

Oct. 4, 1966

G. F. CARLSON

3,276,188

HEATING OR COOLING SYSTEMS AND AIR SEPARATING DEVICES THEREFOR

Filed Feb. 28, 1964

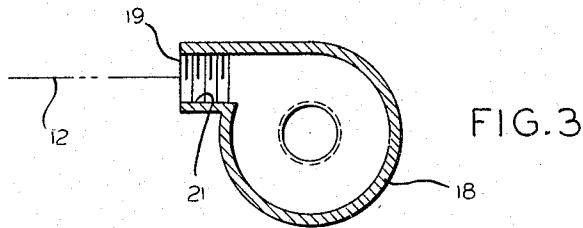


FIG. 3

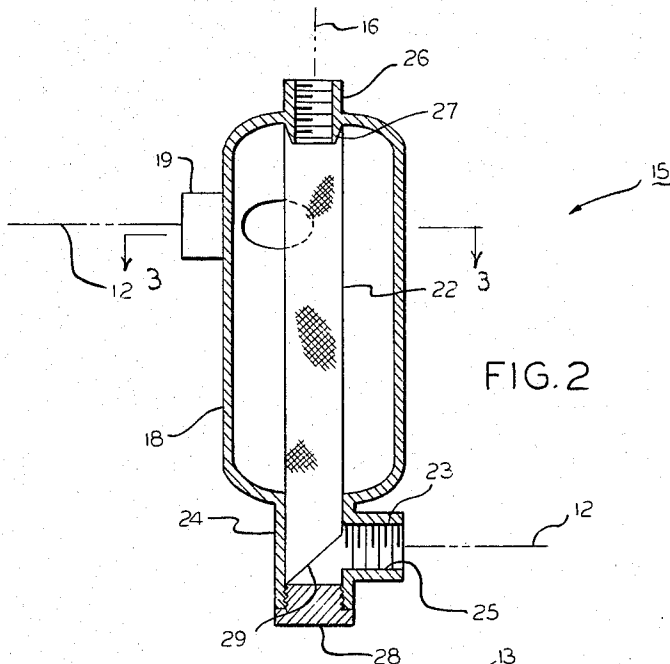


FIG. 2

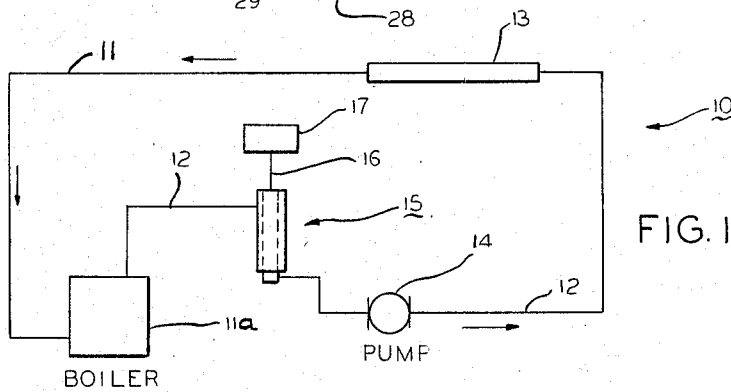


FIG. 1

INVENTOR.
GILBERT F. CARLSON

BY *G. Lindberg*
ATTORNEY

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3,276,188

HEATING OR COOLING SYSTEMS AND AIR SEPARATING DEVICES THEREFOR

Gilbert F. Carlson, Skokie, Ill., assignor to International Telephone and Telegraph Corporation, a corporation of Maryland

Filed Feb. 28, 1964, Ser. No. 348,030

7 Claims. (Cl. 55—204)

This invention relates to improvements in heating or cooling systems, and particularly to a novel combination of elements for use in such systems, which are generally equipped with compression tanks, and more particularly to improvements in air separating devices for such systems wherein the system will be operable at all times insuring against cavitation of the circulating pump therefor.

As an example of such system for heating purposes, it is a common practice to provide with and in connection as a part of such system boiler and radiation units, a compression tank to permit expansion of the liquid content and increase the pressure of the system as its temperature is increased. In such systems it has been the practice to provide devices for separating entrained gases from the heated water of the system, and diverting same to the compression tank. Heretofore such devices have been provided with screens for separating suspended matter from the heating water, but in their operation the pump for circulating the water of the system may be so connected as to prevent a full supply to the suction side of the pump. As is well known, cavitation of the pump results in serious damage thereto, and according to the present invention it is possible to effect the separation of gas from the water of the system as well as the suspended solids in the water, but at all times insuring that there will be ample pressure at the suction side of the pump to prevent cavitation thereof.

One of the principal objects of the invention is to provide an improved liquid circulating system characterized by an air separating device having an integral water strainer so arranged that while it is located close to the pump suction in a physical sense, it is actually located in such a way as to minimize pump cavitation, because the structure causing system pressurization cannot be shut off from the pump suction regardless of the condition of the strainer, whether it be clogged or otherwise.

Another object is to provide in a hot water heating system, an air separator-strainer device so connected with the compression tank that it is at all times connected directly to the pump suction without any intervening pressure drop, the device being so connected into the system that should dirt or suspended material be collected on the strainer, such material cannot in any way induce a pressure drop between the compression tank and the suction side of the pump.

Another important object is to provide an air separating and straining unit for a liquid circulating system, constructed in such a way that clogging of the strainer cannot introduce a pressure drop between the compression tank and the suction side of the pump, thereby preventing cavitation of the pump at all times.

Still another object is to provide an air separating device having a central foraminous tube for the purpose of separating air from the system water, said tube also removing suspended material from the system water, and to connect the interior of the foraminous tube to the compression tank and to the suction side of the pump, the device having structure whereby the tube can be readily located therein and removed for the cleaning thereof.

Other objects and important features of the invention will be apparent from a study of the following specification taken with the drawing, which together describe and illustrate a preferred embodiment of the invention,

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and what is now considered to be the best mode of practicing the principles thereof. Other embodiments of the invention will be suggested to those having the benefit of the teachings hereof, and such other embodiments are intended to be reserved, especially as they fall within the scope and purview of the subjoined claims.

In the drawing:

FIG. 1 is a schematic view of a hot water heating system having the improvements according to the present invention embodied therein;

FIG. 2 is a longitudinal sectional view through an air separating device embodied in the system shown in FIG. 1; and

FIG. 3 is a transverse sectional view taken along the line 3—3 of FIG. 2.

Referring now particularly to FIG. 1 of the drawing, the improvements according to the present invention are embodied in a hot water heating system referred to generally by reference numeral 10, and including a boiler 11a having a supply main 12 and a return main 11 connected thereto, radiation 13 being connected in supply and return mains 11 and 12. A pump 14 is connected in the supply main 12 for providing circulation of hot water in the system thus far described.

An air separating and straining device indicated generally by reference numeral 15 is connected in supply main 12 between the boiler 11a and the pump 14, and is arranged to remove sediment and scale from the boiler water, and to separate gases entrained in the heating water and direct same by way of a pipe 16 connected between device 15 and a compression tank 17.

The air separating and filter device 15 comprises a hollow cylindrical vessel 18 having a tangentially disposed upper opening 19 thereto, the opening 19 being internally threaded as at 21 to receive the supply main 12. The heated water entering the device pursues a generally vortex-shaped path through the vessel 18, and through a hollow cylindrical foraminous tube or screen 22, the water entering the vessel 18 exiting therefrom at a hollow discharge boss 23 extending laterally from a lower hollow extension 24 which is coaxial with the axis of the vessel 18. The hollow discharge boss 23 is internally threaded as at 25 so that it can be connected to the supply main 12.

The upper end of the vessel 18 has an internally threaded cylindrical boss 26 to receive the pipe 16 connected to the compression tank 17, boss 26 being coaxial with the longitudinal axis of the vessel 18.

The hollow cylindrical screen 22 is adapted to be located properly within the vessel 18 along the longitudinal axis thereof by a tapered aligning boss 27 extending inward from the upper end of the vessel 18, the upper end of the cylindrical screen 22 bearing against the inside upper wall of the vessel 18. The lower end of the hollow cylindrical screen 22 is guided within the hollow extension 24 from the lower end of the vessel 18, and is held in place by a closure plug 28 threaded into the lower end of the extension 24. The lower end of the cylindrical screen 22 is beveled as at 29 to insure that connection is always had to the interior of screen 22 at the discharge boss 23.

Referring again to FIG. 1, the air separating and straining device 15 is connected with reference to the pump 14 so that the pressure within the compression tank 17, including the head of water against the suction side of the pump, is always manifested thereagainst irrespective of the condition of the screen 22. Heretofore in hot water heating circuitry, the clogging of the screen of the air separating device would "starve" the suction side of the circulating pump, causing cavitation thereof, with consequent damage thereto.

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It will be seen that the construction of the air separating and strainer device according to the present invention minimizes greatly the possibility of cavitation of the pump, since there is always a supply of water at a positive pressure against the suction side thereof.

While the invention has been described in terms of an improved heating circuit for a pressurized hot water heating system, and in terms of an improved air separating device for such system, the scope of the invention is not limited by the precise embodiment herein shown, other embodiments being intended to be reserved especially as they fall within the scope of the claims here appended.

I claim:

1. In a closed liquid circulating system having supply and return mains and a pump adapted to circulate liquid in said supply and return mains, a compression tank connected at the suction side of said pump and adapted to receive a quantity of liquid from said system and gas which has been separated from the liquid of said system and to store said gas and liquid under pressure; the improvements in said system comprising a device for separating gas from said liquid and diverting the same to said compression tank, said device being connected in a circuit including said compression tank and the suction side of said pump, said device comprising a vessel having a connection to said supply main, a cylindrical strainer extending substantially for the length of said vessel, means for supporting the same therein along an axis substantially coincident with the longitudinal axis of said vessel, a connection at said vessel to the interior of said cylindrical strainer and said compression tank, a second connection to the suction side of said pump and to the interior of said cylindrical strainer comprising an elongated extension at the lower end of said vessel for aligning said cylindrical strainer with said second connection, whereby irrespective of the blockage of said strainer there will at all times be insured a complete supply of liquid at the suction side of said pump to prevent cavitation thereof.

2. In a closed liquid circulating system having supply and return mains and a pump adapted to circulate liquid in said supply and return mains, a compression tank connected at the suction side of said pump and adapted to receive a quantity of liquid from said system and gas which has been separated from the liquid of said system and to store said gas and liquid under pressure; the improvements in said system comprising a device for separating gas from said liquid and diverting the same to said compression tank, said device being connected in a circuit including said compression tank and the suction side of said pump, said device comprising a vessel having a connection to said supply main, a cylindrical strainer extending substantially for the length of said vessel, means for supporting the same along an axis substantially coincident with the longitudinal axis of said vessel, a connection at said vessel to the interior of said cylindrical strainer and said compression tank, a second connection to the suction side of said pump and to the interior of said cylindrical strainer, whereby irrespective of the blockage of said strainer there will at all times be insured a complete supply of liquid at the suction side of said pump to prevent cavitation thereof.

3. In a closed liquid circulating system having supply and return mains and a pump adapted to circulate liquid in said supply and return mains, a compression tank connected at the suction side of said pump and adapted to receive a quantity of liquid from said system and gas which has been separated from the liquid of said system and to store said gas and liquid under pressure; the improvements in said system comprising a device for separating gas from said liquid and diverting the same to said compression tank, said device being connected in a circuit including said compression tank and the suction side of said pump, said device comprising a vessel having a connection to said supply main, a cylindrical strainer ex-

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tending substantially for the length of said vessel, and supported therein along an axis substantially coincident with the longitudinal axis of said vessel, a connection at said vessel to the interior of said cylindrical strainer and said compression tank, a second connection to the suction side of said pump and to the interior of said cylindrical strainer, whereby irrespective of the blockage of said strainer there will at all times be insured a complete supply of liquid at the suction side of said pump to prevent cavitation thereof.

4. An air separation device adapted to be connected in a closed liquid circulating system having supply and return mains including a circulatory pump connected therein for circulating liquid in said system and having a compression tank for receiving gas which has been separated from the liquid of said system, said device being connected in said system and between said compression tank and the suction side of said pump, said air separation device comprising a closed vessel having entrant means near the top thereof for connecting said vessel to one of said mains, a cylindrical screen extending vertically of said vessel and adapted to separate suspended matter from the liquid entering said vessel at said entrant means, an opening at the top of said vessel including means thereat for connecting said vessel to said compression tank, said opening being in communication with a side of said screen opposite to the entrant liquid, means on the interior of said vessel and coaxial with the opening to said compression tank for guiding said cylindrical screen, a hollow extension at the lower end of said vessel coaxial with said upper opening for guiding the lower end of said cylindrical screen and a lower opening from said extension and in communication with the side of said screen opposite to the entrant liquid, and means at said lower opening for connecting said vessel to the suction side of said pump.

5. An air separation device adapted to be connected in a closed liquid circulating system having supply and return mains including a circulating pump connected therein for circulating liquid in said system and having a compression tank for receiving gas which has been separated from the liquid of said system, said device being connected in said system and between said compression tank and the suction side of said pump, said air separation device comprising a closed vessel having entrant means near the top thereof for connecting said vessel to one of said mains, a cylindrical screen extending vertically of said vessel and adapted to separate suspended matter from the liquid entering said vessel at said entrant means, an opening at the top of said vessel including means thereat for connecting said vessel to said compression tank, said opening being in communication with a side of said screen opposite to the entrant liquid, a hollow extension at the lower end of said vessel coaxial with said upper opening for guiding said cylindrical screen, and a lower opening from said extension and in communication with the side of said screen opposite to the entrant liquid, and means at said lower opening for connecting said vessel to the suction side of said pump.

6. An air separation device adapted to be connected in a closed liquid circulating system having supply and return mains including a circulating pump connected therein for circulating liquid in said system and having a compression tank for receiving gas which has been separated from the liquid of said system, said device being connected in said system and between said compression tank and the suction side of said pump, said air separation device comprising a closed vessel having entrant means for connecting said vessel to one of said mains, a cylindrical screen extending vertically of said vessel and adapted to separate suspended matter from the liquid entering said vessel at said entrant means, an opening in said vessel including means thereat for connecting said vessel to said compression tank, said opening being in communication with a side of said screen opposite to the entrant liquid,

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means on the interior of said vessel and coaxial with the opening to said compression tank for guiding said cylindrical screen, a lower opening to said vessel and in communication with the side of said screen opposite to the entrant liquid, and means at said lower opening for connecting said vessel to the suction side of said pump.

7. An air separation device adapted to be connected in a closed liquid circulating system having supply and return mains including a circulating pump connected therein for circulating liquid in said system and having a compression tank for receiving gas which has been separated from the liquid of said system, said device being connected in said system and between said compression tank and the suction side of said pump, said air separation device comprising a closed vessel having entrant means for connecting said vessel to one of said mains, a cylindrical screen extending vertically of said vessel and adapted to separate suspended matter from the liquid entering said vessel at said entrant means, an opening in said vessel

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including means thereat for connecting said vessel to said compression tank, said opening being in communication with a side of said screen opposite to the entrant liquid, a second opening to said vessel and in communication with the side of said screen opposite to the entrant liquid, and means at said second opening for connecting said vessel to the suction side of said pump.

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REUBEN FRIEDMAN, *Primary Examiner.*

R. W. BURKS, *Assistant Examiner.*