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(54) Gas-liquid mixer

(57) A gas-liquid mixer **(1)** for performing gas-liquid mixing on water includes a pump **(11)** and a helical pipe **(13).** The first air inlet valve **(12)** disposed at the front end of the pump **(11)** guides air in to mix with the water in the pump **(11)** and the helical pipe **(13).** A lot of tiny bubbles are generated to achieve the effect of increasing the oxygen content in water.

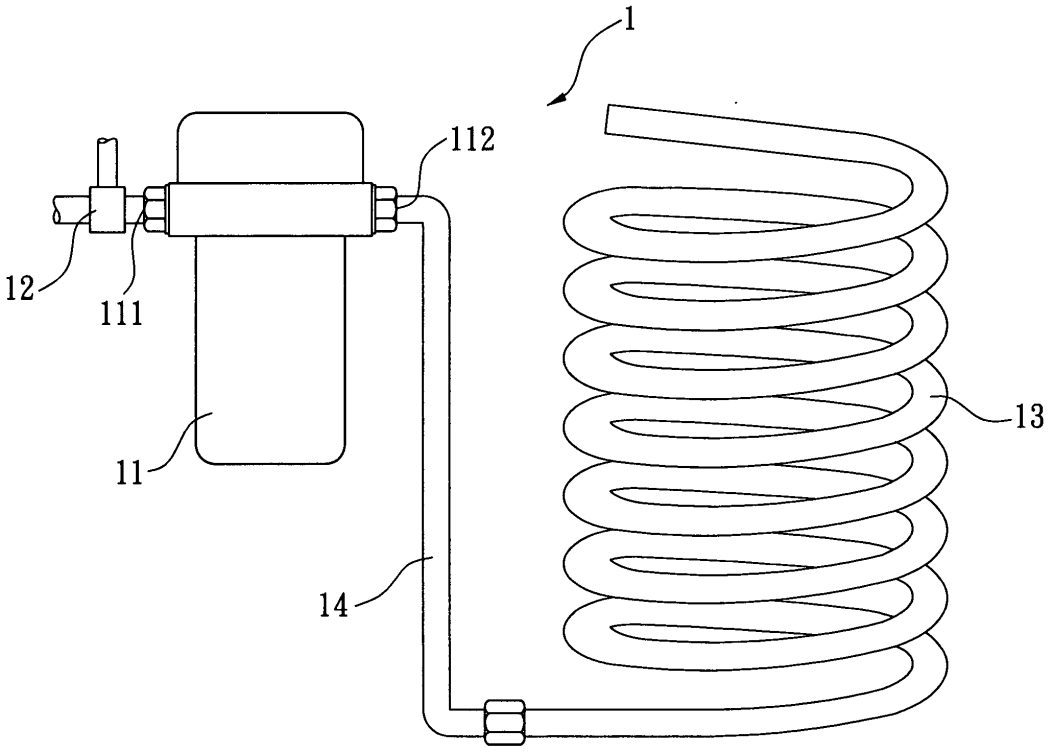

FIG. 1

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Description

BACKGROUND OF THE INVENTION

Field of Invention

[0001] The invention relates to a water processing device and, in particular, to a gas-liquid mixer for increasing the oxygen content of water by forming tiny bubbles for air inside the water.

Related Art

[0002] A conventional water purifying device **8,** as shown in FIG. 10, has a water inlet **81** and a water outlet **82.** The water to be purified enters the water purifying device **8** through the inlet **81.** The purified water flows out via the outlet **82** for users to drink and use or to boil for drinking. However, the above-mentioned water purifying device **8** is usually used to simply filter out impurities inside water. It cannot increase the oxygen content in water.

[0003] Therefore, a tiny bubble water processing device **9,** shown in FIG. 11, has been invented. It comprises a motor **91,** a pressure bucket **92,** and a high oxygen solving mechanism **93.** The motor **91** pushes water to flow through a first channel **94** into the pressure bucket **92.** The first channel **94** is provided with an air valve **95** for air to enter the first channel **94** and to flow with the water into the pressure bucket **92.** The air and water stored in the pressure bucket **92** under a high pressure render the air bubbles solved in the water.

[0004] The high oxygen solving mechanism **93** is connected with the pressure bucket **92** via a second channel **96.** The internal channel of the high oxygen solving mechanism is designed in such a way that the water flow speed is changed and the bubbles solved in the water become even smaller in size.

[0005] Although the above-mentioned tiny bubble water processing device **9** can increase the oxygen content in water, the components of the tiny bubble water processing device are too complicated. It relies on the pressure bucket **92** along with the high oxygen solving mechanism **93** to achieve the desired effect. Moreover, the oxygen is solved in water by taking in air once and imposing a high pressure. The effect is thus very limited.

SUMMARY OF THE INVENTION

[0006] An objective of the invention is to solve the above-mentioned problems by providing a gas-liquid mixer. Using a helical pipe, taking in air through an intake valve, and imposing a pressure with a pump, the air is solved in water and produces a lot of tiny bubbles.

[0007] To achieve the above-mentioned objective, the disclosed gas-liquid mixer performs gas-liquid mixing on a water source. It has the following features.

[0008] The gas-liquid mixer has at least one pump with a water inlet and a water outlet that are in fluid communications with each other and a helical pipe. The water enters the pump through the water inlet. The inlet has at least one air inlet valve. The water outlet is connected with a water supplying channel. The first air inlet valve guides air into the pump. When the pump imposes a pressure, the air and the water are mixed. The gas-liquid mixture is guided by the water outlet to the water supplying channel. The helical pipe is connected with the water supplying channel. When the gas-liquid mixed water flows from the water supplying channel into the helical pipe, the air and water further mix with each other by crossing and spiraling inside the helical pipe.

[0009] Moreover, the disclosed water supplying channel can be installed with an adjusting valve for gauging the water flowing into the helical pipe as well as adjusting the output pressure as the water flows from the water supplying channel into the helical pipe.

[0010] Besides, the disclosed gas-liquid mixer is provided with a gas-liquid mixing bucket. The gas-liquid mixing bucket has a water controlling valve for forming a closed space therein. The helical pipe is disposed inside the closed space. The water controlling valve has a water-entering portion and a water-leaving portion. The water-entering portion is in fluid communications with the water supplying channel and the helical pipe. The helical pipe is further provided with a high-pressure water outlet, so that the second-mixed water is ejected from there and perform a third gas-liquid mixing inside the closed space.

[0011] In addition, the gas-liquid mixing bucket has a second air inlet valve to guide air into the system for the second time. This enables a fourth gas-liquid mixing in the closed space.

[0012] The gas-liquid mixing bucket also has a plurality of granular filtering units for performing a second filtering on the water therein. The squeezing and collisions with the filtering units make the gas-liquid mixing more uniform and lasting. This helps increasing the oxygen content in water.

[0013] The water supplying channel can be installed with at least one horizontal filter. The helical pipe is then disposed in the horizontal filter. Both ends of the helical pipe are connected to a third water inlet and a third water outlet of the horizontal filter, respectively. This also produces water rich in oxygen.

[0014] Furthermore, the invention can have a pressured water storage bucket. It stores the water that has been first mixed by the pump. The pressured water storage bucket stores a pressure in order to perform a second pressure increase as water is output from the pressured water storage bucket.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention will become more fully understood from the detailed description given herein below illustration only, and thus is not limitative of the present invention, and wherein:

FIGS. 1 to 9 are schematic structural views of nine embodiments of the invention;

FIG. 10 shows a conventional water purifying device; and

FIG. 11 shows a conventional tiny bubble water processing device.

DETAILED DESCRIPTION OF THE INVENTION

[0016] The present invention will be apparent from the following detailed description, which proceeds with reference to the accompanying drawings, wherein the same references relate to the same elements.

[0017] Please refer to FIG. 1. The disclosed gas-liquid mixer **1** is used to perform a gas-liquid mixing on water. It has the following features. The gas-liquid mixer **1** has at least one pump **11** with a water inlet **111** and a water outlet **112** that are in fluid communications with each other and a helical pipe **13.** The water enters the pump **11** through the water inlet **111.** The water inlet **111** has at least one air inlet valve **12.** The water outlet **112** is connected with a water supplying channel **14.** The first air inlet valve **12** guides air into the pump **11.** When the pump **11** imposes a pressure, the air and the water are mixed for the first time, producing a lot of tiny oxygen-rich bubbles in the water. The gas-liquid mixture is guided by the water outlet **112** to the water supplying channel **14.** In this embodiment, the pump **11** is a high-pressure pump. The first air inlet valve **12** is a retaining valve to prevent the water from flowing back to the first air inlet.

[0018] The helical pipe **13** is connected with the water supplying channel **14.** When the gas-liquid mixed water flows from the water supplying channel **14** into the helical pipe **13,** the air and water further mix with each other by crossing and spiraling inside the helical pipe **13.**

[0019] The invention also has other embodiments that are only partially different from the first embodiment. Please refer to FIG **2** for a second embodiment. In this embodiment, the water supplying channel **14** is provided with an adjusting valve **3** for gauging the water flux and the water output pressure from the water supplying channel **14** to the helical pipe **13.** The adjusting valve **3** is a retaining valve.

[0020] A third embodiment of the invention is shown in FIG. 3. In this embodiment, the gas-liquid mixer **1** further includes a gas-liquid mixing bucket **15.** A water controlling valve **16** is disposed at the bottom of the gas-liquid mixing bucket to form a closed space **17** therein. The helical pipe **13** is disposed in the closed space **17.** In this embodiment, one end of the helical pipe **13** is mounted on the water controlling valve **16.** The water controlling valve **16** has a water-entering portion **161** and a water-leaving portion **162.** The water-entering portion **161** is connected with the water supplying channel **14** the helical pipe **13** mounted on the water controlling valve **16.** The water-leaving portion **162** has a guiding hole **163** connected with the closed space **17** of the gas-liquid mixing bucket **15.**

[0021] The helical pipe **13** further has a high-pressure water outlet **18.** The high-pressure water outlet **18** has an opening end **181** with a flat shape. The gas-liquid mixing is done in the helical pipe **13,** and then output from the opening end **181** of the high-pressure water outlet **18.**

[0022] Due to the flat shape of the opening end **181** of the high-pressure water outlet **18,** the pressure of water increases when it reaches the opening end **181.** The water is thus ejected from the high-pressure water outlet **18** at a high pressure and directly hits one side of the closed space **17** of the gas-liquid mixing bucket **15.** In this embodiment, the high-pressure water outlet **18** corresponds to one side of the top edge of the gas-liquid mixing bucket **15.**

[0023] Moreover, water molecules change their original moving direction as they hit the gas-liquid mixing bucket **15.** This change in the water flow direction enables the water to produce turbulence inside the gas-liquid mixing bucket **15,** rendering a third gas-liquid mixing. As a result, there are more tiny bubbles in the water.

[0024] To increase the purifying and gas-liquid mixing effects, the disclosed gas-liquid mixing bucket **15** is disposed with a plurality of granular filtering units **19** to further filter the water therein. By colliding wit the filtering units **19,** the gas-liquid mixing is more uniform and lasting. Therefore, the oxygen content of water is increased.

[0025] The water after the above-mentioned three gas-liquid mixings contains a huge amount of tiny bubbles. Therefore, a lot of air has been mixed into the water to increase its oxygen content. Afterwards, the water is guided by the guiding hole **163** of the water controlling valve **16** to leave via the water-leaving portion **162.**

[0026] A fourth embodiment of the invention is illustrated in FIG. 4. It is different from the third embodiment in that the high-pressure water outlet **18** goes through the central region of the helical pipe **13.** The gas-liquid mixing bucket **15** further has at least a second air inlet valve **151.** In this embodiment, the second air inlet valve **151** is a retaining valve to guide more air into the closed space **17** for a fourth mixing. This further enriches the oxygen content of water.

[0027] As shown in FIG. 5, in a fifth embodiment of the invention, the water-leaving portion **162** of the water controlling valve **16** on the gas-liquid mixing bucket **15** is connected with toilet equipment **2** that has at least one faucet **21.** The water processed by the gas-liquid mixer **1** is guided to the faucet **21.** Thereby, the toilet equipment **2** can provide water full of tiny bubbles and rich in oxygen. The helical pipe **13** can be directly mounted inside a filter pipe (not shown) on the market for uses.

[0028] According to the above-mentioned embodiments, the invention has the following features. Air and water enter the pump **11** simultaneously. The pump **11** imposes a pressure to mix the air and water. The mixture then enters a helical pipe **13** at a higher pressure for a further gas-liquid mixing. Afterwards, it goes through a high-pressure water outlet **18** and enters the gas-liquid

mixing bucket **15** by high-pressure injection. Using the first and second air inlet valves **12, 151** and the filtering units **19,** the air and the water can be mixed more uniformly. This does not only greatly increase the oxygen content of water, but produces a huge amount of tiny bubbles in the mixed water.

[0029] A sixth embodiment of the invention is shown in FIG. 6. The gas-liquid mixer **1** is installed on a filter **3** to perform gas-liquid mixing on the water output by the filter **3.** The filter **3** has a first water inlet **31** and a first water outlet **32.** The water inlet **111** of the pump **11** in the gas-liquid mixer **1** is connected with the first water outlet **32** of the filter **3.** Therefore, the water first passes through the filter **3,** and then enters the pump **11** via the water inlet **111.** Through the action of the gas-liquid mixer **1,** the oxygen content and the amount of tiny bubbles in the drinking water are greatly increased.

[0030] Please refer to FIG. 7 for a seventh embodiment of the invention. It differs from the sixth embodiment in that the water supplying channel **14** is provided with at least one horizontal filter **4.** The helical pipe **13** is disposed inside the horizontal filter **4.** Both ends of the helical pipe **13** are connected to a second water inlet **41** and a second water outlet **42** of the horizontal filter **4.**

[0031] As shown in FIG. 8, an eighth embodiment of the invention differs from the seventh embodiment in that a pressured water storage bucket **5** is inserted between the water supplying channel **14** and the horizontal filter **4.** It stores the water that has been done with the first gas-liquid mixing in the pump **11.** The pressured water storage bucket **5** stores a pressure for a second pressure enhancement on the outgoing water.

[0032] A ninth embodiment shown in FIG. 9 is different from the fourth embodiment in that a flow splitting connector **31** is disposed at the water outlet **112** to divide the water output from the water outlet **112** into the water supplying channel **14** and a second water supplying channel **32.** The second water supplying channel **32** is connected to the second air inlet valve **151** on top of the gas-liquid mixing bucket **15.** The water in the second water supplying channel **32** flows into the gas-liquid mixing bucket **15** via the second air inlet valve **151.** Therefore, when the water level in the gas-liquid mixing bucket **15** gradually increases as the helical pipe **13** continues supplying water, the air in the shrinking closed space **17** therein is squeezed. The water entering from the top of the gas-liquid mixing bucket **15** thus mixes with the squeezed air in the closed space **17,** greatly increasing the oxygen content of the water.

[0033] If the invention is used in an aquarium, aquacultural fields or aquaculture-related industries, there is no need to prepare other large air-exchange devices or pumps because the disclosed gas-liquid mixer can increase the oxygen content of water. Not only does the invention reduce the cost, it also saves the space for installing large air-exchange devices.

[0034] Although the invention has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternative embodiments, will be apparent to persons skilled in the art. It is, therefore, contemplated that the appended claims will cover all modifications that fall within the true scope of the invention.

Claims

1. A gas-liquid mixer (**1**) for performing a gas-liquid mixing on water, **characterized in that** the gas-liquid mixer comprises:

   one pump (**11**) having a water inlet (**111**) and a water outlet (**112**) in fluid communications with each other; wherein the water enters the pump (**11**) via the water inlet (**111**), the water inlet (**111**) has at least one first air inlet (**12**) and the water outlet (**112**) is in fluid communications with a water supplying chancel (**14**), the first air inlet valve (**12**) guides air into the pump (**11**) so that the air and the water mix with each other as the pump (**11**) increases its pressure, and the water outlet (**112**) outputs the air-mixed water to the water supplying channel (**14**); and
   one helical pipe (**13**), which is in fluid communications with the water supplying channel (**14**) for the water entering the helical pipe (**13**) from the water supplying channel (**14**) to further mix with air by crossing and spiraling therein.

2. The gas-liquid mixer of claim 1, wherein the pump (**11**) is a high-pressure pump.

3. The gas-liquid mixer of claim 1, wherein the first air inlet valve (**12**) is a retaining valve.

4. The gas-liquid mixer of claim 1, wherein the water supplying channel (**14**) is provided with an adjusting valve (**3**), preferably a retaining valve, for gauging the water flux and output pressure from the water supplying channel (**14**) to the helical pipe (**13**).

5. The gas-liquid mixer of claim 1 further comprising a gas-liquid mixing bucket (**15**) that has a water controlling valve (**16**), preferably disposed at the bottom of the gas-liquid mixing bucket (**15**), to form a closed space (**17**) therein, wherein the helical pipe (**13**) is disposed in the closed space (**17**), and the water controlling valve (**16**) has a water-entering portion (**161**) in fluid communications with both the water supplying channel (**14**) and the helical pipe (**13**) and a water-leaving portion (**161**), one end of the helical pipe (**13**) being preferably mounted on the water controlling valve (**16**).

6. The gas-liquid mixer of claim 5, wherein the water

controlling valve (**16**) has a guiding hole (**163**) in fluid communications with the closed space (**17**) of the gas-liquid mixing bucket (**15**).

7. The gas-liquid mixer of claim 1, wherein the helical pipe (**13**) has a high-pressure water outlet (**18**) with a flat opening end (**181**) for the water to be ejected out of the opening end (**181**) of the high-pressure water outlet (**18**).

8. The gas-liquid mixer of claim 5, wherein the helical pipe (**13**) has a high-pressure water outlet (**18**) with a flat opening end (**181**) for the water to be ejected out of the opening end (**181**) of the high-pressure water outlet (**18**), the high-pressure water outlet (**18**) preferably corresponding to one side of the top edge of the gas-liquid mixing bucket (**15**).

9. The gas-liquid mixer of claim 5, wherein the gas-liquid mixing bucket (**15**) has at least a second air inlet valve (**151**), preferably a retaining valve, for guiding air into the closed space (**17**) for gas-liquid mixing.

10. The gas-liquid mixer of claim 5, wherein the gas-liquid mixing bucket (**15**) is disposed with a plurality of filtering units (**19**) for further filtering and mixing the water therein.

11. The gas-liquid mixer of claim 5, wherein the water-leaving portion (**162**) of the water controlling valve (**16**) of the gas-liquid mixing bucket (**15**) is connected with toilet equipment (**2**) that has at least one faucet (**21**) and the water processed by the gas-liquid mixer (**1**) is guided to the faucet (**21**).

12. The gas-liquid mixer of claim 1 used in a filter (**3**) having a first water inlet (**31**) and a first water outlet (**32**), wherein the water inlet (**111**) of the pump (**11**) and the first water outlet (**32**) of the filter (**3**) are connected, and the water first passes through the filter (**3**) before is enters the pump (**11**) via the water inlet (**111**).

13. The gas-liquid mixer of claim 1, wherein the water supplying channel (**14**) is provided with at least one horizontal filter (**4**) and the helical pipe (**13**) is disposed in the horizontal filter (**4**), and both ends of the helical pipe (**13**) are connected to a second water inlet (**41**) and a second water outlet (**42**) of the horizontal filter (**4**), respectively.

14. The gas-liquid mixer of claim 1, wherein the water supplying channel (**14**) has a pressured water storage bucket (**5**) for storing the water that has passed the first gas-liquid mixing in the pump (**11**), and for storing a pressure to increase the output pressure of water.

15. The gas-liquid mixer of claim 9 further comprising a flow splitting connector (**31**) to divide the water output from the water outlet (**112**) into the water supplying channel (**14**) and a second water supplying channel (**32**) that is connected to the second air inlet valve (**151**) of the gas-liquid mixing bucket (**15**).

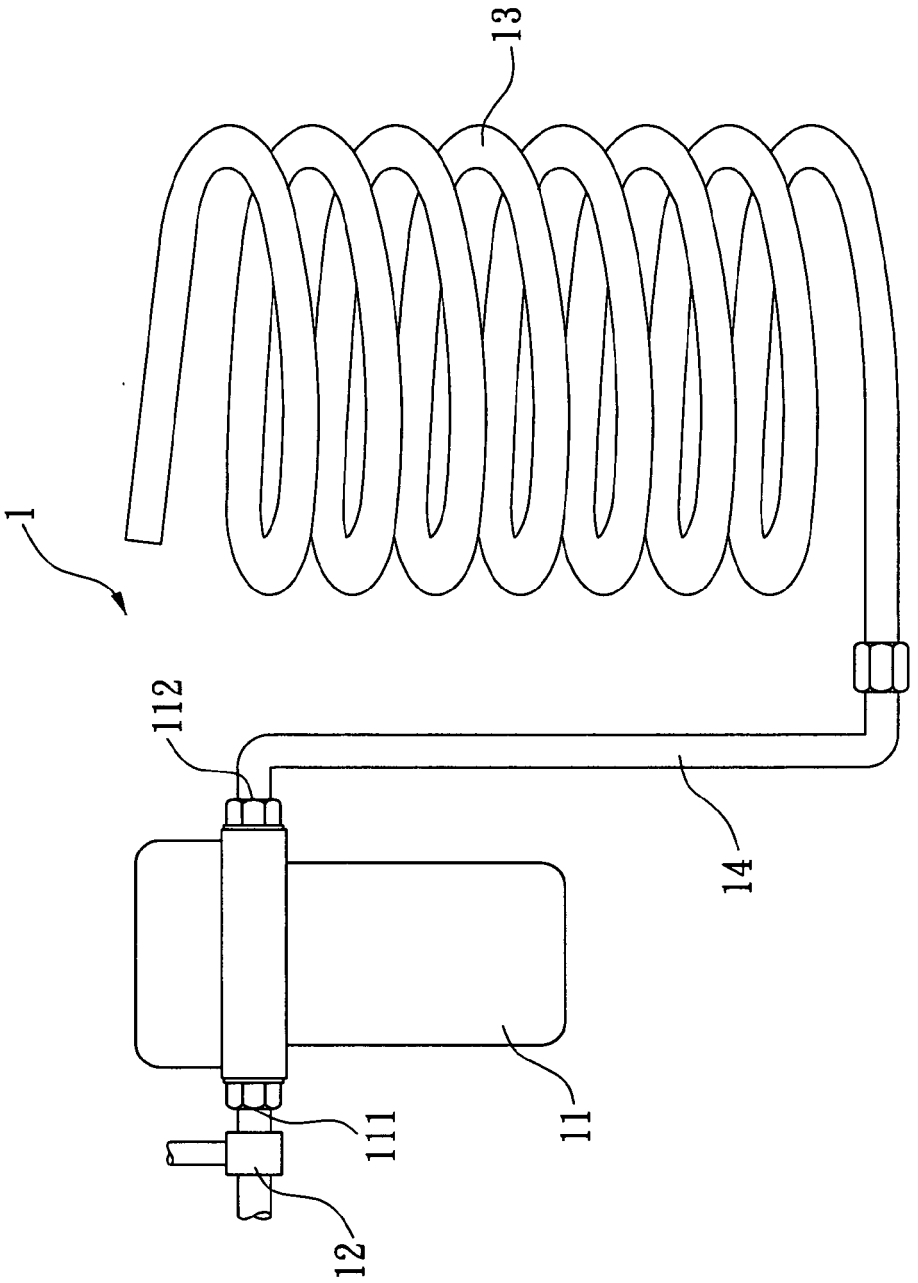

FIG. 1

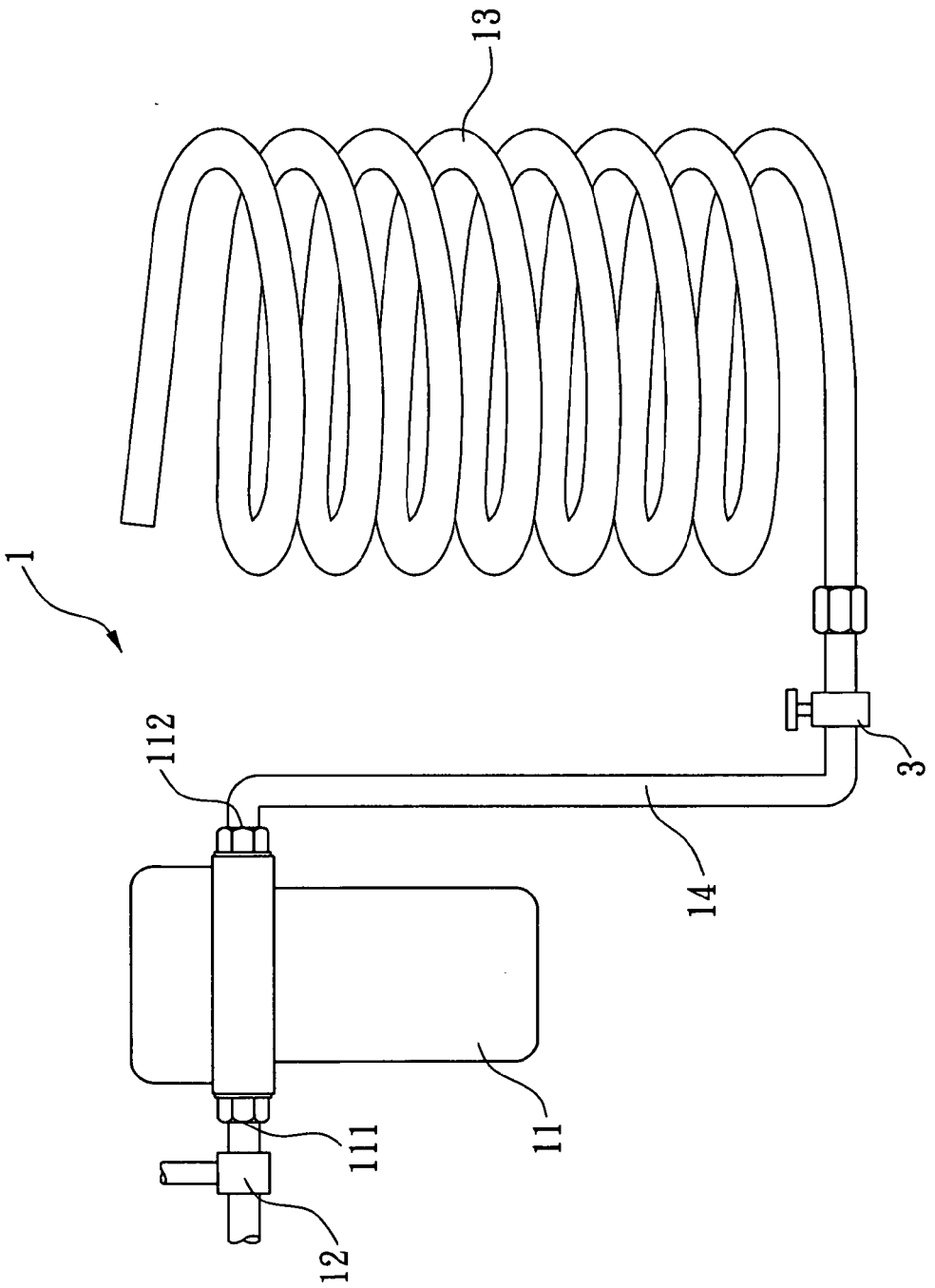

FIG. 2

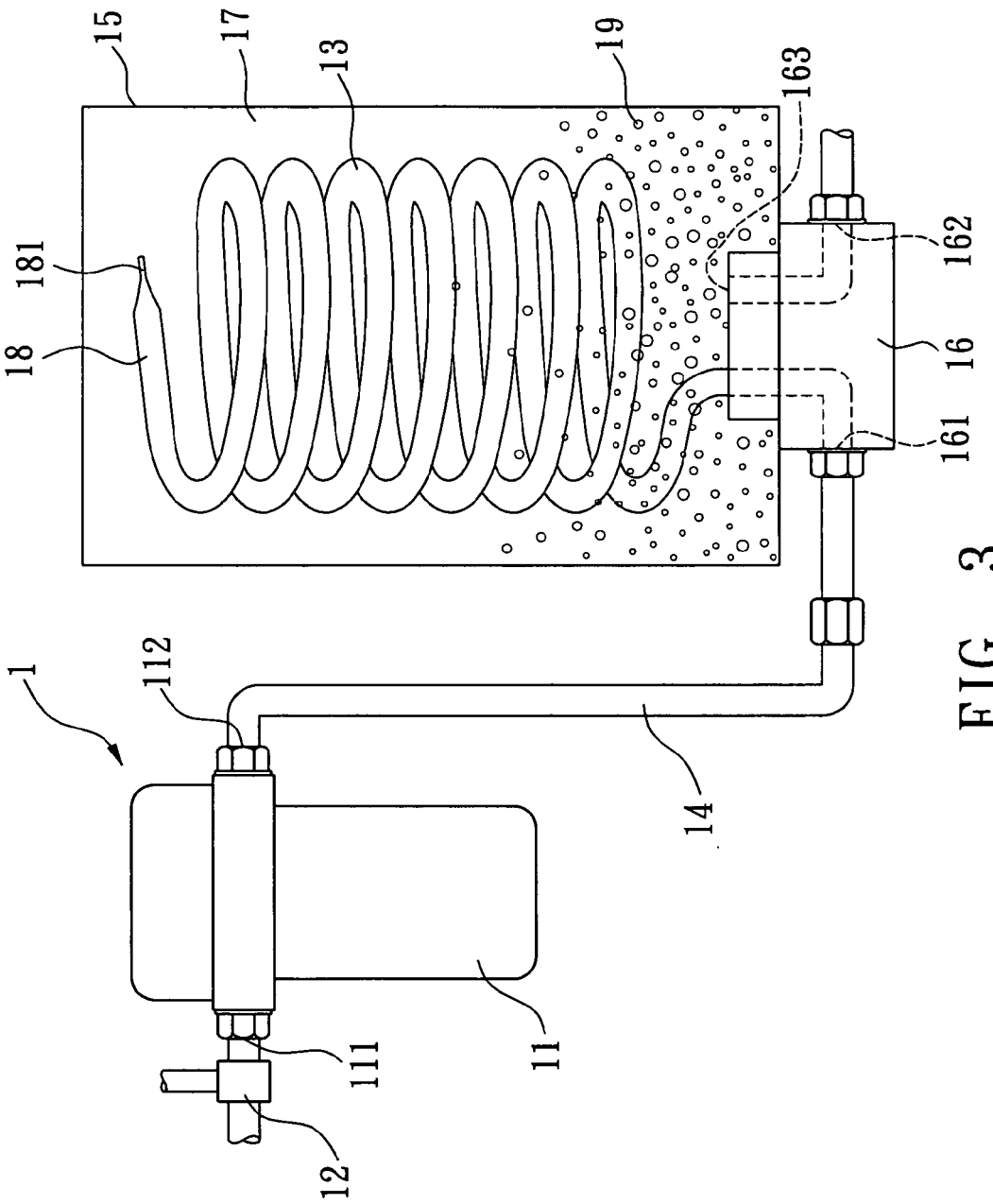

FIG. 3

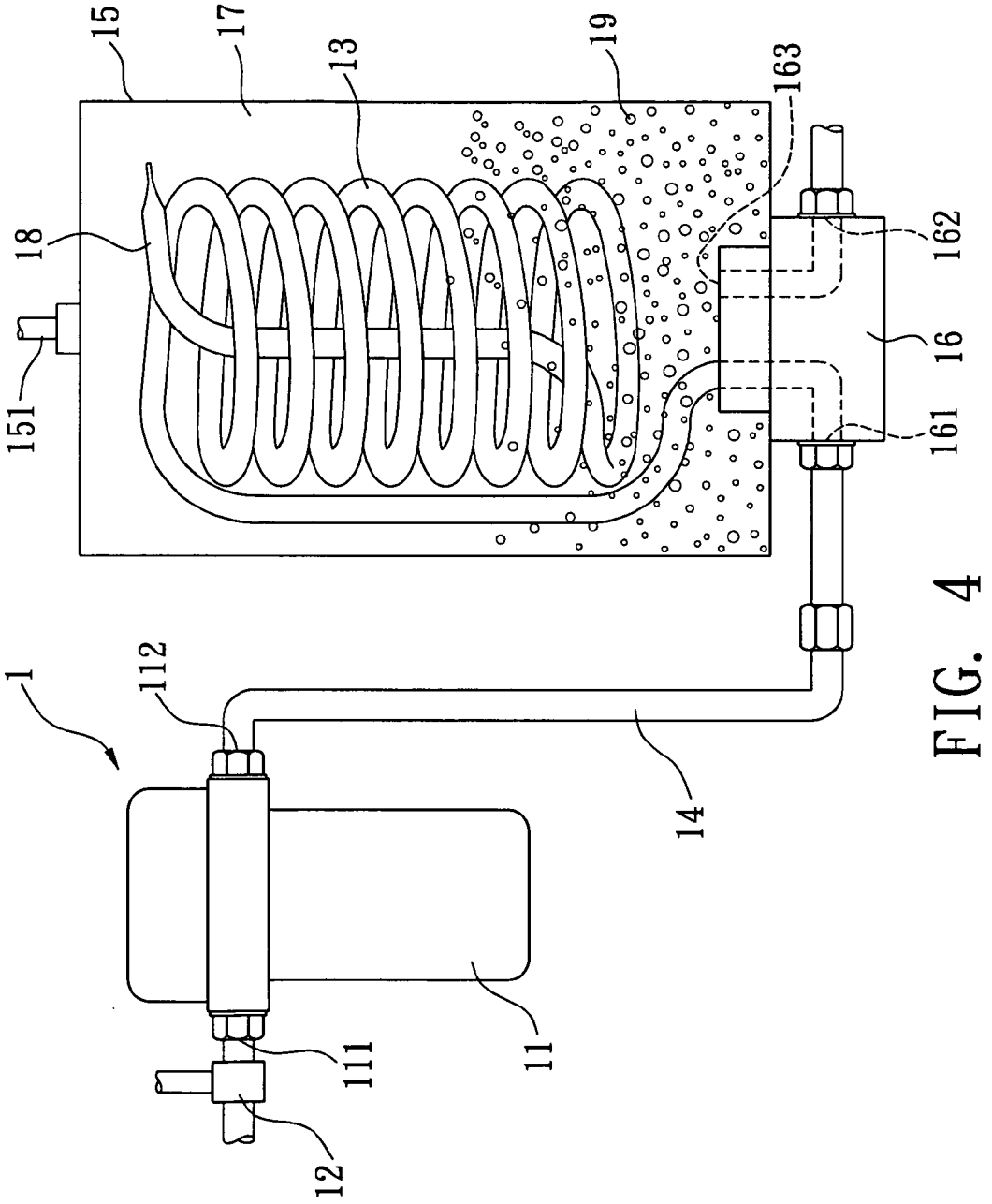

FIG. 4

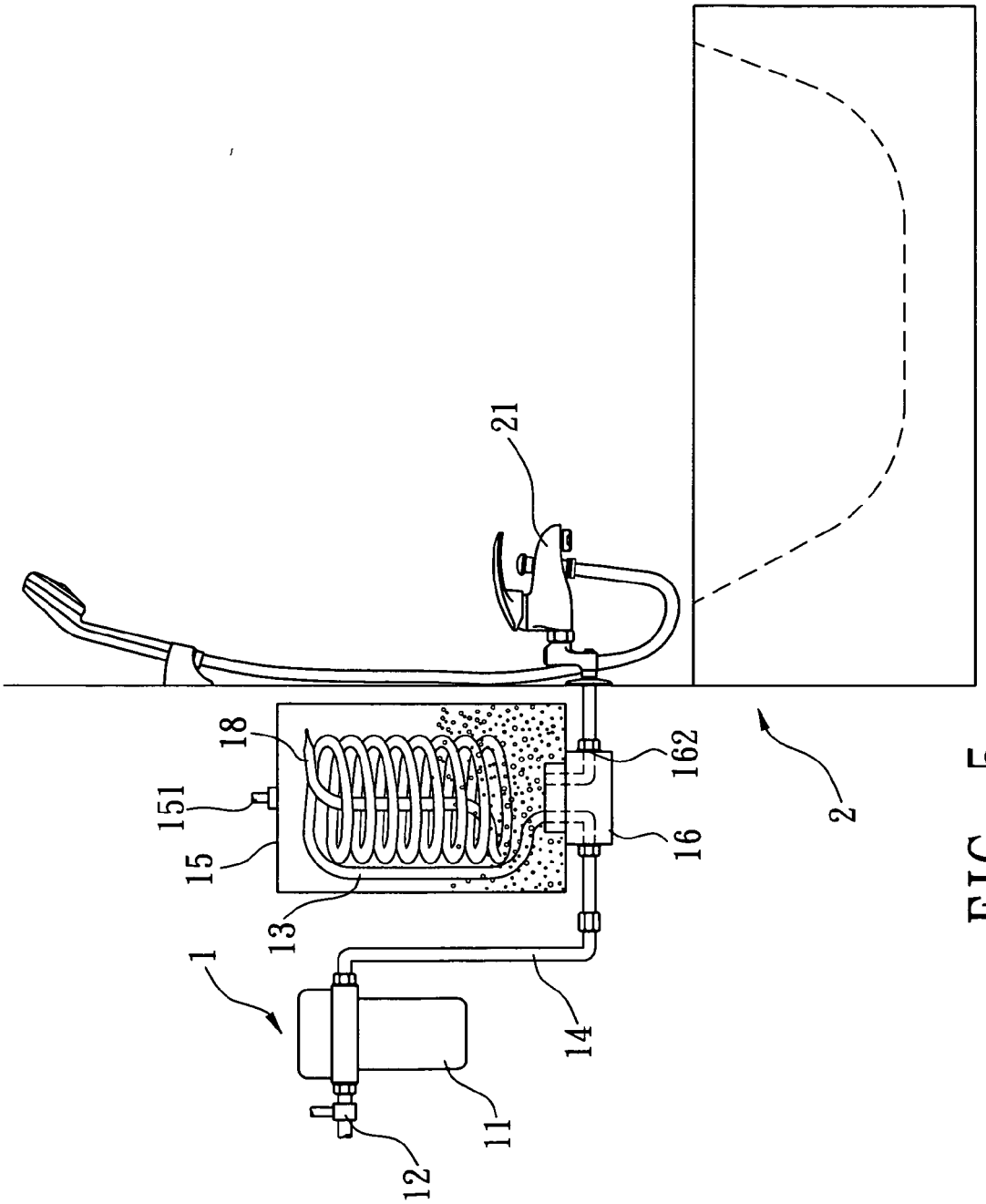

FIG. 5

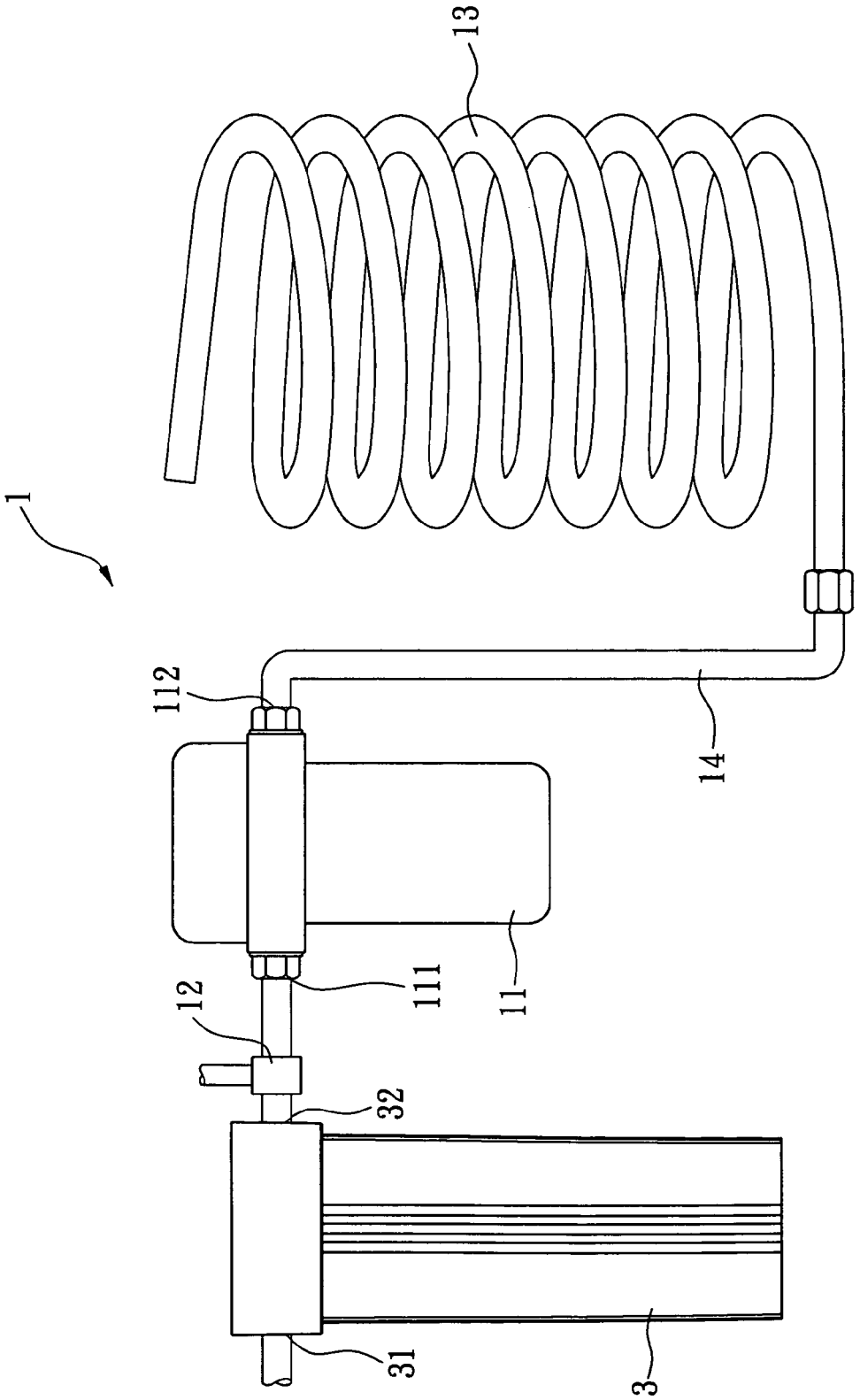

FIG. 6

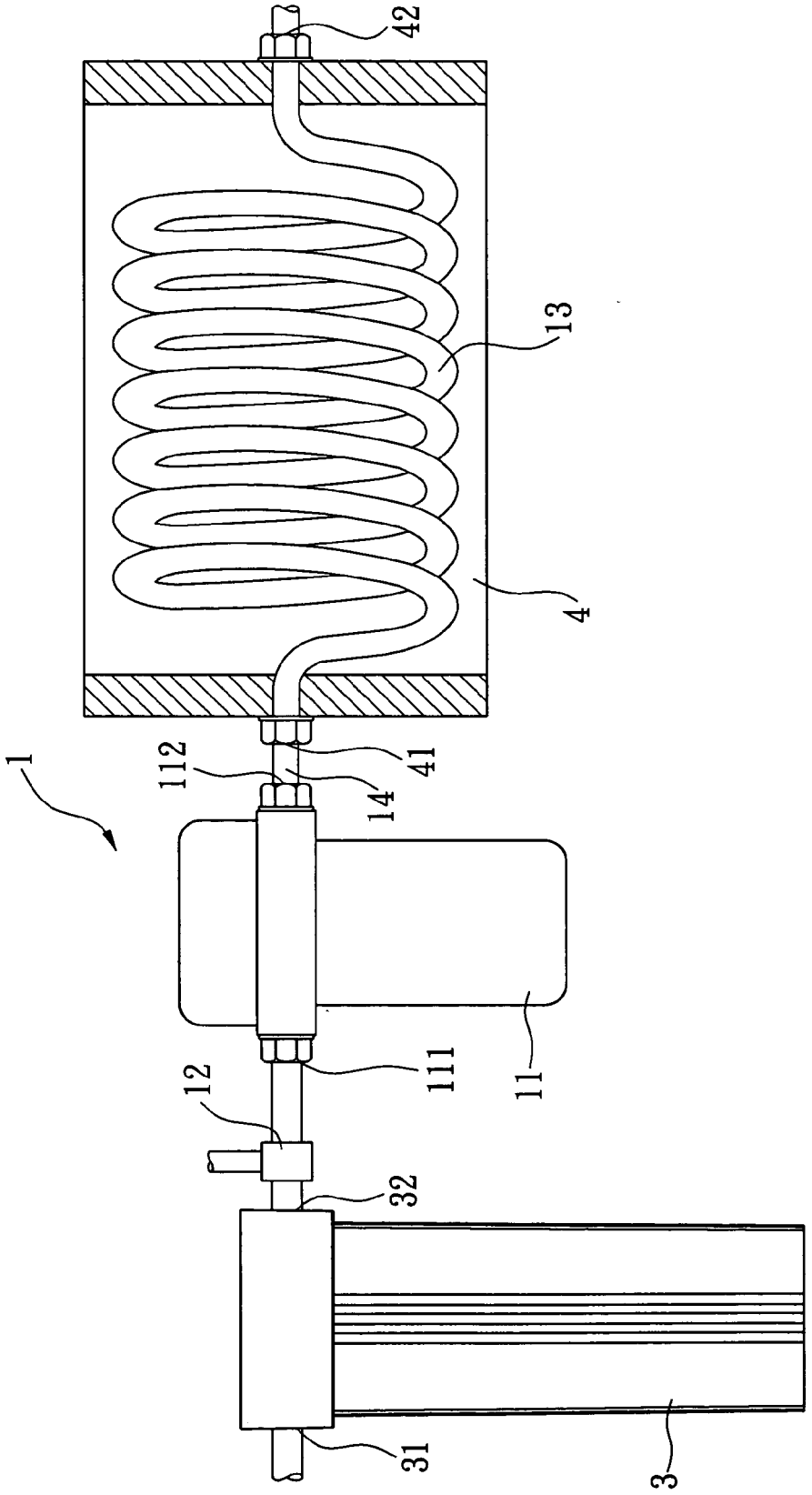

FIG. 7

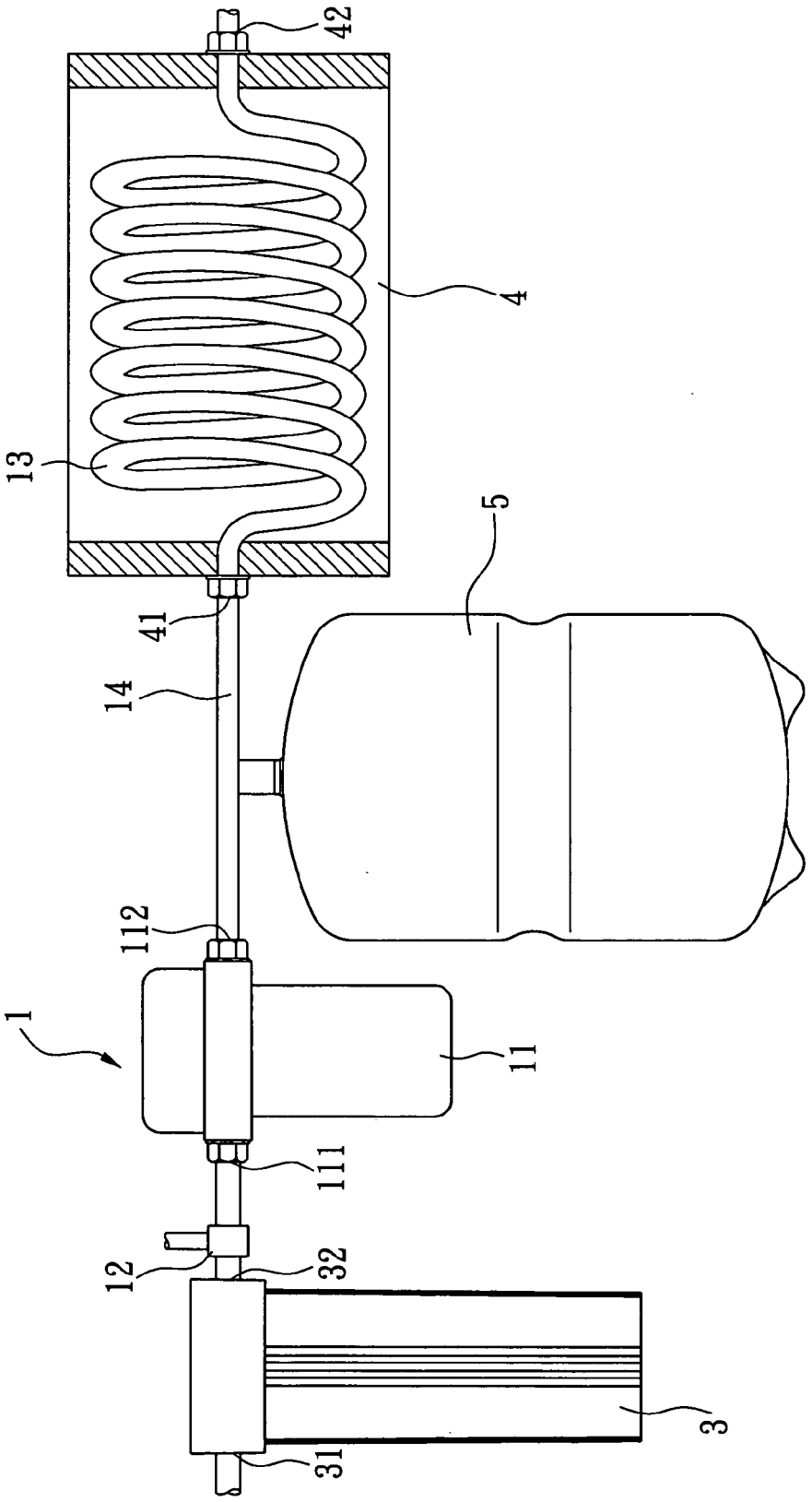

FIG. 8

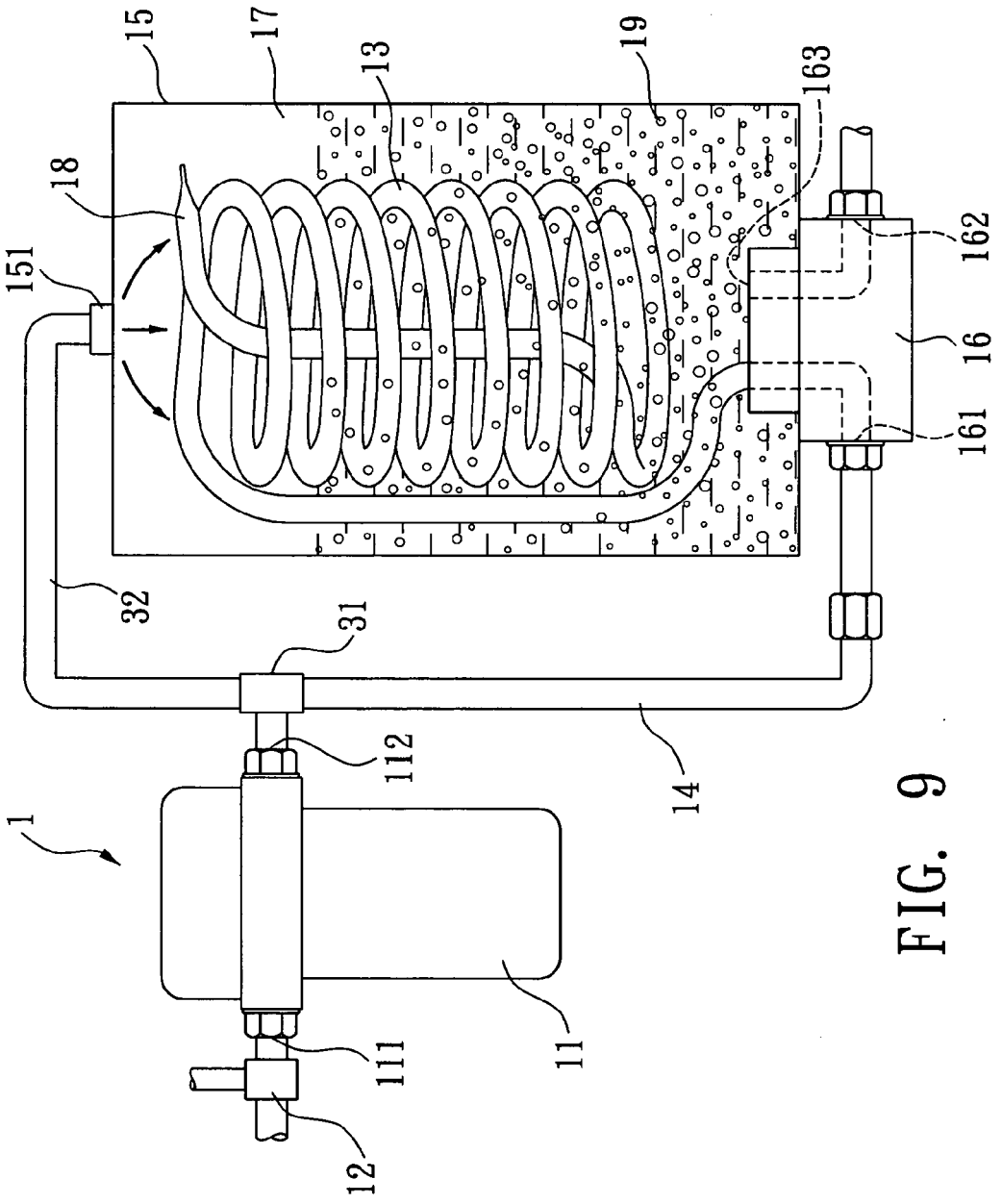

FIG. 9

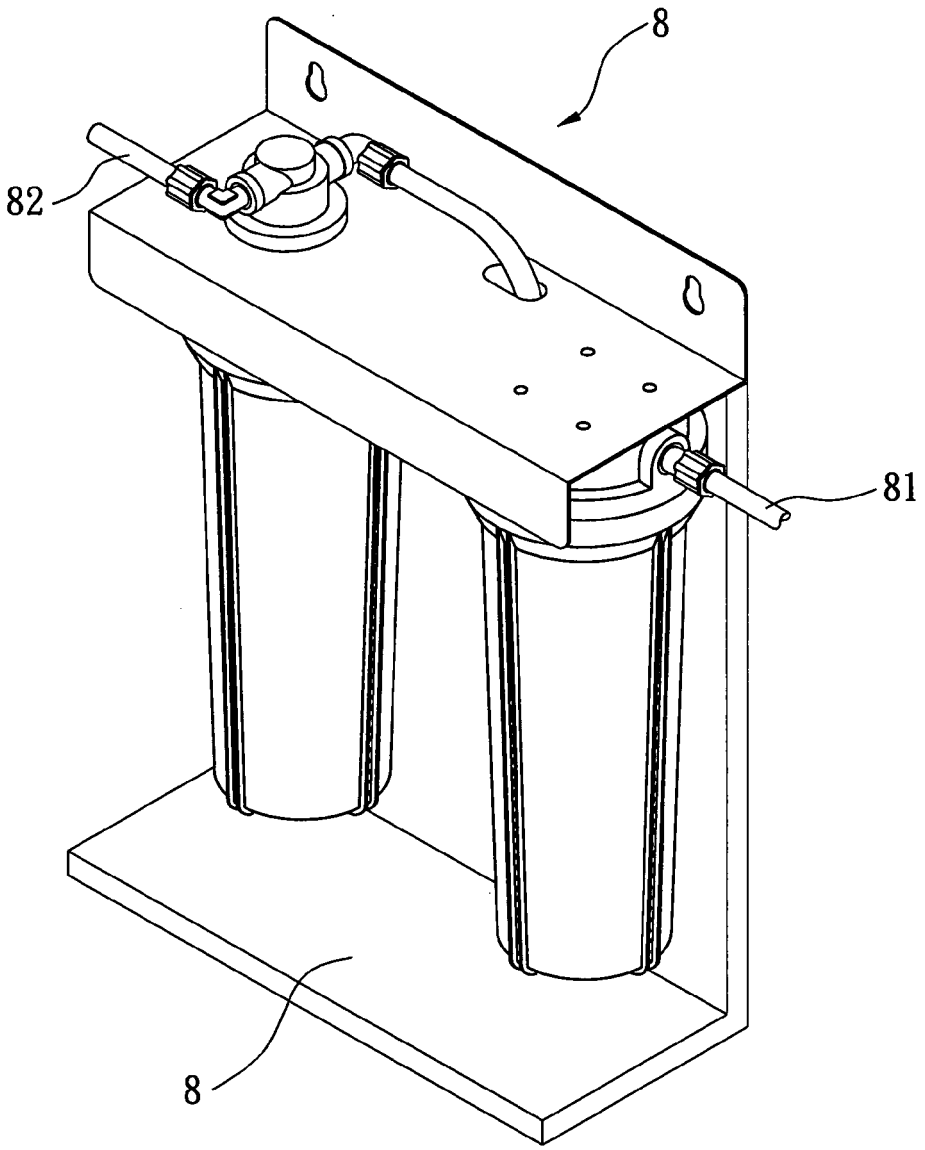

FIG. 10
PRIOR ART

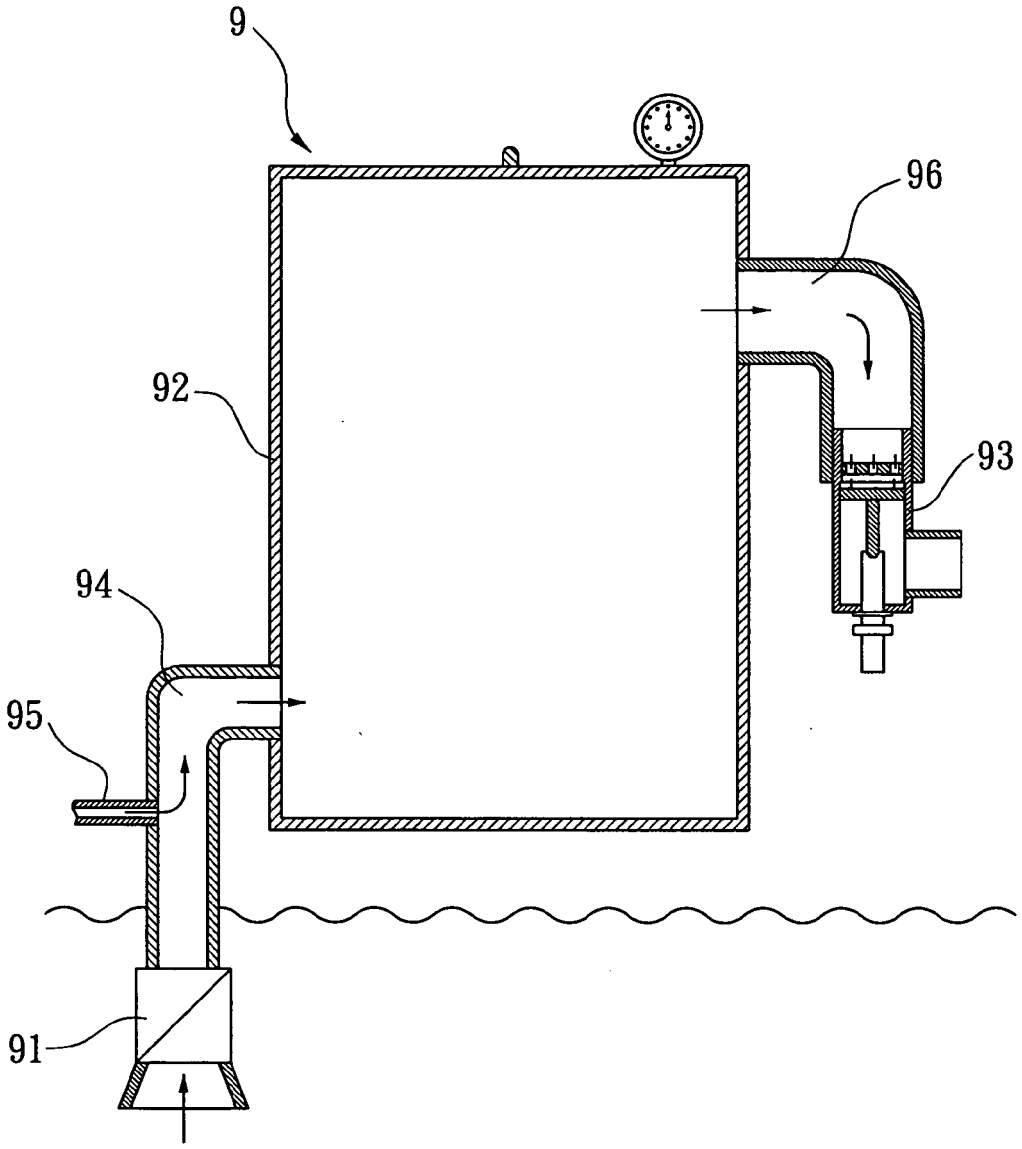

FIG. 11
PRIOR ART

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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 7848

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 July 2009	Brunold, Axel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 7848

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 00 7848

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