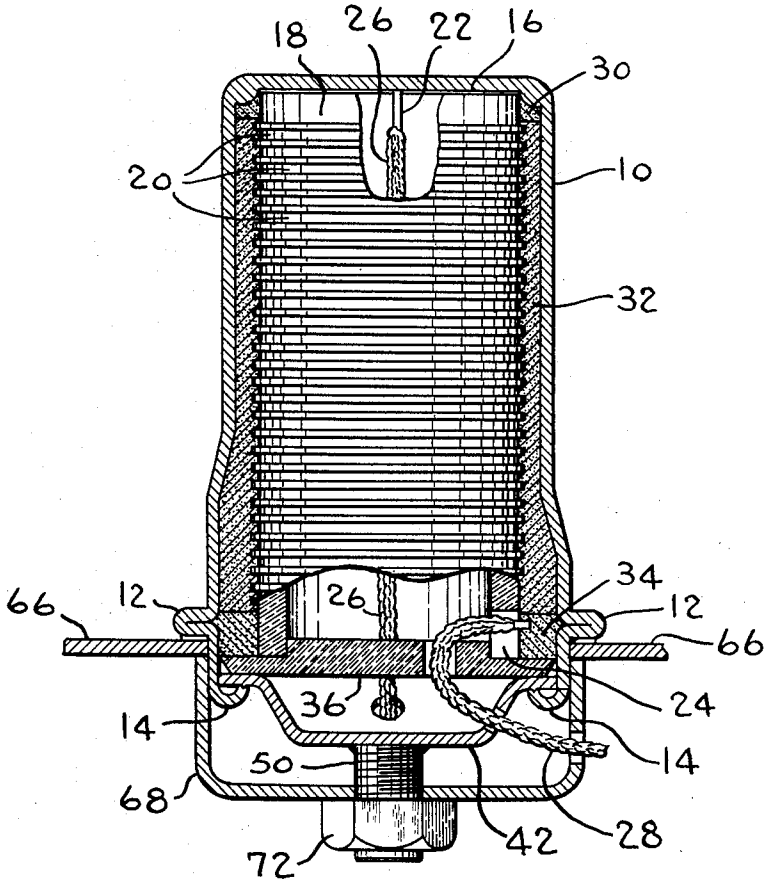
Oct. 6, 1959 T. L. GELLER 2,907,860

IMMERSION HEATERS

Filed Nov. 8, 1957



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United States Patent Office 2,907,860 Patented Oct. 6, 1959

2,907,860

IMMERSION HEATERS

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Application November 8, 1957, Serial No. 695,264

6 Claims. (Cl. 219—41)

This invention relates to improvements in immersion heaters.

A heater of this type is described in U.S. Patent No. 2,719,212, issued September 27, 1955, for Percolator Heater. In the heater of this patent the ceramic core with its heating element and the magnesium oxide in powder form between the element and the housing are held in place by a high temperature cement containing sodium silicate. This cement is hygroscopic in nature and consequently in humid conditions absorbs sufficient moisture to allow electrical current leakage in excess of a safe value above which there is shock hazard.

The object of this invention therefore is to eliminate such leakage and prevent such shock hazard.

This object is attained by using a non-hygroscopic cement which avoids tendency to absorb moisture and the possibility of electrical shock under normal humidity.

In the accompanying drawing there is illustrated in vertical cross-section a percolator heater embodying the present invention.

The percolator heater is mounted in a hole in the bottom **66** of a container or percolator. A flange **12** on a metal housing **10** is pressed toward such bottom by a nut **72** threaded on a mounting stud **50** and pressing a shell **68** against the lower side of such bottom.

Interiorly of the housing **10** the top is recessed to form a seat or shoulder **16** which engages the upper end of a ceramic tube **18** to center said tube spaced from the side wall of the housing. This tube carries a spirally wound resistance ribbon forming a heating element **20**. The tube **18** has an upper notch **22** and a lower notch **24** permitting the passage to the interior of such tube of insulated braided copper lead wires **26** and **28** connected to the ends of the heating element **20**.

After the tube **18** is inserted in the housing **10**, while inverted and centered as described, a ring **30** of non-hygroscopic high temperature cement is placed in the tube to more securely hold the upper end of the tube in proper position. The space between the wall of the housing and the outer surface of the tube is then filled with magnesium oxide **32** in powder form. The magnesium oxide transfers heat from the element **20** to the housing with minimum loss. The magnesium oxide is held in place and the lower end of the tube **18** is more securely held by a ring **34** of non-hygroscopic high temperature cement forced down on the oxide between the tube and the housing. A rigid ceramic washer **36** is then fitted within the open end of the housing and may be pressed in place before the cement is set. A metal cover **42**, to which the stud **50** is attached, is then seated on the ceramic washer and the end of the cover is crimped inwardly and upwardly against such cover.

The non-hygroscopic cement in the rings **30** and **34** will not absorb moisture during humid conditions and thus the tendency of current leakage and the possibility of electrical shock is eliminated. One of the materials tested for this purpose was 11X208 Sicon cement manufactured by Midland Industrial Finishes. Heaters made with this material were tested and a leakage current to ground of approximately 6 microamps was measured after a 48 hour test at 85% relative humidity and 85° F. ambient temperature. This value compares with a leakage to ground of greater than 200 milliamperes occurring in heaters not using the non-hygroscopic cement.

It is not necessary that the cement be used in rings at each end of the magnesium oxide **32**. Any binder for magnesium oxide which (*a*) will withstand the temperature involved, (*b*) is non-hygroscopic, (*c*) has good dielectric properties, and (*d*) will make the magnesium oxide rigid enough to anchor the core and element in the housing would be satisfactory.

The ceramic tube **18** with the heating element **20** may be coated with the non-hygroscopic cement before the tube is inserted in the housing **10** and thus protect the windings from undue current leakage.

I claim:

1. In a heater for a coffee percolator or the like, a metal housing, a heating element in said housing, and a non-hygroscopic electrical insulating heat conducting material between said housing and said heating element.

2. In a heater for a coffee percolator or the like, a metal housing, a heating element in said housing, a ring of non-hygroscopic high temperature cement between said housing and said heating element adjacent one end thereof, a filling of magnesium oxide in powder form between said housing and said element, and a ring of non-hygroscopic high temperature cement between said housing and heating element adjacent the other end thereof confining said filling.

3. In a heater for a coffee percolator or the like, a metal casing having an imperforate top, a side wall and an open bottom, a ceramic tube having a heating element mounted on the exterior thereof, said tube being mounted in said housing and spaced from said side wall, a filling of non-hygroscopic electrical insulating heat conducting material tightly packed in the space between said tube and said side wall, and a closure member held in said open bottom.

4. In a heater for a coffee percolator or the like, a metal casing having an imperforate top, a side wall and an open bottom, a ceramic tube having a heating element mounted on the exterior thereof, said tube being mounted in said housing and spaced from said side wall, a ring of non-hygroscopic high temperature cement between said side wall and the top margin of said tube, a filling of magnesium oxide in powder form between said side wall and said tube below said ring, a second ring of non-hygroscopic high temperature cement between said side wall and the bottom margin of said tube to hold said filling in place and support the lower end of said tube, and a closure member mounted in said open bottom.

5. In a heater for a coffee percolator or the like, a metal housing, a heating element in said housing, and a non-hygroscopic electrical insulating heat conducting material coating over said heating element.

6. In a heater for a coffee percolator or the like, a metal casing having an imperforate top, a side wall and an open bottom, a ceramic tube having a heating element mounted on the exterior thereof, said tube being mounted in said housing and spaced from said side wall, a ring of non-hygroscopic high temperature cement between said side wall and the top margin of said tube, a second ring of non-hygroscopic high temperature cement between said side wall and the bottom margin of said tube to support the lower end of said tube, and a closure member mounted in said open bottom.

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