Oct. 27, 1925. 1,559,381

A. R. SWOBODA

VACUUM BULB DEVICE

Filed Sept. 20, 1921

Fig. 1.

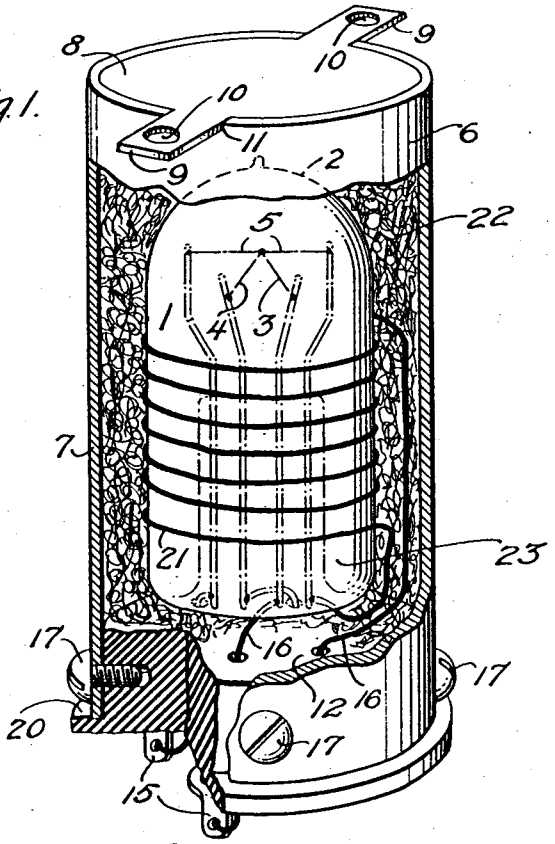
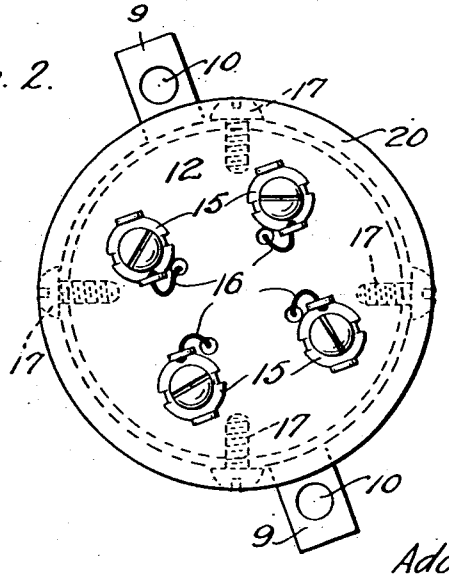


Fig. 2.



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Patented Oct. 27, 1925. 1,559,381

UNITED STATES PATENT OFFICE.

ADOLPH RUDOLPH SWOBODA, OF NEWARK, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VACUUM-BULB DEVICE.

Application filed September 20, 1921. Serial No. 502,003.

To all whom it may concern:

Be it known that I, ADOLPH RUDOLPH SWOBODA, a citizen of the United States of America, residing at Newark, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Vacuum-Bulb Devices, of which the following is a full, clear, concise, and exact description.

The invention relates to vacuum bulb devices, and especially, to vacuum thermo-couple devices.

The object of the invention is to protect vacuum bulbs from extraneous influences in the nature of either mechanical shocks or thermal effects or both, and at the same time to provide for readily replacing the bulbs in means which provides such protection, and for readily connecting the bulbs in electric circuits.

Another object is to provide, for a vacuum thermo-couple bulb, a heater circuit having a definite predetermined resistance.

A further object is to provide a compact arrangement of the thermo-couple having such heater circuit and the protective means for the thermo-couple.

A still further object is to provide means for readily mounting the bulbs and their protective means upon suitable supporting means.

To accomplish these objects, the thermo-couple bulb is surrounded with heat insulating and shock absorbing material, such as cotton batting or the like. The bulb and the protective covering are preferably enclosed in a cylindrical metal casing, open at one end, and a plug of insulating material is provided for closing this end of this cylinder and for carrying electrical terminals for the vacuum bulb. The plug is detachably fastened in the casing by screws or the like in such a manner that it may readily be withdrawn from the casing for renewal of the vacuum bulb. Preferably, resistance wire is wound about the bulb and connected in the heater circuit to adjust the resistance of this circuit to the desired value, and the metal casing is provided with perforated ear or lugs, at the end opposite the plug of insulating material, for receiving screws or the like to attach the thermo-couple device to suitable supporting means.

In the accompanying drawings, Fig. 1 is a perspective view, partly in section, of one embodiment of the invention and Fig. 2 is a bottom plan view of the device shown in Fig. 1.

Referring to these figures, a vacuum thermo-couple bulb of a type well known in the art is shown at 1. This bulb comprises an evacuated envelope 2, preferably of glass, which contains the thermo-couple element proper consisting of two wires 3 and 4 of dissimilar materials, and which also contains the heater element 5 adapted to be heated by the passage therethrough of an electric current, as for instance, an alternating current to be measured or a known fraction of the current to be measured. When the bulb is in use the heater member heats the thermo-junction, which is attached to the middle point of the heater element, and the electromotive force generated by the thermo-couple is applied to a sensitive galvanometer (not shown) connected to the terminals of the thermo-couple, the galvanometer thus indicating the temperature reached by the heater element and therefore the current passing through the heater element.

Since this invention is not concerned with the specific form of the thermo-couple bulb and the general operation of such devices is well understood by those skilled in the art, such operation of the thermo-couple bulb and the specific form of the bulb are not further considered herein. A similar thermo-couple bulb is disclosed in Haddock Patent 1,426,861, August 22, 1922.

A cylindrical metallic casing 6, comprising a tubular portion 7 and an end plate 8 is provided for inclosing the bulb 1. This plate 8 is rigidly attached to the tubular portion 7 is in any suitable way, as by soldering or welding. The plate 8 has two lugs 9 with

holes 10 therein, the lugs fitting in notches 11 in the end of the tubular portion 7 and being designed to receive screws or other fastening means (not shown) for securing the casing 6 to a base or support (not shown) of any suitable type. The end of the casing 6 remote from plate 8 is open, and a plug 12 of insulating material is provided for closing this opening. Heat insulating and shock absorbing material 22, such as cotton batting or the like, completely envelops the bulb 1 and spaces it from the casing 6 and the plug 12. The stem end 23 of the envelope 2 as well as the remainder of the envelope is supported by the material 22, thereby differentiating from prior arrangements wherein the stem end of the envelope was rigidly held in sealing wax or the like. Due to its heat insulating properties, this material 22 protects the thermo-couple against appreciable error due to ordinary sources of external heat. Due to the shock absorbing properties of this material, the bulb is protected against fracture. Terminal clips 15, for the attachment of leads, are carried by the plug 12. The leading-in wires of the bulb 1 are connected to these clips through conductors 16 which are preferably insulated wires passing through holes in plug 12 as indicated in the drawing. The plug 12 is detachably fastened in the casing 6 by screws 17. By simply removing the screws the plug 12 and bulb 1 may be withdrawn from the casing 6 so that the bulb may be readily replaced by another bulb in case a change of bulbs is desirable or necessary. The leads 16 are preferably short, so that the vacuum tube will be removed from the casing with the plug when the latter is removed. The plug 12 may be provided with a flange 20, for abutting against the end of the cylindrical casing and thereby assisting the screws 17 in limiting movement of the plug inwardly of the casing. The casing 6 is preferably of brass and is preferably nickel plated and highly polished on the outside so that it will, as far as possible, reflect incident heat rays. The polished nickel casing as well as the heat insulating material 22 acts to shield the thermo-couple from any radiation from, for instance, an incandescent lamp or a soldering iron or the like which may happen to be near the thermo-couple. Such radiation would tend to raise the temperature of both the cold junction and the hot junction of the couple; but the temperature of the cold junction is usually that of the surrounding air because of heat conduction through the leading-in wires of the bulb and, therefore, the ultimate effect of the lamp or soldering iron or the like would be to raise the temperature of the hot junction more than that of the cold junction. By the use of the heat insulating material 22 such deleterious effects from extraneous heat sources are minimized.

It is frequently desirable to have the total resistance of the heater circuit between the heater circuit terminals on the plug 12 adjusted to a definite predetermined value higher than the value of the resistance of the heater element. For instance, in measuring the current output from a vacuum tube oscillator, or from an output coil of a vacuum tube repeater, the current flow will depend upon the impedance of the output circuit, and it may therefore be desirable to have the value of such impedance higher than it would be convenient to make the impedance of the heater element of the vacuum thermo-couple; and although an auxiliary resistance external to the vacuum thermo-couple and its mounting might be employed to bring the total resistance of the heater circuit up to the required value, it is preferable to connect the desired auxiliary resistance in series in the heater circuit between the heater circuit terminals on the plug 12. To attain this end a series resistance 21 adjusted to bring the heater resistance to the desired value is preferably wound upon the glass bulb, as shown, and connected between one of the conductors 16 and one of the leading-in wires for the heater element 5. This arrangement of the resistance wire makes for a very compact device. The resistance 21 is preferably of insulated wire having high resistivity, as for instance, "Advance" wire. If it is desired to have the resistance element readily separable from the bulb for the purpose, for instance, of enabling the bulb to be readily renewed or replaced without using a new auxiliary resistance or rewinding the resistance wire 21, then this resistance wire instead of being wound directly on the bulb may be wound on a cylinder, say of paper, which may be snugly slideable on to and off the bulb.

What is claimed is:

1. In combination, an evacuated glass vessel having electro-responsive means therein, a cup-shaped metal casing enclosing said vessel, an insulating closure for the open end of said casing, shock absorbing material interposed between said vessel and casing, said material being the sole means of supporting said vessel from said casing and closure terminals carried by said closure, and leading-in wires connecting said terminals and electro-responsive means.

2. A vacuum thermocouple tube having a heater element therein, a metal casing for enclosing said tube, a series resistance for said heater element, said resistance being coiled within said casing, and shock absorbing material spacing said tube and resistance from said casing.

3. A vacuum tube having a conductor therein, said tube having two electrical terminals, and a resistance connected in series with said conductor between said terminals, said resistance being coiled about said tube.

4. A vacuum thermo-couple tube having a heater element therein, a casing for enclosing said tube, and a series resistance for said heater element, said resistance being coiled about said tube within said casing.

In witness whereof, I hereunto subscribe my name this 15th day of September A. D., 1921.

ADOLPH R. SWOBODA.