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(54) **FRICION BOILER APPARATUS USING CENTRIFUGAL FORCE AND JET PROPULSION**

(57) The present invention relates to a friction heat boiler apparatus using a centrifugal force and jet propulsion, capable of providing the propulsion through discharging a fluid while allowing the fluid to spirally flow through a rotational force to compress and heat the fluid by using frictional heat generated by the flow. The friction boiler apparatus includes: a spiral friction member for compressing a fluid by rotating the fluid to spirally flow, heating the fluid through frictional heat generated by a flow, and discharging the fluid; a heat exchange tank for storing a high-temperature fluid discharged from the spiral friction member, and heating a heating target fluid by allowing the high-temperature fluid to exchange heat with the heating target fluid; and a fluid pump for pumping the fluid stored in the heat exchange tank to supply the fluid to the spiral friction member.

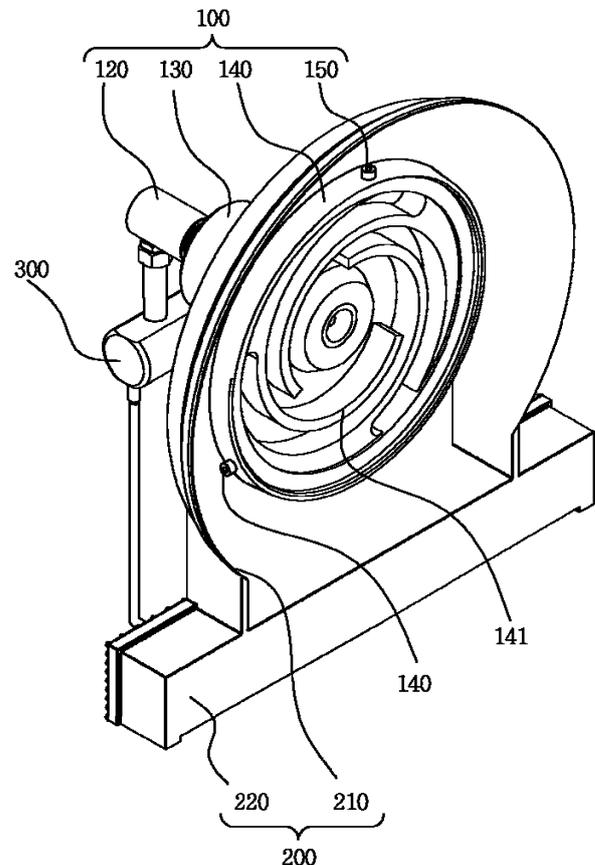


Fig. 3

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DescriptionTechnical Field

[0001] The present invention relates to a boiler apparatus, and more particularly, to a friction heat boiler apparatus using a centrifugal force and jet propulsion, capable of providing the propulsion through discharging a fluid while allowing the fluid to spirally flow through a rotational force to compress and heat the fluid by using frictional heat generated by the flow.

Background Art

[0002] In general, a boiler apparatus for heating a fluid such as water, vapor, or heating medium oil to supply hot water or perform heating is an apparatus that heats the fluid by using chemical fuels or electricity and directly uses the heated fluid or performs indoor heating at a predetermined temperature through the heated fluid.

[0003] In this case, a heating device using the chemical fuels discharges a large amount of pollutants during a combustion process of the chemical fuels, and represents thermal efficiency which is relatively low in comparison with consumption of the chemical fuels.

[0004] In addition, the heating device using electric energy includes an electric heater using electrical resistance and a frictional heater for generating heat through a flow of a fluid. In this case, the electric heater using the electric resistance always has a risk of a short circuit or fire depending on properties of the fluid, and requires a great deal of time to heat a large amount of fluid because the fluid is heated only in the vicinity of a heating wire which generates heat by the resistance.

[0005] Recently, in order to solve the above problems, there is provided a friction heat boiler which uses electric energy to allow a fluid to flow so as to allow the fluid to be directly heated by the flow of the fluid.

[0006] Typical friction heat boilers heat the fluid through friction, cavitation or the like of the fluid, and it is very important to increase a flow rate and a turbulent flow of the fluid to promote the friction, cavitation or the like of the fluid. To this end, the typical friction boilers include a cylindrical case and a cylindrical head that rotates inside the case so as to heat the fluid by friction through the rotation of the head.

[0007] However, a typical friction heat boiler apparatus allow the fluid to flow only by rotating the fluid with a power of a motor, which causes electric energy consumption.

[0008] Therefore, a novel technique for minimizing power consumption of the motor in heating the fluid is required.

DisclosureTechnical Problem

5 **[0009]** To solve the problems of the related art described above, an object of the present invention is to provide a friction heat boiler apparatus using a centrifugal force and jet propulsion, capable of reducing energy consumption of a motor by heating and compressing a fluid
10 to have a high pressure through a centrifugal force while spirally rotating the fluid and providing the propulsion for rotation through a discharge pressure of the fluid compressed with a high pressure.

15 **[0010]** In addition, another object of the present invention is to provide a friction heat boiler apparatus using a centrifugal force and jet propulsion, capable of smoothly heating and compressing a fluid by generating a vortex in the fluid while the fluid flows in a spiral flow channel to expand a friction area.

20 **[0011]** In addition, still another object of the present invention is to provide a friction heat boiler apparatus using a centrifugal force and jet propulsion, capable of allowing a fluid to smoothly flow by varying a width of a spiral flow channel through which the fluid moves.

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Technical Solution

[0012] To achieve the objects described above, according to one embodiment of the present invention,
30 there is provided a friction boiler apparatus using a centrifugal force and jet propulsion, the friction boiler apparatus including: a spiral friction member for compressing a fluid by rotating the fluid to spirally flow, heating the fluid through frictional heat generated by a flow, and discharging the fluid;
35 a heat exchange tank for storing a high-temperature fluid discharged from the spiral friction member, and heating a heating target fluid by allowing the high-temperature fluid to exchange heat with the heating target fluid; and a fluid pump for pumping the fluid stored in the heat exchange tank to supply the fluid to the spiral friction member.

40 **[0013]** For example, the spiral friction member may include: a hollow shaft having a hollow tube shape, in which one of both longitudinal ends of the hollow shaft is connected to the fluid pump to receive the fluid of the heat exchange tank; a rotary joint rotatably connecting the hollow shaft to the fluid pump; a rotary motor coupled to an outer peripheral surface of the hollow shaft to rotate the hollow shaft;
45 a spiral disc having a cylindrical shape formed therein with a flow space for the fluid, and coupled to a remaining one of the both ends of the hollow shaft to rotate together with the hollow shaft, in which the flow space is partitioned by a spiral partition wall to guide the fluid supplied from the hollow shaft to an outer periphery
50 of the flow space along the spiral partition wall to compress and heat the fluid by friction; and a jet nozzle provided at an outer periphery of the spiral disc to generate high-pressure propulsion for rotating the spiral disc by

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discharging the compressed fluid from the spiral disc.

[0014] In addition, the jet nozzle may be configured to be inclined in a direction opposite to a rotational direction of the spiral disc.

[0015] In addition, the spiral disc may include a vortex protrusion protruding along a surface of the spiral partition wall to generate a vortex in the fluid while expanding a friction area with the fluid.

[0016] In addition, the spiral disc may be configured such that a width of a fluid flow channel formed by the spiral partition wall gradually increases from a central portion to the outer periphery of the flow space.

[0017] For example, the heat exchange tank may include: an upper tank accommodated therein with the spiral friction member to downwardly guide the high-temperature fluid discharged from the spiral friction member; a lower tank connected to the lower portion of the upper tank to provide a storage space for the fluid, and connected with the fluid pump; and a heat exchange pipe coupled to the lower tank such that the heat exchange pipe traverses an inside of the lower tank to allow the fluid in the lower tank to exchange the heat with the heating target fluid while allowing the heating target fluid to flow through the heat exchange pipe.

[0018] In addition, the heat exchange tank may further include a plurality of heat dissipation fins coupled to an outer peripheral surface of the heat exchange pipe while being accommodated in the lower tank to expand a heat exchange area.

Advantageous Effects

[0019] According to the friction heat boiler apparatus using the centrifugal force and the jet propulsion of one embodiment of the present invention, the spiral disc constituting the spiral friction member compresses the fluid to have a high pressure through the centrifugal force while spirally rotating the fluid, so that the fluid can be smoothly heated to have a high temperature and a high pressure. In particular, the jet propulsion for rotating the spiral disc is generated by discharging the high-pressure fluid through the jet nozzle, so that energy consumption of the rotary motor can be reduced.

[0020] In addition, according to the present invention, the jet nozzle is configured to be inclined in the direction opposite to the rotational direction of the spiral disc, so that the propulsion for rotating the spiral disc can be smoothly generated.

[0021] In addition, according to the present invention, a vortex protrusion is formed at the spiral partition wall provided in the spiral disc, so that the friction area of the fluid can be expanded, and the fluid can be smoothly heated and compressed by allowing the fluid to move through the spiral flow channel to generate the vortex in the fluid.

[0022] In addition, according to the present invention, the width of the fluid flow channel formed by the spiral partition wall gradually increases from a central portion

to an outer periphery, so that the fluid can be smoothly moved and compressed.

[0023] It should be noted that effects of the present invention are not limited to the above-described effects, and other effects of the present invention will be apparent to those skilled in the art from the appended claims.

Description of Drawings

[0024]

FIG. 1 is a perspective view showing a friction heat boiler apparatus using a centrifugal force and jet propulsion according to one embodiment of the present invention.

FIG. 2 is a perspective view showing a rear side of the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention.

FIG. 3 is a perspective view showing an internal structure of the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention.

FIG. 4 is a longitudinal sectional view showing the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention.

FIG. 5 is a perspective view showing a configuration of a heat exchange pipe shown in FIG. 4.

Best Mode

Mode for Invention

[0025] Hereinafter, embodiments of the present disclosure will be described in detail with reference to accompanying drawings, while identical or similar elements will be given the same reference numerals regardless of the figure number, and any redundant description of the identical or similar elements will not be repeated. The suffixes "module" and "unit" used for the elements in the following description are given or collectively used to facilitate preparation of the specification, but they do not have meanings or roles which are distinct from each other.

[0026] In addition, while the embodiments disclosed herein are shown and described, detailed descriptions of well-known functions and structures incorporated herein may be omitted when they make the subject matter of the embodiments disclosed herein rather unclear. In addition, the accompanying drawings are given for further understanding of the embodiments disclosed in the specification, but are by no means to restrict the technical idea disclosed herein to the accompanying drawings. This shall be construed as including all permutations, equivalents and substitutes covered by the technical ideas and scope of the present invention.

[0027] In addition, although any of the terms including ordinal numbers such as "first" or "second" may be used

herein to describe various elements, the elements should not be limited by the terms. The terms are only used to distinguish one element from another.

[0028] When one element is described as being "connected" or "accessed" to another element, it shall be construed as being connected or accessed to the other element directly but also as possibly having another element in between. Meanwhile, if one element is described as being "directly connected" or "directly accessed" to another element, it shall be construed that there is no other element in between.

[0029] In the present specification, unless clearly used otherwise, expressions in a singular form include a meaning of a plural form. The term such as "comprising" or "including" is intended to designate the presence of characteristics, numbers, steps, operations, elements, parts or combinations thereof, and shall not be construed to preclude any possibility of presence or addition of one or more other characteristics, numbers, steps, operations, elements, parts or combinations thereof.

[0030] FIG. 1 is a perspective view showing a friction heat boiler apparatus using a centrifugal force and jet propulsion according to one embodiment of the present invention, FIG. 2 is a perspective view showing a rear side of the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention, FIG. 3 is a perspective view showing an internal structure of the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention, FIG. 4 is a longitudinal sectional view showing the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention, and FIG. 5 is a perspective view showing a configuration of a heat exchange pipe shown in FIG. 4.

[0031] As shown in FIGS. 1 and 2, the friction heat boiler apparatus using the centrifugal force and the jet propulsion according to one embodiment of the present invention includes a spiral friction member 100, a heat exchange tank 200, and a fluid pump 300.

[0032] The spiral friction member 100 is a component for compressing a fluid by rotating the fluid to spirally flow, heating the fluid through frictional heat generated by a flow, and providing the fluid.

[0033] In detail, the spiral friction member 100 heats the fluid with the frictional heat by rotating the fluid to spirally flow through the centrifugal force, compresses the fluid to have a high pressure by moving the fluid from a rotation center to an outer periphery of a spiral flow channel, and discharges the fluid.

[0034] In other words, the spiral friction member 100 may perform a function of providing the fluid by changing a state of the fluid to have a high temperature and a high pressure through the spiral flow channel.

[0035] In this case, the fluid applied to the present invention may be applied in various configurations such as heat medium oil, water, salt water, or water vapor, and

may be used in a liquid or gaseous state.

[0036] As shown in FIGS. 3 and 4, the spiral friction member 100 may include a hollow shaft 110, a rotary joint 120, a rotary motor 130, a spiral disc 140, and a jet nozzle 150.

[0037] The hollow shaft 110 is a component for supplying the fluid stored in the heat exchange tank 200, which will be described below, to the spiral disc 140.

[0038] In detail, the hollow shaft 110 has a hollow tube shape, in which one of both longitudinal ends of the hollow shaft 110 is connected to the fluid pump 200, which will be described below, to receive the fluid of the heat exchange tank 200, and a remaining one of the both ends of the hollow shaft 110 is connected to the spiral disc 140, which will be described below, to supply the fluid to the spiral disc 140.

[0039] In addition, the hollow shaft 110 is installed to be rotatable by the rotary motor 130, which will be described below, and supplies the fluid to the spiral disc 140 while rotating together with the spiral disc 140 by an operation of the rotary motor 130.

[0040] The rotary joint 120 is a component for allowing the hollow shaft 110 to be rotated by rotatably connecting the hollow shaft 110 to the fluid pump 300.

[0041] In other words, the rotary joint 120 connects one end of the hollow shaft 110 which is rotated by the rotary motor 130 to a connection pipe of the fluid pump 300 which is fixed, and supplies the fluid of the fluid pump 300 to the hollow shaft 110 while allowing the hollow shaft 110 to be rotated.

[0042] The rotary joint 120 may have various structures if it is satisfied that the rotary joint 120 rotates the hollow shaft 110 while supplying the fluid.

[0043] The rotary motor 130 is a component for rotating the hollow shaft 110 to rotate the fluid of the spiral disc 140.

[0044] As shown in FIG. 4, the rotary motor 130 may be coupled to an outer peripheral surface of the hollow shaft 110 to rotate the hollow shaft 110 together with the spiral disc 140 while being operated by a supplied power.

[0045] The spiral disc 140 is a component for compressing the fluid to have a high temperature and a high pressure while rotating the fluid supplied from the hollow shaft 110.

[0046] In detail, the spiral disc 140 has a cylindrical shape, is formed therein with a flow space for the fluid, is connected to the hollow shaft 110 to receive the fluid at a central portion of the fluid space, and rotates together with the hollow shaft 110 by the rotary motor 130 to rotate the fluid to compress the fluid to have a high temperature and a high pressure.

[0047] As shown in FIGS. 3 and 4, the spiral disc 140 is configured such that the flow space is partitioned by a spiral partition wall 141 to form a spiral fluid flow channel, and guides the fluid, which is supplied from the hollow shaft 110 to the central portion of the fluid space, to an outer periphery of the flow space along the spiral partition wall 141 to compress the fluid to have a high pressure

while heating the fluid by friction.

[0048] In other words, the fluid is heated to have a high temperature due to the frictional heat while moving along the spiral partition wall 141 by the rotation of the spiral disc 140, and may be compressed as the fluid moves to the outer periphery of the flow space by the centrifugal force and changed into a high-pressure state.

[0049] In this case, referring to FIG. 3, a front end of the spiral disc 140 is opened. However, as shown in FIG. 4, the front end of the spiral disc 140 may be configured to be shielded by a disc cover 140a.

[0050] The jet nozzle 150 is a component for generating high-pressure propulsion by discharging the fluid compressed to have a high pressure from the spiral disc 140 to generate the high-pressure propulsion for rotating the spiral disc 140.

[0051] In other words, the jet nozzle 150 is a component including a plurality of holes formed in an outer periphery of the spiral disc 140 in a circumferential direction to generate the jet propulsion by discharging a high-pressure fluid from the spiral disc 140 to provide the jet propulsion as a rotational force for the spiral disc 140.

[0052] In other words, the fluid is compressed to have a high pressure while moving to the outer periphery of the fluid space through the centrifugal force generated by the rotation of the spiral disc 140, and discharged to an outside of the spiral disc 140 through the jet nozzle 150 under a high pressure to generate the jet propulsion for rotation of the spiral disc 140.

[0053] Accordingly, the jet nozzle 150 provides the propulsion to the spiral disc 140, so that the spiral disc 140 can smoothly rotate even if an output of the rotary motor 130 is reduced, and ultimately, power consumption of the rotary motor 130 can be reduced.

[0054] In this case, the jet nozzle 150 may be configured to be inclined in a direction opposite to a rotational direction of the spiral disc 140 to emit the fluid in the direction opposite to the rotational direction of the spiral disc 140, thereby smoothly providing the propulsion generated by the emission of the fluid to the spiral disc 140 to rotate the spiral disc 140.

[0055] In addition, the jet nozzle 150 may be configured such that a width of the flow channel gradually decreases toward the outer periphery of the spiral disc 140. This configuration is implemented to increase a speed of the fluid by reducing a volume of the flow channel so as to smoothly generate the propulsion.

[0056] Meanwhile, a vortex protrusion (not shown) may protrude along a surface of the spiral partition wall 141.

[0057] The vortex protrusion is a component for generating a vortex in the fluid while expanding a friction area with the fluid so as to provide a smooth flow.

[0058] A plurality of vortex protrusions may protrude at equidistance from the surface of the spiral partition wall 141 to make contact with the fluid and to interfere with the flow of the fluid so as to generate the vortex in the fluid.

[0059] For example, the vortex protrusion may be configured as an arc-shaped plate having a curvature and fixed to the spiral partition wall 141 while being opposed to a flow direction of the fluid to interfere with the flow of the fluid.

[0060] In addition, the spiral disc 140 may be configured such that a width of the fluid flow channel formed by the spiral partition wall 141 gradually increases from the central portion to the outer periphery of the flow space.

[0061] In other words, the spiral partition wall 141 may be configured such that the width of the flow channel defined a width between partition walls gradually increases toward the outer periphery. Accordingly, the fluid moves to the outer periphery due to the centrifugal force generated by the rotation of the spiral disc 140, and may be compressed with an increased pressure because the flow channel is gradually widened.

[0062] Alternatively, the spiral disc 140 may be configured such that a width of the fluid flow channel formed by the spiral partition wall 141 gradually increases from the central portion to the outer periphery of the flow space.

[0063] In other words, the spiral partition wall 141 may be configured such that the width of the flow channel defined the width between the partition walls gradually decreases toward the outer periphery. Accordingly, the fluid moves to the outer periphery due to the centrifugal force generated by the rotation of the spiral disc 140, and may be compressed with an increased speed because the flow channel is gradually narrowed.

[0064] The heat exchange tank 200 is a component for storing a high-temperature fluid discharged from the jet nozzle 150 constituting the spiral friction member 100 described above, and heating a heating target fluid by allowing the high-temperature fluid to exchange heat with the heating target fluid.

[0065] In other words, the heat exchange tank 200 is a component for providing hot water by allowing the high-temperature fluid discharged from the jet nozzle 150 to exchange the heat with the heating target fluid such as cold water.

[0066] In detail, as shown in FIGS. 1 and 4, the heat exchange tank 200 may include an upper tank 210, a lower tank 220, and a heat exchange pipe 230.

[0067] The upper tank 210 has a substantial box shape having an open bottom to accommodate the spiral disc 140 and the jet nozzle 150 constituting the spiral friction member 100 therein, and may downwardly guide the fluid having a high temperature and a high pressure and discharged from the jet nozzle 150.

[0068] The lower tank 220 has a substantial box shape and is connected to the upper tank 210 under the upper tank 210 to store the high-temperature fluid downwardly guided from the upper tank 210.

[0069] The lower tank 220 provides a storage space for the fluid and is connected with the fluid pump 300, which will be described below, to resupply the fluid to the

hollow shaft 110 through the fluid pump 300.

[0070] The heat exchange pipe 230 is a component for heating the heating target fluid such as the cold water by allowing the high-temperature fluid stored in the lower tank 220 to exchange the heat with the heating target fluid.

[0071] The heat exchange pipe 230 may be coupled to the lower tank 220 such that the heat exchange pipe 230 traverses an inside of the lower tank 220 to heat the heating target fluid by allowing the fluid in the lower tank 220 to exchange the heat with the heating target fluid while allowing the heating target fluid to flow through the heat exchange pipe 230.

[0072] In addition, as shown in FIG. 5, a plurality of heat dissipation fins 240 may be installed at an outer peripheral surface of the heat exchange pipe 230 to expand a heat exchange area of the lower tank 220 with the fluid.

[0073] The fluid pump 300 is a component for pumping the fluid stored in the lower tank 220 to supply the fluid to the spiral friction member 100 described above.

[0074] In detail, the fluid pump 300 is connected to the lower tank 220 and the rotary joint 120 through the connection pipe, and may supply the fluid in the lower tank 220 to the rotary joint 120 to supply the fluid to the hollow shaft 110 and the spiral disc 140 while being operated by a power source.

[0075] In other words, the fluid pump 300 may heat the fluid again to have a high temperature and a high pressure by resupplying the fluid in the lower tank 220, which has been subject to the heat exchange with the heating target fluid, to the spiral disc 140.

[0076] Meanwhile, an operation of the fluid pump 300 may be controlled by control of a temperature sensor (not shown) provided in the lower tank 220.

[0077] The temperature sensor senses a fluid temperature of the lower tank 220 to control the operation of the fluid pump 300, and may stop the operation of the fluid pump 300 when the fluid temperature of the lower tank 220 reaches a preset temperature, for example.

[0078] In other words, when the fluid temperature of the lower tank 220 reaches a high temperature, the fluid pump 300 may allow the fluid to exchange the heat with the heating target fluid while circulation of the fluid is stopped, and may be operated to circulate the fluid to the spiral friction member 100 when a temperature of the lower tank 220 falls below the preset temperature.

[0079] Hereinafter, the operation and action of the friction boiler apparatus using the centrifugal force and the jet propulsion, which includes the above-described components, according to one embodiment of the present invention will be described.

[0080] The fluid pump 300 senses the fluid temperature of the lower tank 220 through the temperature sensor and circulates the fluid to the spiral friction member 100 until the fluid temperature of the lower tank 220 reaches the preset temperature.

[0081] The fluid pumped by the fluid pump 300 is sup-

plied to the hollow shaft 110 and the spiral disc 140 through the rotary joint 120.

[0082] The rotary motor 130 rotates the hollow shaft 110 until the spiral disc 140 reaches a preset number of revolutions (rpm).

[0083] The fluid is heated to have a high temperature by the frictional heat while moving along the spiral partition wall 141 by the rotation of the spiral disc 140 rotated by the rotary motor 130, and compressed through as the fluid moves to the outer periphery of the spiral disc 140 through the centrifugal force.

[0084] In addition, the fluid is further compressed to a higher pressure as the number of revolutions of the spiral disc 140 increases, and is discharged to the outside of the spiral disc 140 through the jet nozzle 150 to provide the propulsion to the rotation of the spiral disc 140.

[0085] In this case, when the spiral disc 140 reaches the preset number of revolutions, the propulsion is generated by the jet nozzle 150, so that the rotary motor 130 is operated with a reduced output load.

[0086] The fluid having a high temperature and a high pressure and discharged from the jet nozzle 150 is supplied to the upper tank 210, moved downward, and resupplied to the lower tank 220, in which the fluid heats the heating target fluid in the heat exchange pipe 230 by exchanging the heat with the heat exchange pipe 230 traversing the lower tank 220.

[0087] As described above, according to the friction heat boiler apparatus using the centrifugal force and the jet propulsion of one embodiment of the present invention, the spiral disc 140 constituting the spiral friction member 100 compresses the fluid to have a high pressure through the centrifugal force while spirally rotating the fluid, so that the fluid can be smoothly heated to have a high temperature and a high pressure. In particular, the jet propulsion for rotating the spiral disc 140 is generated by discharging the high-pressure fluid through the jet nozzle 150, so that energy consumption of the rotary motor 130 can be reduced.

[0088] The above description of the above-described embodiments is provided for illustrative purposes, and it will be understood by those skilled in the art that various changes and modifications can be easily made into other specific forms without changing technical concept and essential features of the above-described embodiments. Thus, it should be understood that the above-described embodiments are illustrative in all aspects and do not limit the present disclosure. For example, each element described to be of a single type can be implemented in a distributed manner. Likewise, elements described to be distributed can be implemented in a combined manner.

[0089] The scope of the present disclosure is defined by the appended claims rather than by the foregoing detailed description. It shall be understood that all changes and modifications conceived from the meaning and scope of the claims and their equivalents are included in the scope of the present disclosure.

Description of Reference Numerals

[0090]

- 100: Spiral friction member 5
- 110: Hollow shaft
- 120: Rotary joint
- 130: Rotary motor
- 140: Spiral disc
- 141: Spiral partition 10
- 150: Jet nozzle
- 200: Heat exchange tank
- 210: Upper tank
- 220: Lower tank
- 230: Heat exchange pipe 15
- 240: Heat dissipation fin
- 300: Fluid pump

Claims

- 1. A friction boiler apparatus using a centrifugal force and jet propulsion, the friction boiler apparatus comprising:
 - a spiral friction member for compressing a fluid by rotating the fluid to spirally flow, heating the fluid through frictional heat generated by a flow, and discharging the fluid;
 - a heat exchange tank for storing a high-temperature fluid discharged from the spiral friction member, and heating a heating target fluid by allowing the high-temperature fluid to exchange heat with the heating target fluid; and
 - a fluid pump for pumping the fluid stored in the heat exchange tank to supply the fluid to the spiral friction member.

- 2. The friction heat boiler apparatus of claim 1, wherein the spiral friction member comprises:
 - a hollow shaft having a hollow tube shape, in which one of both longitudinal ends of the hollow shaft is connected to the fluid pump to receive the fluid of the heat exchange tank; 45
 - a rotary joint rotatably connecting the hollow shaft to the fluid pump;
 - a rotary motor coupled to an outer peripheral surface of the hollow shaft to rotate the hollow shaft; 50
 - a spiral disc having a cylindrical shape formed therein with a flow space for the fluid, and coupled to a remaining one of the both ends of the hollow shaft to rotate together with the hollow shaft, in which the flow space is partitioned by a spiral partition wall to guide the fluid supplied from the hollow shaft to an outer periphery of the flow space along the spiral partition wall to 55

compress and heat the fluid by friction; and a jet nozzle provided at an outer periphery of the spiral disc to generate high-pressure propulsion for rotating the spiral disc by discharging the compressed fluid from the spiral disc.

- 3. The friction heat boiler apparatus of claim 2, wherein the jet nozzle is configured to be inclined in a direction opposite to a rotational direction of the spiral disc.

- 4. The friction heat boiler apparatus of claim 2, wherein the spiral disc comprises a vortex protrusion protruding along a surface of the spiral partition wall to generate a vortex in the fluid while expanding a friction area with the fluid.

- 5. The friction heat boiler apparatus of claim 2, wherein the spiral disc is configured such that a width of a fluid flow channel formed by the spiral partition wall gradually increases from a central portion to the outer periphery of the flow space.

- 6. The friction heat boiler apparatus of claim 1, wherein the heat exchange tank comprises:
 - an upper tank accommodated therein with the spiral friction member to downwardly guide the high-temperature fluid discharged from the spiral friction member;
 - a lower tank connected to the upper tank under the upper tank to provide a storage space for the fluid, and connected with the fluid pump; and
 - a heat exchange pipe coupled to the lower tank such that the heat exchange pipe traverses an inside of the lower tank to allow the fluid in the lower tank to exchange the heat with the heating target fluid while allowing the heating target fluid to flow through the heat exchange pipe.

- 7. The friction heat boiler apparatus of claim 6, wherein the heat exchange tank further comprises a plurality of heat dissipation fins coupled to an outer peripheral surface of the heat exchange pipe while being accommodated in the lower tank to expand a heat exchange area.

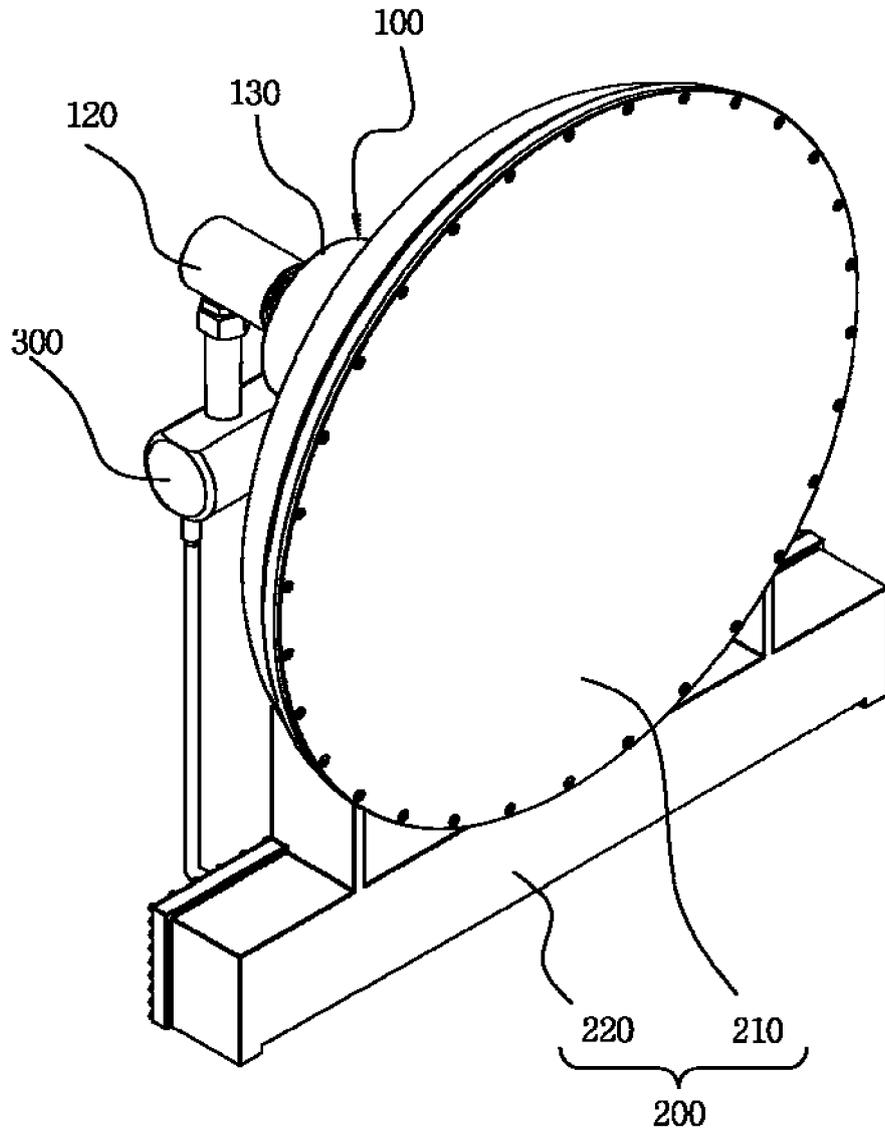


Fig. 1

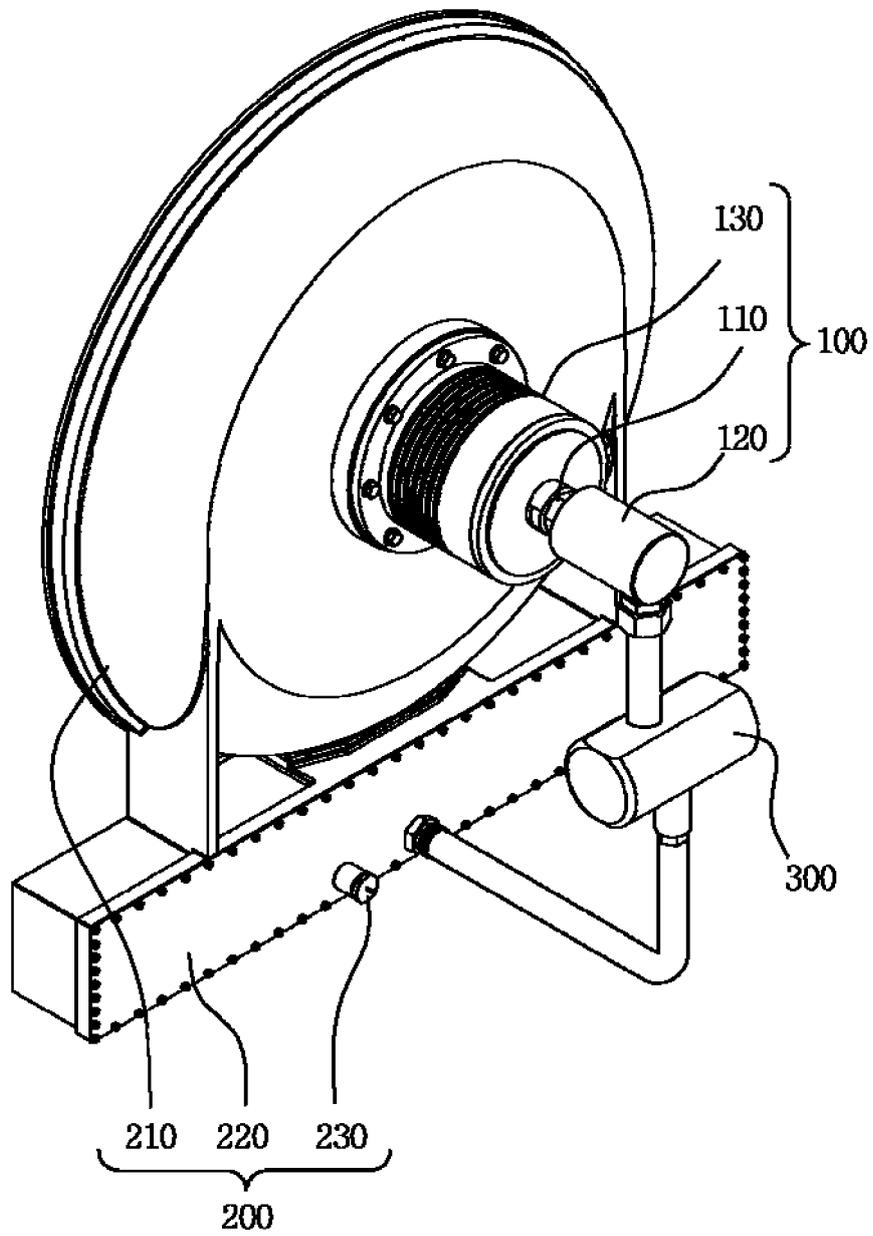


Fig. 2

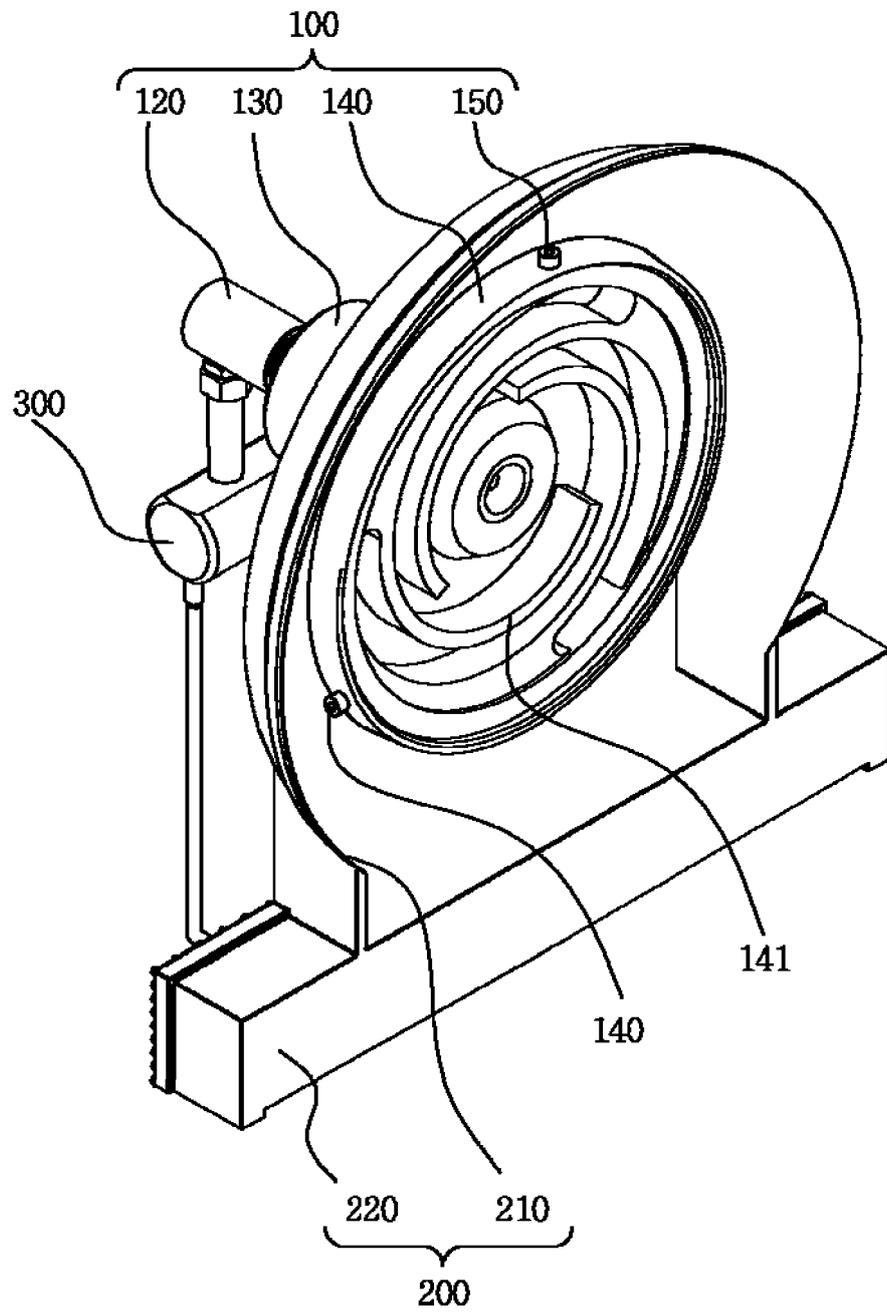


Fig. 3

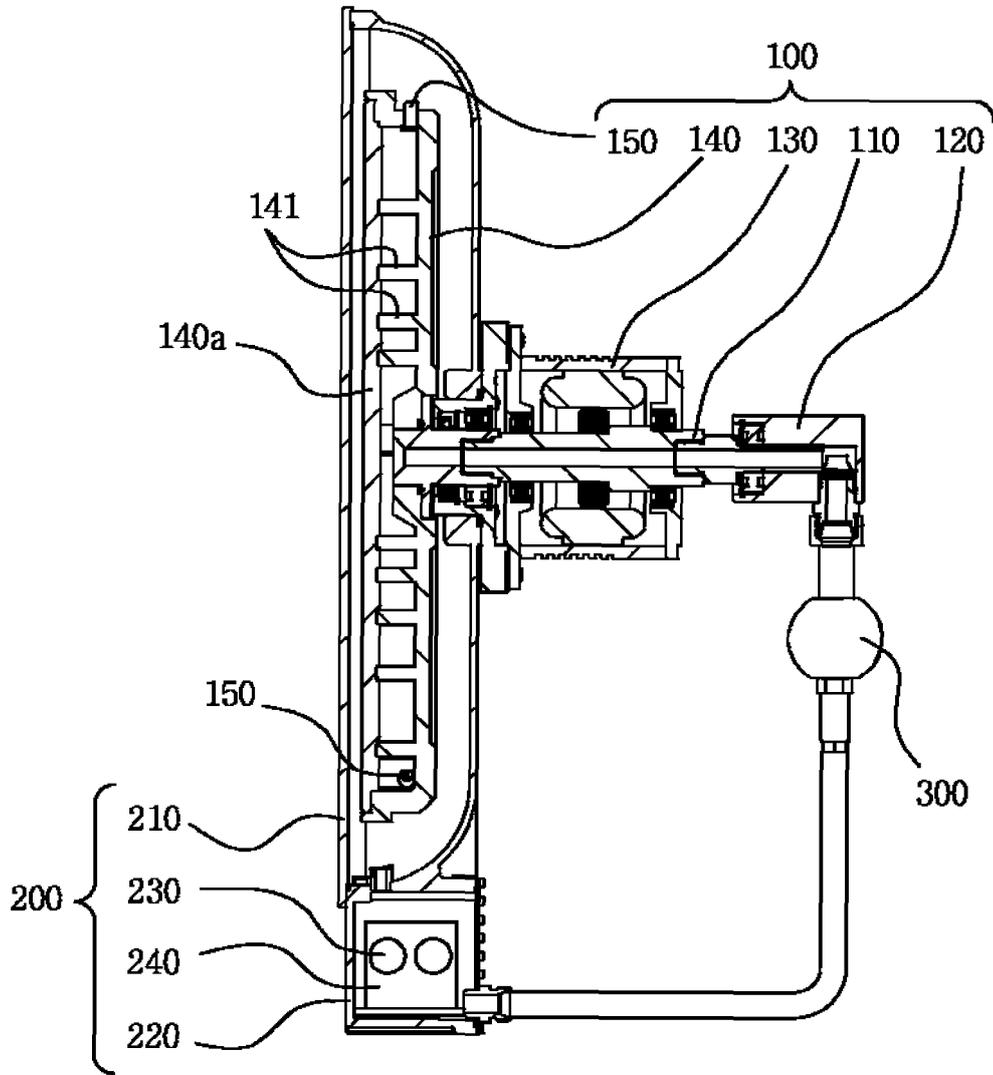


Fig. 4

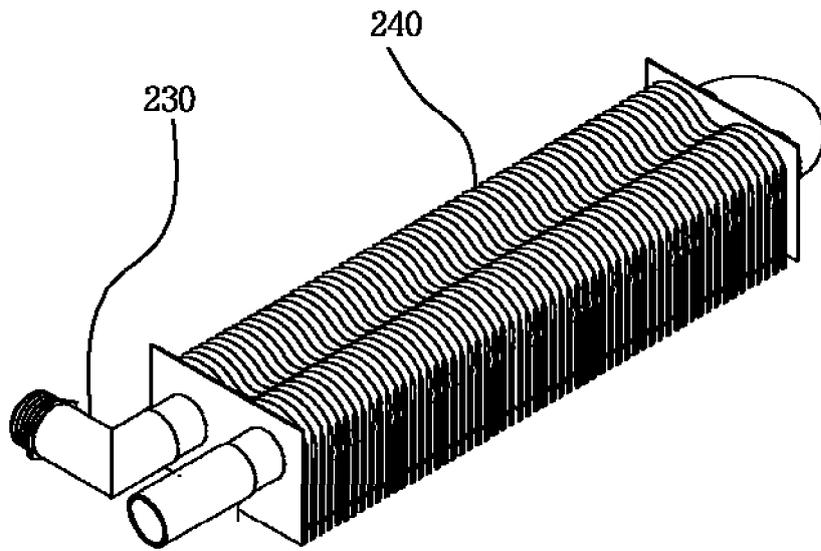


Fig. 5

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 17 2229

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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28-10-2019

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