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An agency of Industry Canada

CA 2672760 C 2017/10/17

(11)(21) 2 672 760

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2009/07/23

(41) Mise à la disp. pub./Open to Public Insp.: 2011/01/23

(45) Date de délivrance/Issue Date: 2017/10/17

(51) Cl.Int./Int.Cl. *F24J 2/02* (2006.01), *A47J 27/00* (2006.01), *A47J 31/44* (2006.01), *A47J 36/24* (2006.01), *F24J 2/04* (2006.01), *F24J 2/42* (2006.01), *F24J 2/54* (2006.01)

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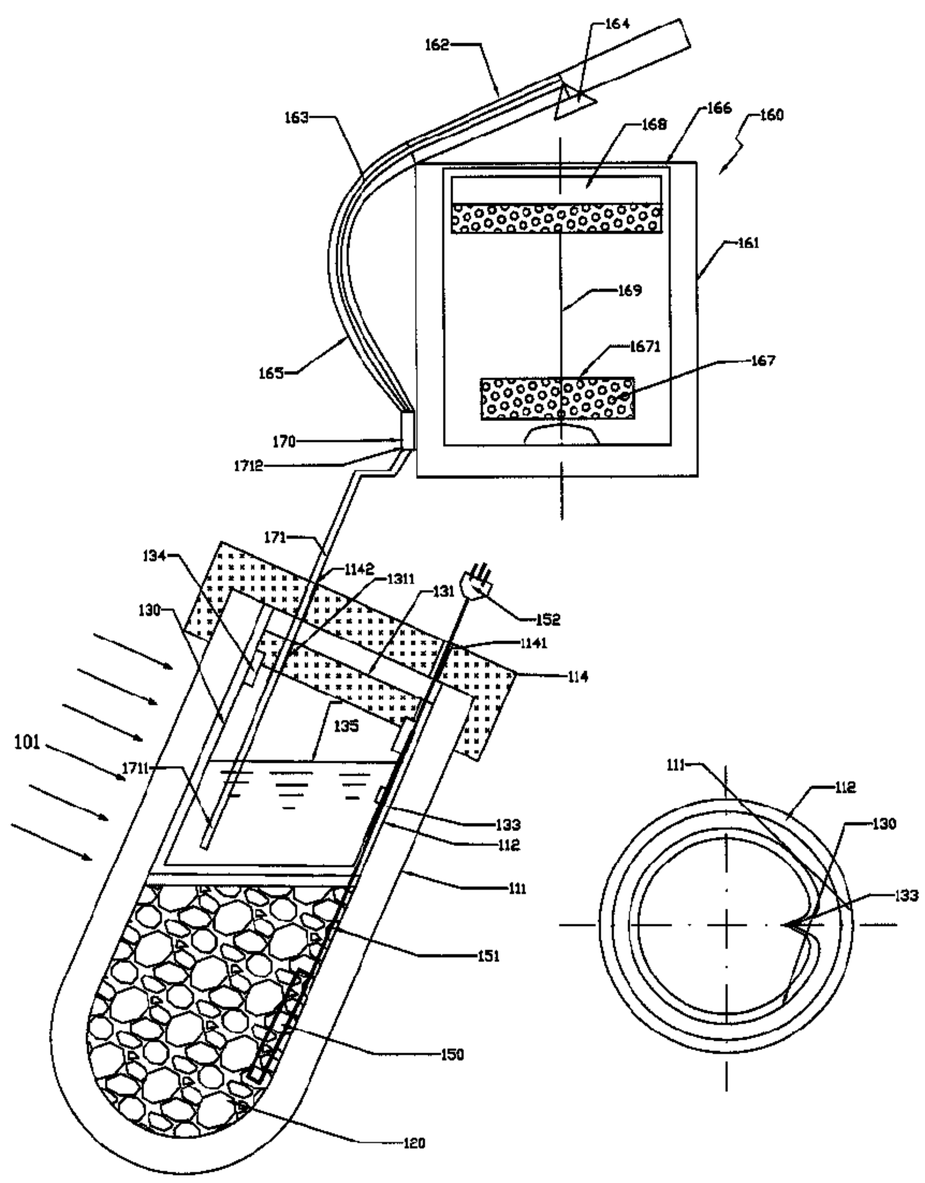
(54) Titre : CAFETIERE/THEIERE ET APPAREILS DE CUISSON SOLAIRE
(54) Title: SOLAR COFFEE/TEA MAKER AND COOKING APPLIANCES



(57) Abrégé/Abstract:
The disclosure provides a solar cooking appliance comprising a solar heat collector for collecting and storing solar heat. A first solid heat storage and conducting material is placed within said solar heat collector. A heat insulated solar cooking utensil/cookware positioned out of the solar heat collector, having a utensil and heat insulation. The heat insulated solar cooking utensil is an electric power cooking utensil. A second heat transferring/conducting material thermally connects said first solid heat storage and conducting material with said solar cooking utensil for transferring heat for cooking.

ABSTRACT

The disclosure provides a solar cooking appliance comprising a solar heat collector for collecting and storing solar heat. A first solid heat storage and conducting material is placed within said solar heat collector. A heat insulated solar cooking utensil/cookware positioned out of the solar heat collector, having a utensil and heat insulation. The heat insulated solar cooking utensil is an electric power cooking utensil. A second heat transferring/conducting material thermally connects said first solid heat storage and conducting material with said solar cooking utensil for transferring heat for cooking.

SOLAR COFFEE/TEA MAKER AND COOKING APPLIANCES

FIELD OF TECHNOLOGY

[001] The present disclosure relates to solar heat application field, especially related to solar cooking appliances to cook the foods in the solar utensil that connects to a solar heat collector filled with heat storage and conducting material.

BACKGROUND

[002] For all kinds of existing energy sources in the earth, solar energy is the most widespread, the richest and the most uniformly distributed energy source. Solar energy can be used very easily. It is available every day, everywhere and for every body.

[003] For all kinds of human energy consuming activities, food and beverage cooking is the most often activity and has the longest history. Every body in anywhere needs to cook the foods every day.

[004] It is very interesting and valuable topic to use solar energy for food cooking. There are many efforts in this field. (Please refer to the existing patents).

[005] The solar power on a unit earth area is not large. The solar radiation intensity is varied from North to South and from morning to afternoon. It depends on the weather and is also different in four seasons, so that to develop an economic solar cooking appliance is always a challenge and need continue efforts.

[006] In view of these difficulties, some solar cooking appliances tried to make the sunlight receiving area as large as possible. But the heat insulation for the received heat is difficult. Some solar cooking appliances follow and focus the sunlight using expensive automation system and need additional power to run the system. Some solar cooking appliances also use the heat storage materials. The materials may be expensive and not easy to get.

[007] The present disclosure absorbs the historic experience and combines the new solar water heating technologies and developed a set of economic and practicable solar cooking appliances.

SUMMERY

[008] The object of this disclosure is to improve the existing technologies and provide a set of solar cooking appliances that is economy, easy to manufacture and use and high efficient. The invention takes following steps to overcome the difficulties of applying solar energy for food cooking:

[009] To use the evacuated solar heat collector for optimum heat collecting;

[0010] To filled heat storage and conducting material in the evacuated solar heat collector for storing and keeping heat to provide a continue and stable cooking heat;

[0011] A light reflector focuses the surrounding light to the cooking appliances;

[0012] A sundial indicates the light direction, an adjustable and rotatable fixing and supporting trestle allows to receiving the highest solar power;

[0013] A electric power supply provides a backup power source when the solar power is not enough. Further more, the solar cooking appliances also provide backup or energy storage equipment at low electricity price period for cooking at electric power outage.

[0014] Following are the detailed summary of present disclosure.

[0015] In accordance with one aspect of the present disclosure there is provided a set of solar cooking appliances, comprising: a solar heat collector in which heat storage and conducting material is filled, wherein solar heat is collected, stored in and transferring from; a heat insulated solar cooking utensil for food cooking inside, having heat connection with heat-transferring medium from said solar heat collector; a heat-transferring medium connected said solar heat collector to said cooking utensil and transferred the heat from said solar heat collector to said heat insulated solar cooking utensil; andnecessary accessories;

[0016] The said solar heat collector is an evacuated-tube solar heat collector or a group of modular evacuated-tube solar heat collectors that mounted in a shape, e.g. row in parallel, column in full or partial cone-shaped. The said solar heat collector can be having an open end extended into a heat insulated solar cooking utensil for heat transferring; or having two open ends; said one of two open end extended into a solar cooking utensil; or having two open ends; said one of two open end connected to a solar cooking utensil by said heat transferring medium; The said solar heat collector where in a heat storage and conducting material is partially filled in and a solar liquid reservoir is arranged for water or food oil heating; For safety reason a evacuated toughened-glass tube solar heat collector and a protective transparent cover is suggested;

[0017] The said heat storage and conducting material can be a solid material, e.g. ore, metal, quartz sand, basalt sand, salt or soil; or a liquid material, e.g. water, oil, cooking oil, or heat conductive grease; or a chemical head storage materials, e.g. CaO plus H_20; or a combination material of two or more heat storage and conducting materials, e.g. rape oil filled in the quartz sand;

[0018] The said heat insulated solar cooking utensil can be a cooking utensil with a heat insulation coating; or a cooking utensil located in a heat insulated container; or an evacuated utensil made of either one of glass, metal, synthetic or ceramic; or a cooking

utensil located in a heat insulated container wherein heat storage and conducting material is filled; or a heat insulated electric power cooking utensil with operating parameter measuring, indicating and controlling devises and system; or a heat insulated electric power cooking utensil having conduit that arranged along inner wall of said utensil from the top to near bottom, having a fitting at the top for receiving a steam conduit from the solar heat collector, said steam conduit having one end extended into a hot water reservoir and not submerged in heated water within solar water collector.

[0019] The said heat-transferring medium can be a heat tube with or without the conducting fins, having its one end in said solar heat collector and another end extended into a said heat insulated solar cooking utensil; a water tube (including the water steam) having one end is submerged in said water reservoir within said solar heat collector and second end extended into a said heat insulated solar cooking utensil; a cooking oil conduit having one end is submerged in cooking oil of a cooking oil reservoir within said solar heat collector and second end extended into a said heat insulated solar cooking utensil; a medium that carries solar heat into said solar cooking utensil, cooks said food and becomes part of said food, e.g. water (including water steam) or food oil; the heat storage and conducting material in said solar heat collector; the heat storage and conducting material in said solar heat collector that connected or extended into heat insulated cooking utensil; the heat storage and conducting material in said solar heat collector that connected or extended into a heat insulated container, wherein a cooking utensil is located; a heat conductor, e.g. a copper bar or the wall of a metal utensil;

[0020] The said necessary accessories can be a fixing and supporting trestle that arrange and support the each part of the solar cooking appliances at a proper situation and allows the adjustment to the incidence angle of the solar heat collector to the sun light and allows the adjustment to the direction of the solar heat collector to the sun light, e.g. a rotatable base; The said necessary accessories further comprise the light reflecting object that focus the surrounding sun light to the solar heat collector; a sundial, e.g. a cone bar attached to the solar heat collector perpendicularly for showing the angle of sun light; a bag and/or membrane for wrap up or cover the food in the solar cooking appliance, e.g. metal, paper or plastic bag and membrane.

[0021] The said accessories further comprses an electric power heat element with power supply including a measuring and indicating device for operating characteristic parameters of the solar cooking appliance, e.g. timing, temperature, pressure, moisture; and a controlling system for characteristic parameter of the solar cooking appliance, e.g. timing, temperature, pressure, moisture.

[0022] The said accessories comprise a suitcase, wherein the solar cooking appliances are arranged and packaged to form a potable solar cooking appliances

[0023] In accordance with another aspect of the present disclosure there is provided a solar coffee/tea pot comprising: a coffee/tea pot wherein the solar heated water cooks the coffee or tea, having a lid and a handle, a coffee and tea holder disposed within said coffee/tea pot, said coffee and tea holder having a punched coffee holder at the upper and

a punched tea basket with a removable cover at lower of the said pot; a hot water shower head at the lid; a conduit connected to the water shower head, passed through and hidden in the lid and the handle, said conduit having a end connected to a fitting at a lower part of the handle, said fitting is for receiving a hot water conduit from a solar water heater;

[0024] The said coffee/tea pot can be a vacuum bottle made of stainless steel, glass or synthetic material and the punched coffee holder and tea basket can be connected through a stand and can be removed through the axis of the stand.

[0025] In accordance with another yet one aspect of the present disclosure there is provided a solar coffee/tea maker comprising: a coffee/tea pot with a lid and a handle, a coffee and tea holder disposed within said coffee/tea pot, said coffee and tea holder having a punched coffee holder at the upper and a punched tea basket with a removable cover at lower of the said pot; a hot water shower head at the lid, a tube connected to the water shower head and hidden in the lid and the handle, said tube having a tube connecting fitting at a lower part of the handle for receiving a hot water tube from a solar water heater; an airtight solar heated water container wherein the water is heated by solar, a hot water connecting conduit extending into said airtight solar heated water reservoir, having one end submerged in heated water of solar heated water container, the opposite end of said hot water connecting conduit is connected with said conduit connecting fitting at said handle of coffee/tea pot; and, necessary accessories;

[0026] The solar heated water reservoir, according to claim 43, that is a evacuated-tube solar heat collector; The solar heated water container is a water heater located in an evacuated-tube solar heat collector filled with heat storage and conducting material; thee coffee/tea pot is a vacuum bottle made of stainless steel, or synthetic material; the punched coffee holder and tea basket that are connected through a stand and can be removed through the axis of the stand.

[0027] In accordance with another yet one aspect of the present disclosure there is provided a solar/electric coffee maker mainly is heated by solar energy and also heated by electric power as a back up energy source, comprising: an electric drip coffee maker having cool water reservoir, coffee pot, electric power heated water tube; first one-way valve, hot water shower head; a hot water tube continued the electric power heated water tube carrying the hot water up to the drip area, said hot water tube having a bypass tube located upper the first one-way valve and electric heated water tube, but lower the shower head; a second one-way valve for preventing hot water flowing backward to solar heat collector, having one end connected to the end of said bypass tube and its opposite end connected to a connecting fitting at said electric drip coffee maker through third tube; said connecting fitting is for receiving a hot water tube from a solar water heater; a third one-way valve equipped at the hot water tube between the bypass and electric power heated tube for preventing hot water from solar heat collector flows toward electric heated tube; an airtight solar heated water container wherein the solar heat, collected and stored by a solar heat collector, heats the water directly or indirectly; a hot water connecting tube (fourth tube) extending into said airtight solar heated water container,

having one end submerged in heated water of solar heated water reservoir, the opposite end of said hot water connecting tube is connected with said tube connecting fitting at said electric drip coffee maker.

[0028] The solar heated water reservoir is an evacuated-tube solar heat collector; the Solar heated water container is a water container located in an evacuated-tube solar heat Collector wherein filled with heat storage and conducting material;

[0029] Other aspects and features of the present disclosure will become apparent to Those ordinarily skilled in the art upon review of the following description of specific Embodiments of the invention in conjunction with the accompanying figures.

BREIF DESCRIPTION OF THE DRAWINGS

[0030] In the figures which illustrate exemplary embodiments of this invention:

[0031] Fig. 1 is a schematic diagram illustrating an exemplary solar coffee/tea maker in vertical section view;

[0032] Fig. 2 is a schematic diagram illustrating a solar/electric coffee maker in vertical section view;

[0033] Fig. 3 illustrates a set of exemplary solar heat collectors are illustrated Schematically in vertical sections;

[0034] Fig. 4 is schematic diagram of an alternative solar cooking appliance that is Illustrated in vertical section view;

[0035] Fig. 5 illustrates schematically a set of solar cooking appliances in vertical section view that uses a heat tube as the heat-transferring medium;

[0036] Fig. 6 illustrates schematically an alternative solar cooking appliance in vertical section view that transfers the solar heat by the direct connection between the graphite in solar heat collector and the graphite under a utensil;

[0037] Fig. 7 is a schematic diagram of a set of solar cooking appliances including multi Mounted solar heat collectors and utensils that is illustrated in a perspective view.

DETAILED DESCRIPTION

[0038] Referring to Fig. 1, a schematic exemplary solar coffee/tea maker is Illustrated in vertical section view.

[0039] The solar coffee/tea maker 100 includes a solar coffee/tea pot 160, a solar heat collector 110 and their connecting conduit 171. The solar heat collector 110 is filled with heat storage and conducting material 120.

[0040] The solar coffee/tea pot 160 is a liquid container with a lid 162. In this case it is a vacuum glass bottle 161. But the stainless steel and synthetic material are also often be used. A coffee/tea holder 166 is disposed in the pot 160. The coffee/tea holder 166 has its lower part of tea basket 167 with removable lid 1671. The upper part of the coffee/tea holder 166 is a punched coffee holder 168. A stand 169 supports the coffee holder 168 and tea holder 167. All three parts of coffee holder, tea holder and its lid can be moved through the axis 169. Based on the cooking requirement, either coffee holder or tea holder or both of them can be stayed in or removed out from the pot 160.

[0041] A hot water shower head 164 is arranged at the center of lid 162. A hot water conduit 163 passes through and is hidden in the lid 164 and the handle 165 of the pot 160. The hot water conduit 163 connects the water shower head 164 at one end. The opposite end of the hot water conduit 163 is connected to a fitting 170 that is at a lower part of the handle 165. The fitting 170 is for receiving a hot water conduit 171 from a solar water heater 110;

[0042] Solar heat collector 110 may be any kind of solar heat collector that can heat the heat storage and conducting material 120 to the temperature more than the water boiling temperature. In this case the solar heat collector 110 is an evacuated-tube solar heat collector. It may also is a group of modular evacuated-tube solar heat collectors mounted in a certain shape, e.g. in parallel row or in full or partial cone-shaped column as of the examples shown in Fig 7. The solar heat collector 110 has a removable part 114 with two holes 1141 and 1142. The hole 1141 is a path for power cable 151 and air exchange. The hole1142 is to continue the hole 1311 for a hot water conduit 171 to go through.

[0043] The evacuated-tube solar heat collectors110 has transparent outer layer 111 and inner layer 112. It is evacuated in between. The inner layer 112 has a heat absorbing coating that does not show in the Fig 1. The evacuated-tube solar heat collector 110 has the same material and manufacture processing as the evacuated-tube solar heat collector that used for solar water heating. But the evacuated-tube solar heat collector 110 used in solar cooking has a larger diameter and a shorter length comparing to the regular evacuated-tube for solar hot water.

[0044] The evacuated-tube solar heat collector 110 is made of glass. In case the glass tube is broken, the glass piece is dangers for the user. So the solar heat collector 110 has a transparent plastic cover for safety reason. (It is not shown in Fig. 1). If the solar heat collector 110 is a group of evacuated-tubes mounted in row, the transparent plastic cover may cover each tube or a plastic protective mantle may cover entire raw. But the plastic protective mantle may reduce the efficiency of the solar heat collector 110. So an evacuated toughened-glass tube solar heat collector is a better solution.

[0045] The evacuated-tube solar heat collector 110 is filled with a heat storage and

conduction material 120. The heat storage and conducting material 120 in this case is salt or stone sand for storing and transferring the solar heat to the water container 130. In fact, many kinds of the materials can be used as the solar heat storage and conducting material. For example, they are solid materials such as salt, sand, graphite and turves. They can be liquid material, such as water and oil including cooking oil and petroleum products. They also can be phase change material, such as paraffin. The combination of different materials, such as bean oil in quartz sand, is also a choice.

[0046] The water container 130 is a cylinder container located inside of solar heat collector 110 upper the heat storage and conducting material 120. It made of stainless steel. The cooking utensil 130 has a removable part 131 with a hole 1311, it is a stopper inserted in the cooking utensil 130. The utensil has a diameter near but not bigger than the inner diameter of the evacuated-tube110. A pleated structure 133 is on the wall of the container from the top to the bottom to provide a gap and patch for air exchange and power cable 151. Furthermore, it allows a minor adjustable diameter for the container130. The cooking utensil 130 further includes a removable and detachable handle 134 at the inner wall for remove the utensil 130 from the solar heat collector 110.

[0047] A removable part 114 covers the top of solar heat collector 110. It has two holes 1141 and 1142. The first hole 1141 connects to said gap and path for air exchange and power cable. The second hole 1142 continues the hole 1311 in the stopper 131 of the container 130.

[048] The electric heat element 150 with power supply is a very low power electric heat element. It located under the water container 130 and within heat storage and conducting material 120. A power cable 151 has very high resistive heat temperature that connects the electric heat element to power supply plug 152 outside of the solar heat collector 110, through the path formed by a pleated structure133 on the walls of the utensil 130. The electric heat element 150 may further includes a measuring, indicating and controlling systems for the solar cooking appliances operating characteristic parameter, e.g. timing, temperature, pressure, moisture etc. These are not shown in Fig 1. The electric heat element with power supply can be removed from the set of cooking appliance. In this case the set of solar cooking appliances is still a complete cooking appliances that use solar heat as only energy source. Fig. 3 shows the solar heat collectors without electric heat element.

[0049] A hot water connecting conduit 171 is extended into said airtight solar heated water container through the holes 1142 and 1311. Its one end is submerged under the water level 135 in heated water container 130. The opposite end of said hot water connecting conduit 171 is connected with a conduit connecting fitting 170 at said handle 165 of coffee/tea pot 160.

[0050] When the solar light 101 shines on the solar heat collector 110, the solar heat collector absorbs the solar heat and stores it in the sand 120. When the water container 130 is put into the solar heat collector 110 and the cool water is poured in, the solar heat is transferred to the solar water container 130 through the inner wall 112, heated sand 120

and heats the water. The conduit 171's end 1711 is submerged under the water level 135 in water container 130. The water container 130 is airtight. When the water is heated to boiling, the water steam gathered in the upper space of the container 130 forces the hot water flows up the conduit 171 and 163. Then the hot water is dispersed to drip evenly on the coffee grounds waiting on the coffee holder 168 through the shower head 164. The hot water picks up the coffee essence and down into the coffee bottle 161. A coffee making processing is completed. A similar processing can be used for making tea. In this case the tea or tea bag can be put in the tea basket 167.

[0051] We can also replace the water container by using the evacuated-tube 110 itself. In this case, there are no water container 130, its stopper 131 and heat storage and conducting material 120 inside of the solar heat collector 110. The removable part 114 needs to make the collector 110 becomes an airtight container. When the solar heats the water in the evacuated tube 110 to boiling, the water steam in the evacuated tube 110 presses the water upward and through the conduit171 and 163 to make coffee. In this case the speed and quantity of coffee making are dependent on the real time solar power. It may be not continued and stable. When we use the water container 130 located in a evacuated tube 160 filled with heat storage and contacting material 120, we can use the stored heat to make coffee and tea at any time continuously and stably.

[0052] When the solar heat is not enough for cooking, electric element 150 heats the water container inside of the solar heat collector 110. Because the tube 110 has very good heat insulation feature, so the required electric power is very low. In this case, the electricity has very high cooking efficiency.

[0053] Based on the idea of a solar coffee/tea maker mentioned above and in Fig. 1, a solar/electric coffee maker can be easily manufactured by making a minor change to an electric heated drip coffee maker or by reequipping a existing electric heated drip coffee maker. Referring to Fig. 2, a schematic solar/electric coffee maker 200 is illustrated in vertical section view. To make the description simpler, the solar heat collector 110 including the filled heat storage and conducting material 120, the solar water boiler 130 and the connection conduit 171 are the same as mentioned in Fig. 1.

[0054] An electric coffee maker 260 has its cool water reservoir 261, electric heated tube 262, hot water tube 263, hot water shower head 264, punched coffee holder 265, coffee pot 266 and first one-way valve 267. These parts mentioned above are as the regular parts that any electric drip coffee maker may have. Comparing to the regular electric drip coffee maker, the major changes of a solar/electric coffee maker are as follows:

[0055] A hot water tube 263 continues the electric heated tube 262 and leads the water up from the base of reservoir 261 to the drip area265. This hot water tube 263 has a bypass tube 268 located upper the first one-way valve 267 and electric heated tube 262, but lower the shower head 264;

[0056] A second one-way valve 270 for preventing hot water flowing backward to solar heat collector 110 is added. Its one end connects to the end of said bypass tube 268 and its opposite end connects to a connecting fitting 269 at said electric drip coffee maker 260 through third tube 272. The connecting fitting 269 is for receiving a hot water tube 171 from a solar water container 130.

[0057] A third one-way valve 273 is equipped at the hot water tube 263 between the bypass 268 and electric heated tube 262 for preventing hot water from solar heat collector flows toward electric heated tube 162;

[0058] A hot water connecting conduit 171 is extended into said airtight solar heated water container 130 through the holes 1142 and 1311. Its one end is submerged under the water level 135 in heated water container 130. The opposite end of said hot water connecting conduit 171 is connected with said conduit connecting fitting 269 at electric drip coffee maker 260.

[0059] When the solar light 101 shines on the solar heat collector 110, the solar heat collector absorbs the solar heat and stores it in the heat storage and conduction material 120. When the water container 130 is put into the solar heat collector 110 and the cool water is poured in, the solar heat is transferred to the solar water container 130 through the inner wall 112, heat storage and conducting material 120 and heats the water. The conduit 171's end 1711 is submerged under the water in the water container 130. The water container 130 is airtight. When the water is heated to boiling, the water steam gathered in the upper space of the container forces the hot water flows up the conduit 171 and 263. Then the hot water is dispersed to drip evenly on the coffee grounds waiting on the coffee holder 165 through the shower head 264. The hot water picks up the coffee essence and down into the coffee port 266. A coffee making processing is completed. When solar heat collector 110 works, the added one-way valve 273 prevents the water flows toward electric heated tube 262.

[0060] When the solar energy is not enough, plug the electric heated tube 162. The cool water from 261 flows through the first one way valve 267 and is heated in electric heated tube 262 until boiling. The bubble in boiled water forces the hot water up to the shower head 264 through hot water tube 263 to make coffee. The processing is the same as the processing in any kind of electric drip coffee maker.

[0061] When solar heat collector 110 works, the one-way valve 273 prevents the water flows toward electric heated tube 262. When electric drip coffee maker 260 works, the added one-way valve 272 prevents the water flows toward solar heat collector 110. If necessary, two heating sources also can work together.

[0062] As mentioned in Fig. 1, an empty solar heat collector tube 110 can replace the hot water container 130 to heat the water and make coffee.

[0063] Refer to Fig. 3, a set of exemplary solar heat collectors are illustrated schematically in vertical sections.

[0064] Fig. 3 A is a schematic vertical section view of an evacuated-tube solar heat collector filled with liquid heat storage and conduction material, e.g. water or oil. In some cases, water can also be a heat transferring medium for food cooking.

[0065] Fig. 3 B is a schematic vertical section view of an evacuated-tube solar heat collector filled with solid heat storage and conduction material, e.g. ore stone or turves.

[0066] Fig. 3 C is a schematic vertical section view of an evacuated-tube solar heat collector filled with sand and having a heat tube or a heat conductor as the heat transferring medium.

[0067] Fig. 3 D is a schematic vertical section view of an evacuated-tube solar heat collector filled with a combination of solid and liquid heat storage and conducting materials, e.g. quartz sand and cooking oil;

[0068] Fig. 3 E is a schematic partial vertical section view of a group of modular evacuated-tube solar heat collectors that mounted in a vertical parallel raw;

[0069] Fig. 3 F is a schematic partial vertical section view of a group of modular evacuated-tube solar heat collectors that mounted in a horizontal parallel raw;

[0070] When set up a solar cooking appliance, not only these kinds of solar heat collectors but also more kinds of their varieties and combinations can be selected and used.

[0071] Refer to Fig.4 an alternative solar cooking appliance (steamer) is illustrated schematically in vertical section view.

[0072] Once again, to make the description simpler, the solar heat collector 110 including the filled heat storage and conducting material 120, the solar water boiler 130 and the connection conduit 171 are the same as mentioned in Fig. 1.

[0073] The utensil 460 now is a food steamer with a heat-insulated lid 462. The side wall of the utensil 460 is heat insulated by a heat insulation coat 461. Three layers of steam basket 468 are arranged in the utensil 460 upper the bottom464. The food is cooked by water steam. A steam tube 463 is arranged inside the utensil from the top to near bottom along the internal wall of the steamer 460. The tube 463 connects to a connection fitting 465 at the heat insulation coat 461.

[0074] The connecting conduit 171 has one end 1711 connects to the connection fitting 465. The opposite end 1712 of the connecting conduit 171 is extended into the hot water container 130 and at the upper of the water lever 135.

[0075] When the solar light 101 shines on the solar heat collector 110, the solar heat collector absorbs the solar heat and stores it in the heat storage and conduction material

120. When the water container 130 is put into the solar heat collector 110 and the cool water is poured in, the solar heat is transferred to the solar water container 130 through the inner wall 112, heat storage and conducting material 120 and heats the water to boiling. The water steam generated in the container 130 up to the utensil 460 through the tubes 171, 463 and 467 to cook the food in 460.

[0076] Fig.5 illustrates schematically a set of solar cooking appliances 500 in vertical section view that uses a heat tube as the heat-transferring medium.

[0077] The solar heat collector 510 is a group of 5 modular evacuated-tube solar heat collectors that mounted in a row. The number of the modular evacuated-tubes in this case is 5, but it can be changed based on the cooking requirement. The solar heat collector 510 is filled with turves 520 in both converge tube 516 and the evacuated tubes 511, 512,513, 514 and 515.

[0078] The cooking utensil 561 is located in a heat insulation greatcoat 562. It has a two layer glass lid 563 with a hole 5631. In the bottom wall of the utensil 561, a fitting 565 is arranged for receiving a heat tube 530 from the solar heat collector 510.

[0079] A heat tube 530's one end is intended into the converge tube 516. The opposite end 531 of the heat tube is inset the fitting 565 in the cooking utensil 561. The two end of the converge tube 516 are closed and heat insulated.

[0080] When the solar heat collector 510 is working, the evacuated tubes absorbs the heat and stores it in the turves in the solar heat collector 510. The heat tube 530 transfers the solar heat to the cooking utensil 561 for food cooking. After cooking, the cooking utensil 561 is took out from the heat insulation greatcoat and is replaced by a heat insulation mass. It is to keep the solar cooking system in a high working temperature for next cooking.

[0081] illustrates schematically an alternative solar cooking appliance 600 in vertical section view that transfers the solar heat by the direct connection between the graphite 620 in solar heat collector 610 and the graphite under a utensil 661.

[0082] The solar heat collector 610 is an evacuated-tube solar heat collector. The solar heat collector 610 is filled with graphite.

[0083] The cooking utensil 661 with a lid 663 is located in a heat insulation greatcoat 662 with a lid 664. There is a space 665 between the bottom of the cooking utensil 661 and the greatcoat 662. It filled with graphite too. The end of the evacuated tube 610 is extended into the space 665. The graphite 620 in solar heat collector 610 and in the space 665 are connected closely.

[0084] When solar heat collector works, the collected solar heat is transferred from the graphite in the evacuated tube to the graphite in the space 665. The solar heat cooks the food in the cooking utensil 661. At some cases for a faster transferring of the solar heat, a

heat conductor may add in between the solar heat collector 610 and the space 665. It also may be a heat tube.

[0085] Usually the evacuated-tubes mounted in a raw for cooking several foods at the same time.

[0086] Refer to Fig. 7, a set of solar cooking appliances 700 is illustrated schematically in perspective view and vertical section view, respectively.

Five evacuated tube solar heat collector 701, 702, 703, 704 and 705 are mounted in a parallel raw illustrated in perspective view. Five cooking utensils including coffee/tea makers 160, 260, 460, 560 and 660 are put at one side of the solar heat collector 710 and are illustrated in vertical section view. Each solar heat corrector is filled with different heat storage and conducting material and has different way to connect the utensil as the descript of Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6. For limitation of the paper size, the connections between the solar heat collectors and the utensils are not shown in Fig. 7.

[0087] A fixing and supporting trestle 706 arranges and supports the five solar heat collectors at the proper locations and situations. The movable support 707 allows a adjustment of the incidence angle of the solar heat collector 710 to the sun light. Four wheels 741, 742, 743 and 744 are installed in the four bottom corners of the supporting trestle 706 for adjust the direction of the solar heat collector 710. (743 and 744 are not shown in Fig.7). A sundial (not shown in Fig. 7) is a cone bar. It attaches to the solar heat collector 710 perpendicularly for indicating the incidence angle of sun light;

[0088] A light reflecting object (not shown in Fig. 7) is equipped under the evacuated-tube for focusing the surrounding sun light to the solar heat collector;

When the solar light shines on the solar heat collector 710, the cooking processing in each utensil is the same as the processing mentioned in Fig. 1 to Fig.6. These processing will not be repeated again.

[0090] Based on the detailed description of the samples, other modifications will be apparent to those skilled in the art and, therefore, the invention is defined in the claims.

We claim:

1. A solar cooking appliance comprising:

a solar heat collector for collecting and storing solar heat;

a first solid heat storage and conducting material for storing and conducting solar heat, and being placed within said solar heat collector, wherein said solar heat collector is able to heat said solid heat storage and conducting material to a temperature higher than ~~the~~ water boiling temperature;

a second heat insulated solar cooking utensil/cookware positioned outside of the solar heat collector and thermally connected with said solar heat collector; and

a second heat transferring/conducting material/medium thermally connecting said solar heat collector with said second heat insulated solar cooking utensil/cookware for heat transferring and comprising: an first airtight container/first solar cooking utensil containing a liquid and located in the solar heat collector, and having a removable part with a hole; a liquid conduit passing through said hole, and having a first conduit end and a second conduit end, and said first conduit end being extended into said first airtight container, and said second conduit end ~~is inserted~~ being connected with said second heat insulated solar cooking utensil/cookware, and

said liquid ~~is~~ being selected from a group of material consisting of: water and oil.

2. A solar cooking appliance comprising:

a solar heat collector for collecting and storing solar heat;

a first solid heat storage and conducting material for storing and conducting solar heat, and being placed within said solar heat collector, wherein said solar heat collector is able to heat said solid heat storage and conducting material to a temperature higher than ~~the~~ water boiling

temperature;

a second heat insulated solar cooking utensil/cookware positioned outside of the solar heat collector and thermally connected with said solar heat collector; and

a second heat transferring/conducting material/medium thermally connecting said solar heat collector with said second heat insulated solar cooking utensil/cookware for heat transferring and comprising: an first airtight container/first solar cooking utensil containing a liquid and located in the solar heat collector, and having a removable part with a hole; a liquid conduit passing through said hole, and having a first conduit end and a second conduit end, and said first conduit end being extended into said first airtight container, and said second conduit end ~~is~~ being connected with said second heat insulated solar cooking utensil/cookware;

an electric heat element with power supply located in said solar heat collector; and

said liquid ~~is~~ being selected from a group of material consisting of: water, and oil.

3. The solar cooking appliance according to claim 1 or 2, wherein said solar heat collector comprises an evacuated-tube solar heat collector.

4. The solar cooking appliance according to claim 3, wherein said evacuated tube solar heat collector further comprises a first open end, and said first open extends into said heat insulated solar cooking utensil for heat transferring.

5. The solar cooking appliance according to claim 1 or 2, wherein said solar heat collector comprises a plurality of modular evacuated-tube solar heat collectors.

6. The solar cooking appliance according to claim 1 or 2, wherein said solar heat collector further comprises a first open end and a second open end, and said first open end extends into said heat insulated solar cooking utensil.

7. The solar cooking appliance according to claim 1 or 2, wherein said solar heat collector further comprises a first open end and a second open end, and said first open end connects to said heat insulated solar cooking utensil/cookware by said second heat transferring/conducting material.

8. The solar cooking appliance according to claim 1 or 2, wherein said evacuated tube solar heat collector is an evacuated toughened glass tube solar heat collector.

9. The solar cooking appliance according to claim 1 or 2, further comprising a protection selected from a group of devices consisting of:

a protective transparent cover, and

a plastic protective mantle for protecting said evacuated-tube solar heat collector.

10. The solar cooking appliance according to claim 1 or 2, wherein said first solid heat storage and conducting material is selected from a group of material consisting of:

a solid material,

a solid chemical heat storage material,

a solid phase change material, and

a combination of at least selected two of such materials.

11. The solar cooking appliance according to claim 1 or claim 2 wherein said first solid heat storage and conducting material is selected from a group material consisting of:

ore, metal, salt, sand, graphite, turves, soil, quartz sand, basalt sand, Ca0, and a combination of at least two ~~or more~~ such materials.

12. The solar cooking appliance according to claim 1 or claim 2 wherein said second heat insulated solar cooking utensil/cookware is selected from the group of devices consisting of:

a utensil having a an outer covering coat,

a utensil located in a heat insulated container,

a utensil located in a heat insulated container partially filled with said solar heat storage and conducting material, and

a heat insulated electric power cooking utensil/cookware ~~with~~ having a data measuring indicating and controlling device and system.

13. The solar cooking appliance according to claim 1 or claim 2, wherein said electric power cooking utensil/cookware further comprises an operation data measuring indicating and a controlling device or system.

14. The solar cooking appliance according to claim 1 or 2, wherein said first liquid conduit end and second conduit end are two open ends.

15. The solar cooking appliance according to claim 1 or 2, wherein said second heat insulated solar cooking appliance comprising a conduit arranged along inner wall of said utensil from the top to near bottom..

16. The solar cooking appliance according to claim 1 or 2, wherein said second heat insulated solar cooking utensil/cookware comprises the first solid heat storage and conducting material.

17. The solar cooking appliance according to claim 2, wherein said electric heat element further comprising a measuring and indicating device.

18. The solar cooking appliance according to claim 1, wherein said second heat insulated solar cooking utensil/cookware comprises a heat insulated container, said solar heat collector further comprises a first open end, and said first open end extends into said heat insulated container for heat transferring.

19. The solar cooking appliance according to claim 1 or 2, wherein said second heat transferring/conducting material comprises a heat conductor.

20. The solar cooking appliance according to claim 1 or 2, further comprising:

a trestle supporting said solar cooking appliance; and said trestle comprising:

an inclining structure for adjusting angle of said solar heat collector to sunlight; and

a directional structure for adjusting direction of said solar heat collector to sunlight.

21. The solar cooking appliance according to claim 1 or 2, further comprising:

a light reflector for focussing sunlight to said solar heat collector; and

a sundial attached to the solar heat collector perpendicularly.

22. The solar cooking appliance according to claim 1 or 2, further comprising: a wrapping covering the food in said solar cooking appliance, and said wrapping is made of a material selected from a group of material consisting of:

metal,

paper,

plastic, and

a combination of these materials.

23. The solar cooking appliance according to claim 1 or 2, further comprising a suitcase whereby said solar cooking appliance is portable.

24. The solar cooking appliance according to claim 1 or 2, wherein said second heat insulated cooking utensil further comprises a coffee/tea pot.

25. The solar cooking appliance according to claim 1 or 2, wherein said second solar cooking utensil is an electric drip coffee maker having a one-way valve for directing solar heated water flow.

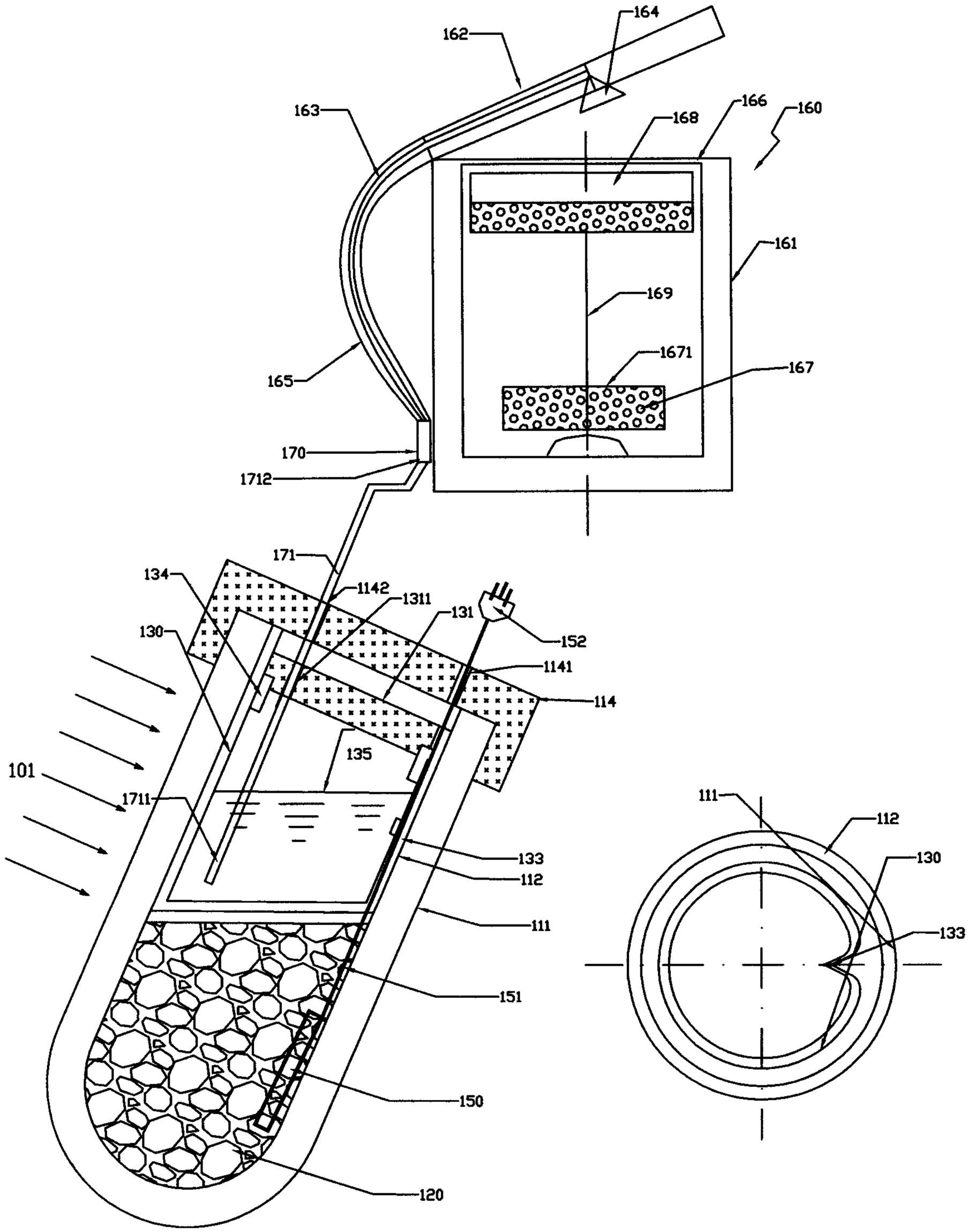

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Fig. 1

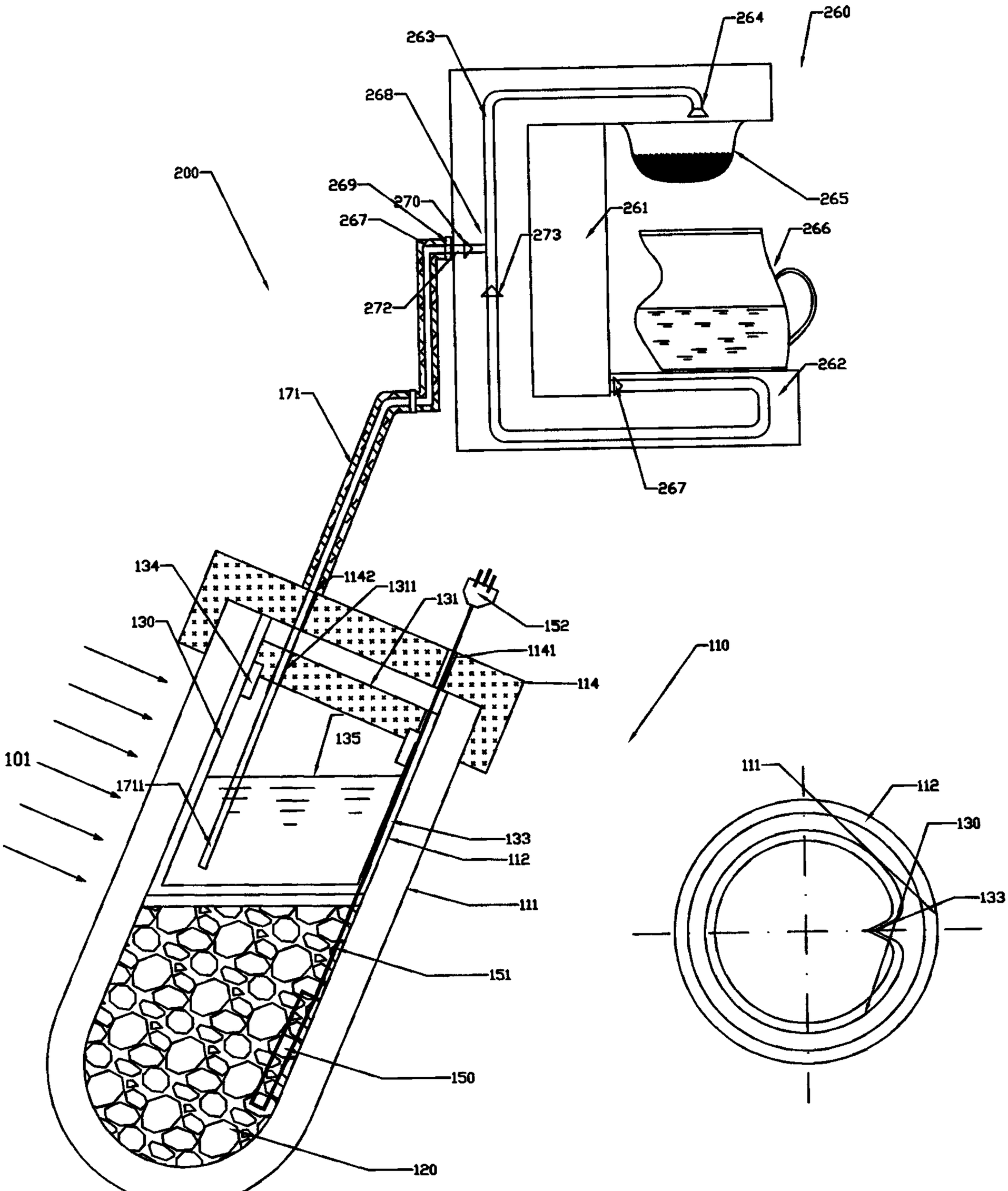
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Fig. 2

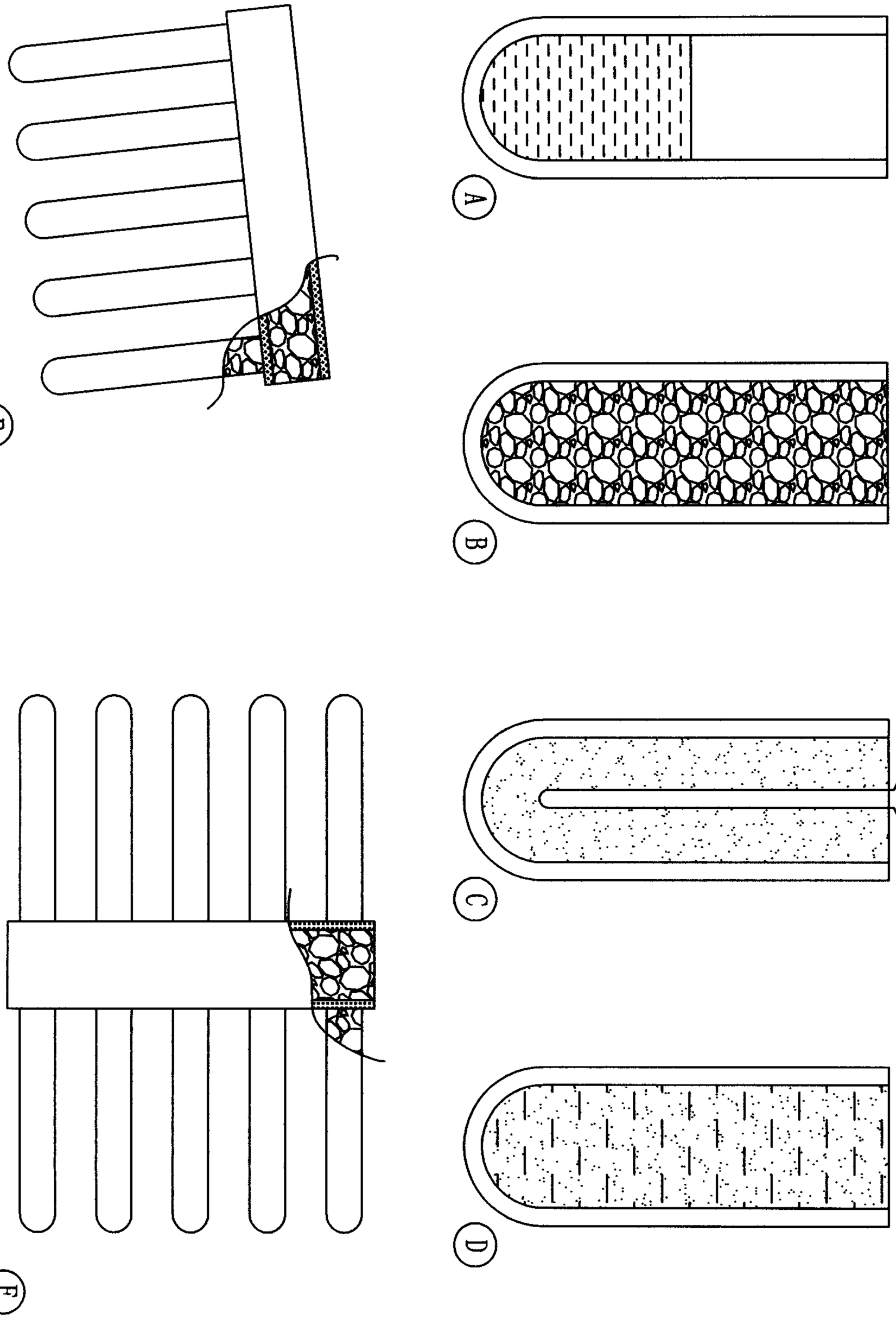

Fig. 3

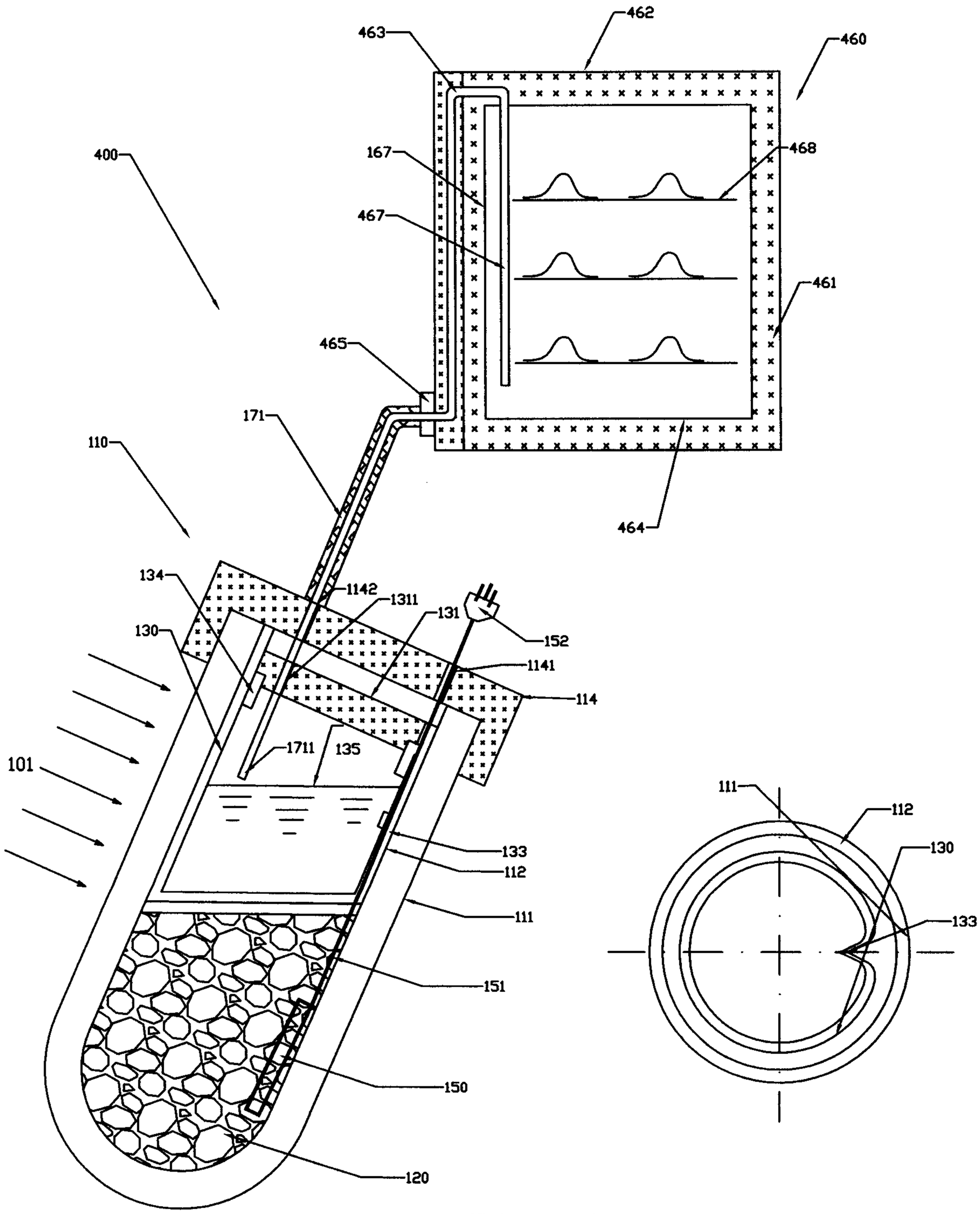
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Fig. 4

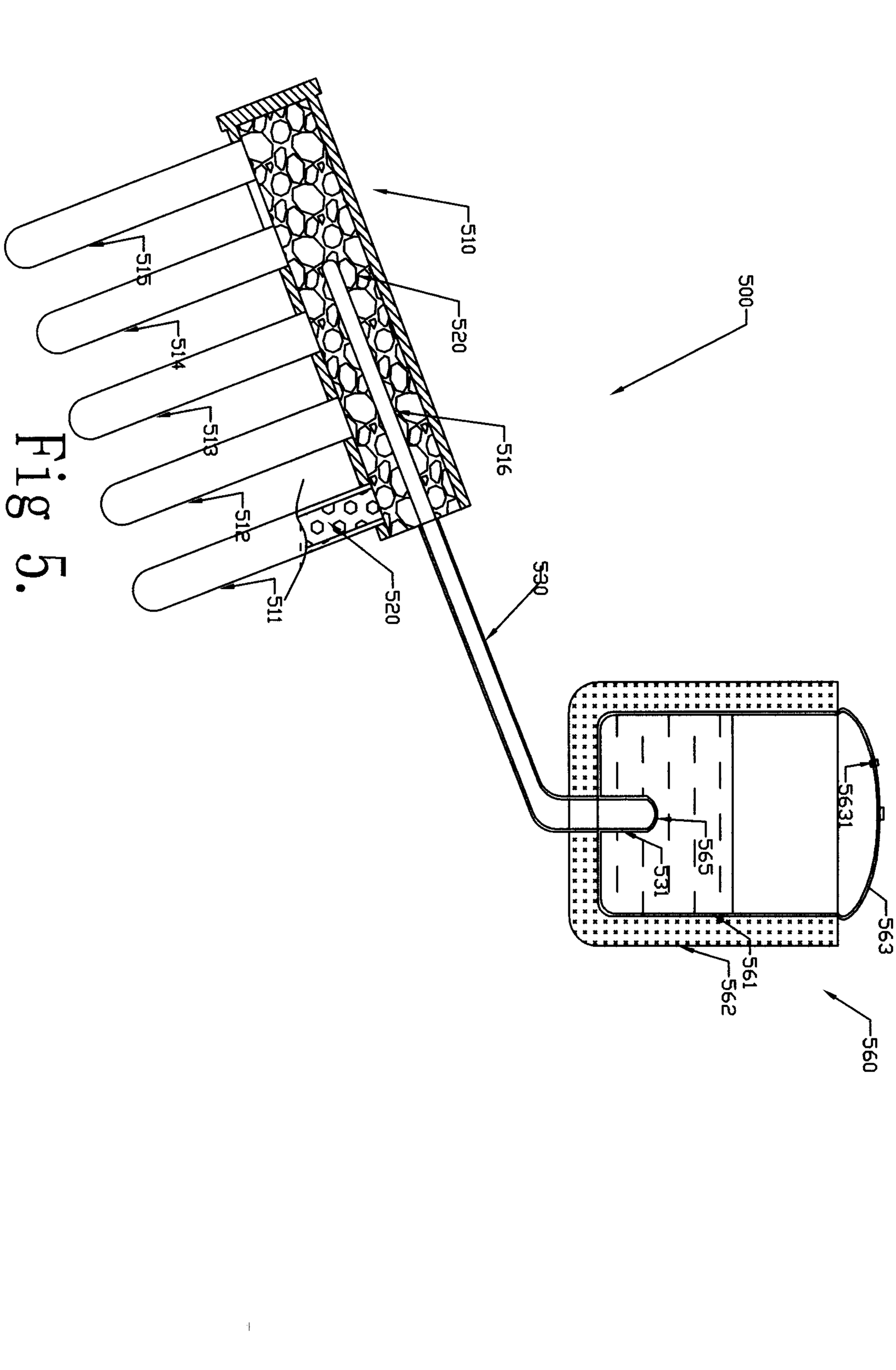
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Fig. 5.

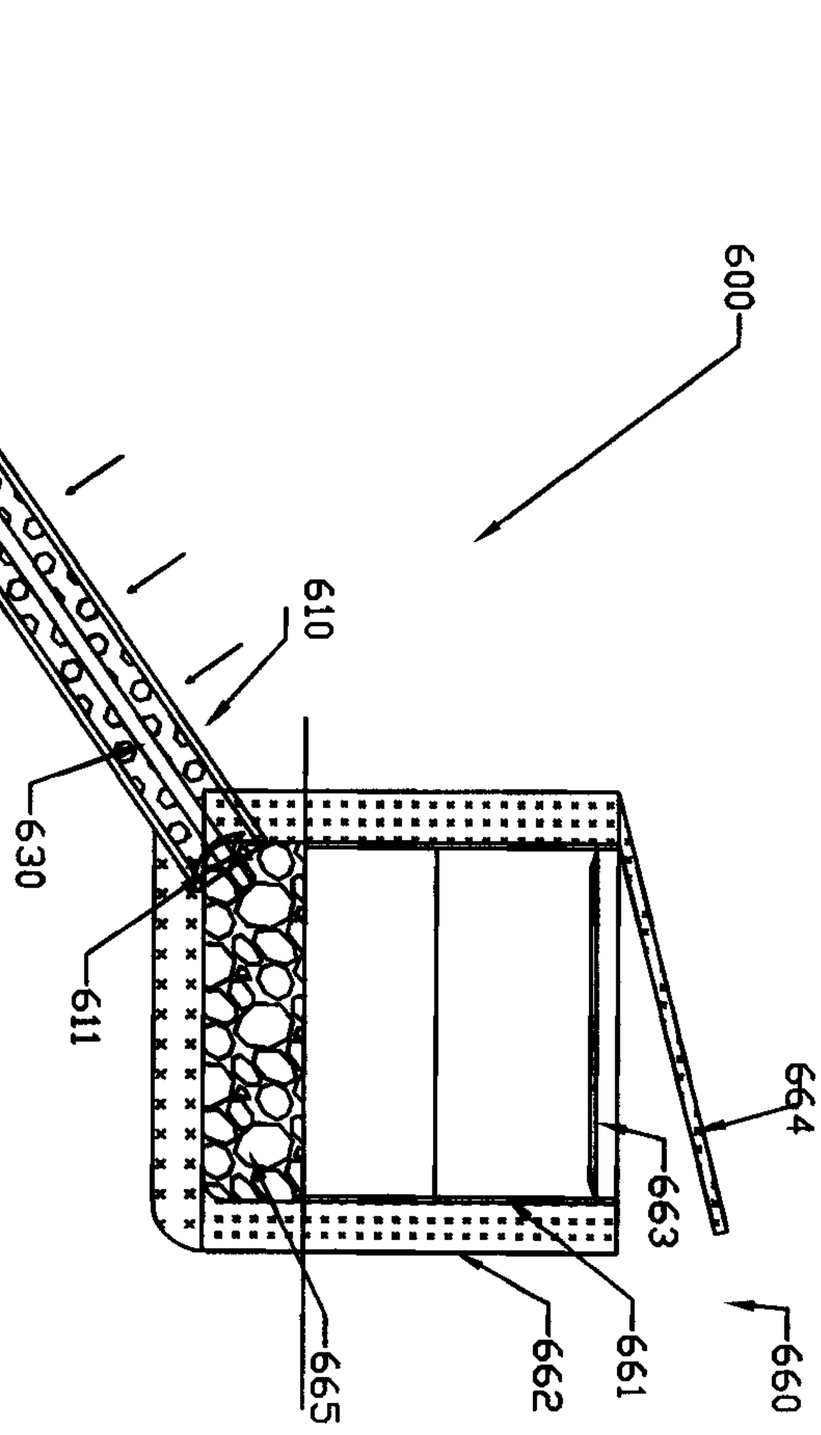
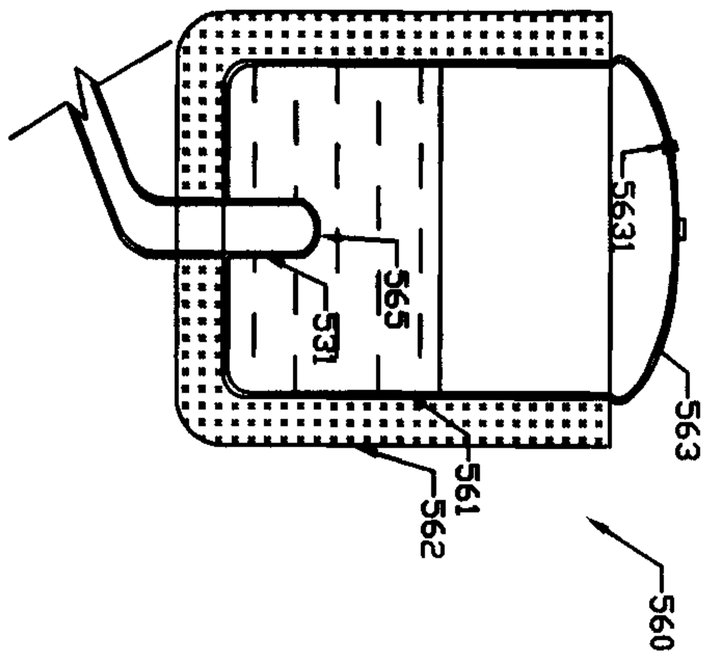


Fig. 6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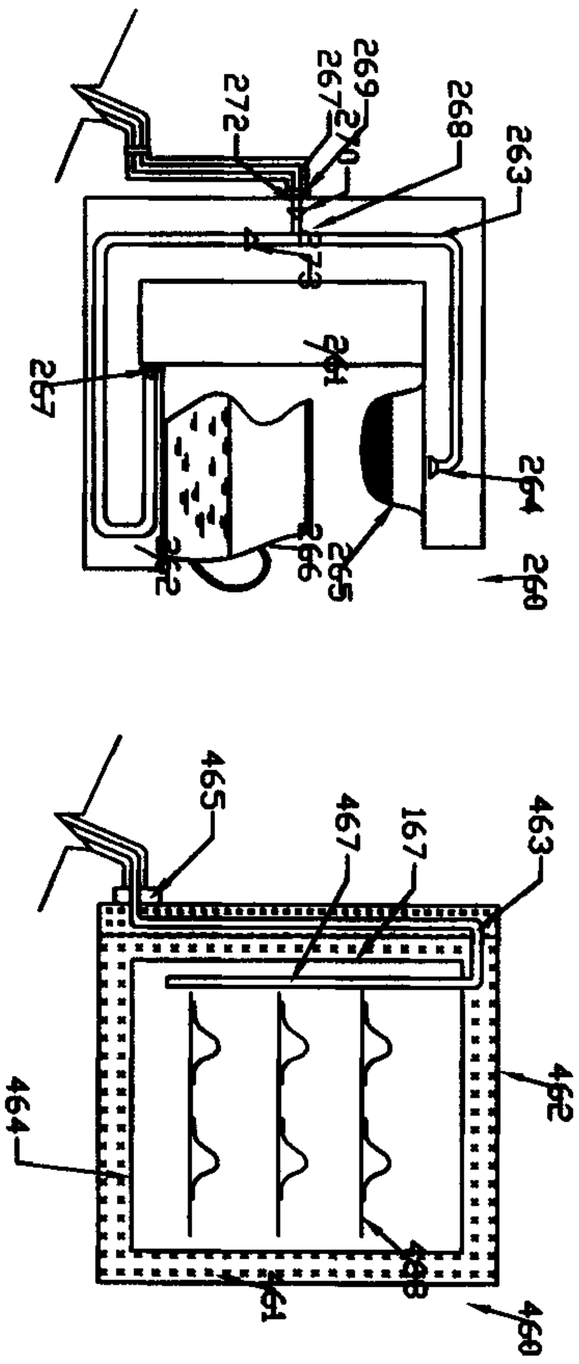
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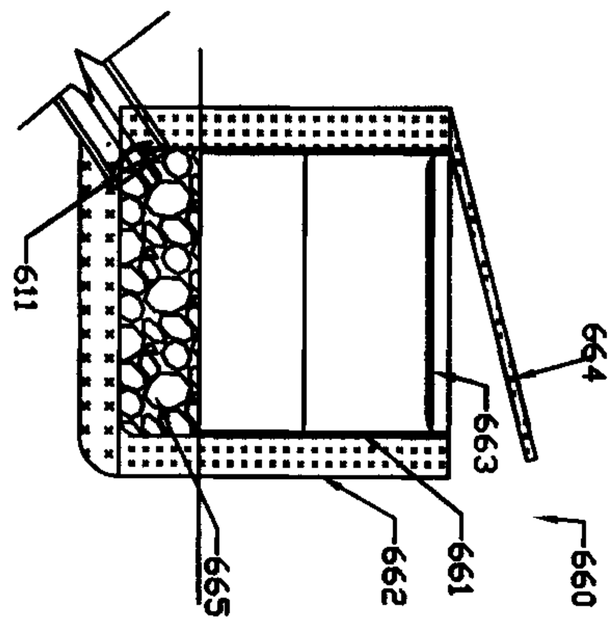
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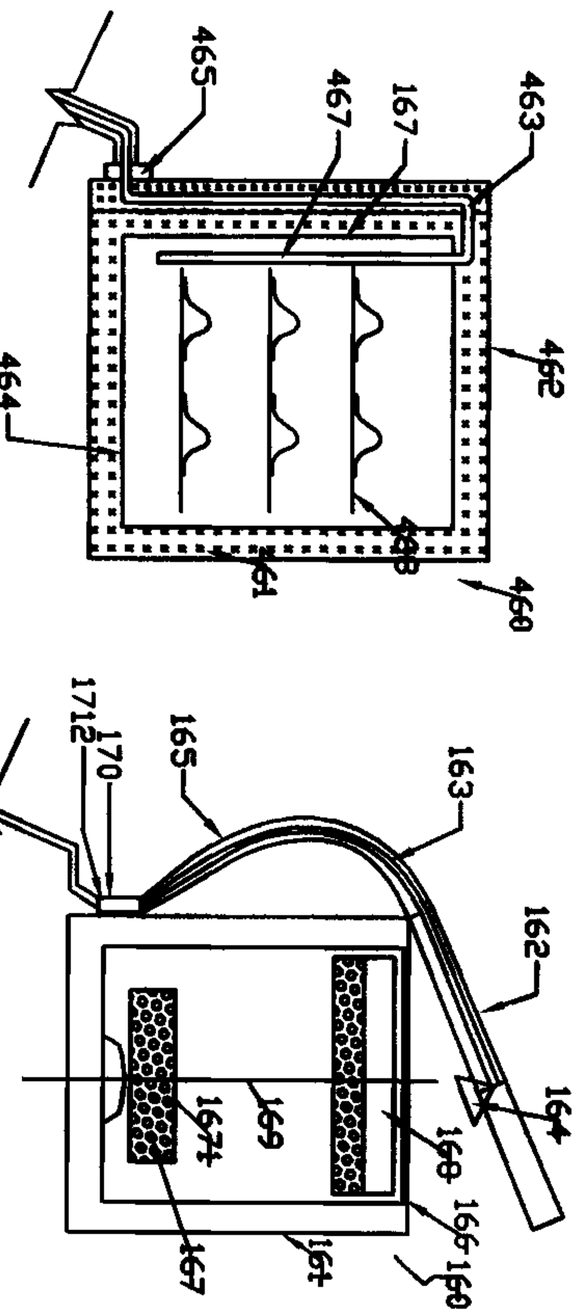
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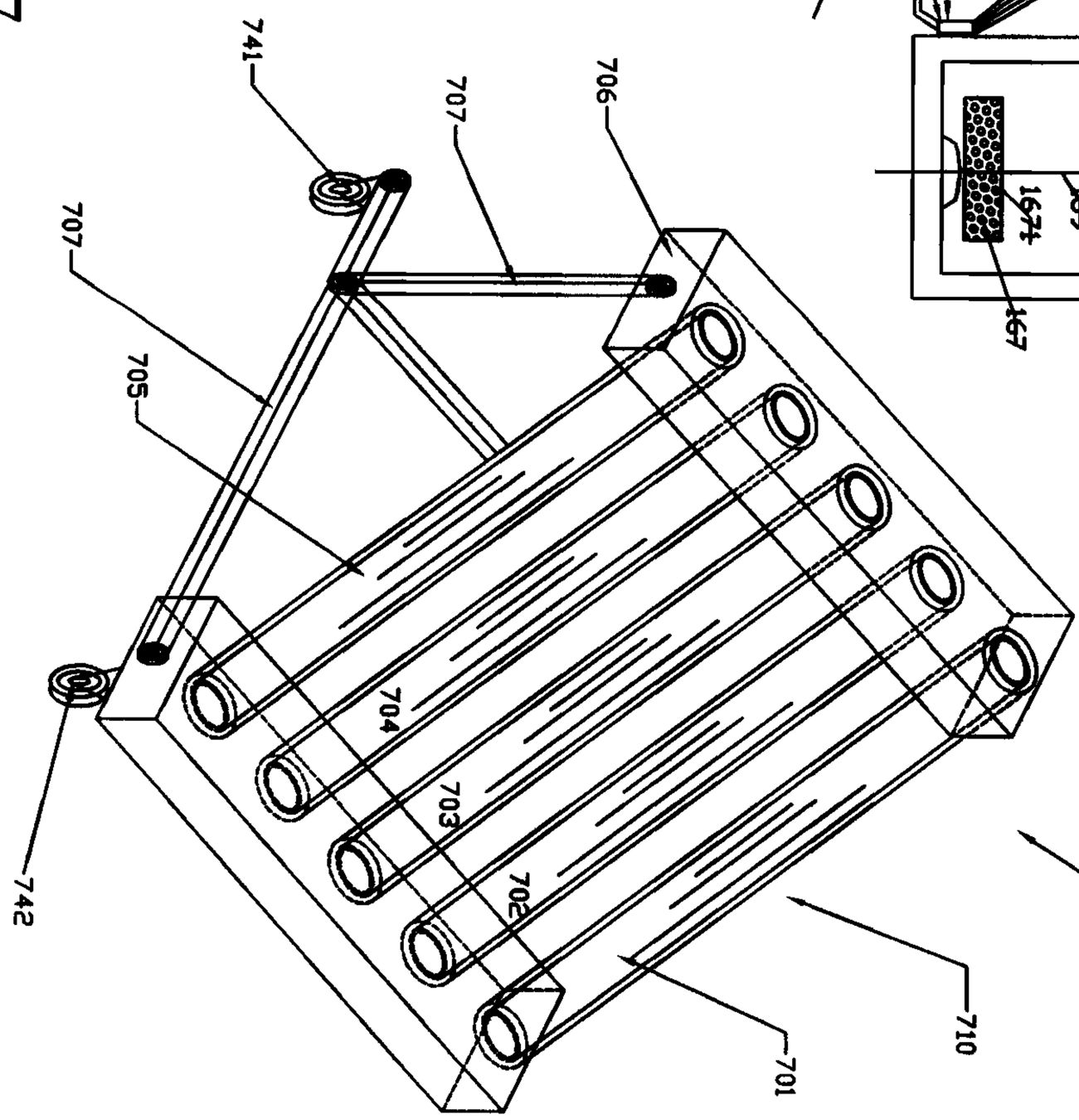
Fig. 7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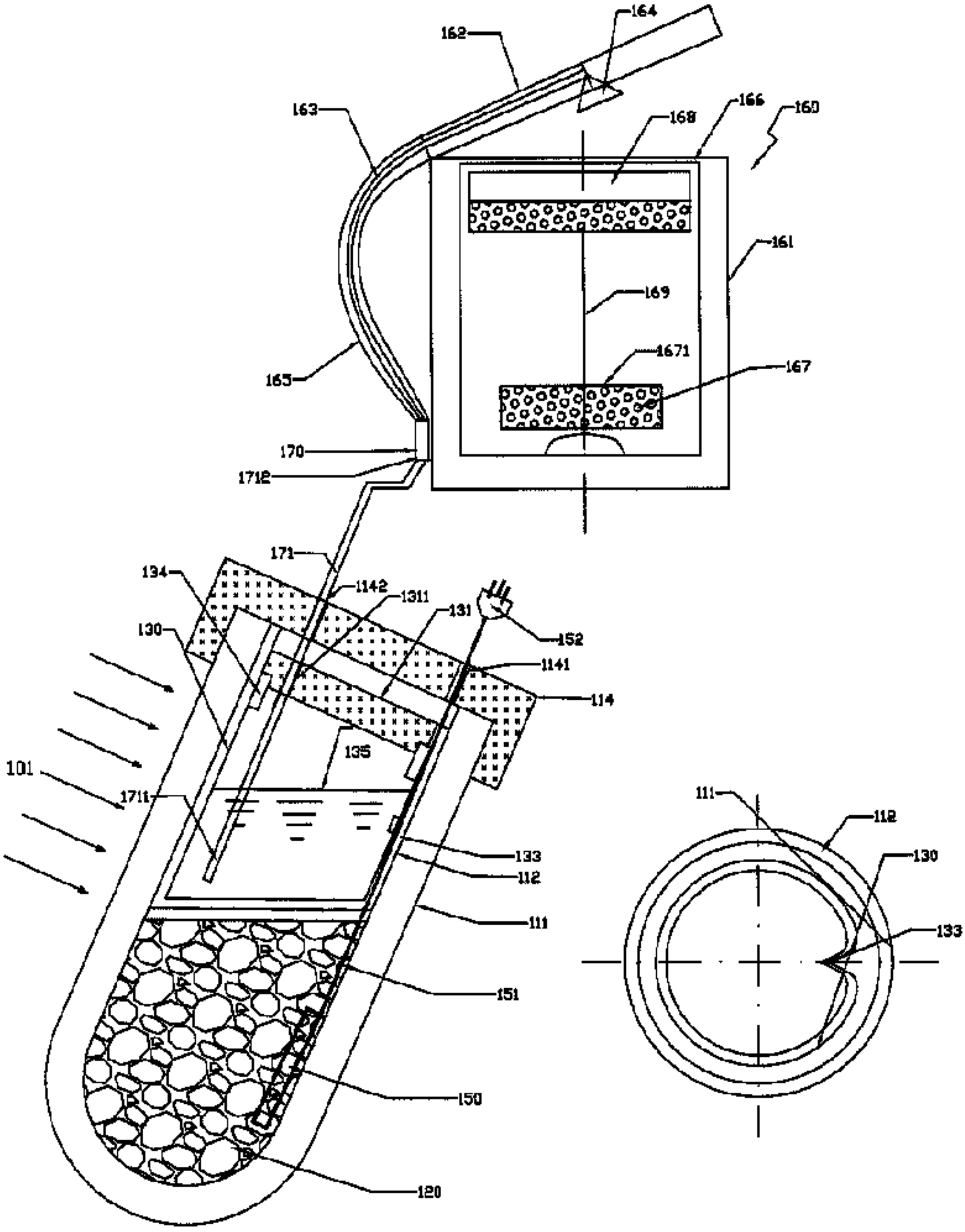
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