June 12, 1962 F. V. BOYLAN 3,038,744

DIP TUBE SUPPORTING MEANS WHICH IS LOCKED AGAINST AXIAL MOVEMENT

Filed May 26, 1958

FIG.1

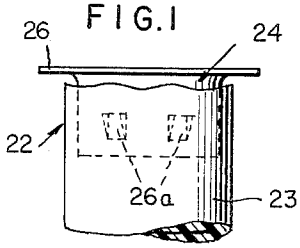


FIG.3

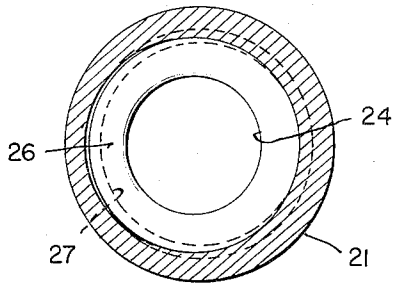


FIG.2

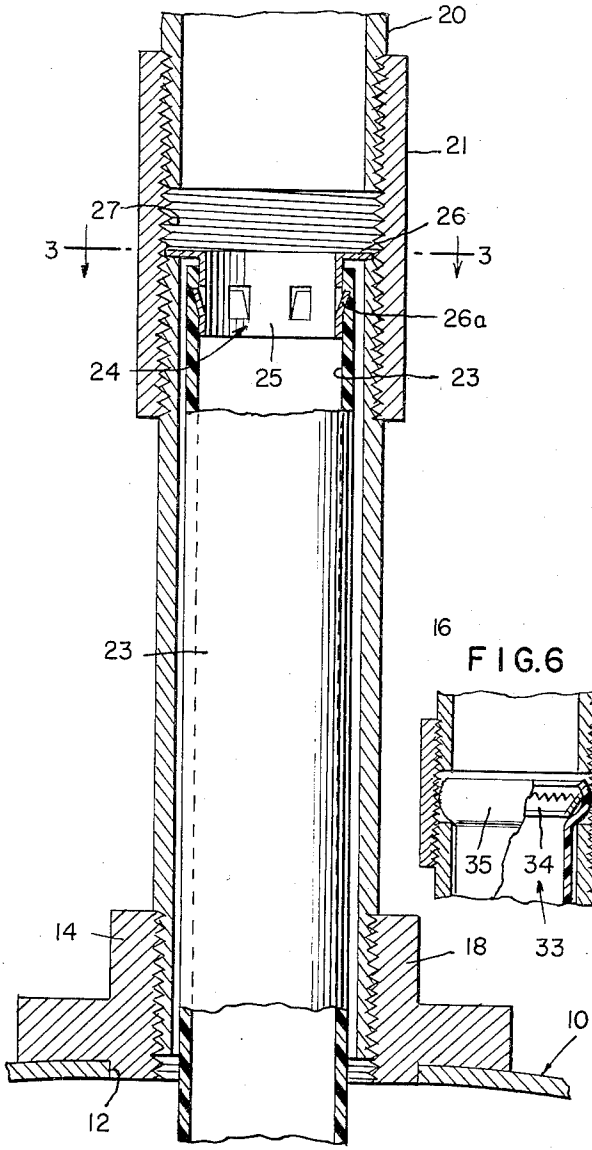


FIG.4

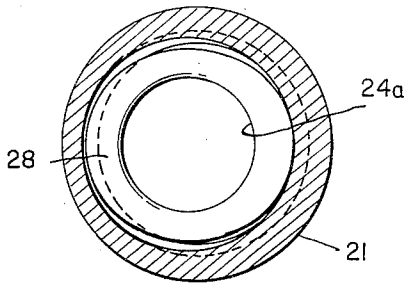


FIG.5

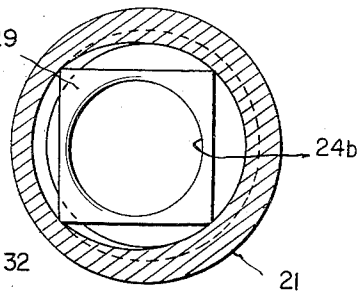


FIG.6

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DIP TUBE SUPPORTING MEANS WHICH IS LOCKED AGAINST AXIAL MOVEMENT

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2 Claims. (Cl. 285—142)

This invention relates generally to water heating devices of the storage type and is directed particularly to improvements in the supporting means for dip tubes forming a part of such water heaters.

Automatic storage water heaters embody in the construction thereof a water inlet tube, termed a dip tube. This tube is provided to conduct cold water from the cold water inlet at the top of the storage tank down through the hot water in the tank to the bottom part of the latter so that the hot water which is being drawn off from the top of the tank will not be chilled by the inflowing cold water. These tubes are conventionally made of metal and are inserted through the water inlet nipple into the tank and have at the top a flared portion which engages the top of the nipple to suspend the tube in place.

Use has been made recently of dip tubes formed of plastic and in order to hold the plastic tube in position so as to prevent the top end of the tube from slipping down through the nipple, it has been proposed to employ a means for expanding the top end of the plastic tube so that the expanded portion may rest on the top end of the nipple. While this means of supporting the tube has been found effective, it has also been found that the projecting portion of the tube is subject to damage in the shipping of the heater so that the effectiveness of the means employed is impaired or defeated in those cases where such part of the tube has become damaged.

Means has been provided for avoiding this difficulty by having at the top end of the plastic dip tube a unique flange structure, or by providing a collar having a flange structure which will rest freely upon the top end of the nipple so that the dip tube is effectively suspended and prevented from sliding down into the nipple, or moving axially relative to the joint. However, it has been found that where the coupling employed for connecting the water supply pipe to the nipple does not draw the water supply or inlet pipe down into engagement with the flange of the collar resting upon the top end of the nipple, the plastic dip tube has a tendency to rise or fall or bounce, resulting in the formation of noise, but in the present invention this is overcome.

In view of the foregoing, it is an object of the present invention to provide an improved construction of a flexible dip tube, which dip tube includes a unique flange structure at its upper end whereby the flange when freely resting on the top end of a nipple or the like is secured or held by the coupling threads so as to hold the flange and the dip tube against axial movement relative to the nipple or the like within which the dip tube is positioned.

A further and more particular object of the invention is to provide in plastic dip tube a supporting collar and flange wherein the flange which is adapted to rest upon the top end of the nipple through which the dip tube extends, is made to have a sufficient over-all width or diameter to lock it in between threads of the pipe coupling so that as the coupling is threaded onto the nipple, the flange of the dip tube collar will have its edge portion engaged between the threads of the coupling and thereby held against movement in and axially of the coupling.

A further object of the invention is the provision in association with a plastic dip tube of an annulus secured to the top end of the tube and having a laterally extending

flange which projects laterally of the tube and a substantial distance beyond the outer sides thereof to be engaged between threads of a pipe coupling attached to the nipple from which the dip tube is suspended, and wherein such flange may be either circular, elliptical or have a polygonal outline and of an over-all width slightly greater than the minimum inside diameter of the threaded pipe coupling whereby a portion of the flange will be secured between threads of the coupling, as stated.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawing forming part of the specification, with the understanding, however, that the invention is not confined to a strict conformity with the showing of the drawing but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawing:

FIG. 1 is a view in side elevation of a dip tube constructed in accordance with the present invention;

FIG. 2 is a longitudinal section taken through the top of a hot water tank and the nipple, water inlet pipe and coupling and showing, also in longitudinal section, the improved dip tube of the present invention secured in position within the nipple;

FIG. 3 is a transverse section taken substantially on the line 3—3 of FIG. 2 illustrating the manner in which a flange of circular peripheral contour is engaged between threads of the pipe coupling;

FIG. 4 is a sectional view corresponding to FIG. 3 and illustrating the use of an annulus or collar having a flange of elliptical peripheral contour;

FIG. 5 is a sectional view corresponding to FIG. 3 and showing the use of an annulus or collar having a flange of polygonal edge form;

FIG. 6 is a sectional view through the upper end of a nipple and threaded coupling attached thereto and illustrating another dip tube construction and method of locking the same to the coupling.

Referring now more particularly to the drawing, the numeral **10** generally designates the top portion of a conventional storage water heater tank having therein an opening **12** and having secured upon the top surface concentric with the opening **12** an internally threaded coupling **14**.

The numeral **16** designates a short nipple which is threaded at one end as indicated at **18** into the coupling and which is connected at its upper end to the water inlet pipe **20** by a conventional internally threaded coupling or fitting **21**.

The dip tube of the present invention, together with the present improved suspension collar or annulus, is generally designated **22**.

The plastic tube body is designated **23** and the annulus or collar which is fitted to the upper end thereof is designated **24**.

The annulus **24** comprises a sleeve portion **25** from one end of which projects the encircling flange **26**. This sleeve body portion is preferably introduced into the upper end of the dip tube **23** and has portions thereof struck outwardly and forced into the material of the dip tube to lock the sleeve in position therein. These outstruck portions are here shown as being in the form of tongues or fingers **26a** and, as stated, they are pressed or made to cut into the material of the tube body **23** with the free ends thereof directed toward the adjacent end of the tube body so that the body **25** of the annulus or collar is securely locked in place.

The flange **26**, which in the form shown in FIGS. 1 to 3 is of circular edge contour, is dimensioned to have an over-all width or diameter slightly greater than the

minimum inside diameter of the coupling **21**. Accordingly it will be seen that when the dip tube is introduced into the nipple **16** and the flange **26** is brought to rest upon the top end of the nipple, when the coupling **21** is threaded onto the nipple the edge of the flange **26** will be threaded into the coupling or will be engaged between the threads **27** of the coupling and thereby securely fastened or locked to the coupling so that no axial movement of the dip tube and the supporting annulus can take place within the nipple. Accordingly it will be apparent that even though the end of the water supply or inlet pipe **20** is spaced from the flange **26** of the dip tube suspending annulus, as shown in FIG. 2, no movement of the dip tube can occur.

FIGS. 4 and 5 illustrate other forms which the flange of the dip tube supporting annulus may have.

In FIG. 4 the dip tube supporting annulus is generally designated **24***a* and the flange is designated **28**. This flange **28** as shown is of elliptical edge contour so that the diametrically opposite portions on the long axis of the ellipse will be engaged between the screw threads of the coupling **21** when the coupling is threaded onto the nipple after the dip tube has been placed in position and the flange **28** is resting upon the top end thereof.

In FIG. 5 the dip tube supporting annulus or collar is generally designated **24***b* and the flange **29** formed integral with the top edge of the body of the annulus has a polygonal contour here shown as square or rectangular, although it may be three sided, if desired. In this form of the flange the greatest width is from corner to corner and this width is, of course, slightly greater than the minimum inside diameter of the coupling **21** so that only the corners of the flange **29** will be engaged between threads of the coupling when the latter is threaded into the nipple.

The annulus or collar **24** and those shown in FIGS. 4 and 5 and designated **24***a* and **24***b*, may be formed of any suitable relatively rigid thin material such as metal, in the form of brass or the like, or a suitable synthetic resin which can be shaped and cut or punched in the same manner as thin metal, as for example, fiber glass or the like.

When the coupling is threaded onto the top end of the nipple it will be seen that by using a thin deformable metal or other material having similar characteristics, the screw threads of the coupling may cut across the edge of the flange of the annulus if it should happen that the threads strike the flange instead of the flange being fed in between the threads. In either event, that is whether the threads of the coupling cut into the edge of the flange of the annulus or whether the flange of the annulus fits in between the threads of the coupling, the desired result will be attained, namely, the locking of the dip tube against axial movement in the nipple.

FIG. 6 illustrates another method of locking the top end of the dip tube to the coupling to hold the dip tube against longitudinal movement in the nipple.

In my application Serial No. 412,417, now Patent No. 2,842,163, allowed November 21, 1957, the means disclosed for suspending the dip tube from the upper end of the nipple embodies the use of a spreading ring or annulus which is considerably larger over-all diameter than the interior of the dip tube and which is forced into the upper end of the tube so as to cause a portion of the wall to bulge outwardly in the form of a rib and this outwardly bulged rib portion rests upon the top end of the nipple.

In FIG. 6 of the present application the numeral **30** designates the upper end of the nipple which is coupled to the water supply pipe **31** by the internally threaded coupling **32**.

The dip tube is generally designated **33** and the upper end portion of the same is here shown located in the upper end of the nipple and extending above the upper end of the nipple and this upper end portion of the dip tube is expanded by an inserted annulus **34** to force a

portion of the dip tube outwardly in the form of a rib **35**.

The corresponding structure of the allowed application above referred to is here modified by employing a spreading annulus, such as that shown and designated **34**, of materially greater over-all diameter so that the rib **35** can be given an outside diameter slightly greater than the minimum inside diameter of the coupling **32**.

The dip tube **33** is, in this form of the invention, an expandable or relatively soft plastic which can be stretched by the insertion of the annulus **34** into the end thereof and by giving to the rib **35** the overall diameter stated, it will be seen that when the coupling **32** is threaded onto the top end of the nipple **30**, the threads of the coupling will cut into the rib **35** and thus hold the dip tube against longitudinal movement.

From the foregoing it will be apparent that there is provided by the present invention a simple, effective means of securely locking or fastening the dip tube supporting annulus in place while it is resting upon the top end of the nipple connected with the top of the hot water tank, thereby preventing any movement of the collar and the dip tube within the nipple.

I claim:

1. A dip tube structure and joint assembly for a water heater having a water inlet pipe nipple having a top end and with external tapered pipe threads on its top end portion and a coupling with tapered internal pipe threads complemental to the external pipe threads on the said nipple, said dip tube structure comprising an elongated flexible tube with an outwardly directed unbroken and uninterrupted flange at its upper end, the said flange having inner and outer faces, the said faces of the flange being substantially parallel and substantially normal to the axis of the tube, the diameter of the flange being slightly greater than the diameter of the crest of the outermost interior screw-thread of the coupling, the diameter of the flange also being slightly less than the root diameter of the threads at the inner end of the coupling, the thickness of the flange being less than one-half the pitch of the threads of the coupling, the flange resting on, and free of rigid connection with, and capable of rotation relative to the top end of the nipple and the tube being suspended in spaced relationship from the inner surface of the nipple, whereby the tube dropped into the nipple with the flange resting on the said top end thereof and with the tube depending in the nipple and spaced from the inner surface of the same, upon tightening the threads of the coupling on the top end portion of the nipple, the dip tube is held against any axial movement relative to the joint by being confined between the threads of the coupling and the top end of the nipple.

2. A dip tube structure and joint assembly for a water heater having a water inlet pipe nipple having a top end and with external tapered pipe threads on its top end portion and a coupling with tapered internal pipe threads complemental to the external pipe threads on the said nipple, with the dip tube suspended in the water inlet pipe nipple by means of a metallic ferrule upon the upper end thereof, said dip tube structure comprising an elongated non-metallic flexible tube, said ferrule being one piece and ring-like and comprising an outwardly directed unbroken and uninterrupted flange and a depending sleeve, the said sleeve of the ferrule being fixed to the upper end of the tube, the said flange having inner and outer faces, the said faces of the flange being substantially parallel and substantially normal to the axis of the tube, the diameter of the flange being slightly greater than the diameter of the crest of the outermost interior screw-thread of the coupling, the diameter of the flange also being slightly less than the root diameter of the threads at the inner end of the coupling, the thickness of the flange being less than one-half the pitch of the threads of the coupling, the flange resting on, and free of rigid connection with, and capable of rotation relative to the

top end of the nipple and the tube being suspended in spaced relationship from the inner surface of the nipple, whereby the tube dropped into the nipple with the flange resting on the said top end thereof and with the tube depending in the nipple and spaced from the inner surface of the same, upon tightening the threads of the coupling on the top end portion of the nipple, the dip tube is held against any axial movement relative to the joint by being confined between the threads of the coupling and the top end of the nipple.

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