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(54) Title: SOLAR WORKSTATION

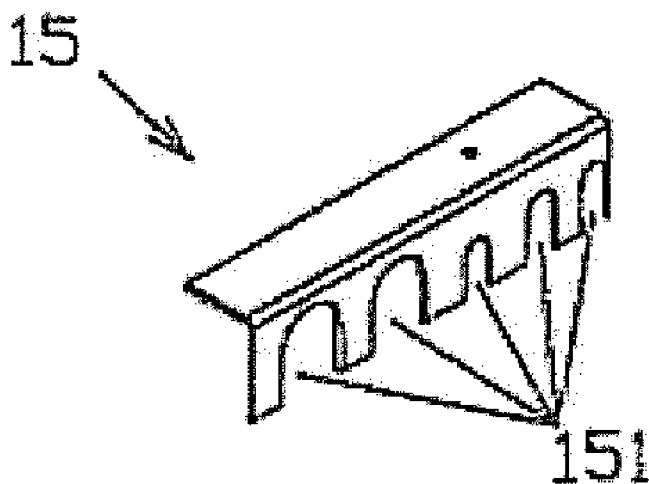


Fig. 2

(57) Abstract: The invention provides a solar workstation for the solar energy heating system, wherein the solar energy heating system comprises a controller, a medium circulating system and a thermal insulation base. A bottom shape of the thermal insulation base matches the top shape of the thermal insulation water tank in the solar energy heating system. Various pipelines of the medium circulating system are parallel to each other and are installed on the thermal insulation base horizontally. One end of each of the first medium pipeline, the second medium pipeline and the pressure-release pipeline protrudes to the rear end surface of the thermal insulation base. A through hole is provided on the thermal insulation base at positions corresponding to the other ends of the first medium pipeline and the second medium pipeline. The solar workstation according to the invention has a compact structure, a smaller volume and an appropriate spatial arrangement. The solar workstation according to the present invention can be placed on the thermal insulation base flat, and fully utilizes the space above the thermal insulation water tank. Therefore, the solar energy heating system equipped with the solar workstation according to the invention has an appropriate overall arrangement.

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Title: Solar Workstation

Description

TECHNICAL FIELD

[01] The present invention relates to a solar workstation for a solar energy heating system.

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BACKGROUND

[02] A solar energy heating system comprises a thermal insulation water tank, a heat collector, a heat exchanger, and a solar workstation wherein the thermal insulation water tank is used to contain water and can be placed indoors; the heat collector needs to be installed outdoors at a position where it is exposed to the sunshine for absorbing solar heat energy; the heat exchanger is generally positioned within the water tank, and the solar workstation is connected between the heat exchanger and the heat collector.

15 [03] A conventional solar workstation comprises a casing, a controller, and a medium circulating system. The medium circulating system comprises a medium circulation pipeline, a pressure-release pipeline and a buffer pipeline which communicate with the medium circulation pipeline respectively, an expansion tank installed in the buffer pipeline, a relief valve installed in the pressure-release pipeline as well as a one-way valve, a medium pump, a pressure gauge, a flow meter and the like installed in the medium circulation pipeline. The medium circulation pipeline is connected with the heat exchanger and the heat collector respectively, so as to form a medium circulation circuit. A medium having a high temperature after absorbing solar thermal energy within the heat collector flows to the heat exchanger in order to exchange heat with water from the water tank having a low temperature so that the

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water temperature is increased and the medium temperature is decreased. Then the low temperature medium flows back to the heat collector by the action of the medium pump to once again turn into the high temperature medium and passes into the next circulation. In this way, the circulation proceeds continuously. Therefore, the water within the water tank can reach a very high temperature.

[04] In the solar workstation according to which the water is hot instantly upon the water tap being turned on, the solar workstation further comprises an instant hot water circulating system. This instant hot water circulating system comprises a hot water return pipe, a hot water inlet pipe as well as a water pump installed on the hot water inlet pipe. Both of the hot water inlet pipe and the hot water return pipe communicate with the thermal insulation water tank at one end, and both of them communicate with a customer terminal water-usage pipe at the other end, so as to form a circulating pipeline which maintains a constant temperature periodically. When the temperature of the customer terminal water-usage pipe is decreased to a temperature lower than the temperature set by the control system while the temperature of the thermal insulation water tank is higher by a certain value than the pipeline set temperature, for example, 5°C, the water pump will initiate to operate and suck the cold water in the pipeline into the thermal insulation water tank. Then the high temperature water within the thermal insulation water tank will be mixed with the cold water within the pipeline once again to turn into hot water which meets the setting condition. When the customer uses water, the hot water will flow out instantly upon a water tap being turned on.

[05] In the above-described conventional solar workstation, the medium circulating system is provided inside the casing, and the protruding end of each pipeline protrudes to the outside of the casing. In use, each pipeline is connected with the heat collector and the heat exchanger by means of a long connection pipeline. That is to say, the conventional solar workstation is arranged to be separate from the

thermal insulation base, and they are apart from each other by a comparatively large distance. Therefore, the overall spatial arrangement of the solar workstation is in a disordered and inappropriate state and has a large volume thereby taking up a large space. With regard
5 to the above problems, a solution has been an attachment of the solar workstation on a side wall of the thermal insulation water tank vertically which solves the problem of taking up much space, having a disordered arrangement and having a large volume to a certain extent. However, this solution is not sufficient to meet the requirements. In the
10 meanwhile, the solar workstation has a certain weight and thus puts a certain load on the load-bearing components such as the thermal insulation water tank. Furthermore, the solar workstation is prone to fall off from the sidewall of the thermal insulation water tank due to gravity so that operation reliability of the solar energy heating system is compro-
15 mised. Additionally, in the conventional solar workstation, the expansion tank is also provided on the outside of the casing and communicates with the medium circulating pipeline within the casing by means of the buffer pipeline. As a result, not only the arrangement of the solar workstation is in disorder whereby the space being occupied is expanded,
20 but also the solar workstation is subjected to the effect of the external force to thus result in a failure of the expansion tank which in turn results in an unreliable operation of the entire solar energy heating system.

SUMMARY OF THE INVENTION

25 [06] An object of the invention is to overcome the technical problem that the existing solar workstation is bulky and has an inappropriate spatial arrangement.

[07] In order to achieve the above-described object, the invention provides the following technical solutions:

30 [08] A solar workstation according to the invention is used for the solar energy heating system. The solar energy heating system comprises a thermal insulation water tank, and the solar workstation comprises a

controller and a medium circulating system. The medium circulating system comprises a medium circulating pipeline composed of a first medium pipeline and a second medium pipeline, a pressure-release pipeline and a buffer pipeline respectively communicating with the medium circulating pipeline, a one-way valve and a medium pump installed in the medium circulating pipeline, an expansion tank connected to the buffer pipeline, and a relief valve installed in the pressure-release pipeline. The solar workstation may further comprise a thermal insulation base made of a thermal insulation material. The pipelines of the medium circulating system may be parallel to each other and installed on the thermal insulation base horizontally. Each one of the first medium pipeline, the second medium pipeline and the pressure-release pipeline may have one end protruding to the outside of a rear end surface of the thermal insulation base respectively, and each one of the first medium pipeline and the second medium pipeline may have the other end corresponding to a through hole being provided in the thermal insulation base.

[09] The thermal insulation base may have a bottom shape matching a top shape of the thermal insulation water tank.

[10] The solar workstation further comprises a hot water return pipe being installed on the thermal insulation base and being parallel to the second medium pipeline, wherein the hot water return pipe has one end protruding to the outside of the rear end surface of the thermal insulation base, and has the other end corresponding to a through hole being provided in the thermal insulation base.

[11] The solar workstation further comprises a hot water inlet pipe being installed on the thermal insulation base and being parallel to the second medium pipeline; and a water pump is installed on the hot water inlet pipe. The hot water inlet pipe has one end protruding to the outside of the rear end surface of the thermal insulation base, and has the other end corresponding to a through hole being provided in the thermal insulation base.

[12] The first medium pipeline comprises a first medium inlet pipeline and a first medium return pipeline which are arranged parallel to each other and communicate with each other at one end.

[13] The one-way valve and the medium pump are installed on the first medium inlet pipeline in a medium flow direction sequentially, and the buffer pipeline communicates with the first medium inlet pipeline at a position between the one-way valve and the medium pump.

[14] The expansion tank is installed on the thermal insulation base, and a centerline of the expansion tank is parallel to a centerline of the second medium pipeline.

[15] In the solar workstation, the pipelines may be arranged in an overlapping manner in at least two rows in an upper and lower direction.

[16] Several accommodation recesses for fixing the first medium pipeline, the second medium pipeline and the pressure-release pipeline of the medium circulating system may be provided in a top surface of the thermal insulation base, and a medium pump accommodation recess for accommodating a part of the medium pump may be provided in the thermal insulation base at a position corresponding to the medium pump. Moreover, at least two expansion tank fixing ribbed plates which are parallel to each other, or expansion tank accommodation recesses which are capable of accommodating a part of the expansion tank are provided on or in the thermal insulation base at one or more positions corresponding to the expansion tank.

[17] An accommodation recess for fixing the hot water return pipe may be further provided on the top surface of the thermal insulation base.

[18] An accommodation recess for fixing the hot water inlet pipe and an accommodation recess for accommodating a part of the water pump may be further provided on the top surface of the thermal insulation base.

[19] Several bearing seats may be further provided on the top sur-

face of the thermal insulation base, and the accommodation recesses are provided respectively in the bearing seats.

[20] The solar workstation may further comprise a clamping member for assisting to fix the respective pipeline.

- 5 [21] Any two of the accommodation recesses may be arranged in an overlapping manner in an upper and lower direction to form one combined recess for accommodating the pipelines arranged in an overlapping manner.

- [22] The solar workstation may further comprise an outer cover connected to the thermal insulation base, and slots may be provided in a
10 bottom of the outer cover at positions respectively corresponding to the protruding ends of the pipelines.

- [23] The solar workstation may further comprise a cover plate for covering the thermal insulation base. The cover plate may cover the
15 accommodation recesses provided at positions corresponding to the pipelines of the medium circulating system respectively, and a gap for allowing the medium pump to be exposed to the outside may be provided in the cover plate at a position corresponding to the medium pump.

- 20 [24] When the expansion tank is provided on the thermal insulation base, the cover plate may be located on one side of the expansion tank so that the expansion tank is exposed to outside.

[25] The cover plate may cover the accommodation recess provided at a position corresponding to the hot water return pipe.

- 25 [26] The cover plate may cover the accommodation recess provided at a position corresponding to the hot water inlet pipe, and a gap for allowing the water pump to be exposed to the outside may be provided at a position corresponding to the water pump.

- [27] A controller accommodation recess for fixing the controller may
30 be provided in a top of the cover plate.

[28] It can be seen from the above-described technical solutions that the advantages and beneficial effects of the solar workstation accord-

ing to the invention lie in that: the pipelines of the solar workstation are installed on the thermal insulation base and parallel to each other, and the pipelines are parallel to the thermal insulation base. Moreover, each of the first medium pipeline, the second medium pipeline and the pressure-release pipeline has one end protruding to the outside of the rear end surface of the thermal insulation base, and the protruding ends and the connection ends of the heat collector and heat exchanger are positioned behind the thermal insulation base or on the base. As a result, the arrangement of the pipelines is ordered and regular. The solar workstation according to the invention has a compact structure, is smaller in size, and has an appropriate spatial arrangement.

[29] The above and other objects, features and advantages of the invention will become more apparent from the description of the preferred embodiment given below with reference to the drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

[30] FIG.1 is a perspective structural schematic diagram of a solar workstation according to the invention viewed from the front;

[31] FIG.2 is a perspective structural schematic diagram of an upper clamping member in the solar workstation according to the invention;

[32] FIG.3 is a perspective structural schematic diagram of the solar workstation according to the invention viewed from the rear;

[33] FIG.4 is a perspective structural schematic diagram of a thermal insulation base having a bearing seat in the solar workstation according to the invention;

[34] FIG.5 is a perspective structural schematic diagram of the thermal insulation base for accommodating pipelines arranged in an overlapping manner in the solar workstation according to the invention;

[35] FIG.6 is a perspective structural schematic diagram of the solar workstation with a cover plate according to the invention;

[36] FIG.7 is a perspective structural schematic diagram illustrating a bottom shape of the thermal insulation base in the solar workstation

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according to the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[37] Hereinafter particular embodiments of the invention will be described in detail. It should be understood that the embodiments described herein are provided by way of illustration only, and do not limit the present invention.

[38] A solar workstation according to the invention is used for a solar heating system. The solar heating system comprises a thermal insulation water tank for storing hot water, a heat collector for collecting solar heat energy, and a heat exchanger for exchanging heat.

First Embodiment

[39] As shown in Figs. 1, 2, and 3, the solar workstation of the first embodiment comprises a thermal insulation base 5, a controller 8, and a medium circulating system 2.

[40] The medium circulating system 2 comprises a four-way joint 20, a first medium pipeline, a second medium pipeline 23, a buffer pipeline 25, a pressure-release pipeline 29, a one-way valve 24, an expansion tank 251, a medium pump 26, a relief valve 27, a flow meter 28, and a pressure gauge 9 etc.

[41] The first medium pipeline comprises a first medium inlet pipeline 21 and a first medium return pipeline 22.

[42] The first medium inlet pipeline 21 is installed on the base 5 horizontally in a front and rear direction (from bottom left to top right in Fig. 1) of the base 5. The first medium inlet pipeline 21 has an inlet end which is installed to a connection port, and has an outlet end which communicates with a first vent of the four-way joint 20. The connection port may be a connection elbow. The one-way valve 24, a three-way joint 213 and the medium pump 26 are installed in the first medium inlet pipeline 21 in a medium flow direction sequentially. The expansion tank 251 is connected to a third vent of the three-way joint 213 via the buffer

pipeline 25. In this way, the expansion tank 251 is connected to an inlet of the medium pump 26, and is connected between the one-way valve 24 and the medium pump 26. On the one hand, in case of normally using water, the expansion tank 251 may absorb an impact force produced due to a pressure fluctuation in the medium circulating system so as to have an effect of buffering so as to ensure that the medium can be circulated steadily. On the other hand, in case of stagnation, when no water is used for a long time or a consumption of water is small such that a temperature of the medium and an amount of vaporization are increased, air bubbles mixed in the medium will flow reversely into the expansion tank 251 via the first medium return pipeline 22 which prevents the components of the solar energy heating system such as the heat collector and the heat exchanger from breaking, and ensures a reliable circulation of the medium.

[43] The first medium return pipeline 22 has an inlet end which communicates with a second vent of the four-way joint 20, and has an outlet end/protruding end which protrudes outside of a rear end surface of the base 5 and is provided with a connection port 222. The first medium return pipeline 22 is disposed parallel to the first medium inlet pipeline 21. In order to reduce an occupied area of the base 5, in this embodiment, the first medium return pipeline 22 may be positioned above the first medium inlet pipeline 21, and the first medium return pipeline 22 may be bent several times such that the inlet end of the first medium inlet pipeline 21 is adjacent to an outlet end of the second medium return pipeline 22. The flow meter 28 is installed in the first medium return pipeline 22, and preferably, the flow meter 28 is installed between the inlet end of the first medium return pipeline 22 and the second vent of the four-way joint 20.

[44] The second medium pipeline 23 disposed parallel to the first medium inlet pipeline 21 has one end (protruding end) which also protrudes to the outside of the rear end surface of the base 5, and is provided with a connection port 231, and has the other end (outlet end)

which is provided with a connection elbow 232.

[45] The pressure-release pipeline 29, disposed parallel to the first medium inlet pipeline 21, has one end (protruding end) which protrudes outside of the rear end surface of the base 5 and is provided with a connection port, and has the other end which communicates with the relief valve 27 connected to a third vent of the four-way joint 20. When the pressure in the medium circulating system is higher than a set safety value, the relief valve 27 will be opened automatically to release pressure so as to protect the medium circulating system from damage. The pressure gauge 9 is installed on a fourth vent of the four-way joint 20. In the first embodiment, the protruding ends of the first medium return pipeline 22, the second medium pipeline 23 and the pressure-release pipeline 29 lie in a same plane. Thus, the pipelines are arranged aesthetically. For further reducing the space of the solar workstation, these pipelines may be further arranged into two rows in such a way that one row overlaps the other row vertically.

[46] In the solar workstation of the first embodiment, the thermal insulation base 5 is a thick plate with a certain thickness in which various recesses may be provided. Preferably, the thermal insulation base 5 is made of a thermal insulation material such as EPP or melamine but it is not restricted to this. The base 5 made of the thermal insulation material maintains the temperature of the medium in the medium circulating system, and is of advantage for reducing a thermal loss during circulating the medium. The bottom shape of the thermal insulation base 5 may match the top shape of the thermal insulation water tank in the solar energy heating system. For example, if the top shape of the thermal insulation water tank is spherical, the bottom shape of the thermal insulation base 5 will correspondingly be spherical (see Fig. 7). The bottom shape of the base 5 is not limited to a spherical shape but rather may have any shape as long as it matches the shape of the top surface of the thermal insulation water tank. In this way, the solar workstation of the embodiment can be conveniently placed on top of the

thermal insulation water tank and attached to the thermal insulation water tank, thereby allowing the solar workstation not only to fully utilize the space above the thermal insulation water tank so as to compactly and appropriately arrange the entire solar energy heating system
5 equipped with the solar workstation according to the invention, but also allows to replace the thermal insulation layer on top of the thermal insulation water tank with the base. The base may play a role of thermal insulation. As shown in Fig. 4, in the first embodiment, several accommodation recesses 511 for fixing the first medium inlet pipeline 21,
10 the second medium pipeline 23 and the pressure-release pipeline 29 of the medium circulating system are provided in the top surface of the thermal insulation base 5 along the front and rear direction. Each of the accommodation recesses 511 has a radius equal to or slightly larger than that of the corresponding pipeline accommodated therein.
15 Through holes 512 are provided on the thermal insulation base 5 at positions respectively corresponding to connection ports at the inlet end or outlet end of the first medium inlet pipeline 21 and the second medium pipeline 23. A medium pump accommodation recess 526 (see Fig. 5) for accommodating a part of the medium pump 26 is provided on the
20 thermal insulation base 5 at a position corresponding to the medium pump 26 (see Fig. 5). Furthermore, a wiring through hole 17 (see Fig. 4) is provided in the thermal insulation base 5 so that various control wires can pass through the base from below to connect with the controller. Several legs (not shown) may be provided on a bottom surface of the
25 thermal insulation base 5. The legs may be formed integrally with the base.

[47] The solar workstation of the first embodiment can further comprise an outer cover (not shown) which is connected to the thermal insulation base 5 by means of snap-fit or a buckle and the like, and
30 several slots may be provided at the bottom of the outer cover at positions corresponding to the protruding ends of the pipelines. The bottom of the outer cover may be arranged to totally cover a profile of the

thermal insulation base 5 from the outside. In such a case, various through holes for these parts protruding outside of the rear end surface of the base may be disposed in the outer cover. A rear board which is convenient for opening and closing is provided in the outer cover at a position corresponding to the controller, so as to facilitate maintenance of the controller 8. The outer cover may not only play a role of assisting in fixing the pipelines, but also covers all components of the solar workstation so as to play a role of protection. If the outer cover is made of a thermal insulation material such as EPP or melamine, it will further have an effect of thermal insulation.

[48] When it is intended to install the medium circulating system on the thermal insulation base 5, the four-way joint 20 is fixed on the front surface of the thermal insulation base 5 and adjacent to a front end surface of the thermal insulation base 5. For the fixing of the four-way joint 20, a recess for accommodating the four-way joint 20 may be provided in the thermal insulation base 5, such that the four-way joint 20 may be placed in this recess and may be further fixed. To this end, one or more auxiliary fasteners may be provided additionally. Each of the pipelines in the medium circulating system may be placed in the corresponding accommodation recess 511, and the medium pump 26 may be accommodated in the medium pump accommodation recess 526.

[49] During installation of the solar workstation according to the first embodiment, the solar workstation may be placed on the top surface of the thermal insulation water tank. In case of no leg being provided on the thermal insulation base 5, several pads may have to be disposed between the thermal insulation base 5 and the thermal insulation water tank, such that there is a certain space between the thermal insulation base 5 and the top surface of the thermal insulation water tank, so as to receive a connection elbow or connection port of the heat collector or the heat exchanger. The connection elbow of the first medium inlet pipeline 21 which protrudes below the thermal insulation base 5 from the corresponding through hole in the thermal insulation

base 5, is connected to an outlet pipeline of the heat exchanger in the solar energy heating system. The connection port 222 of the first medium return pipeline 22 is connected with an inlet pipeline of the heat collector; the connection port 231 of the second medium pipeline 23 is connected with an outlet pipeline of the heat collector; and the connection elbow 232 of the second medium pipeline 23, which protrudes below the thermal insulation base 5 from the corresponding through hole in the thermal insulation base 5, is connected with an inlet pipeline of the heat exchanger.

[50] The high temperature medium from the heat exchanger flows into the heat exchanger which is positioned in the water tank via the connection elbow 232 at the outlet end of the second medium pipeline 23, so as to transmit heat to the water in the water tank and thus to turn into a low temperature medium. The medium then flows into the first medium inlet pipeline 21 via the connection elbow at the inlet end of the first medium inlet pipeline 21, flows into the first medium return pipeline 22 via the one-way valve 24, the three-way joint 213, the medium pump 26, and the four-way joint 20 sequentially, and further flows into the heat collector via the connection port 222. The medium thereafter flows into the heat exchanger via second medium pipeline 23 to pass into the next circulation. In this way, the temperature of the water within the water tank is increased. By way of a customer terminal water pipe that communicates with the thermal insulation water tank, the customer can use hot water.

Second Embodiment

[51] The solar workstation of the second embodiment is different from the solar workstation of the first embodiment in that: the medium circulating system is provided with an additional hot water return pipe 30 installed parallel to the first medium inlet pipeline 21. The hot water return pipe 30 has one end protruding to the outside of the rear end surface of the base 5 and being provided with a connection port 301,

and has the other end being provided with a connection elbow 302. The protruding end of the hot water return pipe 30 lies in the same plane together with the protruding ends of the first medium return pipeline 22, the second medium pipeline 23 and the pressure-release pipeline 29.

[52] Correspondingly, an accommodation recess for fixing the hot water return pipe 30 is provided on the front surface of the thermal insulation base 5, and a through hole 1302 (see Fig. 1) is provided in the thermal insulation base 5 at a position corresponding to the connection elbow 302 of the hot water return pipe 30. In use, the connection elbow 302 communicates with the thermal insulation water tank, and the connection port 301 communicates with the customer terminal water-usage pipe. Therefore, the hot water may flow from the thermal insulation water tank to the customer terminal water-usage pipe via the hot water return pipe 30. In this way, the pipelines of the solar energy heating system may be arranged more compactly and aesthetically.

[53] The other portions of the solar workstation of the second embodiment which are identical to those of the first embodiment in the structure will not be redundantly described herein.

Third embodiment

[54] The solar workstation of the third embodiment is different from the solar workstation of the above-described second embodiment in that: the medium circulating system is provided with an additional hot water inlet pipe 31 installed parallel to the first medium inlet pipeline 21, and is further provided with a water pump 32 installed on the hot water inlet pipe 31. The hot water inlet pipe 31 has one end protruding to the outside of the rear end surface of the base 5 and being provided with a connection port 311, and has the other end being provided with a connection elbow 312. The protruding end of the hot water inlet pipe 31 lies in the same plane as the protruding ends of the hot water return pipe 30, the first medium return pipeline 22, the second medium pipe-

line 23, and the pressure-release pipeline 29.

[55] Correspondingly, an accommodation recess for fixing the hot water inlet pipe 31 is provided in the top surface of the thermal insulation base 5, and a through hole 531 is provided in the thermal insulation base 5 at a position corresponding to the connection port at the protruding end of the hot water inlet pipe 31. Moreover, a water pump accommodation recess 532 (see Fig. 4) for accommodating a part of the water pump 32 is provided in the thermal insulation base 5 at a position corresponding to the water pump 32. In use, the connection elbow 312 communicates with the thermal insulation water tank, and the connection port 311 communicates with the customer terminal water-usage pipe. Thus, the hot water inlet pipe 31, the thermal insulation water tank, the hot water return pipe 30 and the customer terminal water-usage pipe constitute an instant hot water circulating system. When a water temperature in the customer terminal water-usage pipe is decreased to a temperature lower than a temperature set by the control system, and a water temperature in the thermal insulation water tank is higher by a certain value than the pipeline set temperature, for example 5°C, the water pump will be enabled to pump cold water from the pipeline to the thermal insulation water tank, such that the water at a high temperature in the thermal insulation water tank is mixed with the cold water from the pipeline once again to produce a hot water which meets the setting condition. When the customer uses water, hot water will flow out instantly upon opening of the water tap.

[56] The solar workstation of this third embodiment may provide hot water instantly upon turning on. The other portions of the solar workstation of the third embodiment which are identical to those of the second embodiment in the structure will not be redundantly described herein.

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Fourth embodiment

[57] The solar workstation of the fourth embodiment is different from

the first to third embodiments in that: the expansion tank 251 of the medium circulating system is also installed on the thermal insulation base 5 horizontally. The expansion tank 251 may have a shape of a column or other shapes such as rectangular and the like, so as to lower its height.

[58] Correspondingly, an expansion tank accommodation recess 525 (see Fig. 4) for accommodating a part of the expansion tank 251 is provided on the top surface of the thermal insulation base 5 at a position corresponding to the expansion tank 251. A partition plate 53 is provided on the base 5 between the medium circulation pipeline and the expansion tank 251 (see Fig. 4).

[59] When the medium circulating system is intended to be installed on the thermal insulation base 5, in addition to accommodating of the pipelines in the corresponding accommodation recesses, the expansion tank 251 is accommodated in the expansion tank accommodation recess 525, and the expansion tank 251 communicates with the first medium inlet pipeline 21 by means of the buffer pipeline 25.

[60] The other portions of solar workstation of the fourth embodiment which are identical to those of the first to third embodiments will not be redundantly described.

Fifth embodiment

[61] The solar workstation of the fifth embodiment is different from the first to fourth embodiments in that: several bearing seats 54 are provided on the top surface of the thermal insulation base 5 and are integrated with the base. One of the bearing seats 54 is positioned at a rear portion of the thermal insulation base 5, and the other bearing seats are positioned at a middle portion and a front portion of the thermal insulation base 5, respectively. Accommodation recesses 511 for accommodating the pipelines of the medium circulating system may be provided in the bearing seats 54. Accommodation recesses for the medium pump 26 and the water pump 32 may also be provided in

the bearing seats 54 (see Fig. 4). In the fifth embodiment, an upper clamping member 15 for assisting in fixing the pipelines (see Fig.2) is further provided. This upper clamping member 15 can be an L-shaped plate with a vertical portion and a horizontal portion. The vertical portion can have a plurality of notches 151 for being clamped on the pipelines, and the horizontal portion or the vertical portion can be fixed in position on the thermal insulation water tank or the vertical plate 7. In this way, the pipelines can be fixed more reliably. In the fifth embodiment, since the accommodation recesses are provided in the bearing seat 54 having a certain height, there is a distance between the pipelines accommodated within these recesses and the top surface of the thermal insulation base 5. Thus, it is not necessary for the connection elbows at the connection ports of the pipelines to protrude below the thermal insulation base 5. When the medium pipeline of the solar workstation is connected to the heat collector and the heat exchanger, the connection port of the heat collector and the heat exchanger may protrude above the top surface of the thermal insulation base 5 via the corresponding through holes in the thermal insulation base 5, thereby, connection of the pipelines may be completed above the thermal insulation base 5. Thus, connecting operations are more convenient.

[62] The other portions of the solar workstation of this fifth embodiment which are identical to those of the first to fourth embodiments will not be redundantly described.

25 **Sixth embodiment**

[63] As shown in Fig. 5, the solar workstation of the sixth embodiment is different from the first to fifth embodiments in that: the accommodation recesses for accommodating the pipelines are provided in the thermal insulation base 5, such as the accommodation recesses for the first medium return pipeline 22, the second medium pipeline 23, the pressure-release pipeline 29, the hot water return pipe 30 and the hot water inlet pipe 31, respectively, may be arranged in such a way that

any two of the accommodation recesses are arranged in an overlapping manner in upwards and downwards directions to form one combined accommodation recess, so as to form the combined accommodation recess such that two pipelines can be arranged in one combined accommodation recess in an overlapping manner along the upwards and downwards directions. In this way, the number of the recesses for accommodating the pipelines can be reduced, and the arrangement of the pipelines can be more compact so that the overall arrangement of the solar workstation is more compact. In addition, with regard to the installation of the expansion tank, the expansion tank may be positioned by expansion tank fixing ribbed plates 55 and the vertical plate 7 fixed on the thermal insulation base 5. The number of the expansion tank fixing ribbed plates 55 may be at least two, preferably three. Moreover, the expansion tank fixing ribbed plates 55 are parallel to each other. In such a case, it is not necessary to provide the tank accommodation recess in the thermal insulation base 5.

[64] The portions of the solar workstation of this sixth embodiment which are identical to those of the first to fifth embodiments will not be redundantly described.

Seventh embodiment

[65] As shown in Fig. 6, the solar workstation according to the seventh embodiment is different from the first to sixth embodiments in that: according to the seventh embodiment, the solar workstation further comprises a cover plate 6 covering a part of the base 5 and being positioned on one side of the expansion tank 251. The cover plate 6 covers the accommodation recesses provided at positions corresponding to the first medium inlet pipeline 21, the first medium return pipeline 22, the second medium pipeline 23, the hot water return pipe 30 and the hot water inlet pipe 31, respectively (see Fig. 1). A gap for allowing the medium pump to be exposed to the outside is provided at a position corresponding to the medium pump 26 (see Fig. 1) in the cover plate 6,

and a gap for allowing the water pump to be exposed to the outside is also provided at a position corresponding to the water pump 32 in the cover plate 6. The cover plate 6 may be made of a thermal insulation material that is identical to that of the base 5. Therefore, according to
5 this embodiment, the cover plate 6 can play a role of assisting in fixing the pipelines on the one hand, and provide a thermal insulation to the pipelines on the other hand. In addition, a controller accommodation recess for fixing the controller 8 may be provided in the top of the cover plate 6 so that the controller 8 can be installed in the solar workstation
10 horizontally with respect to the base 5. The controller 8 may be installed at any angle with respect to the base 5. For example, the controller may be installed vertically or inclined at a certain angle and the like. In the seventh embodiment, when the expansion tank 251 is not installed on the thermal insulation base 5, the cover plate 6 can cover the entire
15 thermal insulation base 5; and when the expansion tank 251 is provided on the thermal insulation base 5, the cover plate 6 is on one side of the expansion tank 251 so that the expansion tank is exposed to the outside.

[66] The other portions of the solar workstation of the seventh embodiment which are identical to those in the first to sixth embodiments will
20 not be redundantly described.

[67] In the solar workstation of the invention, the fixing of the medium circulation pipeline is not limited to the manners mentioned above such as utilizing the notches or the recesses, but rather instead, other conventional manners, such as utilizing the pipeline clamps and the like,
25 are also applicable for fixing the solar workstation of the present invention. Similarly, the fixings of the medium pump, the water pump and the expansion tank are also not limited to those mentioned above such as utilizing the recesses or the fixing ribbed plates or the accommodating
30 opening in cooperation with the strutting plate. Other conventional manners are also applicable for the present invention.

[68] Although the present invention has been described with refer-

ence to several preferred embodiments, it should be understood that the terms used herein are merely illustrative and exemplary, not restrictive. Since the present invention may be embodied in various forms without departing from its spirit or essence, it should be understood that

5 the above-described embodiments are not limited to any details set forth above. Thus, all the modifications and variations and their equivalents should be covered by the appended claims.

CLAIMS

1. A solar workstation for a solar energy heating system comprising a thermal insulation water tank, comprising:
- 5 a controller;
- a medium circulating system comprising: a medium circulating pipeline composed of a first medium pipeline and a second medium pipeline, a pressure-release pipeline and a buffer pipeline respectively communicating with the medium circulating pipeline, a one-way valve
- 10 and a medium pump installed in the medium circulating pipeline, an expansion tank installed in the buffer pipeline, and a relief valve installed in the pressure-release pipeline; and
- a thermal insulation base made of a thermal insulation material;
- wherein the pipelines of the medium circulating system are parallel
- 15 to each other and installed on the thermal insulation base horizontally; each of the first medium pipeline, the second medium pipeline and the pressure-release pipeline having one end protruding to the outside of a rear end surface of the base respectively; each of the first medium pipeline and the second medium pipeline having the other end corresponding to a through hole being provided in the thermal insulation
- 20 base.
2. The solar workstation according to claim 1, wherein the thermal insulation base has a bottom shape matching a top shape of the thermal insulation water tank.
- 25 insulation water tank.
3. The solar workstation according to claim 1 or claim 2, wherein the solar workstation further comprises a hot water return pipe installed on the thermal insulation base and being parallel to the second medium
- 30 pipeline, wherein the hot water return pipe has one end protruding outside of the rear end surface of the thermal insulation base, and has the other end corresponding to a through hole being provided in the ther-

mal insulation base.

4. The solar workstation according to any one of claims 1-3, wherein the solar workstation further comprises a hot water inlet pipe installed on
5 the thermal insulation base and being parallel to the second medium pipeline; a water pump being installed on the hot water inlet pipe; and the hot water inlet pipe having one end protruding to the outside of the rear end surface of the thermal insulation base, and the other end corresponding to a through hole being provided in the thermal insulation
10 base.

5. The solar workstation according to any one of claims 1-4, wherein the first medium pipeline comprises a first medium inlet pipeline and a first medium return pipeline which are arranged inparallel in order to com-
15 municate with each other at one end.

6. The solar workstation according to claim 5, wherein the one-way valve and the medium pump are installed in the first medium inlet pipeline in a medium flow direction sequentially, and the buffer pipeline
20 communicates with the first medium inlet pipeline at a position between the one-way valve and the medium pump.

7. The solar workstation according to any one of claims 1-6, wherein the expansion tank is installed on the thermal insulation base, and a center-
25 line of the expansion tank is parallel to a centerline of the second medium pipeline.

8. The solar workstation according to any one of claims 1-7, wherein the pipelines in the solar workstation are arranged in an overlapping man-
30 ner in at least two rows in an upwards and downwards direction.

9. The solar workstation according to any one of claims 1-8, wherein

several accommodation recesses for fixing the first medium pipeline, the second medium pipeline and the pressure-release pipeline of the medium circulating system are provided in a top surface of the thermal insulation base, and a medium pump accommodation recess for accommodating a part of the medium pump is provided in the thermal insulation base at a position corresponding to the medium pump.

10. The solar workstation according to claim 9, wherein at least two expansion tank fixing ribbed plates which are parallel to each other or an expansion tank accommodation recess which is capable of accommodating a part of the expansion tank are/is provided on/in the thermal insulation base at position(s) corresponding to the expansion tank.

11. The solar workstation according to any one of claims 1-10, wherein an accommodation recess for fixing the hot water return pipe is further provided in the top surface of the thermal insulation base.

12. The solar workstation according to claim 11, wherein the accommodation recess for fixing the hot water inlet pipe and an accommodation recess for accommodating a part of the water pump are further provided in the top surface of the thermal insulation base.

13. The solar workstation according to any one of claims 9-12, wherein several bearing seats are further provided on the top surface of the thermal insulation base, and the accommodation recesses are respectively provided in the bearing seats.

14. The solar workstation according to any one of claims 1-13, wherein the solar workstation further comprises a clamping member for assisting in fixing each pipeline.

15. The solar workstation according to any one of claims 9-12, wherein

any two of the accommodation recesses are arranged in an overlapping manner in upwards and downwards directions to form one combined recess for accommodating the pipelines arranged in an overlapping manner.

5

16. The solar workstation according to claim 15, wherein any two of the accommodation recesses are arranged in an overlapping manner in upwards and downwards directions to form one combined recess for accommodating the pipelines arranged in an overlapping manner.

10

17. The solar workstation according to any one of claims 1-16, wherein the solar workstation further comprises an outer cover connected to the thermal insulation base wherein slots are provided at the bottom of the outer cover at positions corresponding to the protruding ends of the pipelines.

15

18. The solar workstation according to any one of claims 9-17, wherein the solar workstation further comprises a cover plate for covering the thermal insulation base; the cover plate covering the accommodation recesses provided at positions corresponding to the pipelines of the medium circulating system respectively wherein a gap for allowing the medium pump to be exposed to the outside is provided in the cover plate at a position corresponding to the medium pump.

20

19. The solar workstation according to claim 18, wherein when the expansion tank is provided on the thermal insulation base, the cover plate is located on one side of the expansion tank so that the expansion tank is exposed to the outside.

25

20. The solar workstation according to claim 18 or 19, wherein the cover plate covers an accommodation recess provided at a position corresponding to the hot water return pipe.

30

21. The solar workstation according to claim 20, wherein the cover plate covers the accommodation recess provided at a position corresponding to the hot water inlet pipe, and a gap for allowing the water pump to be exposed to the outside is provided at a position corresponding to the water pump.

22. The solar workstation according to any one of claims 18-21, wherein a controller accommodation recess for fixing the controller is provided in a top surface of the cover plate.

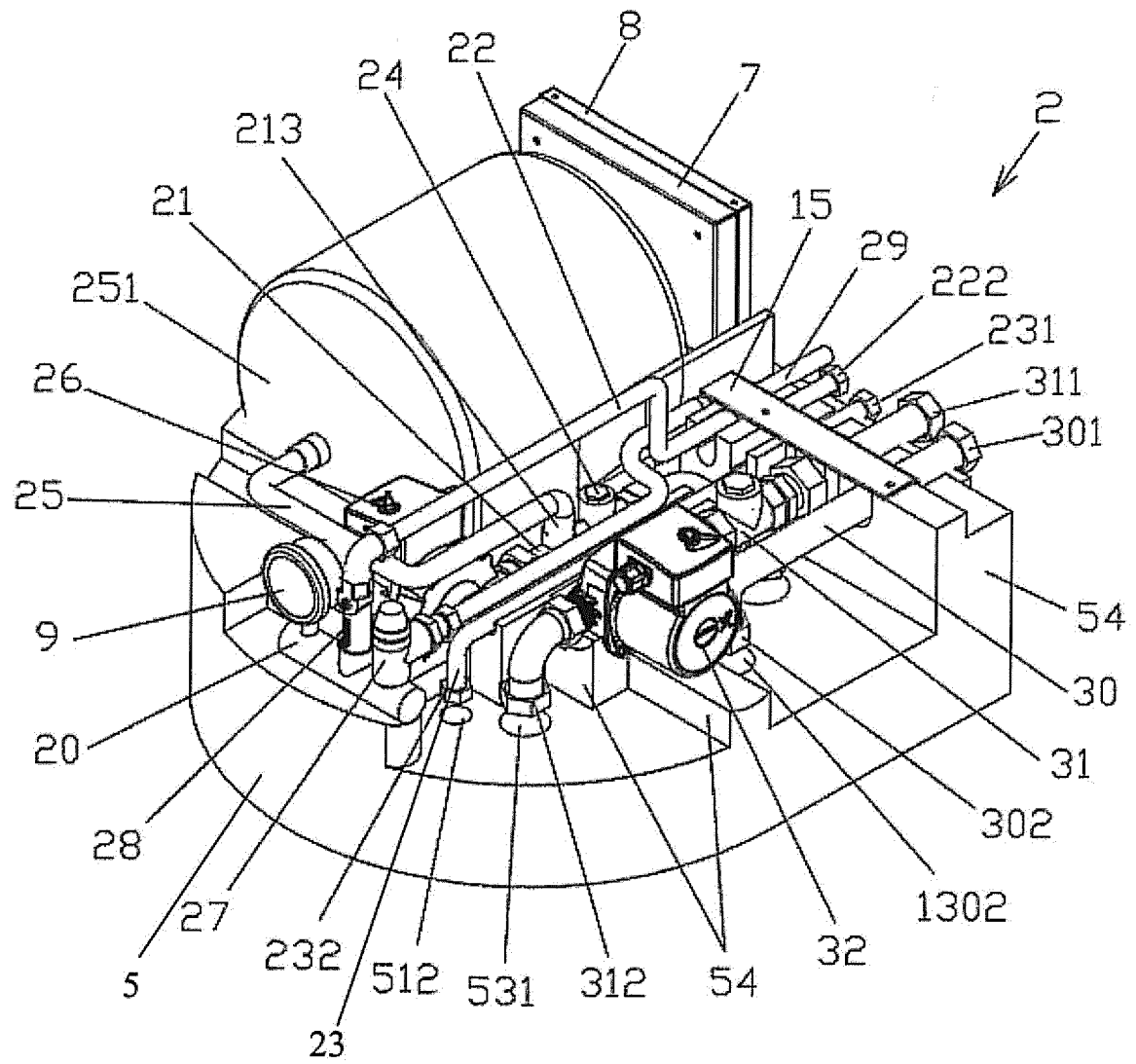


Fig. 1

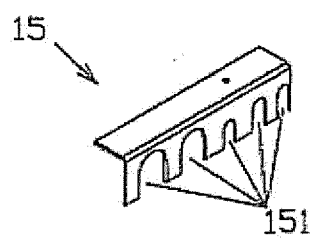


Fig. 2

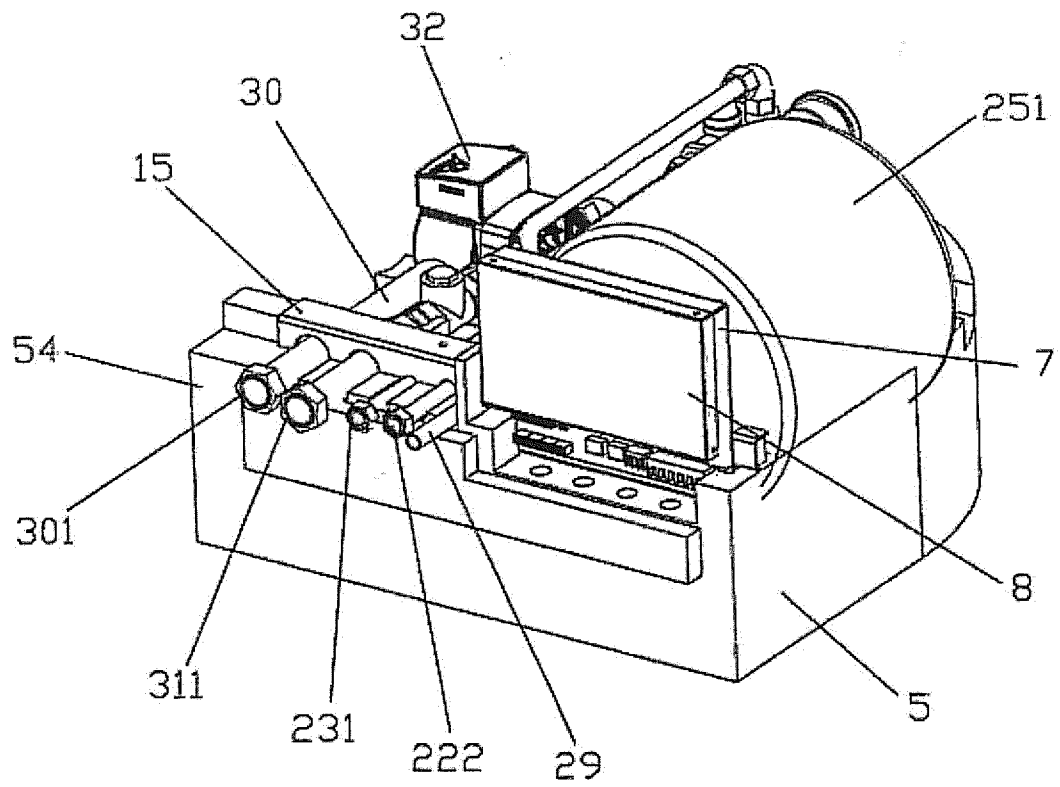


Fig. 3

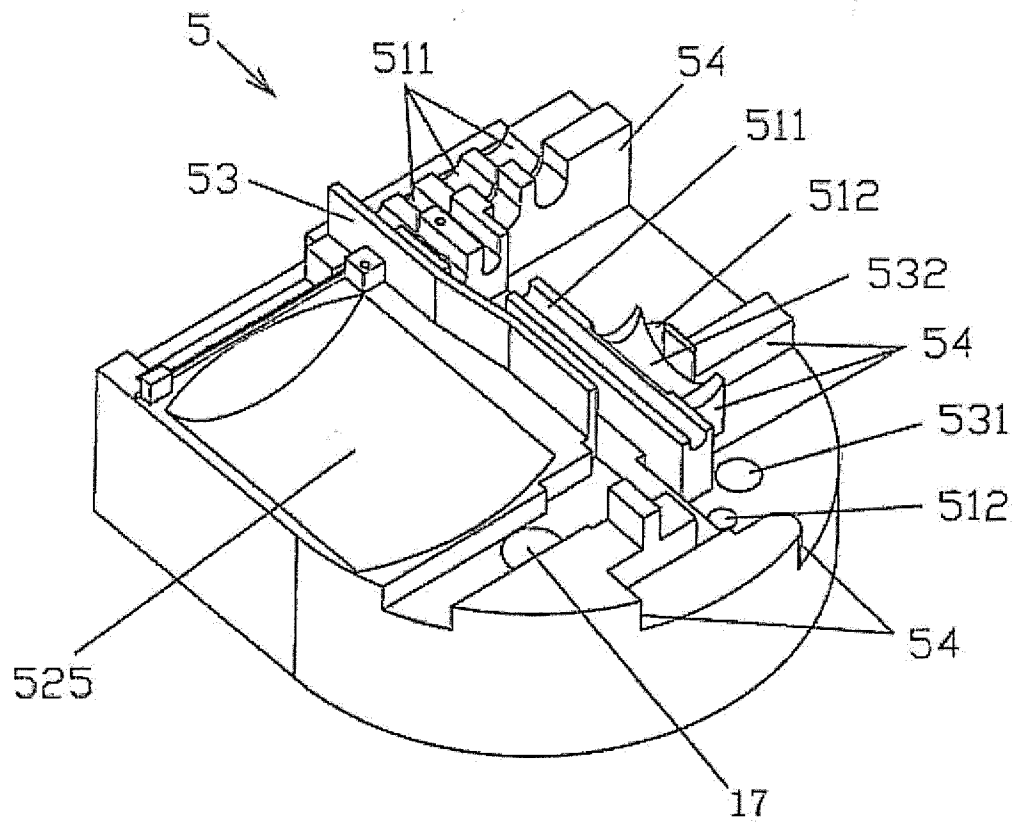


Fig. 4

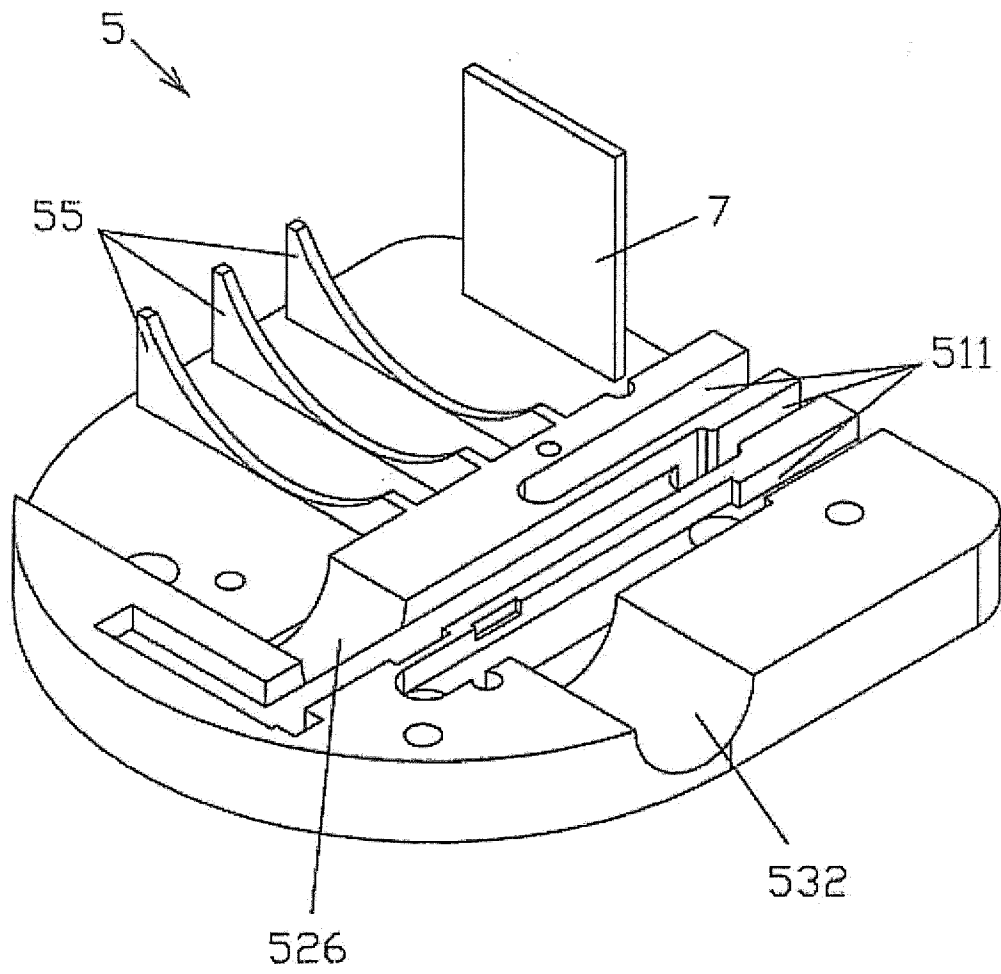


Fig. 5

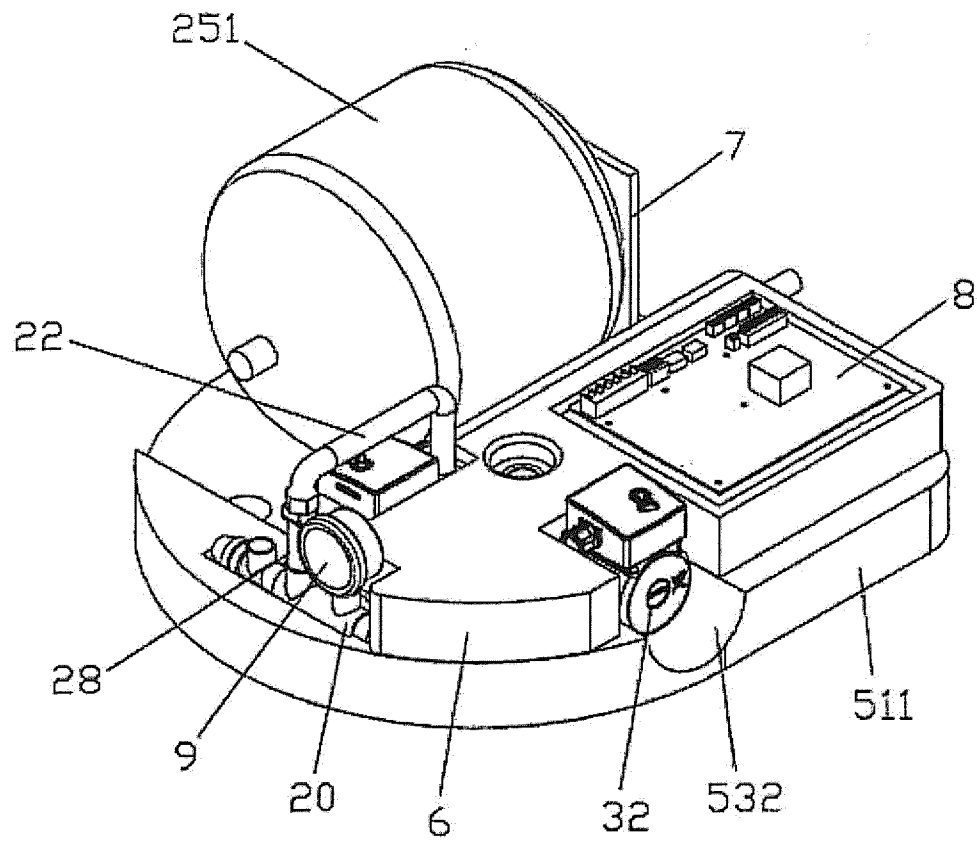


Fig. 6

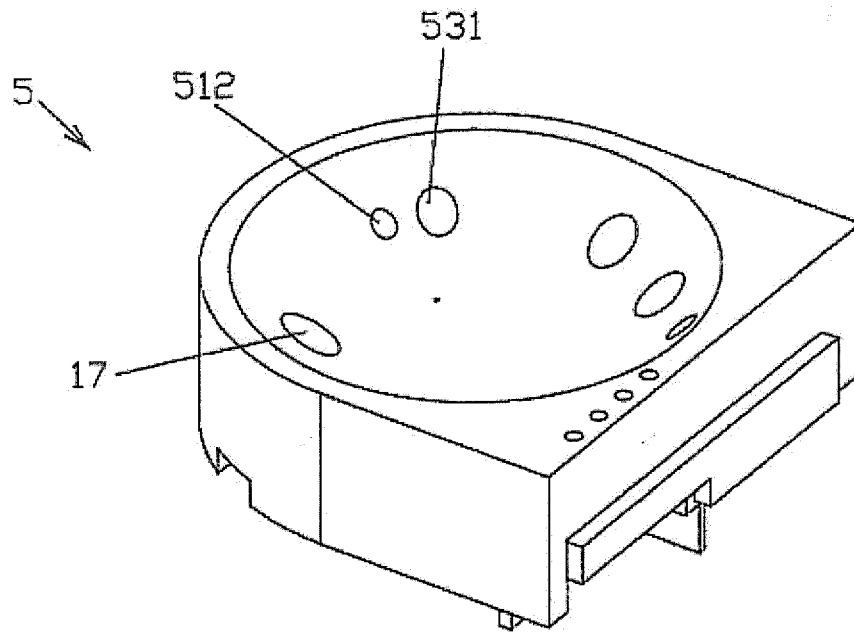


Fig. 7