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EXPANSION TANK AND AIR REMOVAL UNIT

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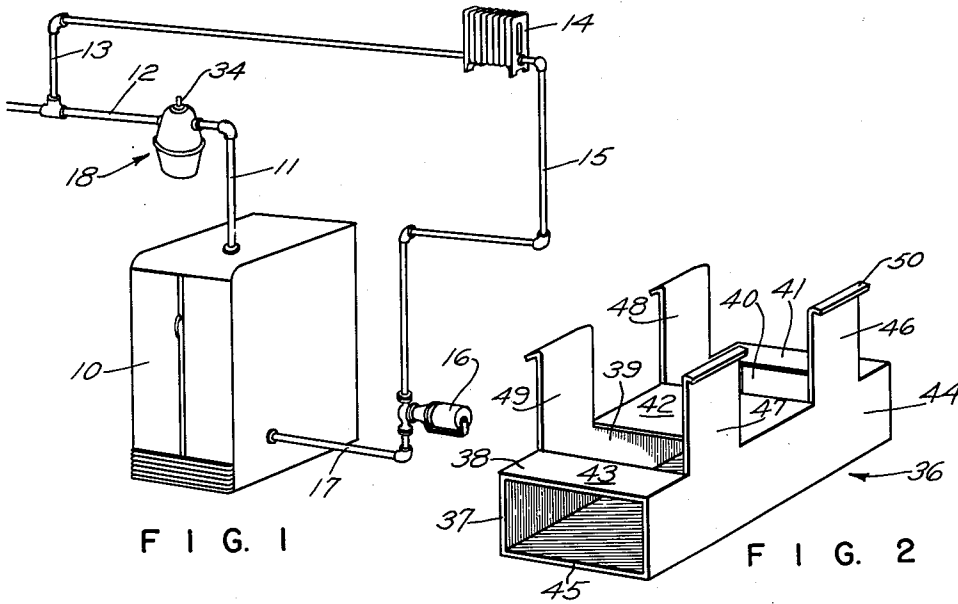


FIG. 1

FIG. 2

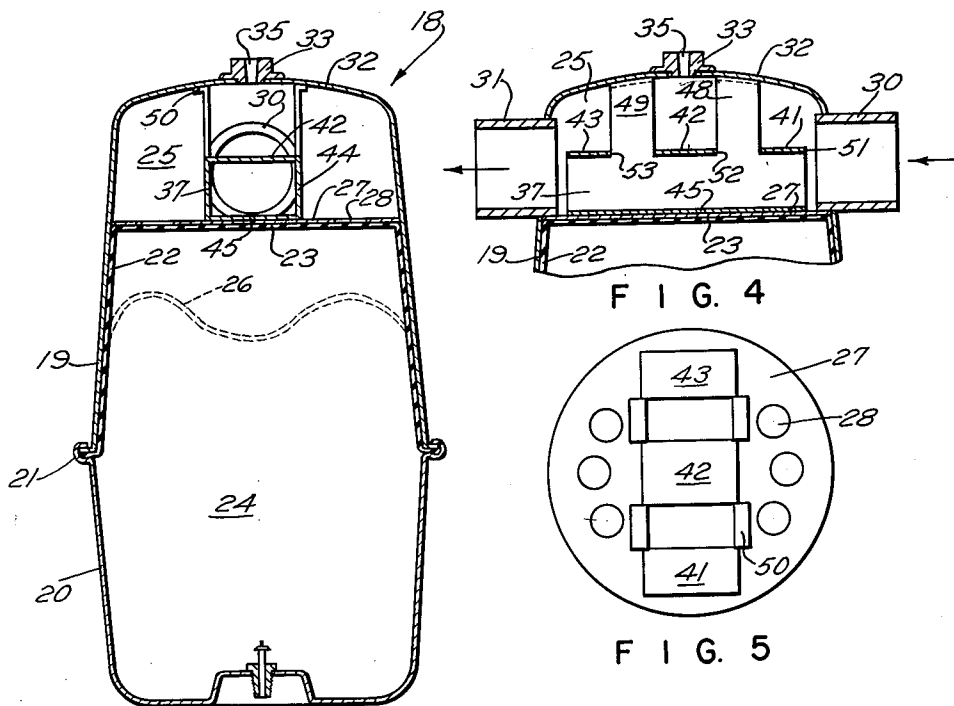


FIG. 3

FIG. 4

FIG. 5

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EXPANSION TANK AND AIR REMOVAL UNIT
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This invention relates to a hot water heating system and more particularly to a unit which serves as an expansion tank and also as a means for removing air from the system.

One of the objects of this invention is to provide in a single unit an arrangement so that the water as it is heated may expand and also a means for removing any air in the hot water as circulation through the system occurs.

Another object of this invention is to provide a simplified structure for removing air from the system.

Another object of the invention is to provide a structure for removing air from the system which may be made up of sheet stock rather than a casting.

Another object of the invention is to provide a device for removal of air from a hot water system which device will be a separate part and may be removed or replaced as occasion may require.

Another object of the invention is to provide a device for permitting expansion of water in a hot water system preventing direct contact of system water with air cushion.

With these and other objects in view the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

FIG. 1 is a perspective view illustrating a hot water heating system with my improved unit installed therein;

FIG. 2 is a perspective view of the separable air removal device by itself;

FIG. 3 is a sectional view through the unit which serves for air removal and also as an expansion tank;

FIG. 4 is a view similar to FIG. 3 taken at right angles thereto and showing only the upper portion of the unit, the lower portion being substantially the same as that shown in FIG. 3; and

FIG. 5 is a top plan view of a perforated plate and my air removal device in position thereon.

In proceeding with this invention, I have provided a casing in which there is a flexible diaphragm which divides the casing into upper and lower chambers. In the lower chamber I have provided a gas which will permit the diaphragm to expand downwardly as the volume of water increases due to heat in the operation of the hot water system. In the upper chamber I have provided a device for removing air and position this device in line with inlet and outlet ports. The device provides baffles in substantially the plane of flow between these ports so as to restrict the flow of water between the ports to a minimum and eliminate turbulence as much as possible, while at the same time providing an arrangement which will remove air from the water causing it to rise in the upper chamber where it may be vented. A horizontal perforated plate extends across the upper chamber in a position so as to support the baffle unit and also to limit the upward movement of the flexible diaphragm.

With reference to the drawings 10 designates a boiler from which there extends upwardly piping means 11 which then extends horizontally as at 12, then again upwardly as at 13 to a heat transfer device such as a radiator 14 which may exist in several such units in the system. Each of these are connected to some return line 15 in which there is located a pump 16 for returning the water through the pipe 17 to the boiler. The unit which is the subject

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of this invention is designated generally 18 and is inserted in a substantially horizontal portion of the piping system such as that shown here at 12. Although I refer to this portion as horizontal, it may have a slight inclination for drainage of liquid therein to the boiler.

This unit 18 is shown in section in FIGS. 3 and 4 which unit comprises a casing having two parts 19 and 20 which are secured together by rolling the edge of one about a flange of the other as at 21. A flexible diaphragm of rubber or synthetic rubber 22 is rolled into the connection 21 so as to provide a tight joint and also to secure it therein and this diaphragm may take the form of extending along the inner surface of the sides of the part 19 and horizontally as at 23 across the casing to form a top part. This diaphragm divides the casing into a lower chamber 24 and an upper chamber 25. The lower chamber 24 is provided with gas under some pressure greater than atmosphere and normally holds the diaphragm upwardly in the full line position such as shown at 23 when this hot water system above referred to is at zero pressure or unfilled. The gas is inserted through a valve at the bottom. However, when the system is filled with water under approximately a ten pound pressure through a regulating valve, the diaphragm may take the position such as indicated at 26 in dotted lines. Further when the water expands on heating, the diaphragm may flex further to allow some additional volume in the system. A perforated plate 27 extends substantially horizontally across the casing 18 and serves as a limit for the upward movement of the portion 23 of the flexible diaphragm and in FIGS. 3 and 4 the upper portion 23 of the diaphragm is shown as engaging this plate in its full line showing. The perforations in this plate are designated 28 and are of a sufficient number to permit water to pass freely through the plate for expansion of the water in the system.

The upper chamber 25 through which the water passes is provided with an inlet port 30 and an outlet port 31 at diametrically opposite sides of the chamber, and it is these ports 30 and 31 that are connected in the horizontal piping means 12 of the system. The chamber 25 has a top wall 32 which is arch-shaped and there is a boss 33 provided at the upper point or high point of this arch for the connection of an air vent valve 34 in the opening 35 for permitting air to escape although not enter through this opening.

The air removal device or baffle unit, designated 36 and shown by itself in FIG. 2, comprises essentially a tube 37 which is rectangular in cross section. The top wall 38 of this tube is opened as at 39 and 40 so as to provide baffles 41, 42 and 43 with the spaces 39 and 40 between them. This unit is formed of sheet metal and each of the baffles 41, 42 and 43 are of a planar form and are in substantially the same plane. When the unit 36 is in position between the inlet port 30 and outlet port 31, these baffles 41, 42 and 43 will be between the upper and lower edges of the inlet and outlet ports 30 and 31 so as to position the baffles in a plane parallel to the center of the path of flow of the water through the chamber 25 and slightly thereabove. This tube 37 has side walls 44 and also a bottom wall 45. This bottom wall 45 is supported by the perforated plate 27 which itself is secured to the side walls of the casing by welding or any suitable means. Thus this unit is supported from below by this perforated plate which also serves to limit the movement of the diaphragm. The tube 37 will be of a width substantially the width of the ports 30 and 31, although the baffles will be of a height less than the height of the ports as above mentioned. Vertical baffles extending upwardly from the location of the spaces 39 and 40 between the horizontal baffles are shown as at 46, 47, 48 and 49 as extending from the tube 37 to the top 32 of the chamber

and are there flanged as at 50 to extend along the top 32 of the chamber and be secured thereto such as by welding.

In the above described manner I have provided horizontal baffling and also vertical baffling. The horizontal baffling is in substantially a single plane and thus offers minimum resistance to the flow of water and will maintain turbulence at a minimum. Generally air that moves in the piping remains in the upper part of the cross-section thereof or upper strata. By the presentation of the edges of the baffles such as 51, 52 and 53 to the flow of water at a location near or slightly above the center line of port 30, they will separate the air-in-water strata which usually is located in the upper portion of the piping from the lower uncontaminated strata. The air-in-water strata and particularly the entrapped air will remain in the relatively large volume of the upper part of chamber 25 rising to the high point thereof where it will be vented through the opening 35. Thus, the baffles serve not only to direct the entrapped air to the upper portion of chamber 25 but also prevent co-mingling of the two stratas of water and enhance laminar flow.

In operation, as the water is circulated through the piping system by the pump 16, this water will pass freely through the chamber 25 although the upper part of the water which will contain the greatest amount of the air will, by reason of engagement with the edges 51, 52 and 53, cause this air to be removed which will be vented from the system. Also by reason of the flexible diaphragm with pressure air separated from the water, any further co-mingling of air and water is prevented and yet an air cushion is always maintained to accommodate volume changes. By having an expansion tank and air eliminating means in one unit with the air eliminating means formed of sheet stock, a very inexpensive device may be provided, one which may be installed easily in the system with no right or lefthand arrangement required; that is, the inlet port may be the outlet port or the outlet

port may be the inlet port without any change in operation.

I claim:

1. In a hot water heating system having heat transfer devices therein, the combination including a boiler, a circulating pump in the system, piping means including a generally horizontal portion connecting said boiler to said devices and pump, a unit serving as an expansion tank and air removal means in said horizontal portion interposed in the path of water flowing therethrough and comprising a casing, a flexible diaphragm dividing said casing into upper and lower parts and providing with the wall of the lower part of the casing a chamber to confine a pressurized gas, a horizontally disposed perforated plate fixed in the upper part of the casing to serve as a limit for the movement of said diaphragm into said upper part, inlet and outlet ports in said upper part above said plate, horizontally aligned spaced baffles in said upper part in the line of flow between said ports, means supporting said baffles by said plate, and an air vent extending from the high point in said upper part.

2. In a combination as set forth in claim 1 wherein said baffles are interconnected to form a unit located between said plate and top of the upper part of the casing.

3. In a combination as set forth in claim 1 wherein said baffles are interconnected to form a unit resting upon said plate and wherein said units is provided with arms engaging the top of the upper part of the casing to hold it snugly therebetween.

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