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GB 1562610
GB 1540432
GB 1494611
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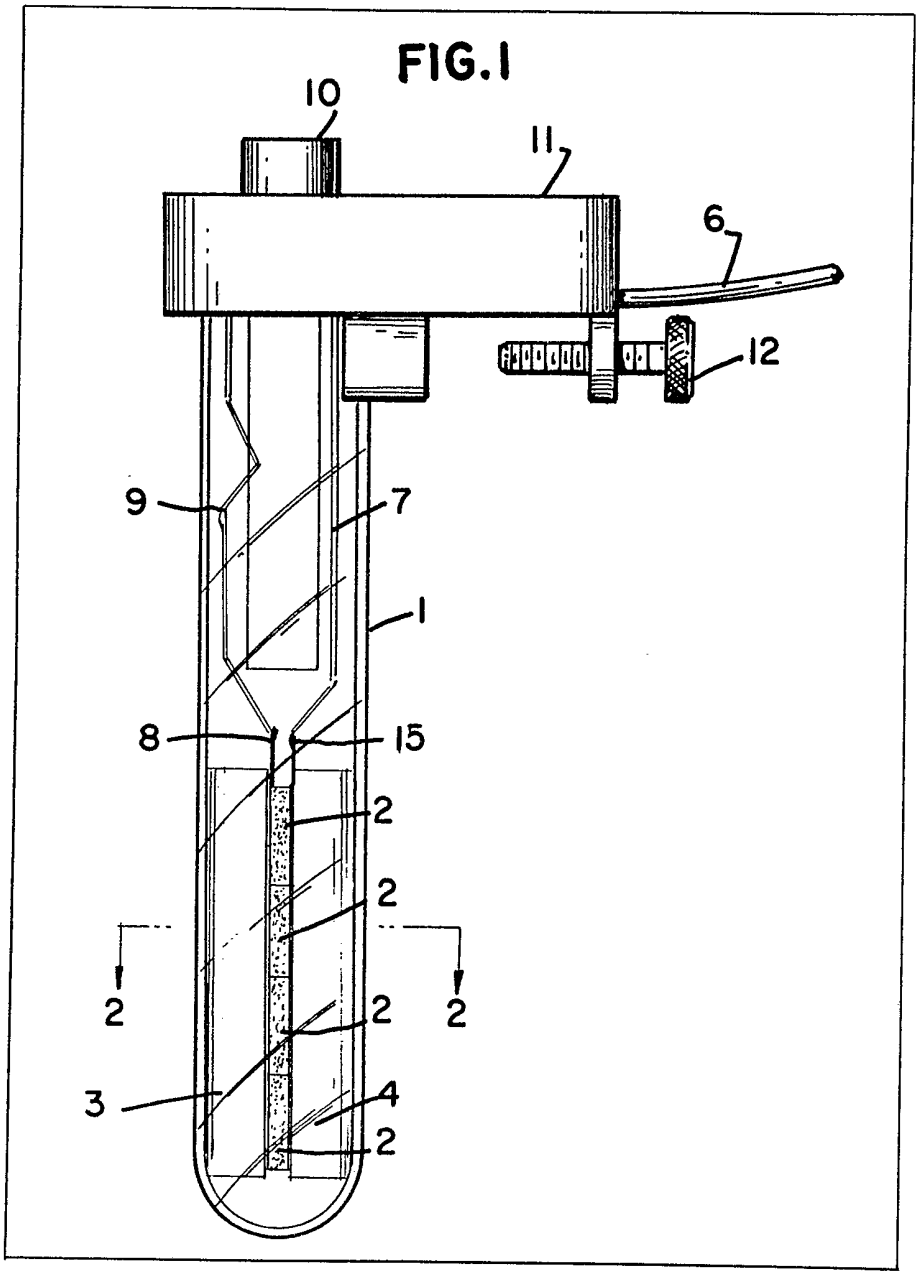
(54) **PTC energized immersible heater**

(57) An immersible heater comprises two elongated heat conductors (3, 4) disposed in a heater envelope (1). Each heat conductor has a flat portion and a semi-circular portion. A plurality of PTC heater discs (2) are disposed between the flat portions of the heat conductors. The semi-circular portions of the heat conductors (3, 4) press against the walls of the heater envelope (1). Thermostatic control under normal conditions is achieved by thermostatic switch (9); the PTC heater discs are designed to reach their high resistance level should the heater be accidentally operated in air.

FIG.1



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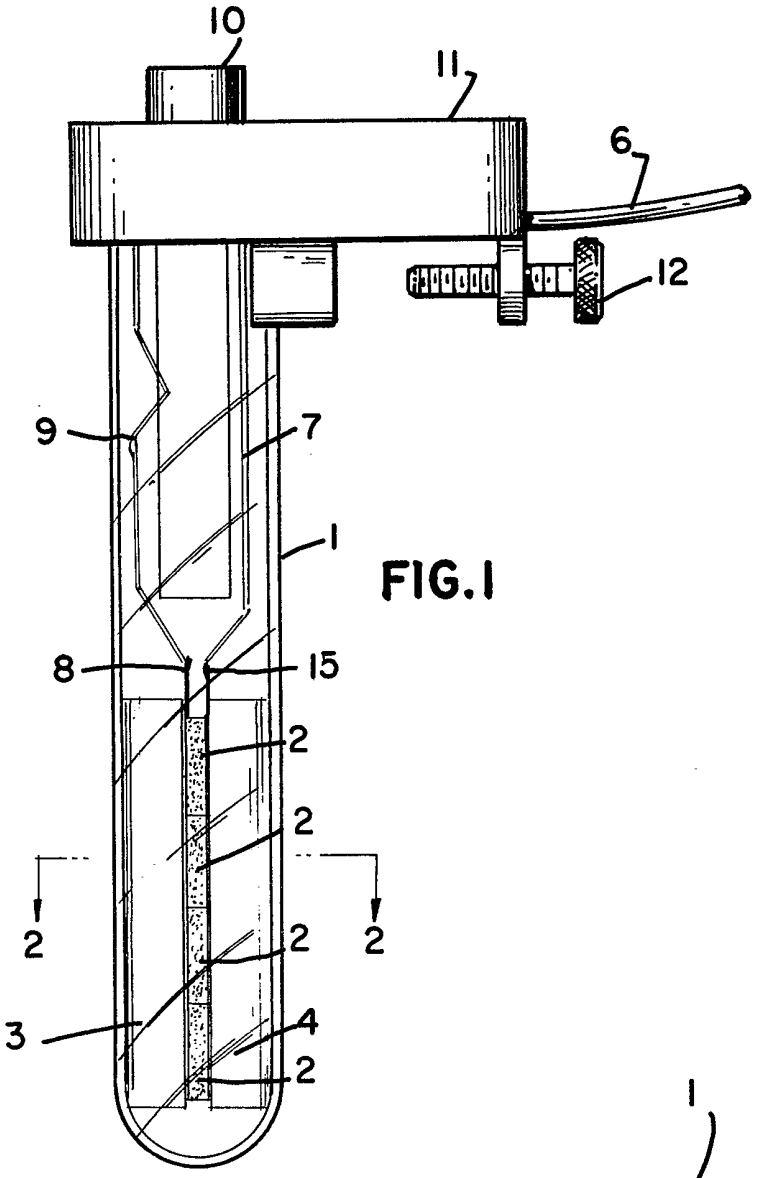

FIG.1

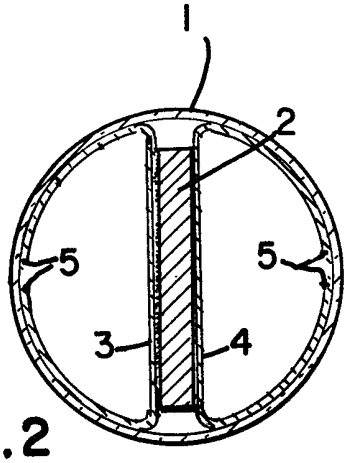

FIG.2

SPECIFICATION

PTC energized immersible heater

This invention is concerned with immersible heaters such as are used in aquariums. The conventional immersible heater consists of a heater envelope containing resistance wire wrapped around a ceramic insulator. The heater is in series with a thermostatic switch which shuts off power to the heater when the water is heated to a predetermined temperature, and turns power back on when the water temperature drops below a predetermined temperature.

One of the problems with such heaters occurs when the water incidentally leaks out of the aquarium and the heater operates in air. Under some such conditions it is possible that the thermostat will not shut off power and that current will flow through the heater continuously. This results in an excessively high temperature on the outside of the heating envelope, say, above about 240°C in the case of a 100 watt heater, and such a high temperature could present a fire hazard if, say, readily flammable paper happened to be disposed proximate the heater envelope. It is the purpose of this invention to prevent such a fire hazard if the heater is accidentally operated in air.

The present invention provides an immersible heater comprising: a tubular heater envelope; two elongated heat conductors having flat portions and semi-circular portions disposed in the heater envelope, the semi-circular portions being in efficient heat transfer relationship with said envelope; a plurality of PTC heater discs in abutting relationship to each other disposed between the flat portions of the heat conductors and being in efficient heat transfer relationship with said heat conductors; and electrical circuit means for providing electrical power to said PTC heater discs, the heat conductors being part of the electrical circuit of said electrical circuit means.

The invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is an elevation of one embodiment of an immersible heater in accordance with this invention, and

Fig. 2 is a section on the line 2—2 of Fig. 1.

Referring to the drawings, the heater comprises a tubular glass envelope 1 containing four 25 watt PTC square discs 2 mounted in parallel and abutting each other edgewise. The flat surfaces of discs 2 are electroded and are in physical contact with flat surfaces of elongated heat conductors 3 or 4, preferably by being bonded thereto with an electrically conductive cement, such as silver-filled epoxy. Heat conductors 3 and 4 are somewhat semi-circular, in shape, are made of a resilient metal, and are arranged to be a tight fit when they are inserted into envelope 1, with discs 2 bonded to the flat surfaces of conductors 3 and 4. Conductors 3 and 4 are slightly oversize in relation to envelope. This results in good surface contact of the curved surfaces of conductors 3 and 4 to the walls of envelope 1, providing for good heat transfer therebetween.

An electrical terminal 15 is attached to conductor 4 and is connected to one side of power line 6 through lead-in wire 7. An electrical terminal 8 is attached to conductor 3 and is connected to thermostatic switch 9 which is connected to the other side of power line 6. When switch 9 is closed, power is applied to disc heaters 2. Knob 10 is used to adjust switch 9 to a desired operating temperature, the mechanism for which is contained in plastic housing 11. Housing 11 is the supporting structure for envelope 1 and can be mounted on an aquarium by means of mounting thumb screw 12.

Under normal operation, envelope 1 is disposed in the water of an aquarium and heat is transferred from discs 2, through conductors 3 and 4, to the walls of envelope 1 and then to the water. When the water is heated to a predetermined temperature, switch 9 is activated and terminates current flow to discs 2. When the water cools sufficiently, switch 9 closes and restarts the heating cycle. Heater transfer from discs 2 to the water is good enough to prevent discs 2 from being heated to their high resistance level.

If the heater is accidentally operated in air, as could occur if the water leaked out of the aquarium, the thermostatic switch 9 does not become heated to its activating temperature and there is continuous current flow through discs 2. In such a case heat transfer from discs 2 to the air surrounding envelope 1 is less effective and discs 2 become heated to their high resistance level with the result that the current flow through discs 2 decreases considerably. The steady state operation under such conditions results in a lower heater envelope temperature than in the case of the prior art resistance wire heater, about 180° versus about 240°C.

CLAIMS

1. An immersible heater comprising: a tubular heater envelope; two elongated heat conductors having flat portions and semi-circular portions disposed in the heater envelope, the semi-circular portions being in efficient heat transfer relationship with said envelope; a plurality of PTC heater discs in abutting relationship to each other disposed between the flat portions of the heat conductors and being in efficient heat transfer relationship with said heat conductors; and electrical circuit means for providing electrical power to said PTC heater discs, the heat conductors being part of the electrical circuit of said electrical circuit means.

2. A heater as claimed in Claim 1, wherein the PTC heater discs are conductively bonded to the heat conductors.

3. A heater as claimed in Claim 1 or 2, wherein the heat conductors are made of metal.

4. A heater as claimed in any one of Claims 1—3, wherein the heater envelope is made of glass.

5. A heater as claimed in Claim 4, wherein the semi-circular portions of the heat conductors

press against the glass walls of the heater envelope.

6. An immersible heater substantially as described herein with reference to the accompanying drawings.

7. The features as herein described, or their equivalents, in any novel selection.

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