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(71) Applicant: **Tekno-Innovaatio Oy**
20810 Turku (FI)

(72) Inventor: **Kärkkäinen, Aatos**
20810 Turku (FI)

(74) Representative: **Heikkilä, Hannes Antero**
Turun Patenttitoimisto Oy,
P.O. Box 99
20521 Turku (FI)

(54) Method and connecting element for filling heating systems

(57) The object of the invention is a method intended for the filling of liquid circulation heating piping systems, and a connecting element (3) to be installed in the piping system for the time of filling the piping system when the method is applied. No traditional air venting at the radiators is required when the system is filled according the invention. During the filling of the piping system liquid is supplied through an supply opening (1), so that the piping system is filled from the return side. Then the air in the piping system is carried with the liquid flow to the input side of the piping system and further out from the piping system through a discharge opening (2), provided that the flow rate is sufficiently high. The piping section between the input and discharge openings is hydraulically cut off. The required large input opening (1) and discharge opening (2) are provided by a connecting element (3) which is installed for the time of filling in the housing (4) of the centrifugal pump of the piping system to be filled, or by a connecting element which is installed in place of the pump of the piping system to be filled.

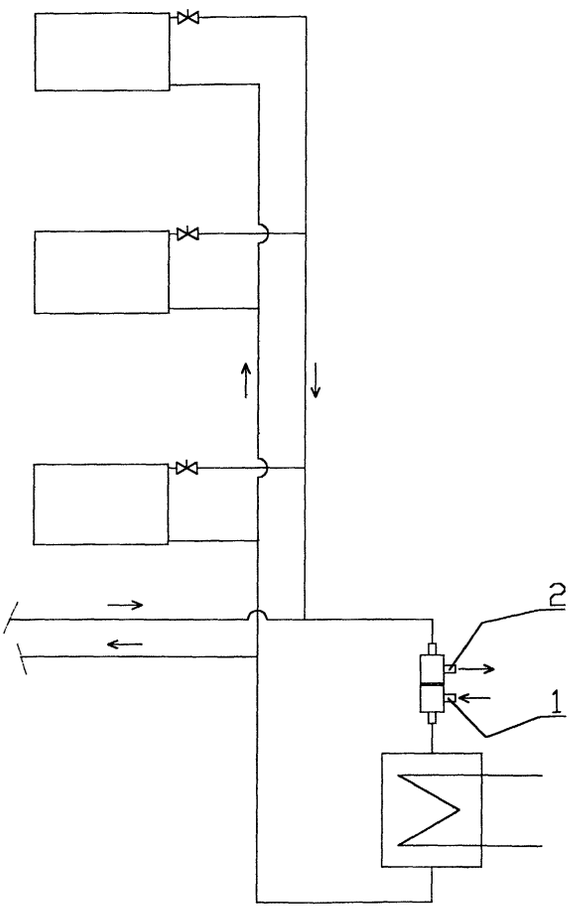

FIG 1

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Description

[0001] Heating systems with liquid circulation are full of air before they are filled. During filling of the piping system the air is compressed and rises to the topmost parts of the piping system which are located, where the air is removed through venting screws in the radiators. The air removal performed during the filling of the piping system is an operation requiring a great deal of work.

[0002] Nowadays so-called automatic air vent valves are installed to facilitate manual venting. Sometimes they are mounted in radiators which accumulate gases separated from the circulating water during the heating period. Deaerators mounted in the heat distribution room serve the same purpose, whereby the heated circulating water is brought into contact with as large a contact surface as possible in the deaerator. However, these solutions do not eliminate the basic venting required during filling.

[0003] This invention comprises a method and an apparatus, with the aid of which it is possible to completely abandon venting made at the radiators. The essential factor in the invention is that, during the filling of the piping system, one uses a flow rate which is so high that air bubbles travel in the flow downwards in the field of gravity in the vertical heating pipes, whereby the air in the piping system can be removed from the piping at the filling point.

[0004] The rise velocity of a bubble in water is proportional to the square root of the diameter of the bubble. The resistance coefficient of a spherical body is required for the calculation. According to information in literature it is about 0.5, the Reynolds number being between 1,000 and 200,000. If the diameter of the bubble is 5 mm, then a calculation with the resistance coefficient of 0.5 gives 0.36 m/s as the rise velocity of the bubble. In the example cases the Reynolds number is 2200, as calculated by viscosity values corresponding to a water temperature of 30 °C.

[0005] In Finland heat piping is nowadays dimensioned so that a larger pipe size is chosen if the pressure drop exceeds 50 Pa/m. Thus the average pressure drop is lower than this value. If the pressure drop is 40 Pa/m, then the flow rates corresponding to different pipe sizes are as follows: DN 10 0.15 m/s; DN 15 0.18 m/s; DN 20 0.24 m/s; DN 25 0.28 m/s. By comparing these results to the rise velocity of an air bubble with a diameter of 5 mm it can be seen, that the volume flow supplied from the return side in smaller pipes must be about the double as compared to the flow used in normal heating operation in order for the bubbles with the diameter 5 mm to be carried with the flow. At such high flow rates the flow in the piping is clearly turbulent, which on its part obviously breaks down the bubbles and thus reduces their rise velocity. Experimentally it has also been confirmed that the required flow rate is of the order presented in the above calculations.

[0006] A considerably large liquid flow must be supplied to the piping system and removed from the system in order to remove the air bubbles from the piping system. This is not possible e.g. through the taps used normally for filling and emptying. Substantially larger flow orifices are required. The required large liquid flow can be supplied and removed with the aid of connecting elements according to the invention without making any extra changes in the piping. It is also possible to use the large flow supplied to the piping system and removed from it for a mechanical cleaning of the piping system.

[0007] The invention is described in more detail below with reference to the enclosed drawings.

[0008] Figure 1 shows a principle with the aid of which the method and components according to the invention can be utilised. When the piping system is filled the liquid is supplied into the piping system through a supply opening 1 therein, so that the radiators are filled from the return side, and the air in the piping system is carried through the radiator valves into the input pipes of the heat piping system. When the liquid flow rate is sufficiently high, then the air bubbles are carried with the liquid in the vertical return pipes downwards and further out from the piping system via a discharge opening 2. The piping section between the supply opening 1 and the discharge opening 2 is hydraulically shut off.

[0009] Figure 2 shows a typical heat piping pump in cross section. The motor of the pump is fastened by a bolt joint to the pump housing 4. When the bolt joint is opened the impeller fastened to the motor axis and the motor will come off as one unit. Only the pump housing 4 is left in the piping system. During the system filling a connecting element 3 is fastened to the pump housing 4 according to figure 3. This creates the required supply opening 1 and discharge opening 2. The seal 5 between the connecting element 3 and the pump housing 4 shuts off the hydraulic connection between the supply opening 1 and the discharge opening 2.

[0010] It is also possible to realize the supply opening 1 and the discharge opening 2 with the aid of a connecting element according to figure 4, which for the filling is fastened to the brackets of the pump of the piping system to be filled.

[0011] The German patent publication 197 09 700 presents an equipment which is primarily intended for the cleaning of heat exchangers, where the connecting parts enabling supply of the cleaning liquid are fastened between the heat exchanger and the flanges of the piping, both on the input and discharge sides. The connecting parts have a flow barrier, so that the heat exchanger is disconnected from the piping system in the flow sense.

[0012] An application according to the invention utilises a single connecting element, which is connected to the housing of the centrifugal pump or instead of the pump of the piping system being the object of the actions. In an embodiment according to the invention the liquid is circulated through the whole heating system. Thus the invention is completely different from the in-

vention presented in the German patent publication 197 09 700 both regarding the connecting elements being used, and also regarding the process techniques.

Claims

1. A method intended for filling heating piping systems, **characterised in that** liquid is supplied to the piping system to be filled through a supply opening (1) using a flow rate, which is so high that air bubbles are carried downwards with the flow through the vertical pipes in the piping system to be filled and further away from the piping system through a discharge opening (2).

2. A connecting element (3) intended for the filling of heating piping systems, **characterised in that** it can be installed into the housing (4) of a centrifugal pump of the piping system to be filled, and that it is provided with supply (1) and discharge (2) openings for liquid.

3. A connecting element according to claim 2, **characterised in that** it comprises a seal (5) with which the hydraulic connection between the supply opening (1) and the discharge opening (2) is shut off.

4. A connecting element intended for the filling of heating piping systems, **characterised in that** it can be installed in the place of a pump of the piping system to be filled, and that it is provided with supply (1) and discharge (2) openings for liquid.

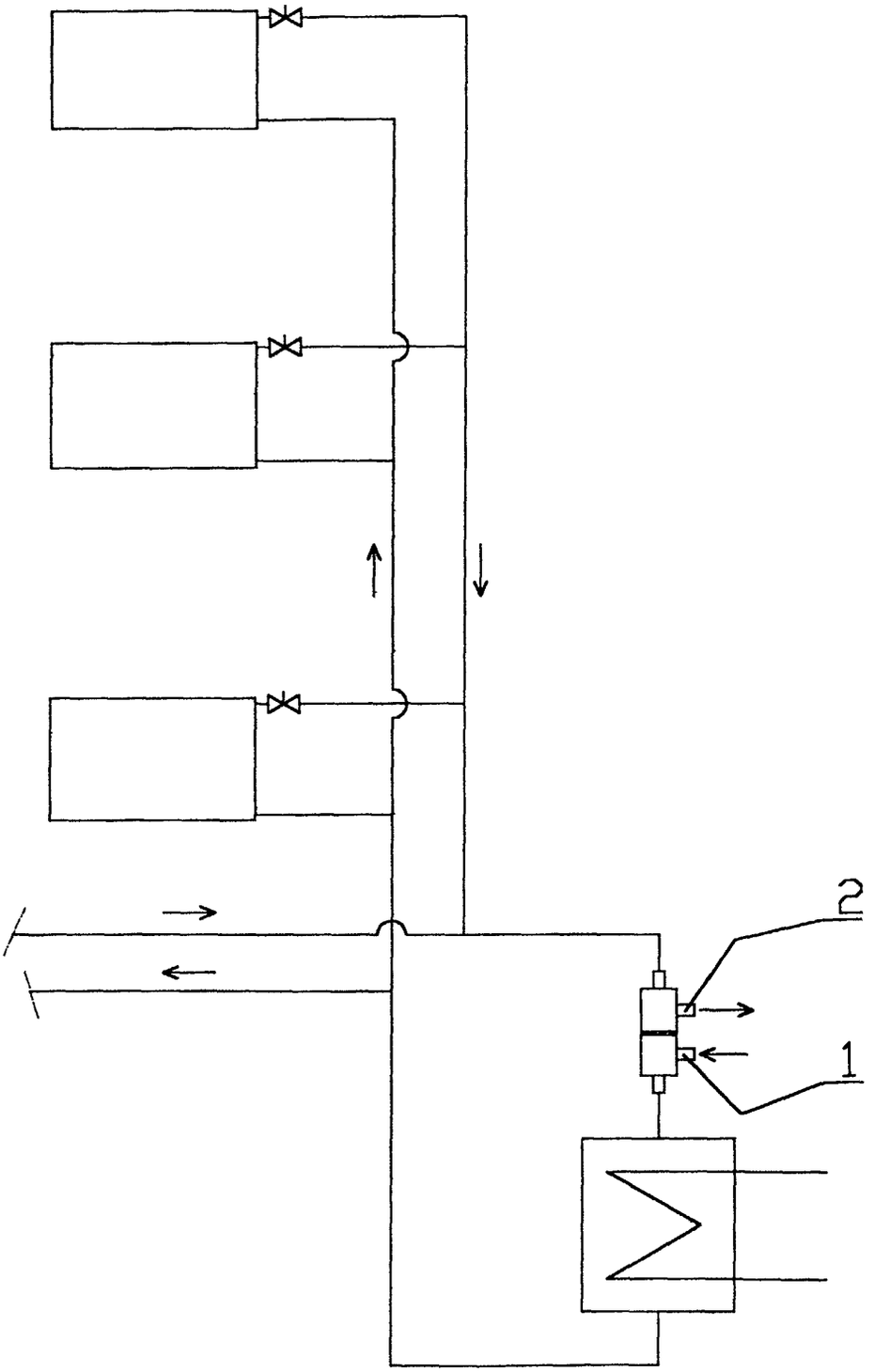

FIG 1

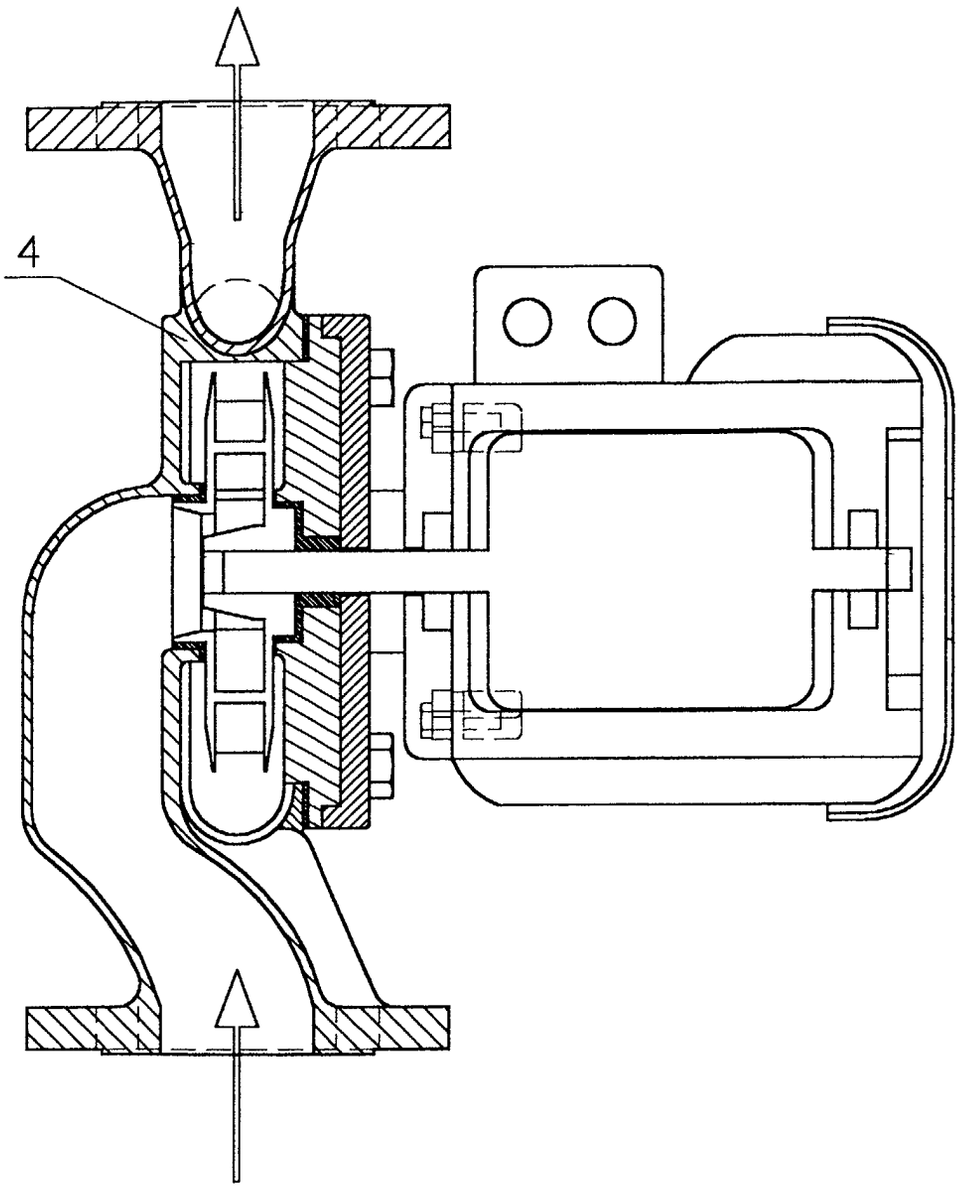

FIG 2

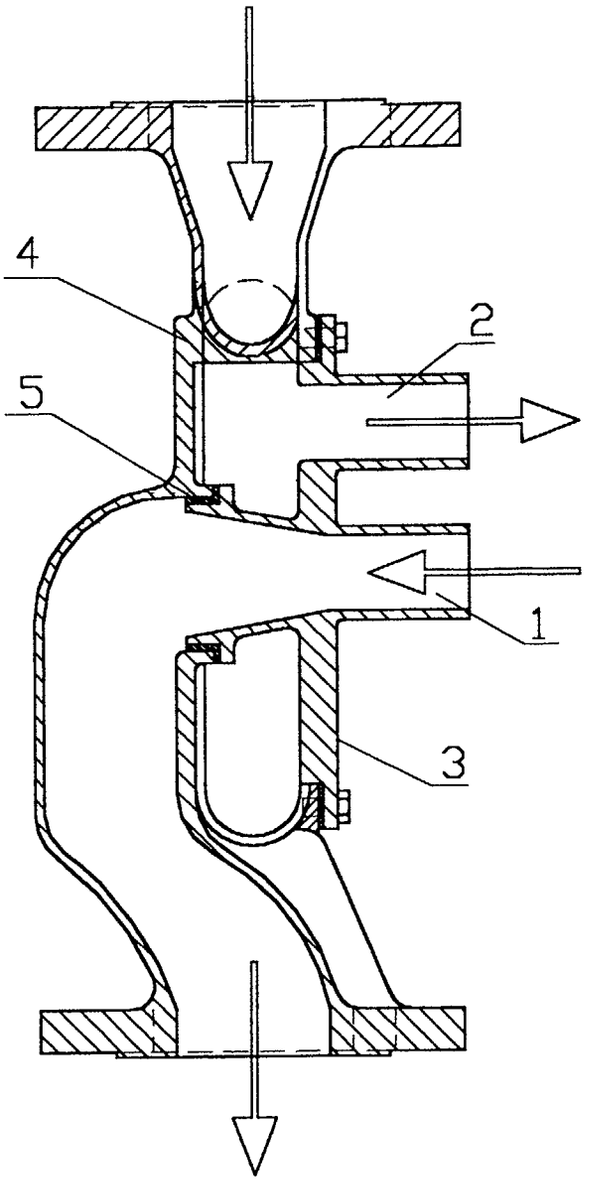

FIG 3

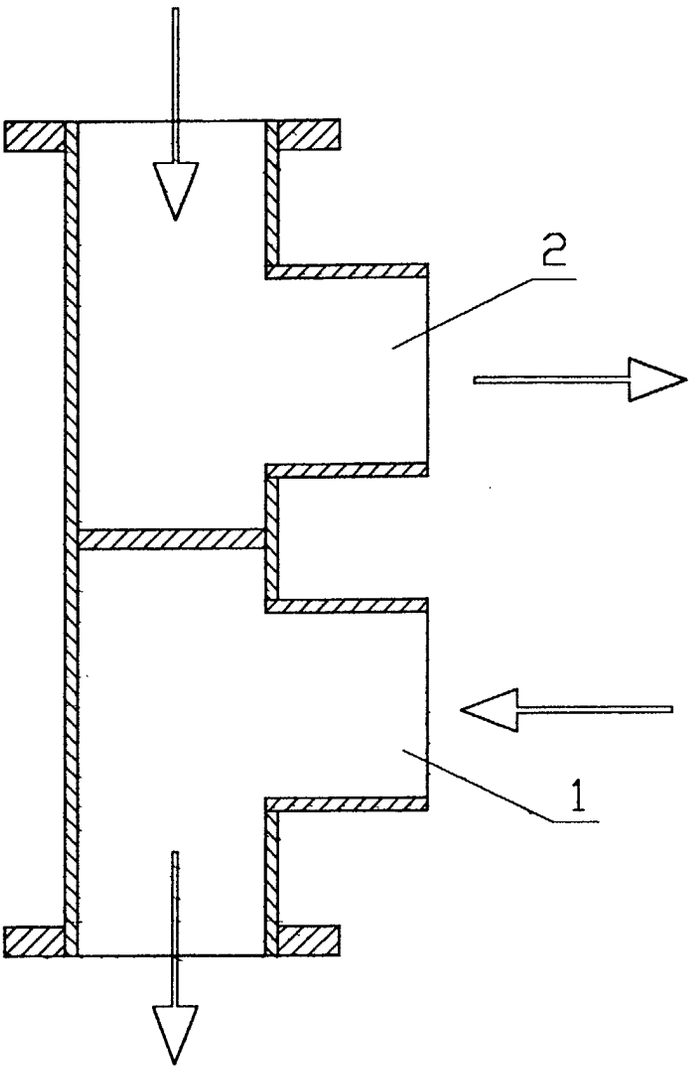

FIG 4

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EUROPEAN SEARCH REPORT

Application Number
EP 02 39 6045

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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	15 October 2002	Descoubes, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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