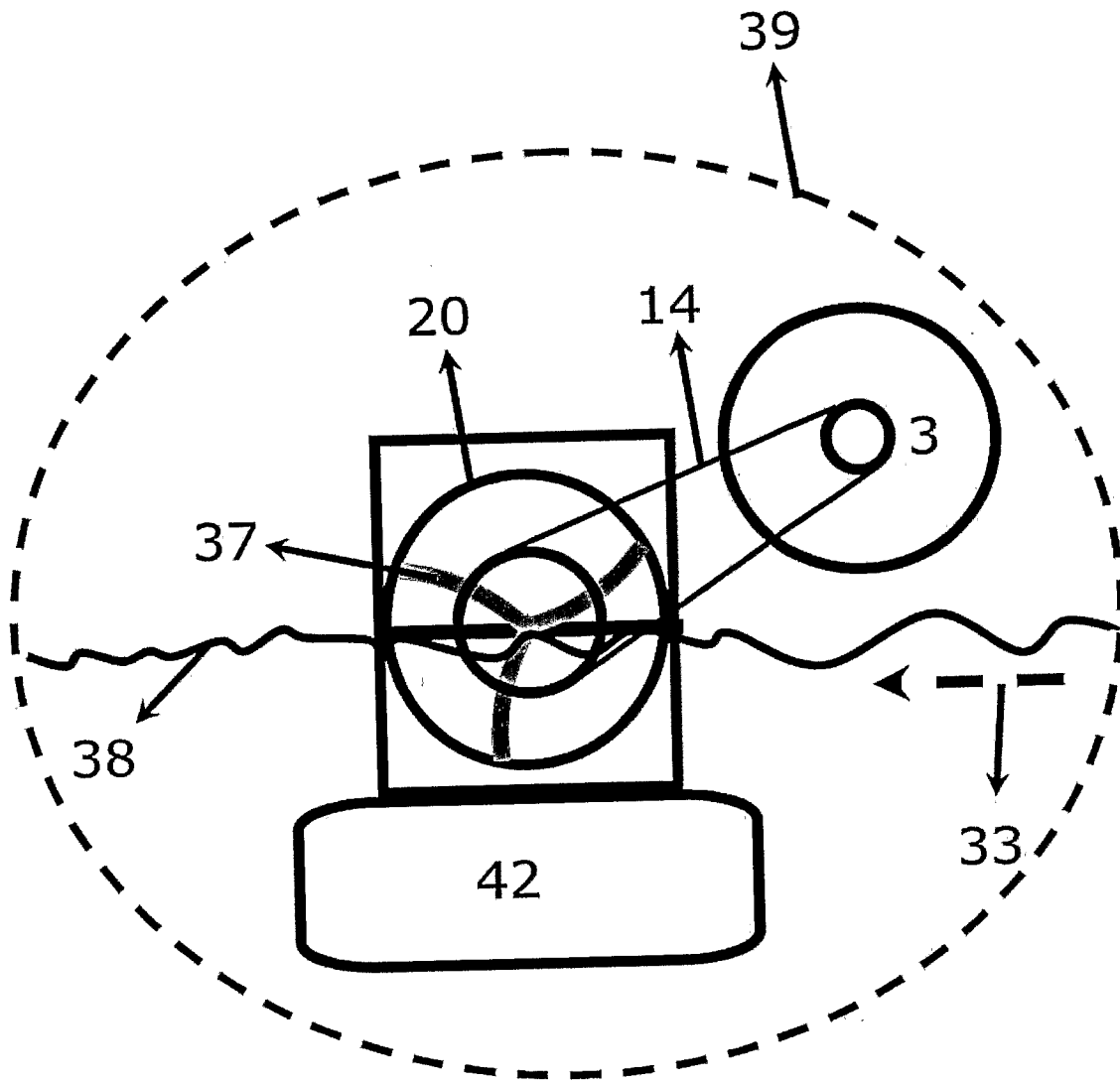


Fig. 7

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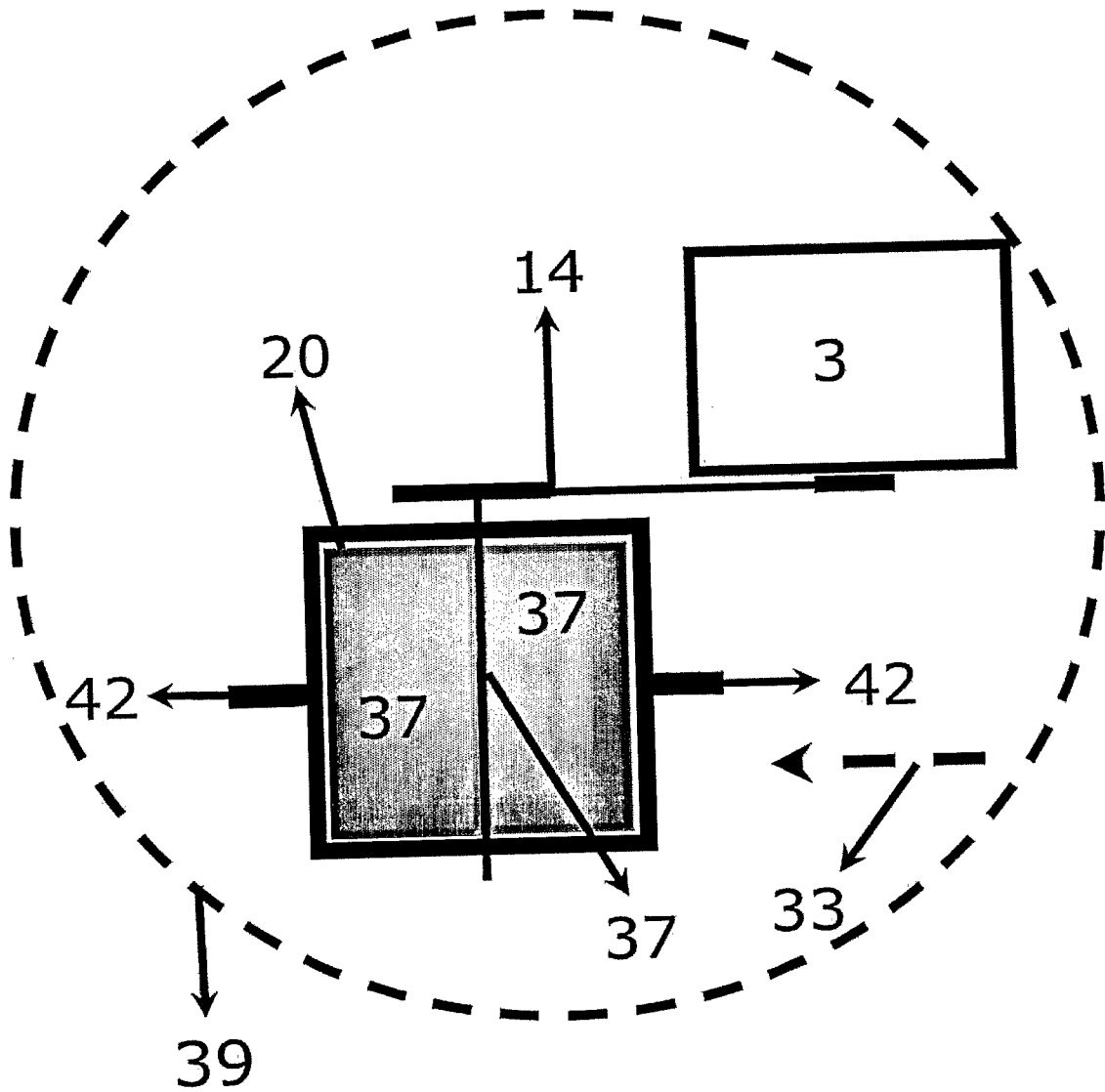


Fig. 8



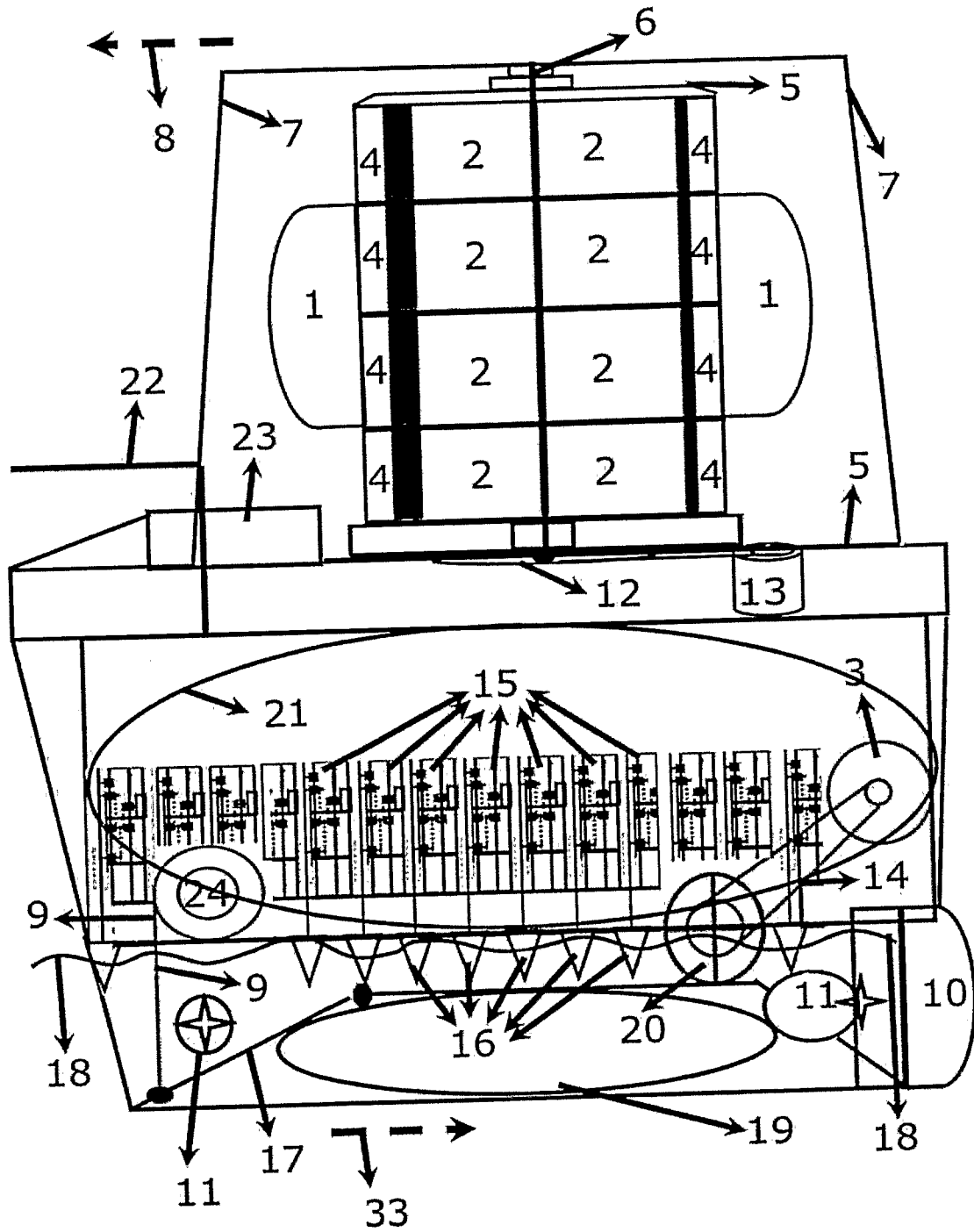


Fig. 9

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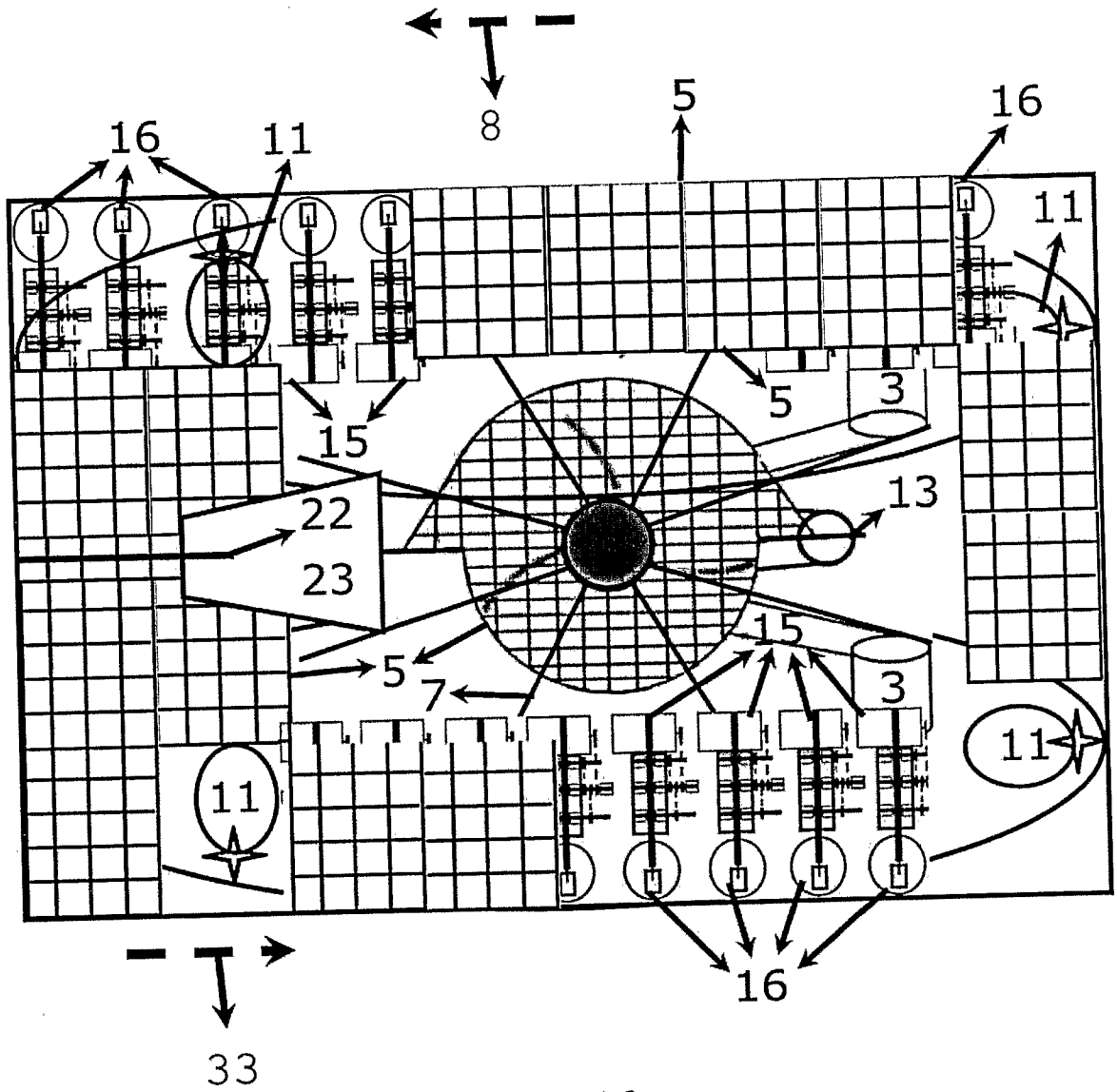


Fig. 10

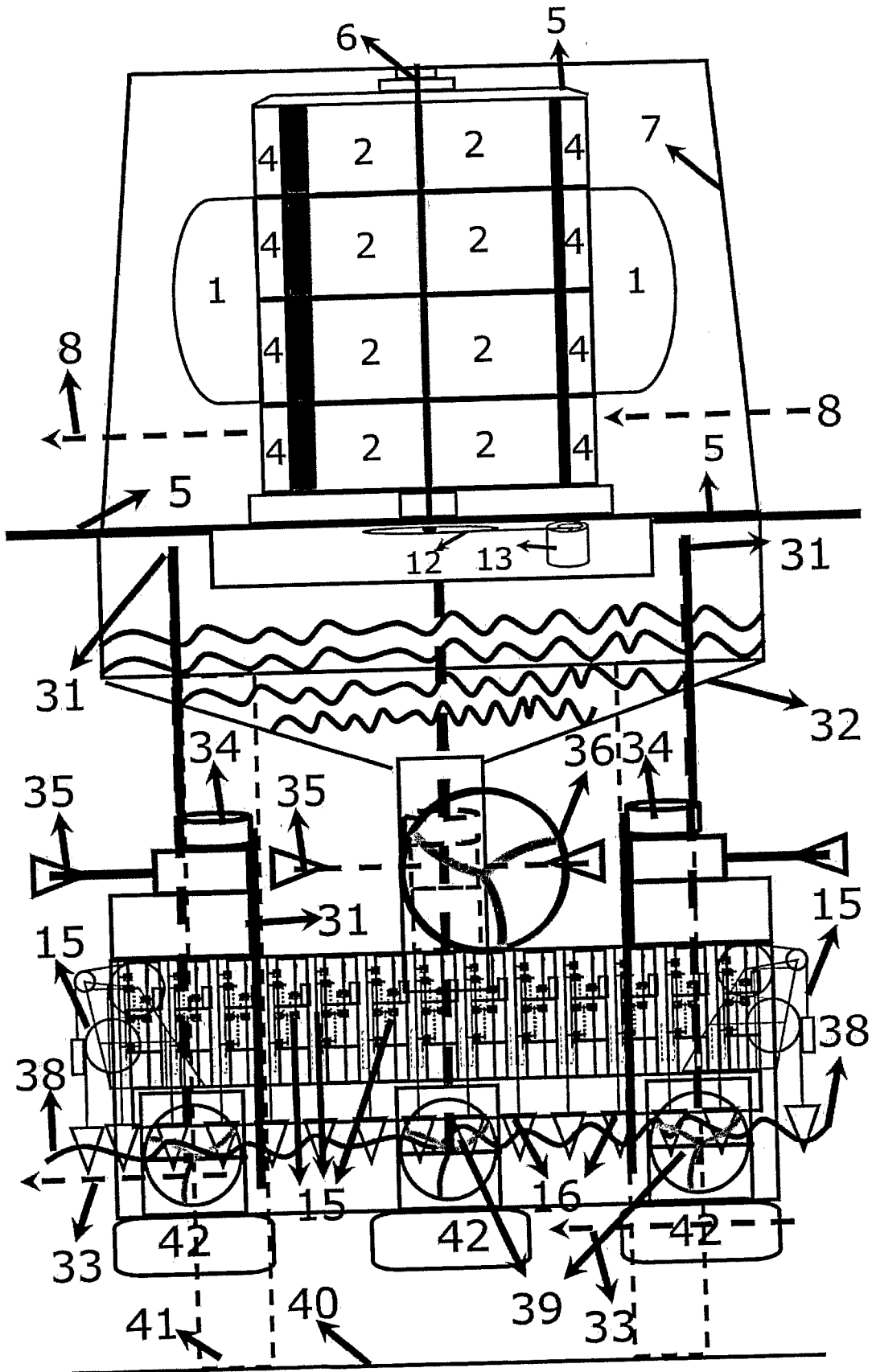


Fig. 11

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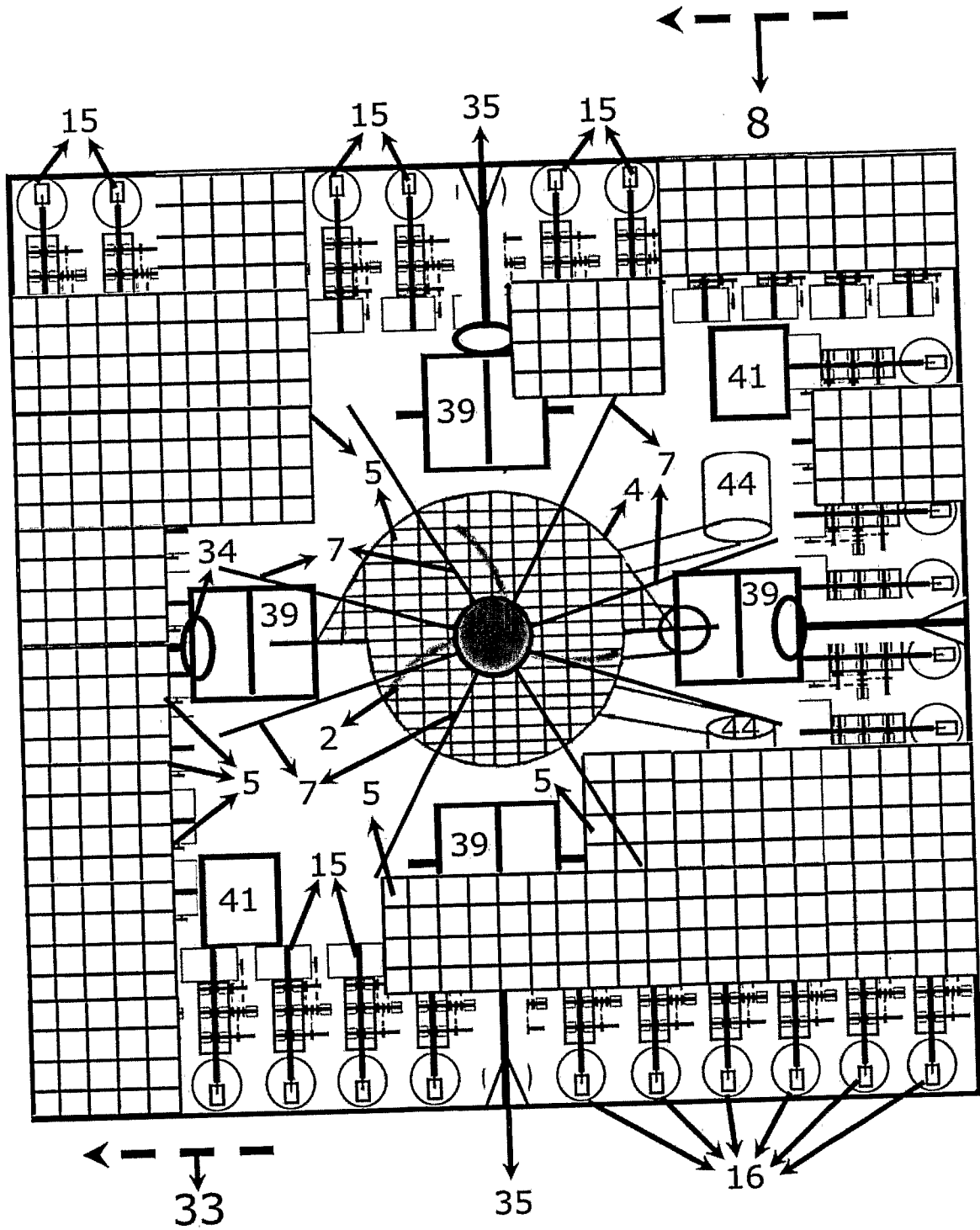


Fig. 12

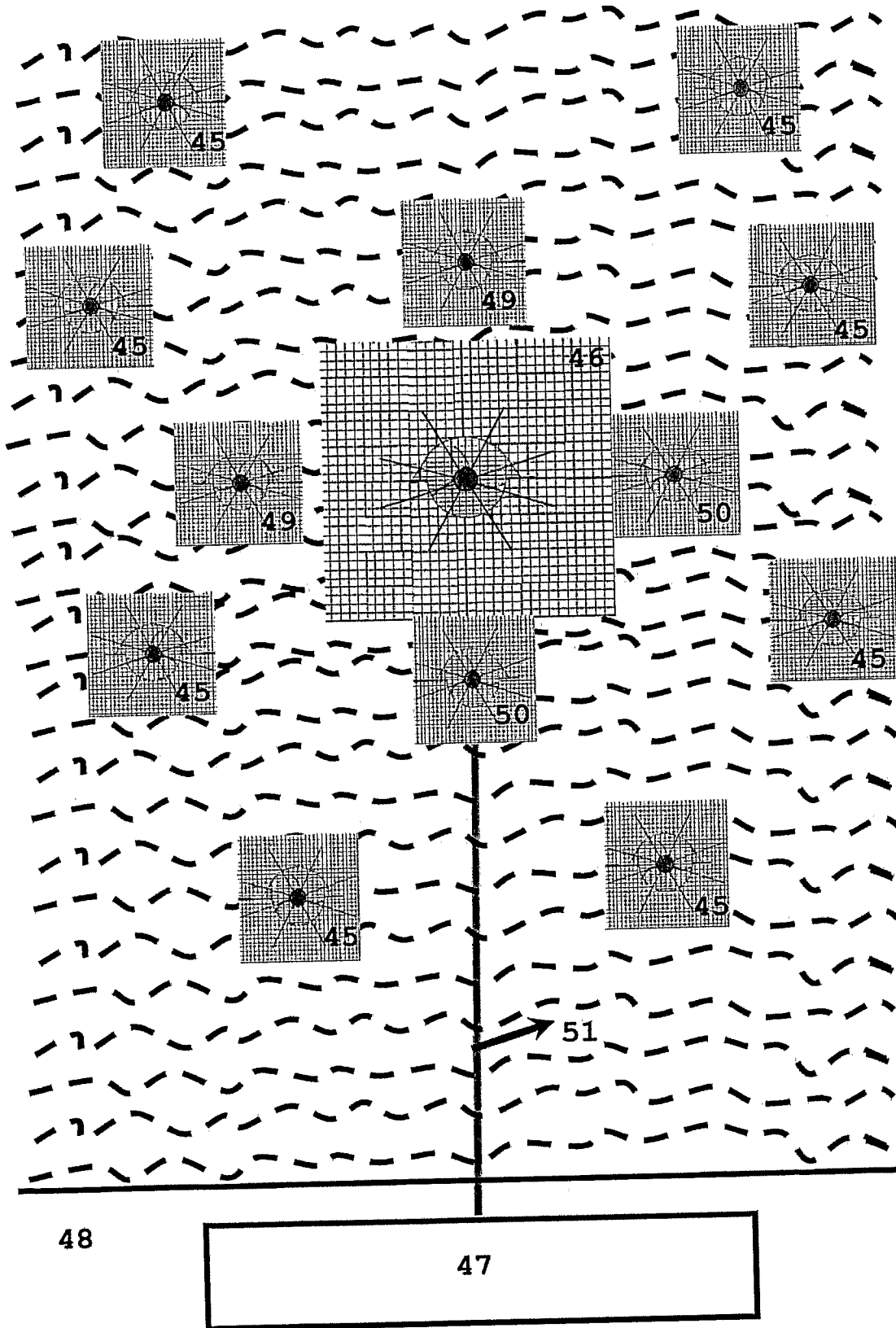


Fig. 13

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/PT2007/000028

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. F03D9/00

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)  
F03D

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)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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X	US 4 993 348 A (WALD LEONARD H [US]) 19 February 1991 (1991-02-19) column 3, lines 37-49; figure 1 column 10, line 20 - column 13, line 55	1-4
X	BE 876 855 A2 (HENDRIKS P J) 1 October 1979 (1979-10-01) page 2, paragraph 1-3; claims 3,5; figures 1-4	1

Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search

7 May 2008

Date of mailing of the international search report

15/05/2008

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/PT2007/000028

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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