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Willard et al.

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[54] ELECTRIC TEST TUBE HEATER

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[52] **U.S. Cl.**.....**219/521,** 23/253 PC, 219/342, 219/385, 219/415, 219/433, 219/535

[51] **Int. Cl.**.....**H05b 3/00**

[58] **Field of Search**.....219/520, 521, 432, 219/433, 385, 386, 535, 339, 342, 354, 415; 23/253 PC

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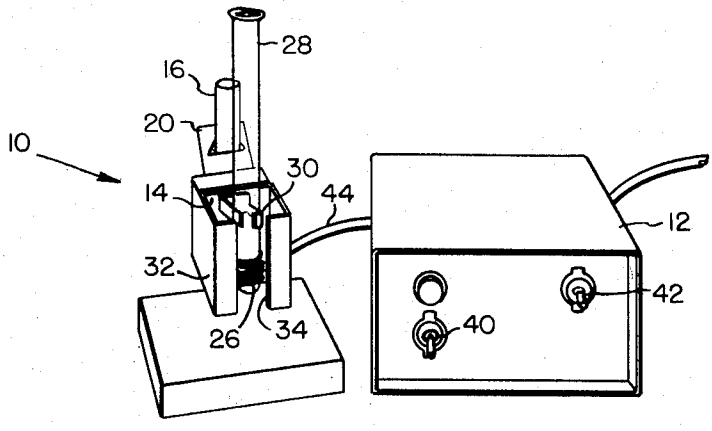
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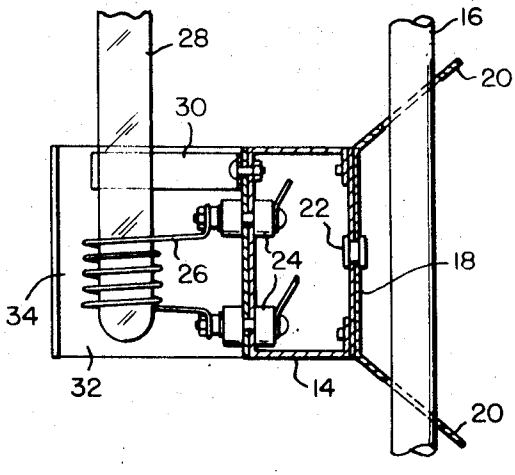
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[57] **ABSTRACT**

An electric test tube heater has a self-supporting, free-standing electric resistance heating coil of low mass attached to and electrically insulated from a support member adjustably mounted for vertical movement on an upright stand. The coil is wound about a vertical axis and has an internal diameter larger than the outside diameter of the test tube to be heated. A clamp is also fixed to the support member and is axially aligned with the coil for holding the test tube so as to locate the lower portion thereof within the coil. A channel-shaped reflective heat shield open at the top and bottom to allow insertion of the test tube into the heater and having a vertical slot at the front to permit visual inspection of the test tube during the heating process is fixed to the support member and surrounds the coil. The support member is pivotally attached to the stand whereby the heating coil, clamp, test tube being heated and shield are all tiltable as a unit relative to the stand.

3 Claims, 4 Drawing Figures





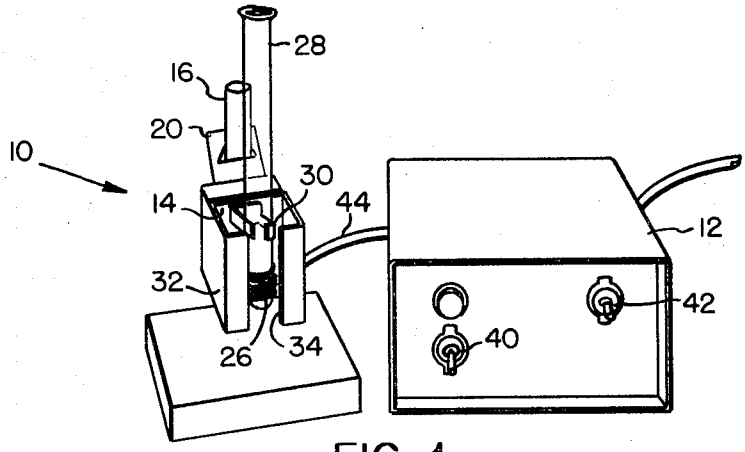


FIG. 1

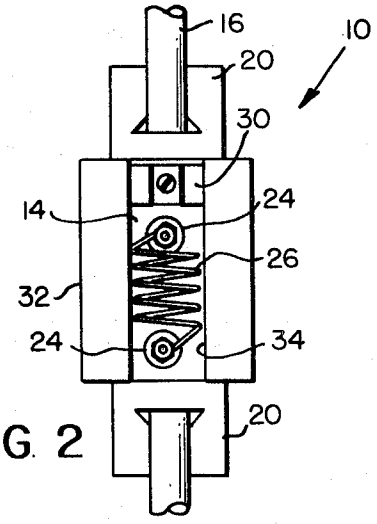


FIG. 2

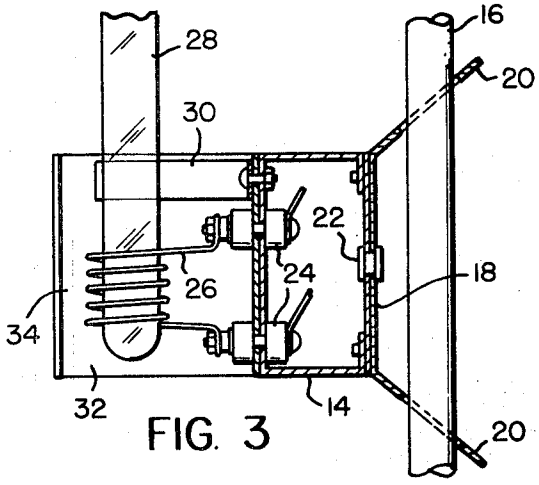


FIG. 3

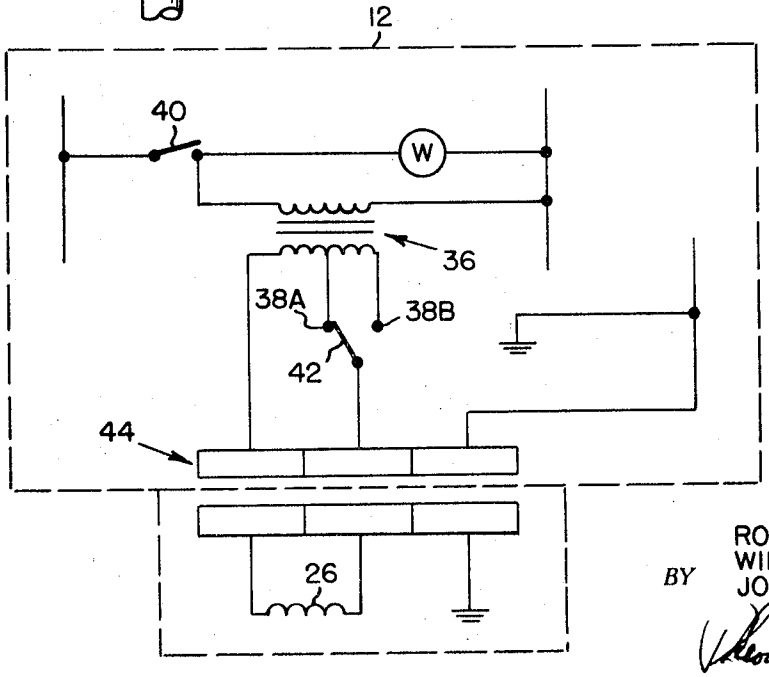


FIG. 4

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ELECTRIC TEST TUBE HEATER

BACKGROUND OF THE INVENTION

The present invention relates to test tube heaters and more specifically to an electric test tube heater. Electric test tube heaters, which are to some extent safer than the conventional flame heaters, are known in the art. Such electrical heaters usually consist of a resistance wire wound in a close coil about a refractory member which forms the upright core of the heater; or such a coil is laid in the concentric grooves on the face of a refractory member, which forms the base of the heater. The refractory member and its coil are located in a housing which is shaped or which contains means to focus the radiant heat generated by the coil on the test tube. Another heater incorporates the heating coil into a refractory member which is formed as a cup, parabolic in shape, to focus heat onto the test tube held in the refractory cup.

One drawback of such heaters is that the relatively large mass of the refractory member results in a slow heat-up time. Another drawback is the low efficiency resulting from attempting to focus the radiant heat generated by the coil on to the test tube.

In the present invention these drawbacks are overcome by utilizing a self-supporting heating element of low mass. The coils of the heating element are arranged so that the test tube to be heated can be lowered into the center of the coil. The result is both rapid heat-up and more efficient transfer of heat to the test tube.

SUMMARY OF THE INVENTION

The present invention may be characterized in one aspect thereof, by the provision of a self-supporting electric resistance heating coil of low mass attached to and electrically insulated from a support stand, the coil being wound about a vertical axis with the internal diameter of the coil being larger than the outside diameter of the test tube to be heated; and clamp means fixed to the support and axially aligned with the coil for holding a test tube upright with the lower portion of the test tube extending into the coil.

OBJECTS OF THE PRESENT INVENTION

One object of the present invention is to provide an electric test tube heater which has a relatively short heat-up time and which is safe and efficient in operation.

Another object of the present invention is to provide an electric test tube heater having a low mass, self-supporting coil which can be operated from a stepdown transformer.

A further object of the present invention is to provide an electrical test tube heater which utilizes a self-supporting heating coil of low mass, the coil being wound about a vertical axis and of sufficient size to permit the insertion of the test tube into the coil.

These and other objects, advantages and characterizing features of the present invention will become more apparent upon consideration of the following detailed description thereof, when taken in connection with the accompanying drawings depicting the same.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the electrical test tube heater of the present invention and its control means;

FIG. 2 is a front elevation view on a larger scale of a portion of the heater;

FIG. 3 is a side elevation view of the heater, partly broken away in showing a test tube in position; and

FIG. 4 is an electrical schematic of the heater and its control means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, FIG. 1 shows the heater of the present invention generally designated at **10.** A control means for the heater, more specifically described herein below, including a power supply is located within a chassis **12.** The heater includes a support member **14** which may be attached by any suitable means to a stand **16** similar to a conventional laboratory stand. For example, as shown in FIGS. **2** and **3,** support member **14** is attached to a well known spring clamp means **18,** having projections **20** which frictionally engage stand **16** to hold the support member at any vertically adjusted position on the stand. Preferably, support member **14** is attached to the spring clamp by a pivot arrangement **22** (FIG. 3) so that the support member can be tilted clockwise and counter-clockwise from the normal vertical position shown in FIG. **2.**

Attached to the support and electrically insulated therefrom by insulators **24** is a heating element **26.** The heating element is self-supporting and in the form of a free-standing coil wound about a vertical axis. The heating coil may be made from any of the commonly available alloys for this purpose. It should be appreciated that the internal diameter of the coil should be larger enough to accommodate the test tube **28,** which is to be heated. Since there is no intimately associated refractory support for the heater into which heat can flow, the mass of the heater consists almost solely of the mass of the heating coil. This means that the coil heats very quickly to a relatively high temperature where radiant heat is effective in transferring heat from the coil to the test tube.

Also attached to support member **14** is a clamp **30,** for holding the test tube. Preferably the clamp is disposed above and in axial alignment with the heating coil, so that the clamp may hold the test tube with the lower portion of the test tube located in the center of the heating element. With this arrangement, the test tube is in a position to intercept directly a large portion of the radiation from the heating element.

Also fixed to support member **14** is a heat shield and reflector **32.** The shield is preferably formed as a channel, open at the top and bottom, for purposes of allowing the test tube to be inserted into the heating element. Except for a vertical opening **34** at the front, the shield otherwise substantially embraces the heating element. With this arrangement radiant heat from the coil is deflected back towards the test tube and accidental contact with the coil is prevented. The shield then not only acts to increase efficiency of the heater, but also offers some degree of protection against the user burning himself by directly contacting the heating coil. The vertical slot **34** at the front of the shield permits a visual inspection of the test tube and its contents during the heating process.

FIG. **4** shows the schematic of a simple power supply and control for the test tube heater. The chassis **12** of the power supply (indicated by the dash line) contains a transformer **36** which has two taps **38** A and **38** B in

the secondary for converting normal 120 V. AC line voltage to approximately 6 or 12 V. respectively in the secondary of the transformer. A first switch **40** on the chassis is an on/off switch for supplying power to the primary of the transformer. A second switch **42** on the chassis is for selecting between the low and high taps **38**A and B respectively of the secondary. Any suitable connection such as a plug-in cord generally indicated at **44** then connects the output terminals of the chassis to the input terminals of the heating coils. By this arrangement the operator may select between applying approximately 6 or approximately 12 V. to the heating coil depending upon the amount of heat which is desired.

Furthermore, operating the heating element from 6 or 12 V. significantly reduces the shock hazard from the heating element.

Thus it will be appreciated that the present invention accomplishes its intended objects in providing a simple, efficient and safe electrical test tube heater. The heater is relatively simply constructed and the free-standing heating element of low mass has a relatively fast heat-up time. For example, the heater of the present invention is able to bring water in a conventional size test tube to boil in less than one minute. Making the heating element free standing with coils of sufficient diameter to accommodate test tubes permits insertion of the lower portion of the test tube into the coil, and allows the test tube to directly intercept radiant heat from the coil. Since the test tube is located in the center of the heating element, the tube receives an equal amount of heat from all sides so that it is not necessary to turn the tube as with a conventional flame heater. For this reason the tube can be clamped in position instead of being hand held, which reduces the possibility of burns. Placing a heat reflecting shield around the coil adds to the efficiency and safety of the heat transfer. Attaching both the heating coil and clamp to the same support member **12** and allowing this member to pivot on stand **14** allows quick adjustment of the test tube, clamp and heater to any desired inclined position even while the test tube is being heated.

Having thus described the invention in detail, what is claimed as new is:

1. An electric heater for test tubes and the like comprising:

a. vertically adjustable means;

b. a support member pivotally attached to said means;

c. a free standing, self supporting electric resistance heating coil attached to and electrically insulated from said support member, said coil being wound about a vertical axis and having an internal diameter larger than the outside diameter of the test tube being heated;

d. clamp means attached to said support member in axial alignment with said heating coil for holding a test tube extending into said coil, said clamp, the test tube therein, said heating coil and support member all being tiltable as a unit about said pivot and vertically adjustable means; and

e. means for connecting said coil to an electric power supply.

2. An electric heater as set forth in claim **1** including a heat shield and reflector attached to said support member and spaced about said heating coil, said heat shield and reflector being open at the top thereof to permit insertion of a test tube into said coil.

3. An electric heater as set forth in claim **1** wherein said heat shield is formed with a vertical slot at the front thereof for observing a test tube inserted into said coil.

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