July 24, 1956 R. C. WUERTH 2,756,382

SYSTEM AND DEVICE FOR PROLONGING THE LIFE OF CURRENT ENERGIZED FILAMENTARY ELEMENTS

Filed June 30, 1953

FIG. 1.

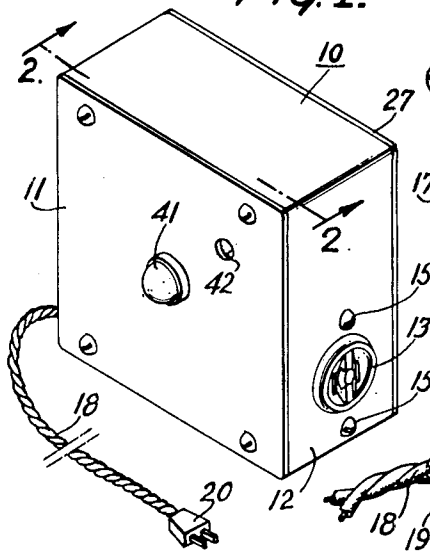


FIG. 2.

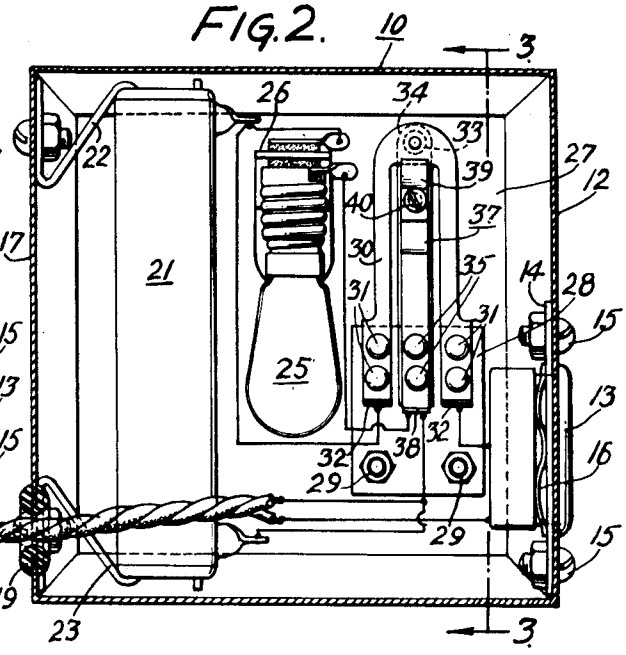


FIG. 3.

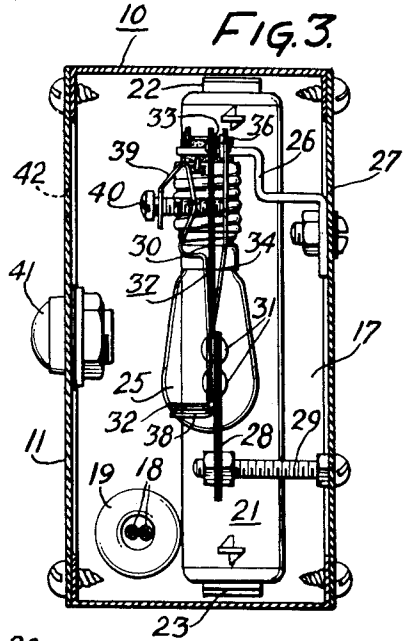


FIG. 4.

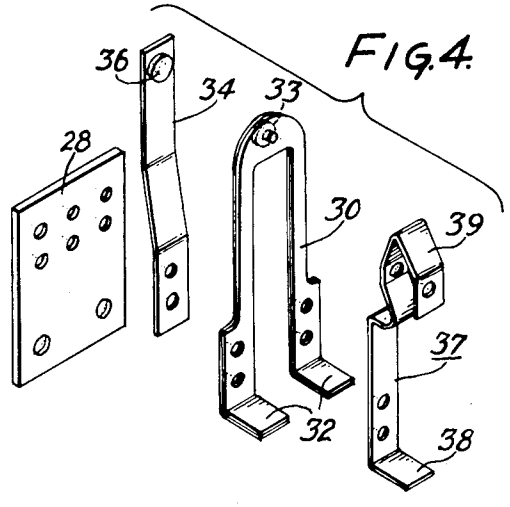
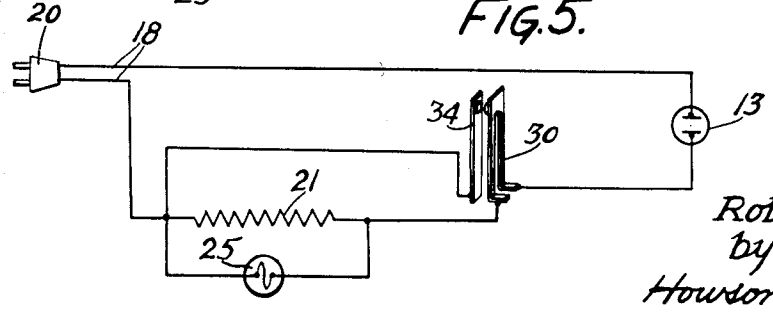


FIG. 5.



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SYSTEM AND DEVICE FOR PROLONGING THE LIFE OF CURRENT ENERGIZED FILAMENTARY ELEMENTS

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2 Claims. (Cl. 323—68)

This invention relates to systems and devices for prolonging the life of devices such as electron tubes having current-receiving elements which when cold are subjected to severe shock by initial full energization. More particularly, the invention relates to systems and devices for effecting initially reduced energization of such elements to lessen or substantially eliminate the shock.

Experience has shown that the life of an electron tube is greatly shortened by premature burn-out of the filamentary element, employed either as the cathode or as the cathode heater, due to repeated severe shock caused by application of full energizing current to the element when it is cold. This is particularly serious in view of the present day extensive use of electron tubes in various fields. The television field alone uses a very great number of electron tubes, and since television receivers are now in wide use in homes and have largely supplanted radio receivers, the burn-out of tubes in television receivers directly affects almost everybody and is a source of annoyance and expense. Most failures of television receivers are due to tube burn-outs, and therefore prolongation of the life of television receiver tubes will greatly reduce the inconvenience and expense incident to tube burn-outs. While the present invention is not limited to television, it is particularly useful in respect thereto.

The principal object of this invention is to provide a simple and inexpensive system for overcoming the above-mentioned objection.

Another object of the invention is to provide a simple device which may be manufactured and sold at low cost, and which requires only the insertion of a plug into a power outlet to put the device into operation.

A further object of the invention is to provide a device which is easily adjustable to vary the time interval of reduced energization of the supplied apparatus.

Other objects and features of the invention will be apparent from the following detailed description.

In the accompanying drawing,

Fig. 1 is a perspective view of a device embodying the invention;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is an exploded perspective view of the elements comprising the thermostatic time delay arrangement employed in the device; and

Fig. 5 is a diagrammatic illustration of the electrical system.

Referring more particularly to the drawing, in the preferred form of the invention, there is provided a relatively small compact unit comprises a casing or housing **10**, having a removable cover **11**, within which the elements of the device are contained. Wall **12** of the casing is apertured to accommodate a conventional outlet receptacle **13** which is held in place by means of a plate **14** secured to wall **12** by bolts **15**, and an associated spring-retainer ring **16**. The opposite wall **17** of the casing is

also apertured to accommodate a conducting cord **18** extending through a grommet **19** provided in the wall aperture. At the outer end of the conductor cord **18** is a conventional power receptacle plug **20**.

Within the casing **10** are connections which provide a supply circuit extending to the receptacle **13**, which circuit is shown in Fig. 5 and will be described later. A resistor **21** is mounted within the casing **10**, as by means of spring clips **22** and **23** engaging the ends of the resistor and bolted to the wall **17**. A lamp socket **24**, to accommodate a lamp **25**, is also mounted within the casing **10**, as by means of a bracket **26** bolted to the wall **27**. Also provided within the casing **10** is a thermostatic time delay switch arrangement now to be described.

An insulating plate **28** is fixedly mounted within the casing **10** as by means of supporting bolts **29**. A substantially U-shaped bimetallic member **30** is mounted at the end portions of its legs on the insulating plate **28**, as by means of rivets **31**. This member has terminal extensions **32** to facilitate electrical connection thereto. At the bend of the U-shaped member, there is provided a contact **33**. Also, mounted on the insulating plate **28** is a current-conductive spring arm **34** which is secured at one end to the plate **28** as by means of rivets **35**, and which carries a contact **36** at its free end for cooperation with contact **33**, these two contacts constituting a switch. A relatively rigid current-conductive arm **37** has its lower portion in engagement with the lower portion of arm **34** and is secured by the same rivets **35** which secure arm **34**. The lower end of arm **37** is provided with a terminal extension **38** for connection of a conductor thereto. Thus, the terminal **38** effectively serves as a terminal for the switch arm **34** which is electrically connected to arm **37** through the rivets **35**. The upper portion **39** of arm **37** is looped and is provided with threaded apertures to accommodate an adjusting screw **40**. This screw engages arm **34** and serves to adjust contact **36** in relation to contact **33**.

Referring now to Fig. 5, it will be seen that one of the supply conductors **18** is connected directly to one side of the receptacle **13**. The other supply conductor is connected to one end of the resistor **21**, the other end of which is connected to one of the legs of the U-shaped bimetallic member **30**. The other leg of the U-shaped member is connected to the receptacle **13**. The lamp **25** is connected in parallel relation with the resistor **21**. The switch arm **34** is connected to the line end of resistor **21**.

In using the device, for example in conjunction with a television receiver, it is merely necessary to insert the plug **20** into a power outlet, and to insert the power supply plug of the television receiver into the receptacle **13**. In operation, the contact **36** is stationary, and initially the contacts **33** and **36** are open. When the television receiver is turned on, current flows through the resistor **21** and lamp **25** in parallel and through the entire U-shaped bimetallic member **30**. The resistor **21** serves as a current-limiting impedance and reduces the current substantially below the full energization current. Of course, the value of the resistor will depend upon the voltage and load and the extent to which it is desired to reduce the current. The current flowing through the U-shaped bimetal member **30** causes it to flex in a direction to move contact **33** toward contact **36**. After a predetermined time interval, the contacts close and this short circuits both the resistor **21** and lamp **25** and also one leg of the U-shaped member **30**. The flow of full energization current through the other leg of member **30** maintains it in its flexed condition to keep contacts **33** and **36** closed. The short circuiting of the resistor **21** effects flow of full energization current to the apparatus being supplied. The remaining leg of the bimetal member does not appreciably reduce the current

as it is of low resistance compared with the current limiting resistor and filaments of the load.

It should be noted that each leg of the U-shaped bimetallic member is a thermomotive element, and initially the reduced energization current flows through both legs and is sufficient to flex member 30 because of the combined thermomotive action of the two legs. When the contacts close, only one leg continues to function as a thermomotive element, but the full energization current flowing therethrough compensates for the effective removal of the other leg and maintains the switch contacts closed. It will be apparent, of course, that the substantially U shape of the bimetal member may be in the form of a V, and in fact the bimetal member may take any suitable form.

The time interval during which less-than-full energizing current is supplied may be varied by means of the adjusting screw 40. The lamp 25 serves as an indicator, and a light-transmitting member 41 is provided on the cover 11 to provide a visual indication. Any form of window will serve the latter purpose, for example a simple aperture could be employed. An aperture 42 is provided in cover 11 in alignment with the head of screw 40 so that a screw driver may be inserted to adjust the screw.

The use of the present device, e. g. with a television receiver, does not appreciably prolong the time required to bring the receiver to operative condition. Actual tests have shown that a period of about ten seconds is sufficient for the initial decreased energization, and the delay in operation of the receiver is only about five seconds. Further, actual test over a period of time has shown that, with initial decreased energization of about one-half the full current for a period of about ten seconds, this device will prolong the life of tubes to about three times their ordinary life.

While a preferred form of the invention has been illustrated and described, the invention is not limited thereto but contemplates such other embodiments and modifications as may occur to those skilled in the art.

I claim:

1. A current-supply system for effecting initially reduced energization of devices such as electron tubes, comprising a current-supply circuit, a current limiting impedance serially included in said circuit, whereby initially to effect less-than-full energization of a supplied device, a current-conducting thermomotive member serially included in said circuit to receive current and connected to one side of said impedance, both ends of the thermomotive member being supported on rigid supports fixed relative to one another, a normally-open switch comprising a stationary contact fixed relative to the ends of the thermomotive member and a contact electrically connected to an intermediate point of said member and movable thereby to engage said stationary contact upon current activation of said member, and a connection between said stationary contact and a point of said circuit on the side of said impedance opposite the side to which said member is connected, whereby the closing of said switch short circuits said impedance and a portion of said member, whereupon substantially full energizing current is supplied to the supplied device and said switch is maintained in the short-circuiting position by the heating effect generated in the remaining portion of said member by the increased current which flows therethrough, whereby one portion of the thermomotive member is cooler than the other and whereby the cooler portion partially counteracts the forces acting on the hotter portion.

2. A current-supply system for effecting initially reduced energization of devices such as electron tubes, comprising a current-supply circuit, a current limiting impedance serially included in said circuit, whereby initially to effect less-than-full energization of a supplied device, a current-conducting U-shaped thermomotive member mounted at its ends on rigid supports fixed relative to one another and serially included in said circuit to receive current and having one leg connected to one side of said impedance, a normally-open switch comprising a stationary contact fixed relative to the ends of the U-shaped member and a contact carried by said member at the bend thereof for engagement with said stationary contact upon current activation of said member, and a connection between said stationary contact and a point of said circuit on the side of said impedance opposite the side to which said member is connected, whereby the closing of said switch short circuits said impedance and said leg of the U-shaped member, whereupon substantially full energizing current is supplied to the supplied device and said switch is maintained in the short-circuiting position by the heating effect generated in the other leg of said U-shaped member by the increased current which flows therethrough, whereby the short circuited leg is cooler than the other leg and whereby the cooler leg partially counteracts the forces acting on the hotter leg.

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