(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 June 2008 (12.06.2008)

PCT

(10) International Publication Number
WO 2008/068760 A2

(51) International Patent Classification:
F01N 3/02 (2006.01)

(21) International Application Number:
PCT/IL2007/001507

(22) International Filing Date:
6 December 2007 (06.12.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
179878 6 December 2006 (06.12.2006) IL

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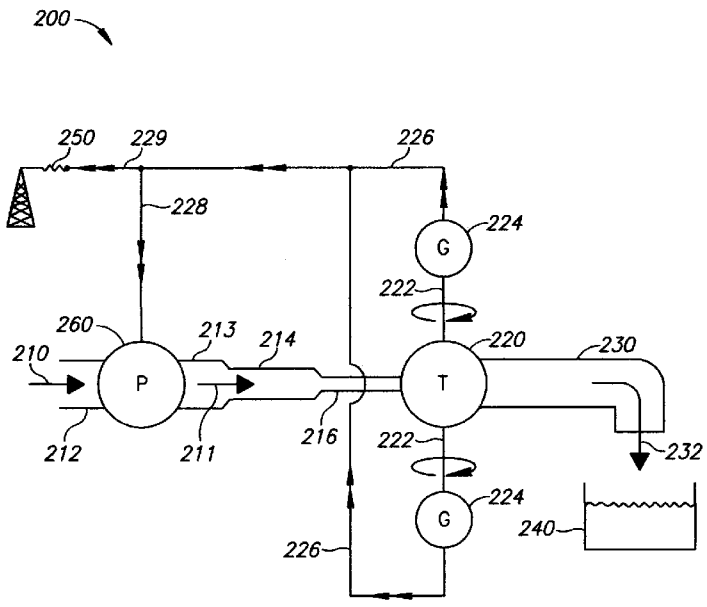
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

(54) **Title:** ENERGY PRODUCTION FROM ARTIFICIAL WATER SOURCE



(57) **Abstract:** The present invention relates to an economical way of generating electrical energy by extracting energy from water flowing in pipe 213 or similar conduit, said water originates from any artificial source such as a reservoir, water desalination plant and the like.A power conversion unit including a turbine 220 mountable on said pipe, activated by said flowing water and functionally conected to an ekectric generator 220 and possibly to energy storage device, is also provided, as well as means for accelerating the water that actuates the turbine by progressively lowering the cross section of the pipes 214, 216 upstream of the turbine. Pump 260, operated by part of the electricity 228, increases the pressure in 213. The remaining electricity is transmitted to consumers grid 150.

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ENERGY PRODUCTION FROM ARTIFICIAL WATER SOURCE

Technical Field

The present invention relates to an economical way of generating electrical energy by extracting energy from water flowing in a pipe or similar conduit, said water originate from any artificial source such as a reservoir, water desalination plant and the like. A power conversion unit including a turbine mountable along said pipe, activated by said flowing water and functionally connected to an electric generator and possibly to energy storage device is also provided, as well as means for accelerating the water that actuates the turbine by progressively lowering the cross section of the pipes upstream of the turbine.

Background Art

The efficient generation of energy, electrical or other, is of the utmost importance, and any extraction and generation of energy that otherwise would be lost has high commercial and environmental value. Numerous devices and methods are known and exist for its extraction and generation. This invention provides for a novel energy generation device made of known components.

The use of waterfalls, or of water flowing from a high altitude source to a lower place, for the generation of electrical energy is known. A large number of natural streams or dams are equipped with turbines, rotated by the flowing water, and rotating electric generators. No patents or any kind of professional literature in this field are quoted, as this technology is very well known. This inventive device uses the energy in different ways including the use of energy that would otherwise be lost.

Summary of the Invention

This invention deals with a device for the generation of electrical energy by using water flowing from an artificial source. In one embodiment of this inventive device, a turbine is installed along a water pipe through which flows water emanating from a source under pressure and is actuated by the flow. The term turbine is used in this document to mean any device which converts energy of flowing water into mechanical motion such as rotation. As is often the case, this pressure is higher than the pressure required for the water flow to reach its destinations and its consumers. The turbine is installed to be rotated by the flowing water and lowers the pressure during said rotation to a desired or sufficient level. The turbine rotates an electric generator to generate electrical energy, said energy could be used in a variety of ways such as feeding an electric grid. The electricity could also be stored in electric accumulators or any other storage devices such as pneumatic accumulators, or it could be split between users and storage.

In another configuration of this invention, there are provided water pipes or similar conduits and other elements listed hereinbelow forming a hydraulic circuit. Water flow that emanate from a container or a reservoir located at a high altitude, such as a hill or a tall building, flows through a pipe which could be vertical or otherwise generally downward pointing, and actuates a turbine which could be mounted along said vertical or downward pointing pipe. The turbine rotates an electrical generator for the generation of electricity. A pipe connected to the input orifice of the turbine may be made of several pipe sections of decreasing diameter, arranged in decreasing diameter sequence, the highest diameter section facing upstream, the lowest diameter section facing downstream, said lowest diameter section being connected to the turbine water inlet, thus increasing the inlet water velocity and the energy extraction from it. Blunt conical pipe section, with the small diameter side leading to the turbine water inlet and the large diameter connected upstream, may also be used for increasing the flow velocity, as may be other arrangements and combinations of similar nature.

The water emanating from the turbine outlet then flows to another vertical or otherwise upward pointing pipe. A pump, hydraulically connected to the turbine inlet which may be mounted along the upward pointing pipe and, is used to pump the water along the upward pointing pipe, whose top level is functionally at least at the same level as the top level of the downward pointing pipe. As less energy is required to pump the water along the upward pointing pipe than is generated by the generator rotated by the turbine by the downward flowing water and mounted along the down pointing pipe, excess energy is generated which can be profitably utilized.

List of Figures

Fig. 1 is a depiction of a preferred embodiment according to this invention.

Fig. 2 is a depiction of another preferred embodiment according to this invention.

Fig. 3 is a depiction of a still another preferred embodiment according to this invention.

Fig. 4 is a depiction of yet another preferred embodiment according to this invention.

Description of the Illustrative Preferred Embodiments

It is universally accepted that the generation or conversion of energy by using renewable energy sources or energy that would otherwise be lost is of the utmost importance.

Descriptions of several illustrative preferred embodiments of this invention for the generation of energy from artificial water sources are presented hereinbelow.

In the Figs of this document, a single arrowhead designates the motion of a mechanical device such as the rotation of a shaft, but not necessarily in the

direction shown. A double arrowhead designates the flow of electric power in an electric conductor. A single, thick arrowhead designates the direction of water flow. A "G" within a circle designates an electric generator, a "P" within a circle designates a water pump and a "T" within a circle designates a turbine or other water operated device that extracts energy from flowing water and converts it to a mechanical energy, to be further transmitted via a rotating shaft or other means suitable for the operation of electrical generator.

One preferred embodiment 100 of this inventive device is shown in Fig. 1, wherein: 110 designates input water flowing in a pipe 112 or other conduit and emanating from an upstream pumping station (not shown) of any water supply system. The pressure of the water in 112 is often more than the pressure required to provide the water customers with their water, such excessive pressure is often damaging to pipes and other devices. The excessive pressure is utilized in this inventive device. The water flows through pipe sections 114, 116, of successively decreasing cross sections diameters and its flow velocity through the low diameter pipe sections increases, permitting better utilization of the water flow. Any number of pipe sections of successively decreasing cross section may be provided in the inventive devices of this document. "Sections of successively decreasing cross section" also mean, in this document, a blunt conical pipe section having its small diameter facing the downstream side of the flow and leading towards the inlet of a turbine. The downstream extremity of the lowest cross section pipe section 116 is connected to the inlet orifice of a water operated turbine 120 and rotates said turbine. Turbine 120 rotates preferably two electric generators 124 via shafts 122 to generate electricity that flows in lines 126, said lines feed power line 150 of any suitable consumer, such as the national grid. This generated electricity is to be sold to provide revenue to the operator of this inventive device. The water 132 that leaves turbine 120 outlet flows in pipe 130 to the consumers, schematically represented by container 140. The electricity may also be stored in storage devices such as accumulator 170, shown only in this embodiment but which may be installed in any device according to this invention. If so desired, more than one turbine such as 120

may be installed along 130, fed by pipes of successively decreasing diameter such as 114, 116 and rotating more electric generators such as 124.

Another preferred embodiment 200 of this inventive device is shown in Fig. 2, wherein 210 is input water flowing in a pipe 212 or the like into a pump 260, said pump augments the pressure of water 210. Higher pressure water 211 emanating from the pump then flows through another section of 213 and, further downstream, through a number of pipe sections of downstream decreasing cross section 214 and 216. The pressure of the water in 213 is therefore raised to a value above than the pressure required to provide the customers with their water, and the excess pressure is utilized in this inventive device. The water flows through pipe sections 214, 216, of successively decreasing cross sections and consequently its flow velocity increases, thus permitting a better utilization of their pressure. The downstream part of the lowest cross section pipe section 216 is leading to the inlet orifice of a water operated turbine 220 and rotates said turbine. Turbine 220 rotates preferably two electric generators 224 via shafts 222 to generate electricity that flows in lines 226. Part of the electricity in 226 flows in 228 is used to operate pump 260, the remaining part feeds power line 250 of any suitable consumer, such as the national grid. This generated electricity is to be sold to provide revenue to the operator of this inventive device. The water 232 that leaves turbine 220 outlet then flows in pipe 230 to the consumers, schematically represented by container 240. The electricity may also be stored in storage devices such as accumulators, not shown.

Still another preferred embodiment 300 of this inventive device is shown in Fig. 3, wherein: 310 is input water emanating from a reservoir 340 located on the top of a hill, tower, tall building 370 and the like. Water 310 flows in a pipe 312 and pipe sections 314, 316 of successively decreasing cross sections and its flow velocity increases, thus permitting a better utilization of their pressure. The downstream part of the lowest cross section pipe section 316 is leading to the inlet orifice of a water operated turbine 320 and rotates said turbine. Turbine 320 rotates preferably two electric generators 324 via

shafts 322 to generate electricity that flows in lines 326. Part of the electricity in lines 326 flows in line 328 to operate pump 360 and to recirculate the water into reservoir 340, the remaining part of the electricity feeds power line 350 of any suitable consumer, such as the national grid. This generated electricity is to be sold to provide revenue to the operator of this inventive device. The water 332 that exits turbine 320 outlet then flows in pipe 336 to a pump 360, said pump pumps the water 334 via pipe 338 to reservoir 340, the water is then fed again to turbine 320, generates electricity etc. This way a permanent motion of water is set in action by this inventive device, actuating a turbine and generators, producing the electricity required for the operation of the pump, necessary for the water circulation and leaving an excess electricity to be used or sold as desired. As shown earlier, all or part of the excess electricity, above the energy required to operate the pump, may be stored in storage devices such as accumulators, not shown.

Yet another preferred embodiment 400 of this inventive device is shown in Fig. 4, wherein 470 is a platform standing on a support 472 and resting on the sea bed 476, below sea level 474. 432 is input water pumped from the sea via pipe 436 by pump 460, 410 is the water emanating from pump 460 under pressure. Water 410 flows in pipe 438 into blunt conical pipe section 439 whose large diameter points upstream and its small diameter points downstream to turbine 420. The decreasing cross section of 439 increases the water flow velocity, thus permitting a better utilization of its pressure. The small diameter of pipe section 439 is leading to the inlet orifice of a water operated turbine 420, increasing the water velocity and rotates said turbine. Turbine 420 rotates preferably two electric generators 424 via shafts 422 to generate electricity that flows in lines 426. Water 410 exits turbine 420 via pipe 439 and into the sea. Pump 460, turbine 420, generators 424 and their connecting parts are to be mounted on platform 470. Part of the electricity in lines 426 flows in line 428 to operate pump 460, the remaining part feeds power line 450 of any suitable consumer, such as the national grid. This generated electricity is to be sold to provide revenue to the operator of this inventive device. This way a permanent motion of water is set in action by this

inventive device, actuating a turbine, generators, producing electricity for the pump necessary for its operation and leaving an excess electricity to by used or sold as desired. As shown earlier, part or all of the excess electricity may also be stored in storage devices such as accumulators, not shown.

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It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove by way of examples only.

Rather, the scope of the present invention is defined by the appended
10 claims and includes both combinations and sub-combinations of the various features described hereinabove, as well as variations and modifications thereof which would occur to persons skilled in the art upon reading this description.

CLAIMS

I claim:

1. A device for the generation of electricity from a water flow in pipe emanating from an artificial water source, including:
   - a number of pipe sections of successively decreasing cross section attached consecutively to said pipe in the downstream direction to accelerate said water;
   - a turbine with an inlet orifice and an outlet orifice, said inlet orifice fed by said accelerated water;
   - at least one electrical generator mechanically coupled to said turbine to generate electricity.

2. A device according to claim 1 including means for conducting electricity from said generator to a consumer.

3. A device according to claim 1 including electricity storage means.

4. A device according to claim 1 including means for conveying water from said turbine outlet to a water user.

5. A device for the generation of electricity from a water flow in pipe, said water flow emanating from an artificial water source, including:
   - an electric pump having a water inlet and a water outlet orifices, said pump installed on said pipe, to accept said water flow by its inlet and to raise its pressure;
   - a number of pipe sections of successively decreasing cross section in the downstream direction, attached consecutively to said pump outlet, to accelerate said water in said downstream direction;

- a turbine having an inlet and an outlet orifices, said inlet fed by said accelerated water;
- at least one electrical generator mechanically coupled to said turbine to generate electricity;
- means for conducting electricity from said generator to said pump to operate said pump.

6. A device according to claim 5 including means for conducting electricity from said generator to a consumer.

7. A device according to claim 5 including electricity storage means.

8. A device according to claim 5 including means for conveying water from said turbine outlet to a water user.

9. A device for the generation of electricity from a water flow in pipe, said water flow emanating from a water reservoir, said reservoir located on a relatively elevated location, including:

- a number of pipe sections of successively decreasing cross section in the water downstream flow direction, attached consecutively to said source outlet, to accelerate said water in said downstream direction;
- a turbine having an inlet and an outlet orifices, said inlet fed by said accelerated water, said turbine located below said reservoir;
- at least one electrical generator mechanically coupled to said turbine to generate electricity;
- an electric pump having an inlet and an outlet;
- an outlet pipe connected to said turbine outlet to conduct the emanating outlet water to said electric pump inlet, said pump pumping said water to said reservoir via said pump outlet, said pump located below the level of said reservoir, to permit the continuous operation of said turbine;
- means for conducting electricity from said generator to said pump to operate said pump to permit the continuous operation of said turbine;

10. A device according to claim 9 including means for conducting excess electricity from said generator to a consumer.

11. A device according to claim 9 including electricity storage means.

12. A device for the continuous generation of electricity from a water flow in pipe, said water flow sustained by one part of said generated electricity, said device located on a platform erected in the sea and above sea level, including:

- an electric pump including a water inlet and a water outlet for the provision of high pressure water flow to a turbine;
- a water operated turbine having a water inlet and a water outlet to accept said pumped water;
- at least one electrical generator, wherein said pump, turbine and generator are mounted on said platform;
- a pipe partly sunk in the sea and connected to the inlet of said pump to provide water to said pump;
- a number of pipe sections of successively decreasing cross section in the water downstream flow direction, accepting high pressure water flow from said pump outlet, to accelerate said water in said downstream direction and to operate said turbine,
- at least one electrical generator mechanically coupled to said turbine to generate electricity;
- means for conducting the outlet water to said turbine to the sea;
- means for conducting electricity from said generator to said pump to operate said pump to permit the continuous operation of said turbine.

13. A device according to claim 12 including means for conducting electricity from said generator to a consumer.

14. A device according to claim 12 including electricity storage means.

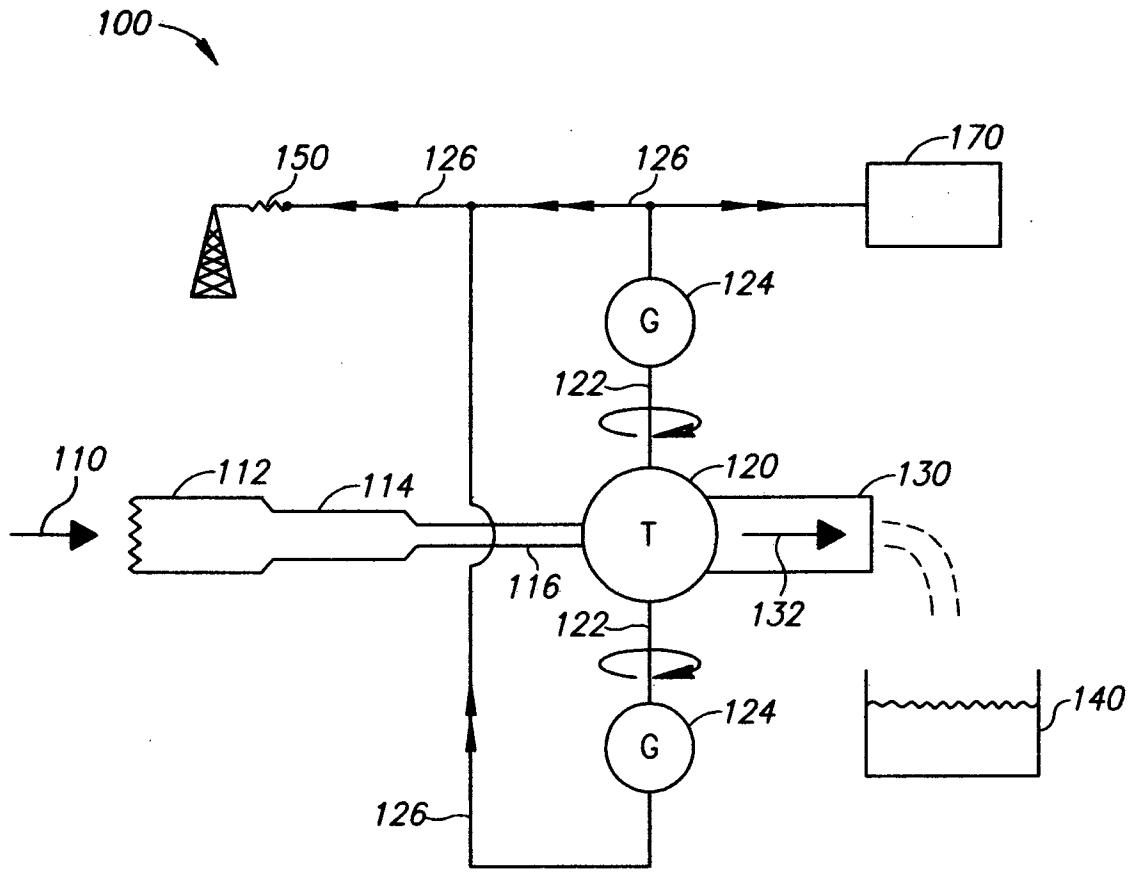
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FIG.1

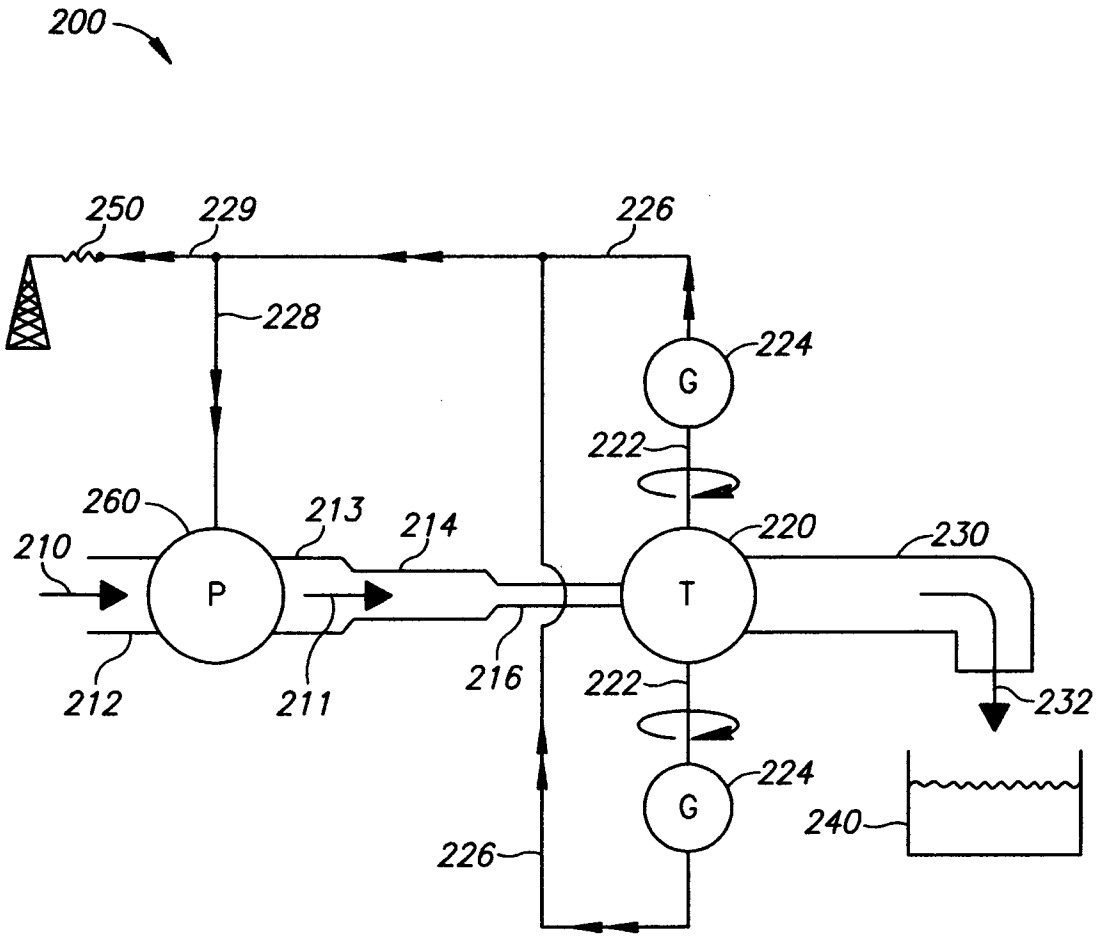
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FIG.2

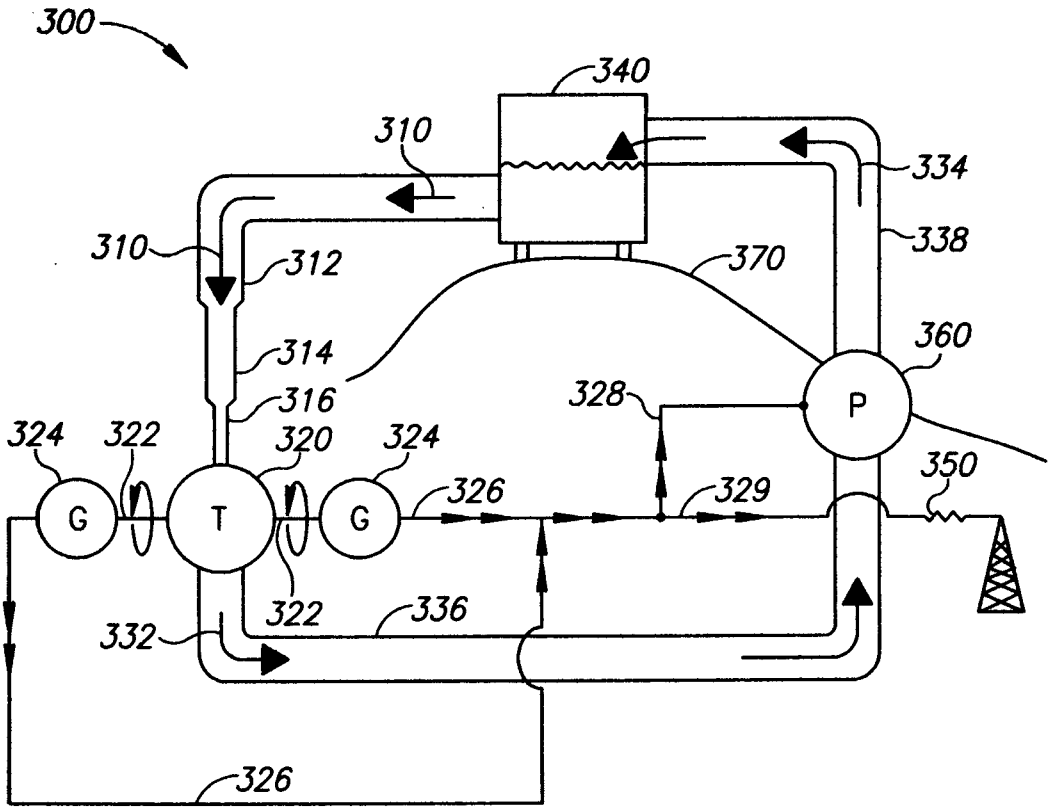
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FIG.3

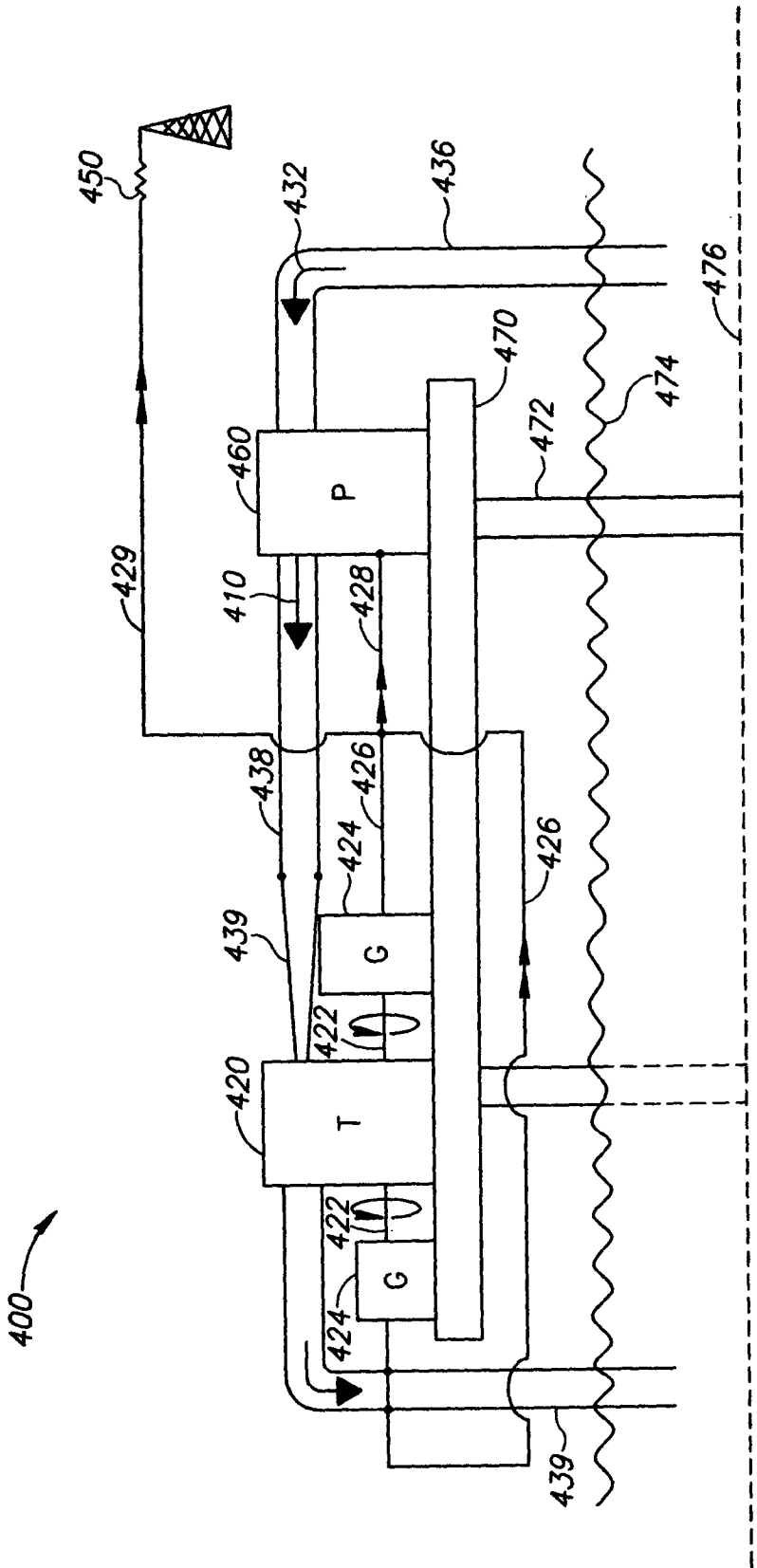
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FIG.4