Feb. 28, 1967 M. J. CAPARONE 3,306,109

INSULATOR INSERT FOR THERMAL SENSING DEVICE

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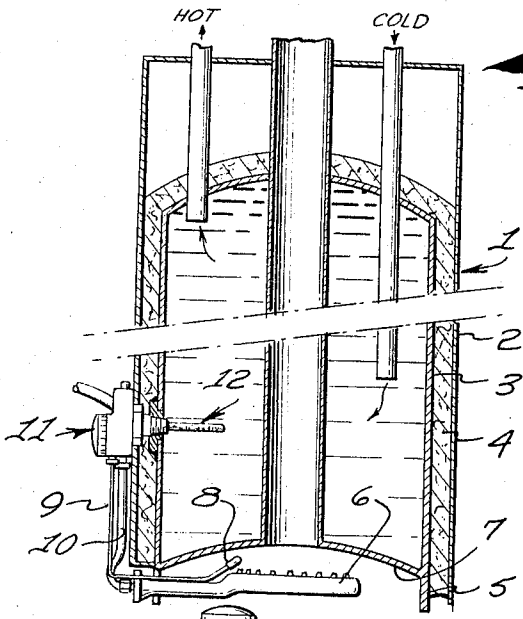


Fig. 1.

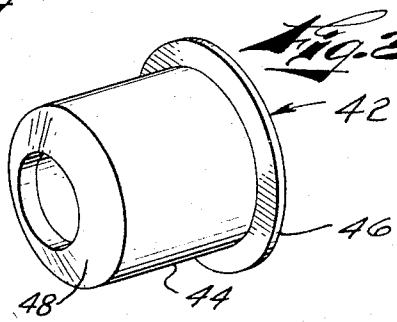


Fig. 2.

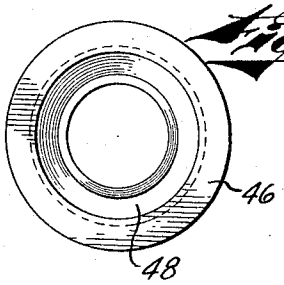


Fig. 3.

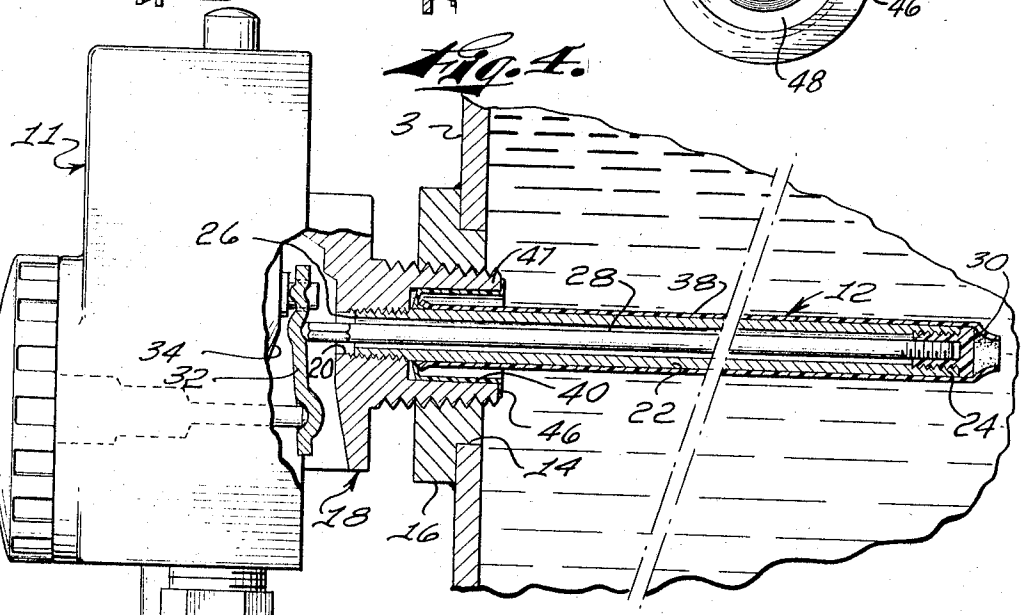


Fig. 4.

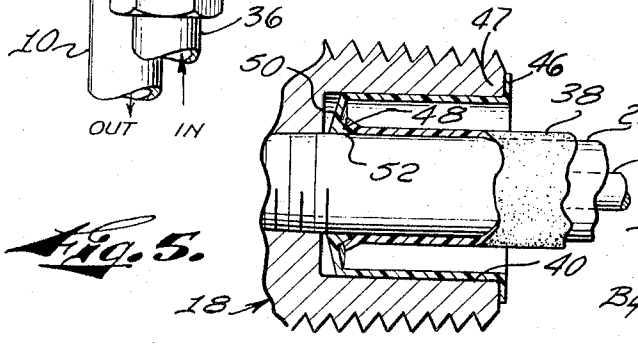


Fig. 5.

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Fig. 6.

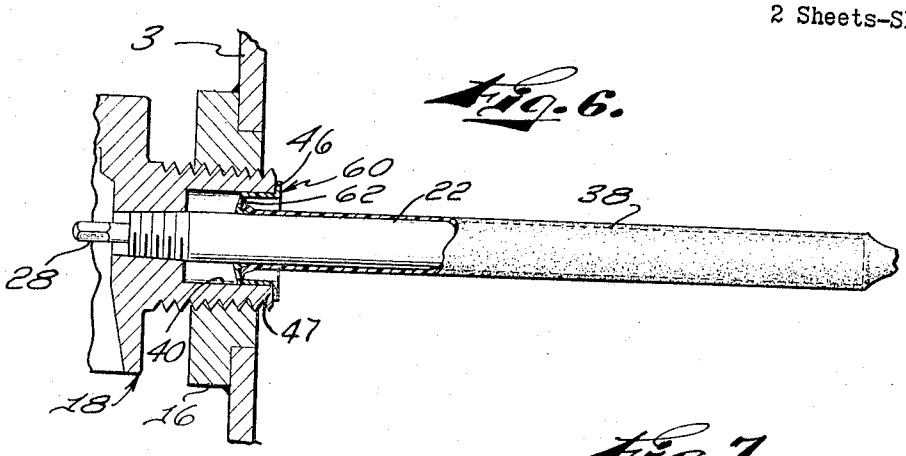


Fig. 7.

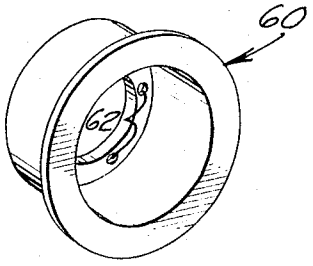


Fig. 9.

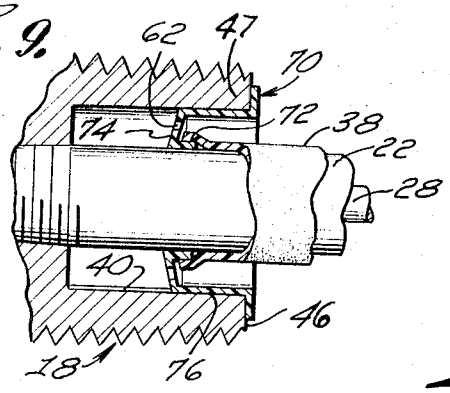


Fig. 8.

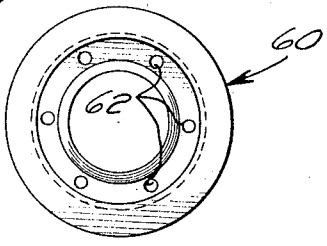


Fig. 10.

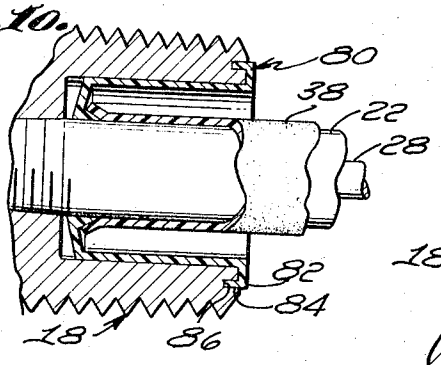


Fig. 12.

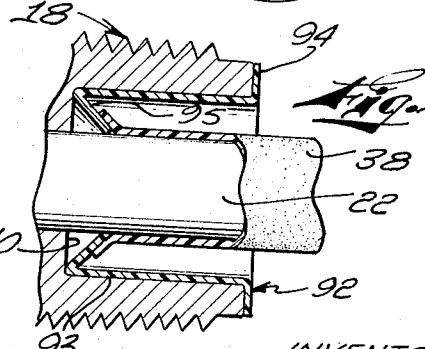
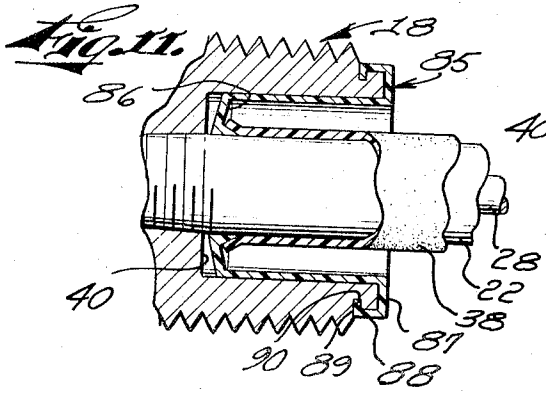


Fig. 11.



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United States Patent Office 3,306,109 Patented Feb. 28, 1967

3,306,109

INSULATOR INSERT FOR THERMAL SENSING DEVICE

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Filed July 11, 1963, Ser. No. 294,350
6 Claims. (Cl. 73—362.3)

This invention relates to hot water heater controls and more particularly to an insulator insert used on a hot water heater thermostat.

One of the major problems facing manufacturers of hot water heaters resides in corrosion. In recent years, manufacturers have substantially prolonged the life of hot water heaters by lining the tanks of the heaters with glass and other similar ceramic materials. This lining has greatly diminished corrosion in tanks; however, it has aggravated the problem of galvanic corrosion which results from the use of dissimilar metals in the presence of an electrolyte. A material such as copper, brass or bronze, for example, causes less noble metals to sacrifice themselves to the copper, brass, or bronze materials through the medium of the electrolyte, which in the case of a hot water heater, is in the water in the tank. In combatting galvanic corrosion, attempts have been made to protect components exposed to the water against such corrosion. It is conventional practice to place an anode of a less noble metal within the tank, which will sacrifice itself in preference to the tank components. It has also been proposed to insulate components subjected to galvanic action with suitable insulating materials.

Hot water heater controls generally use a shank assembly made from brass or bronze that causes ferrous boiler or tank components to be subjected to galvanic corrosion. It will be appreciated that in lining a tank with a glass or ceramic material, there will always remain minute discontinuities of bare metal surface so that with the new tank lining practices, the amount of copper, brass, or bronze surface exposed to the water in the tank greatly exceeds the amount of ferrous metal. Since copper, brass, or bronze is a more noble metal in the electromotive series, a less noble ferrous metal sacrifices itelf to the more noble metal through the medium of the electrolyte. This type of corrosion has been sufficiently sever to cause failure to the tanks of this nature within one to three years of service.

Two approaches have been utilized to prevent tank failure due to galvanic action. One common device used today is a magnesium anode in the water tank, which anode is less noble than that of the iron tank and will sacrifice itself to a more noble material such as copper or brass in preference to the iron because of its higher position in the electromotive series. Another approach is to provide a plastic coating or sleeve to isolate the more noble metals, such as copper, brass or bronze, which are found quite often in the controls used for hot water heaters, from contact with the water within the heater. One difficulty involved in the use of plastic coatings resides in their insulating properties, which causes a heat transfer lag which can upset the thermostat differential. These coatings have been difficult to apply to a shank portion of a hot water heater control because of the difficulty of assembling the temperature sensor or rod and tube section to the shank while preserving the coating. Furthermore, difficulty has been encountered in coating the cavity of the shank while leaving the exterior thereof free of the coating such that threads may be formed thereon.

Accordingly, an object of this invention is to provide an insulator insert for hot water heater controls which will reduce tank corrosion and prolong tank life.

Another object of this invention is to provide an insulator insert for hot water heater controls which does not reduce the amount of sensitivity of the rod and tube. One feature of this invention is to provide an insert which will be readily retained upon the shank assembly of the hot water heater control by existing components currently used in a great majority of the controls.

Another feature of the present invention is an insulator with such configuration that the great majority of the shank is covered and insulated from causing galvanic action.

Another object of the present invention is to increase the resistance to galvanic action within a hot water heater tank to prolong life of a sacrificial anode and thereby lengthen the useful life of the tank.

The above problems have been overcome by the use of the present invention which in its broadest aspect is an insulator insert for use on a hot water heater thermostat shank assembly with a cylindrical cavity formed in the shank and a rod and tube assembly mounted within the cavity. The insert includes a body portion which extends across the shank cavity for shielding the shank from galvanic action and a device for interlocking the insert with a plastic tube encased on the rod is used for the mechanical interlock.

Other features and advantages not specifically enumerated above will be apparent after considering the following detailed description and the appended claims. The preferred form which the invention may assume is illustrated in the accompanying drawings in which:

FIGURE 1 is a vertical cross-section of a conventional hot water heater having a thermostat in its lower portion utilizing the present invention;

FIGURE 2 is an enlarged perspective view of a detail shown in FIG. 4;

FIGURE 3 is an end view of FIG. 2;

FIGURE 4 is a partial vertical cross-section of a hot water control extending into a conventional hot water heater and having a shank assembly with the present invention mounted thereon;

FIGURE 5 is an enlarged fragmentary vertical cross-sectional view of the present invention as illustrated in FIGURE 4;

FIGURE 6 is a fragmentary vertical cross-sectional view of another embodiment of the present invention mounted on a conventional shank assembly of a hot water thermostat;

FIGURE 7 is an enlarged perspective view of a detail shown in FIG. 6;

FIGURE 8 is an end elevation of the embodiment of the present invention illustrated in FIGURE 7;

FIGURE 9 is a fragmentary sectional view showing another embodiment of the present invention;

FIGURE 10 is a fragmentary vertical cross-sectional view of another embodiment of the present invention mounted upon a conventional shank assembly of a hot water heater thermostat;

FIGURE 11 is a fragmentary vertical cross-sectional view of another embodiment of the present invention mounted upon a conventional shank assembly of a hot water heater thermostat; and

FIGURE 12 is a fragmentary sectional view of another embodiment of the present invention mounted on a conventional shank assembly of a hot water heater thermostat.

Before explaining the present invention in detail, it should be understood that the invention is not limited in this application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being carried out in various ways.

Also it is to be understood that the phraseology or

terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, there is shown in FIGURE 1 a hot water heater **1** which utilizes the present invention. This hot water heater **1** comprises an outer casing **2** and an inner cylindrical wall **3**. Insulation **4** is inserted between the casing **2** and the inner wall **3**. This structure is mounted upon a base **5** which has a gas burner **6** mounted therein under the lower portion of the lower wall **7**. Any other suitable combustible or electrical source of heat may be utilized. In the present embodiment, the gas burner **6** is of a conventional type in which the gas supply induces primary air to a venturi. Air and gas pass into a plenum from which a mixture is emitted through suitable openings in the burner **6**, mixed with secondary air and then burned. Adjacent the openings in the burner is a pilot light burner **8**. Both the pilot burner **8** and the gas burner **6** are operatively associated with a control **11** by means of gas lines **9** and **10**. The control **11** has included therein a protuberance which is a thermostatic sensing element **12** commonly known in the industry as a rod and tube.

Referring now to FIGURE 4, an opening **14** in the wall of the tank **3** is provided with nut **16** secured thereto by any suitable means such as brazing or welding. An assembly shank **18** has one end threaded into the nut **16** while its opposite end projects inside the tank and a central bore **20** in the shank **18** establishes communication between the control **11** and sensing element **12**. A hollow tube **22** fabricated from a highly expansible metal such as copper, has a closed end **24** projecting into the water tank while its opposite threaded end **26** projects into the threaded central bore **20** for rigid attachment to the shank **18**. A relatively non-expansible rod **28**, such as Invar, is suspended within the hollow tube **22** and extends through the shank central bore **20**. One end of the rod is attached to the plug **30** which is threaded within the extremity of the tube **22**. The rod **28** has a longer longitudinal dimension than the tube **22** so that its exposed end abuts a lever **32** which can transpose movement of the rod to a clicker disc **34** mechanism, generally known in the art, and a valve (not shown) for controlling the flow of gas from the line **10** to the conduit **36** which passes through the control **11**. The innards of the control itself are not a part of the present invention and any well known hot water heater control may be used, such as that illustrated in the patent to Caparone et al. 2,707,078. It is understood that the mechanism within the control means actuated by the rod controls the transfer of gas to a burner for the water tank.

In operation, the rod **28** is free to move longitudinally as the tube **22** expands and contracts with temperature variations. The expansion and the contraction of the tube **22** transmitted by rod **28** under conditions of satisfaction and demand for heat in the water in which the device is mounted causes longitudinal movement of the rod **28**. It applies pressure on the lever **32** to actuate a control means (not shown). As the demand for heat is satisfied, the tube **22** expands with the increased temperature of the water within the tank, allowing the free end of the rod **28** to move and release pressure on the lever **32** to thereby terminate flow of gas through the control **11**.

It is quite conventional to place a plastic sleeve **38** upon the tube **22** for gas controls used in hot water heater applications. This sleeve **38** acts as an insulator to the galvanic action on the tube **22** and generally extends along the entire length of the tube **22** extending into the interior cavity **40** of the shank **18**.

Referring now to FIGURES 2–5, there is illustrated one embodiment of the present invention which is an insert **42** comprising a body portion **44**, a lip **46** projecting therefrom, and a means for interlocking the insert **42** with the plastic sleeve **38** on the temperature sensing element **12**.

A means for interlocking the insert **42** with the plastic sleeve may take the form of a return flange **48** formed on the bottom **50** of the insert **42**. The passageway **52** through the bottom **50** of the insert **42** is of a size just a little larger than the diameter of the tube **22**. The tapered return flange **48** forces the plastic sleeve **38** to ride up the flange and interlock the insert **42** with the plastic tube without an additional fastening device. While the particular return flange **48** has a tapered portion thereon, it is within the present invention to use a return flange which has a portion parallel to the length of the tube which would serve to interlock the plastic sleeve with the insert and still perform the same function.

The shank **18** is quite often constructed in many sizes and shapes and the body portion **44** of the insert **42** may extend the entire depth of the cavity **40** as shown in FIGURES 4 and 5, or conversely it may extend only a short distance within the cavity if this is desirable. The lip **46** covers the land **47** on the shank **18** and this lip helps limit the insertion of the insert within the shank cavity.

In assembly, the insert **42** is inserted within the shank cavity **40** until the lip **46** abuts the shank land **47**. Thereafter the plastic sleeve **38** is subjected to air pressure to increase its diameter and is forced over the tube **22** until the edge of the sleeve **38** contacts the tapered return flange **48** of the insert **42**. Upon release of the air pressure, sleeve **38** will contract to intimately engage the tube **22** and the forward portion of the sleeve **38** will engage the tapered return flange **48** to rigidly retain the insert **42** in the shank cavity **40**. In this manner, the insert **42** cannot be removed unless the plastic sleeve **38** on the tube **22** is also removed.

Referring now to FIGURES 6–8, the length of the insert **60** may be adjusted to any desired size in relation to the depth of the cavity **40** within the shank **18**. In this embodiment, there is a plurality of perforations **62** in the bottom of the insert **60**, which allow the water within the hot water tank **3** to pass therein and subject the entire length of the rod **22** to the changes in temperature of the water. In cases where the depth of the shank cavity **40** is three or four inches deep, it is advantageous to have the entire length of the rod in contact with the water, thereby rendering the entire length of the rod and tube temperature sensor effective. The size of the orifices is kept to a minimum which keeps the current density also to a minimum.

Another embodiment of the present invention is illustrated in FIGURE 9 wherein the insert **70** has basically the same configuration as shown in FIGURES 2–8. A return flange **72** is formed at the bottom **74** of the cup-shaped body portion **76** and extends substantially parallel to the tube **22**. Plastic sleeve **38** is expanded as it is slid over the tube **22** and extends over the return flange **72** to interlock the insert **70** upon the shank **18**.

Another embodiment of the present invention is illustrated in FIGURE 10, wherein the insert **80** is quite similar in configuration to that illustrated in FIGURES 2–5 with the exception of the lip **82**. In this embodiment, the lip **82** has a skirt **84** formed thereon which extends within a groove **86** formed in the shank **18**. This arrangement provides a definite position for the insert **80** and protects the lip **82** of the insert from being pried away from the shank **18**.

Still another embodiment is illustrated in FIGURE 11, wherein the insert **85** fits within the cavity **40** of the shank **18**. The insert bottom **86** merely contacts the tube **22** without having a tapered return flange portion as shown on FIGURES 9 and 10. The plastic sleeve **38** on the tube **22** extends within the shank cavity **40** and abuts the bottom portion of the insert for locking purposes. The lip **87** at the top portion of the insert **85** has a return flange **88** and a locking rim **89** engaging an annular groove **90** formed within the shank **18**. This lip **87** and locking rim **89** interlock the insert **85** to the shank **18** and prevent accidental removal. The plastic material used to fabricate the insert may be polypropylene

which is flexible enough to allow the rim **89** to snap within the groove **90** without cracking or deforming the insert **85**.

Another embodiment is illustrated in FIGURE 12 wherein the general configuration of the insert **92** is quite similar to the inserts illustrated in FIGURES 2–6 and 9. The body **93** and lip **94** are quite similar to the insert illustrated in FIGURE 6 with the exception that the inclined portion **95** extends from the tube **22** directly to the body portion **93** and somewhat simplifies the construction of the insert. A plastic sleeve **38** rides up the inclined portion **93** during assembly and locks the insert **92** within the shank cavity **40**.

While a substantial number of means for locking the insert with the plastic sleeve used on the thermostat have been illustrated, it is understood that the invention is not limited to these particular embodiments since only these preferred embodiments have been illustrated and others may be devised and that the invention is not limited by these embodiments thereto, since it may be otherwise embodied within the scope of the following claims.

I claim:

1. In combination, a thermostat and a mounting assembly for a water heater having a mounting aperture,

said mounting assembly comprising a metallic shank adapted to be rigidly fastened to the water heater, a center bore opening into a cylindrical cavity at one end of said shank,

said thermostat being formed of metal dissimilar to said metallic shank and comprising a rod disposed within a hollow tube and spaced from the inner wall thereof,

said hollow tube having a closed end adapted to project into the water heater and an open end secured within said center bore,

an insulating sleeve covering said tube between said cavity and said closed end of the tube,

the improvement comprising an insert having a tubular body with lip means at one end and flange means at the opposite end,

said lip means abutting the shank surface adjacent to said cavity to position said body within said cavity, and

said flange means being engaged by said insulating sleeve to retain said insert within said cavity.

2. The invention as defined in claim **1** wherein one end of said insulating sleeve has tapered means thereon for facilitating the engagement of said flange means and said sleeve.

3. The invention as defined in claim **1** wherein said flange means includes an annulus shaped member, the interior diameter of the annulus being slightly greater than the diameter of said hollow tube and the exterior diameter of the annulus being slightly smaller than the diameter of the cylindrical cavity in said shank.

4. The invention as defined in claim **3** wherein said flange means further includes a tapered segment extending along said tube for a short distance toward the open end of said cavity, said tapered segment facilitating the engagement of said flange means and said sleeve.

5. The invention as defined in claim **1** wherein an annular groove is formed in the shank end surface adjacent to said cavity, and said lip means includes a skirt which is seated within the groove.

6. The combination as defined in claim **1** wherein the cavity in said shank has a depth dimension greater than the length of the tubular body of the insert, said insulating sleeve terminating at a point within said cavity and spaced from said central bore, and a plurality of apertures extend through said flange means to allow the portion of the rod between the end of the insulating sleeve and the central bore to be subjected to the temperature of the water within the tank.

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LARAMIE E. ASKIN, *Primary Examiner.*