

CONNECTION TUBES

This invention relates to pipes and other fittings used within tanks and other vessels. This invention in particular relates to pipes and fittings used in hot water heaters which provide boiling or near boiling water in kitchens, tea rooms, cafeterias, etc.

With reference to Figure 1, which is a schematic representation of a conventional hot water heater, the heater and its associated disadvantages will be described. The major component of the conventional hot water heater 1 is a water heater tank 2 and an expansion tank 3. Cold water is supplied to the water heater tank 2 via water supply pipe 4 which is attached to inlet fitting 5. A backflow preventing valve may also be incorporated with this fitting 5. The water within the heater tank 2 is heated to boiling or near boiling point by heating element 6.

A conventional connection tube 7 is located at the top of the heater tank 2, and passes through the expansion tank 3. The connection tube 7 has a threaded upper portion 8 for attaching an outlet pipe 9 thereto. The connection tube 7 has a central bore 10 providing fluid communication between the heater tank 2 and the outlet pipe 9. A venturi hole 11 provides fluid communication between the central bore 10 and the expansion tank 3.

In use, the heater tank 2 is full of water. When the tap 35 is closed, and the water within the heater tank 2 is heated, the water within the tank 2 expands. The expansion tank 3 is provided to contain the expanded water and prevent nuisance dripping from the free outlet. In the water heater 1 shown in Figure 1, the expanding water will pass up the central bore 10 of the connection tube 7, and out the venturi hole 11 and into the expansion tank 3. As the water expands the water level in the expansion tank 3 rises to an upper level 12. The expansion tank 3 provides a large volume to contain the increase in the volume of water, and has a vent 36 to atmosphere.

When the tap 35 is opened, water under pressure within the heater tank 2 flows through the central bore 10 to the outlet pipe 9 and then to the free outlet. Also, water within the expansion tank 3 will flow through the venturi hole 11 to the central bore 10 and then to the outlet pipe 9. The latter flow is due to the venturi effect of water flowing through the central bore 10 past the venturi hole 11. The water will flow out of the expansion tank 3 until the water level in the expansion tank 3 drops to the lower water level 13.

One embodiment of a conventional connection tube is shown in Figure 2. This connection tube 7 comprises a lower portion 14 and an upper portion 15, both having a central bore 10. The lower portion 14 is brazed at 26 or otherwise sealingly secured to an aperture in the upper wall 20 of the heater tank 2. Orifice 16 and venturi hole 11

allow fluid communication between the central bore 10 and the insides 17,18 of the heater and expansion tanks 2,3, respectively.

The upper portion 15 is also brazed 26 or otherwise sealingly secured to an aperture within the upper wall 19 of the expansion tank 3. The top of the upper portion 15 is threaded 8 to allow the attachment of an outlet pipe. The diameter of the lower end 21 of the upper portion 15 is reduced to locate the upper portion 15 within the lower portion 14.

During construction of the water heater 1, each of the connection tube portions 14,15 are secured to the respective tank wall 20,19, prior to joining the expansion tank 3 to the heater tank 2.

The expansion tank 3 is then formed by attaching the expansion tank wall 19 to the heater tank 2, the upper wall 20 of which serves as the lower wall of the expansion tank 3. As the walls 19,20 are brought together the two connection tube portions 14,15 locate relative to one another by means of the lower end 21 of the upper portion 15 locating within the lower portion 14. The expansion tank 3 is then sealed to the heater tank 2, holding the connection tube portions 14,15 together.

Problems arise during use of water heaters 1 constructed using conventional connection tubes of the type described above. During use, small openings may become blocked by, for example, calcium deposits. The venturi hole 11 is particularly vulnerable to blocking due to its small size and the fact that it provides a horizontal or angled surface upon which deposits may settle. In as little as two to three years of use, and in some areas in only 2 to 3 months, deposit levels can build up to an extent which prevents efficient and correct operation of the heater. Due to the nature of the construction of the water heater tanks 2,3, in which there is limited or no access to the internal fittings, it is cheaper to replace both tanks 2,3 and the connection tube 7 with a pre-assembled substitute unit, rather than disassembling the tanks 2,3 to clean or replace the connection tube 7. Although cheaper than cleaning or replacing the connection tube 7, the cost of such replacement is still high. The practice of replacing the whole assembly is also wasteful of materials.

It is an object of this invention to provide a water heater, and a connection tube therefor, which allows easy cleaning or replacement of component parts, whilst reusing as many parts as possible. This invention in one broad form provides a connection tube comprising:

a first member adapted to be attached to a first aperture in a first wall, said first member having an aperture therethrough to provide fluid communication through said first wall;

a second member adapted to be attached to a second aperture in a second wall, said second member having an aperture therethrough to provide fluid communication



through said second wall; and

a tubular member having a first end and a second end, said first and second ends being adapted for engagement with said first and second members, respectively, said tubular member having a central bore providing fluid communication between said first and second ends, said tubular member having fluid communication means between said central bore and the outside of said tube, said fluid communication means being located adjacent the first end of the tubular member,

wherein said tubular member and said second member are adapted to permit said tubular member to be removably attached and sealed to said second member.

It is preferred that said fluid communication means comprises a venturi hole at an angle to said central bore.

It is preferred that said second member has an internal thread and that said tubular member has a mating external thread, said threads providing said means for removably attaching and sealing said tubular member to said second member.

It is preferred that said first end has a diameter slightly smaller than the diameter of said first member aperture, for locating said first end within said first member aperture.

It is preferred that said first end comprises means for attaching a second tubular member thereto. It is further preferred that said means for attaching a second tubular member comprises threads.

It is preferred that said first, second and tubular members consist of brass, metal, plastics or a similar suitable material that will not deteriorate though use in water.

It is preferred that said first member further comprises a flange to prevent said first member passing through said first aperture.

It is preferred that seal means be disposed between said tubular member and said first member and between said tubular member and said second member. It is further preferred that each seal means comprises an O-ring. It is still further preferred that either or both seal means be disposed at least partially in a recess.

This invention in a further broad form provides a water heater having a connection tube as described anywhere above.

By way of example only, one preferred embodiment of a connection tube according to the invention will now be described with reference to the accompanying drawings, wherein:

Fig. 1 is a schematic view of a conventional water heater;

Fig. 2 is a partial side elevational view and partial sectional view of a prior art connection tube;

Fig. 3 is a sectional view of a hot water heater incorporating a connection tube



according to the present invention; and

Fig. 4 is an enlarged partial view of part of Fig. 3.

Figures 3 and 4 show a preferred embodiment of the invention, indicated generally at 22. As with Figure 2, the connection tube 22 is symmetrical about the centre line with the exception of the venturi hole 11, of which there is only one. Features similar to those of the prior art connection tube of Figure 2 are identified using the same reference numerals. In the embodiment shown in Fig. 3, the water heater is shown mounted in an outer case 39. The vent 36 from the expansion tank 3 passes through an aperture in the outer case 39, and preferably through a grommet 40. The water heater shown has a heating element 6, thermostat 42, and an over-temperature cut-out 43 to control the maximum temperature in the water heater.

The first member 23 comprises a squat cylinder 24 with a flange 25, and has a central bore 10. The first member 23 protrudes through an aperture in the upper wall 20 of the heater tank 2, and is brazed 26 thereto to both fix the first member 23 and seal any gaps between the first member 23 and the heater tank wall 20.

A second member 27 having a hexagonal outer surface 28 and threaded internal surface 29 is likewise fixed sealingly 26 to the expansion tank upper wall 19. One end of the second member 27 has a rim 30 to which the wall 19 may be attached 26. The other end of the second member 27 has an annular recess 36 in which is disposed an O-ring 97, to form a seal between the second member 27 and the tubular member 31.

The lower end 32 of the tubular member 31 has a reduced diameter which fits within the central bore 10 of the first member 23. The lower end 32 also has an annular groove 37 in which is located an O-ring 98, providing a seal between the first member 23 and the tubular member 31. This lower end 32 has an orifice 33 which opens onto the central bore 10 of the tubular member 31. The venturi hole 11, which may be at any angle, is disposed adjacent to the lower end 32, to be located just above the flange 25 when the connection tube 22 is assembled.

The tubular member 31 has an external thread 29 adapted to mate with the internal thread 29 of the second member, and a hexagonal outer surface 34. A lock nut 41 may be used to locate the tubular member 31 relative to the outer case 39. The tubular member 31 is sealingly secured to the second member 27 by screwing the tubular member 31 into the second member until O-ring 97 seals. Spanners or other tools may be used on the hexagonal surfaces 28,34 to ensure a tight seal.

A thread 8 is provided on the upper end of the tubular member 31 so that an outlet pipe may be attached thereto. The shape of the upper portion of the central bore can be shaped as required for attaching an outlet pipe.

The advantage of the present invention is that the tubular member 31 may be

readily removed for cleaning or replacement, should the venturi hole 11 become blocked. After disconnecting the outlet pipe and lock nut 41, the outer casing 37 can be removed from the water heater. It is then simply a matter of unscrewing the tubular member 31 from the second member 27, eg. using spanners on hexagonal surfaces 28 and 39, and withdrawing it from the expansion tank 3. The reverse procedure is used to reassemble the water heater. There is no need to disassemble the expansion tank 3 or destroy and then remake any welds or brazing 26.

CLAIMS:

1. A connection tube comprising:
a first member adapted to be attached to a first aperture in a first wall, said first member having an aperture therethrough to provide fluid communication through said first wall;
a second member adapted to be attached to a second aperture in a second wall said second member having an aperture therethrough to provide fluid communication through said second wall; and
a tubular member having a first end and a second end, said first and second ends being adapted for engagement with said first and second members, respectively, said tubular member having a central bore providing fluid communication between said first and second ends, said tubular member having fluid communication means between said central bore and the outside of said tube, said fluid communication means being located adjacent the first end of the tubular member,
wherein said tubular member and said second member are adapted to permit said tubular member to be removably attached and sealed to said second member.
2. The connection tube of claim 1, wherein the fluid communication means comprises a venturi hole at an angle to said central bore.
3. The connection tube of claim 1 or claim 2, wherein the second member has an internal thread and said tubular member has a mating external thread, said threads providing said means for removably attaching and sealing said tubular member to said second member.
4. The connection tube of any one of claims 1 to 3, wherein the first end has a diameter slightly smaller than the diameter of said first member aperture, for locating said first end within said first member aperture.
5. The connection tube of any one of claims 1 to 4, wherein the first end comprises means for attaching a second tubular member thereto.
6. The connection tube of claim 5, wherein the means for attaching a second tubular member comprises threads.
7. The connection tube of any one of claims 1 to 6, wherein the first, second and tubular members consist of brass, metal, plastics or a similar suitable material that will not deteriorate though use in water.
8. The connection tube of any one of claims 1 to 7, wherein the first member further comprises a flange to prevent said first member passing through said first aperture.
9. The connection tube of any one of claims 1 to 8, wherein seal means are disposed between said tubular member and said first member and between said tubular member and said second member.

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10. The connection tube of claim 9, wherein each seal means comprises an O-ring.
11. The connection tube of claim 9 or claim 10, wherein either or both seal means are disposed at least partially in a recess.
12. A water heater having a connection tube as defined in any one of claims 1 to 11.
13. A connection tube substantially as hereinbefore described with reference to the accompanying drawings.
14. A water heater substantially as hereinbefore described with reference to the accompanying drawings.

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