Jan. 19, 1960 C. R. McCAULEY 2,921,606

DIP TUBE SUPPORTING MEANS

Filed Feb. 18, 1955

FIG.1.

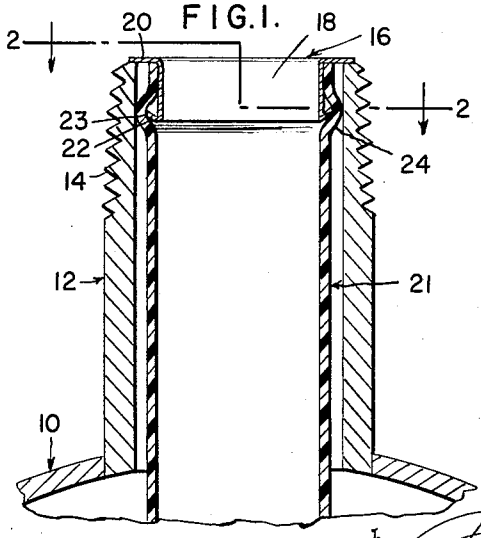


FIG.3.

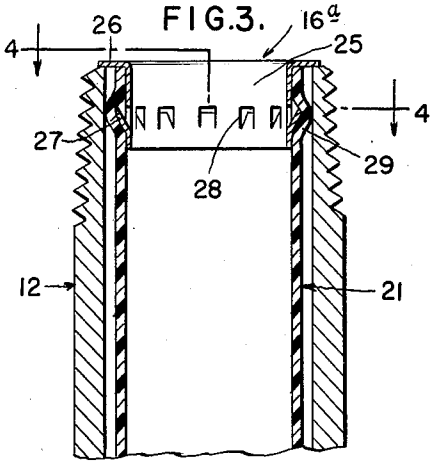
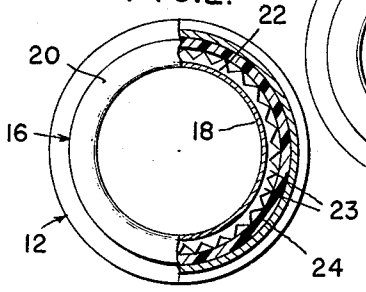


FIG.2.



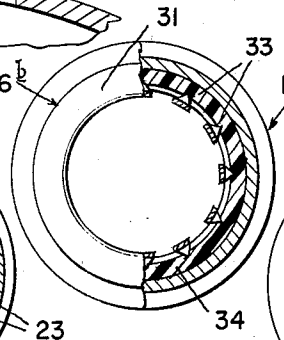


FIG.6.

FIG.4.

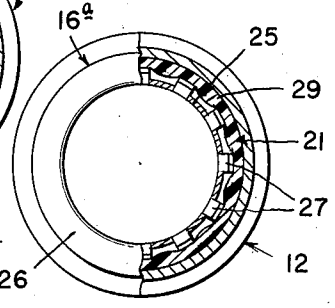


FIG.5.

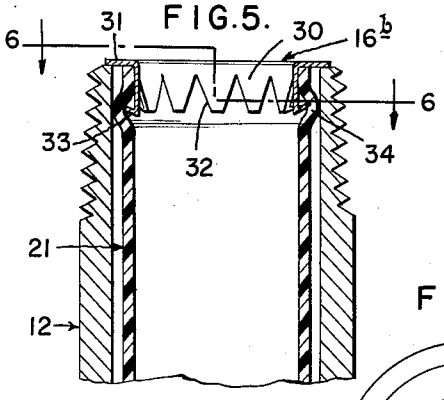


FIG.7.

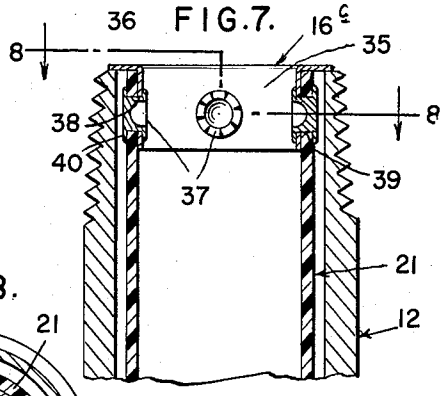
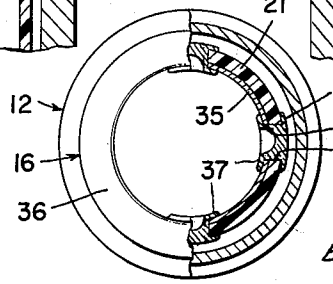


FIG.8.



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DIP TUBE SUPPORTING MEANS

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Application February 18, 1955, Serial No. 489,069

7 Claims. (Cl. 138—47)

This invention relates generally to the class of water heaters and is directed more particularly to storage type water heaters.

Automatic storage water heaters embody in the construction thereof a water inlet tube termed a dip tube. This tube is for the purpose of conducting cold water from the cold water inlet at the top of the 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 of a size or diameter to slide through the water inlet nipple into the tank and they have at the top a flared portion which engages the top of the nipple to hold or suspend the tube in place.

Recently, manufacturers of storage water heaters have started to use dip tubes made of plastic and in order to hold the plastic tube in position, that is, 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 portion of the plastic tube so that such expanded portion may rest upon the top end of the nipple. While the means employed for expanding the top end of the plastic tube and thereby preventing such end from slipping through the tube has been found effective, the expanded portion rests upon and projects from the top end of the nipple and it has been found that this projecting portion of the tube is subject to damage in the shipping of the heater.

In the light of the foregoing, a particular object of the present invention is to provide new and novel means of attaching the top end of the plastic dip tube to the nipple whereby the possibility of damage being done to the tube is avoided.

Another object of the invention is to provide in a manner as hereinafter set forth, new and novel means for coupling the top end of the plastic dip tube with the nipple in such a way as to prevent such end of the tube from extending above the top of the nipple.

Still another object of the invention is to provide in a manner as hereinafter set forth, new and novel means for coupling the top end of the plastic dip tube with the water inlet nipple whereby complete protection is given the end of the tube from mechanical injury during shipping and during the installation of the water heater and, also, a complete seal is effected between the plastic tube and the nipple which prevents cold water bypassing the outside of the tube into the tank.

In previous installations of plastic tubes in the inlet nipple, according to prior known methods, collapsing of the tube has occurred when the tube has been softened as a result of being subjected to excessively high temperatures, either as a result of increase of water temperature or from the use of a heating torch such as is used in effecting the attachment of copper fittings and because of such softening, the tube is permitted to slip through the nipple into the tank. Accordingly, another object of the present invention is to provide new and novel

means, in a manner as hereinafter set forth, for attaching the end of the tube to the nipple in such a manner that softening and collapsing of the tube when subjected to excessively high temperatures, will not occur.

The foregoing and possibly other objects are attained by the provision of a metal grommet of an outside diameter to fit snugly in the top end of the plastic dip tube and which grommet is provided at the top edge with an outturned encircling flange which projects beyond the outside of the plastic tube and rests upon the top of the nipple through which the tube extends. In order to prevent the tube from slipping off of the grommet, the grommet carries suitable means which couples it with the tube. In certain forms of the grommet, prongs or teeth are provided which project outwardly and are embedded in the inner wall surface of the plastic tube and are additionally so formed that the weight of the tube pulling down thereon causes the prongs to become more firmly embedded in the material of the tube so that even though the tube may be softened from excessive heat, it cannot slip off of the grommet but will be securely suspended.

In another form of the invention, the tube and grommet are coupled together by a series of rivets which pass through the wall of the tube and grommet.

In addition to suspending the tube in the tank nipple, the flange portion of the grommet protects the top edge of the tube and forms a seal which prevents cold water bypassing the outer side of the tube into the tank through the nipple.

The invention will be best understood from a consideration of the following detailed 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 that minor changes and modifications may be made so long as the same form 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 vertical section through a portion of the top of a water heater tank and a pipe nipple showing in section one embodiment of the present invention fitted in an end of a dip tube and suspending the latter in the nipple.

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is a view corresponding to Fig. 1 and illustrating a second embodiment of the invention.

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 3.

Fig. 5 is a view corresponding to Fig. 1 and illustrating a third embodiment of the invention.

Fig. 6 is a sectional view taken substantially on the line 6—6 of Fig. 5.

Fig. 7 is a view corresponding to Fig. 1 and illustrating a fourth embodiment of the invention.

Fig. 8 is a sectional view taken substantially on the line 8—8 of Fig. 7.

Referring now more particularly to the drawing, with specific reference to Figs. 1 and 2, the numeral **10** generally designates a portion of the top or head of a tank such as may form a part of a storage water heater while the numeral **12** generally designates the conventional nipple which is welded in the top wall of the tank and which projects upwardly and is suitably screw threaded as indicated at **14** for the attachment of a cold water pipe, not shown.

While the nipple **12** has been illustrated as screw threaded, it is, of course, contemplated to provide a non-threaded nipple where connections are made by sweating

as in the use of copper tubing such as is required in many installations.

In the figures of the drawing above referred to, one embodiment of the present invention is illustrated. This embodiment comprises a tubular thin metal sleeve or grommet which is generally designated **16** and comprises the annular wall portion **18** which carries the integral outturned encircling flange **20**. The outside diameter of the annular portion **18** of the grommet is approximately the same as the inside diameter of the plastic dip tube in which it is designed to fit. Such a dip tube is here illustrated and generally designated **21**, the upper portion only thereof being shown.

The overall diameter of the flange **20** is greater than the inside diameter of the nipple but less than the outside diameter thereof so that when the device is in use, the flange will rest upon the top edge of the nipple but will not project beyond the outer side.

The grommet annular portion **18** is fitted within the plastic tube **21** and in this embodiment the lower edge of the portion **18** has an outturned narrow flange **22** which is turned up slightly and which has the edge notched in a saw-tooth fashion to provide the pointed teeth **23**.

It will be seen that when the annular portion **18** of the grommet is slipped into the top end of the plastic tube, the upturned flange and the teeth forming part thereof will slide in freely but will oppose outward movement as the teeth will press the adjacent or opposing part of the tube outwardly as indicated at **24** and penetrate the tube material.

The annular portion **18** is of a diameter to fit more or less tightly in the tube and the outward projection of the teeth **23** is such that the portions **24** of the tube will not be extended to such a degree as to oppose the insertion of the tube into the nipple but they will be tightly engaged against the inner wall of the nipple.

Since the diameter of the flange **20** is greater than the outside diameter of the tube, it will be seen that it will rest upon the top end of the nipple and the out-pressed portions will center the tube in the nipple so that there will be an equal bearing of the flange on the end of the nipple all around the flange.

Figs. 3 and 4 illustrate a second embodiment of the invention wherein the grommet is generally designated **16*a***. In this and the succeeding figures, the same reference characters are employed for designating the tank top, the nipple and screw threads on the latter.

The embodiment **16*a*** comprises the relatively long annular sleeve portion **25**, the outside diameter of which is approximately equal to the inside diameter of the tube **21** in which it is inserted and this annular portion is also provided with the outturned flange **26** which rests upon the top end of the tank nipple.

In this second embodiment, the annular portion **25** is preferably, though not necessarily, of slightly greater length than the annular part **18** and a plurality of outwardly projecting and upwardly directed teeth **27** are formed by punching out portions of the wall of the annular body, as illustrated. In this illustration, the punch openings **28** are shown as being rectangular with the prongs or teeth **27** joined to the body adjacent the bottom edge thereof but it is to be understood that other forms of the prongs or teeth may be employed if desired. In this embodiment, the prongs have their free upper ends pressed against or embedded in the inner surface of the plastic tube and force portions of the latter outwardly as indicated at **29** for tight engagement against the inner surface of the tank nipple. Thus the plastic tube will be centered in the nipple by these out-pressed or outwardly projecting portions of the tube so that proper engagement of the flange **26** with the top end of the nipple is obtained.

Figs. 5 and 6 illustrate a third embodiment. In this third embodiment, the grommet is generally designated **16*b*** and comprises the annular sleeve portion **30** having at the top edge the outturned surrounding flange **31** to engage upon the top of the tank nipple, as illustrated. In this embodiment, the annular sleeve portion of the grommet is provided with a plurality of deep V-notches **32** cut therein from the bottom edge thereby providing a series of bottom edge points or prongs **33**. These prongs are bent upwardly as illustrated and correspond in their action to the pointed teeth or prongs **23** and to the prongs **27** in that they can slip into the nipple **21** without difficulty as the grommet is inserted but, because of the fact that the points are directed upwardly and outwardly, they will press into the wall of the tube and oppose outward movement of the grommet. Likewise, these prongs or points will press out portions of the tube as indicated at **34**, which outpressed portions will engage tightly against the inner surface of the tank nipple and maintain the tube centered therein.

A further embodiment of the invention is illustrated in Figs. 7 and 8. In this fourth embodiment, the grommet is generally designated **16*c*** and like the preceding forms, it comprises the annular sleeve portion **35** having the outturned flange **36** at its top edge which, like the preceding flanges, is of a diameter greater than the inside diameter of the tank nipple to rest upon the top end of the latter but not sufficiently wide to project beyond the outer side of the nipple. In place of the tube engaging or penetrating prongs illustrated and described in connection with the preceding embodiments, this last mentioned embodiment is secured to the plastic dip tube **21** by means of a number of solid rivets **37**. As will be readily apparent, the wall of the annular portion **35** is provided with suitable apertures at **38** and corresponding apertures **39** are formed in the dip tube to receive the rivets which are illustrated as being of solid form through a portion of their length, and which have the ends turned or flanged as indicated at **40** after being inserted through the aligned openings **37** and **38**. In this manner, the outer surface of the annular portion **35** of the grommet will be firmly secured against the inner surface of the dip tube into which it is extended.

By the use of the inside grommet of the present invention to support the plastic dip tube, four distinct and desirable advantages are had:

First, the grommet holds the tube completely inside the tank nipple to give it complete protection from mechanical injury during shipping and installation of the water heater;

Second, the grommet gives a complete seal between the plastic tube and the nipple so that water will not be bypassed around the outside of the tube into the tank. In other known methods, such by-passing or leakage occurs;

Third, the grommet is inserted into the inside of the tube and holds the tube from collapsing into a closed or restricted position should the tube become softened due to excessive temperature in the water tank. If the grommet were used on the outer side of the plastic tube, this desirable advantage would be lost; and

Fourth, the metal grommets of the present invention are attached to the tube in such a manner that they will not pull out even though the tube should become softened by hot water of the tank or by heat from a torch in soldering a copper water line to an adaptor fitting screwed onto the tank nipple. It is readily obvious, this latter advantage is accomplished in the first three embodiments of the invention by the sharp projections provided on the grommet which tend to dig into the plastic still further as the plastic becomes soft, while in the fourth embodiment, the rivets provide a positive attachment. The fact that the plastic tube and its attachment point are below the conventional tube, which employs a ring type flare, gives added safety against softening and possible charring of the plastic when soldering is done.

I claim:

1. A plastic dip tube and means for suspending the same in an upright pipe nipple, said means comprising a grommet in the form of a thin walled annular sleeve of an outside diameter approximating the inside diameter of and fitted in an end portion of the tube, a right angularly extending flange extending laterally from an end of the sleeve across the adjacent end edge of said portion and beyond the outer side of the tube, and a plurality of tube penetrating elements carried by the sleeve around the outside thereof, said elements being directed outwardly and pressing the penetrated portions of the tube outwardly, the outer surfaces of said out-pressed portions of the tube defining a circular area substantially equaling the inside diameter of the nipple to engage the inner surface of the nipple to center the tube in the nipple.

2. As a new article of manufacture for use in a water heater, a dip tube unit adapted to be suspended in and from the top end of an upright water inlet nipple, said unit consisting only of a tube body of an elastic material adapted for insertion into the water inlet nipple of a water heater and a thin walled annular grommet sleeve inserted in one end only of the tube and having a right angled outwardly directed terminal flange portion projecting across the adjacent end of the tube and beyond the outer side of the tube, and means carried by and projecting laterally from the grommet sleeve and forming the sole fastening between the same and the tube to prevent separation of the grommet sleeve from the tube, the flange being adapted to rest freely on and support the tube from the said top end of said nipple.

3. The invention according to claim 2, wherein said means comprises an annular series of finger-like elements projecting obliquely outwardly from the grommet sleeve and directed toward the flange and having their ends embedded in the material of the tube body and said material of the tube body being pressed outwardly by said ends of said projecting finger-like elements beyond the over-all diameter of the tube above and below the said elements.

4. The invention according to claim 3, wherein said finger-like elements consist of integral portions of the material of the said grommet sleeve.

5. The invention according to claim 2, wherein said means comprises an annular series of finger-like elements projecting obliquely outwardly from the grommet sleeve and directed toward the flange, said elements comprising pointed prongs formed in an outwardly turned portion of the end of the sleeve remote from the flange and having their ends pressed against the material of the tube body and causing the material of the tube body to be pressed outwardly beyond the over-all diameter of the tube above and below the said elements and the said pointed ends of the elements being adapted to enter into the material of the tube body to prevent the latter from slipping off of the sleeve.

6. The invention according to claim 2, wherein said means comprises an annular series of finger-like elements projecting obliquely outwardly from the grommet sleeve and directed toward the flange, the said grommet sleeve having a plurality of V-slots therein and extending from the end thereof remote from the flange toward the flanged end and the said finger-like elements constituting out-turned pointed terminal portions of the sleeve material between the V-slots and adapted to have the points thereof embedded in the tube material and the said material of the tube body being pressed outwardly by the said pointed ends of the projecting finger-like elements beyond the over-all diameter of the tube above and below said elements and the pointed finger-like elements being adapted to enter the material of the tube body to prevent the tube body from slipping off of the sleeve.

7. The invention according to claim 2, wherein said means comprises an annular series of finger-like elements consisting of integral portions of the sleeve located between the flange and the remote end of the sleeve and projecting obliquely outwardly from the wall of the sleeve and directed toward the flange and having their ends pressed against the material of the tube body to become embedded therein upon movement of the tube body on the sleeve in a direction away from the flange and said material of the tube body being pressed outwardly by the said ends of the projecting finger-like elements beyond the over-all diameter of the tube above and below the said elements.

References Cited in the file of this patent

UNITED STATES PATENTS

921,079	Burtscher	May 11, 1909
1,548,986	Donovan	Aug. 11, 1925
1,746,132	Stokes	Feb. 4, 1930
2,477,436	Bannister	July 26, 1949
2,648,549	Woodward	Aug. 11, 1953
2,764,427	Andrus	Sept. 25, 1956
2,842,163	Boylan	July 8, 1958

FOREIGN PATENTS

739,434	France	of 1932