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SYSTEM AND DEVICE FOR PROLONGING THE LIFE OF
CURRENT ENERGIZED FILAMENTARY ELEMENTS
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2,914,637

FIG. 1.

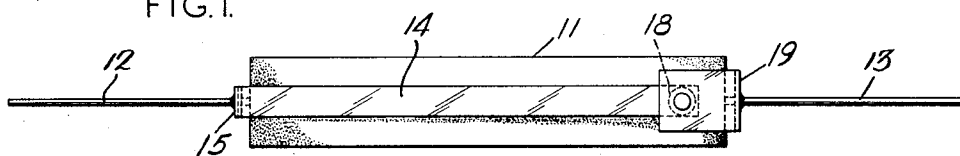


FIG. 2.

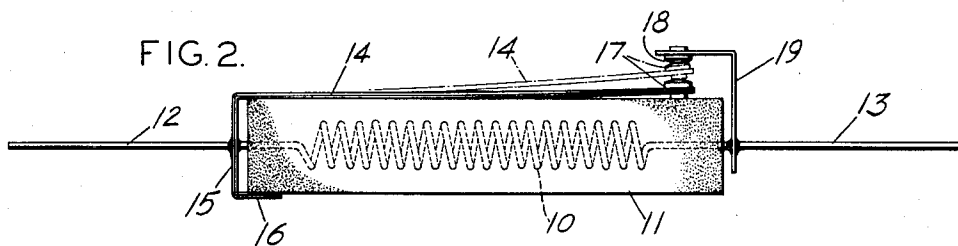
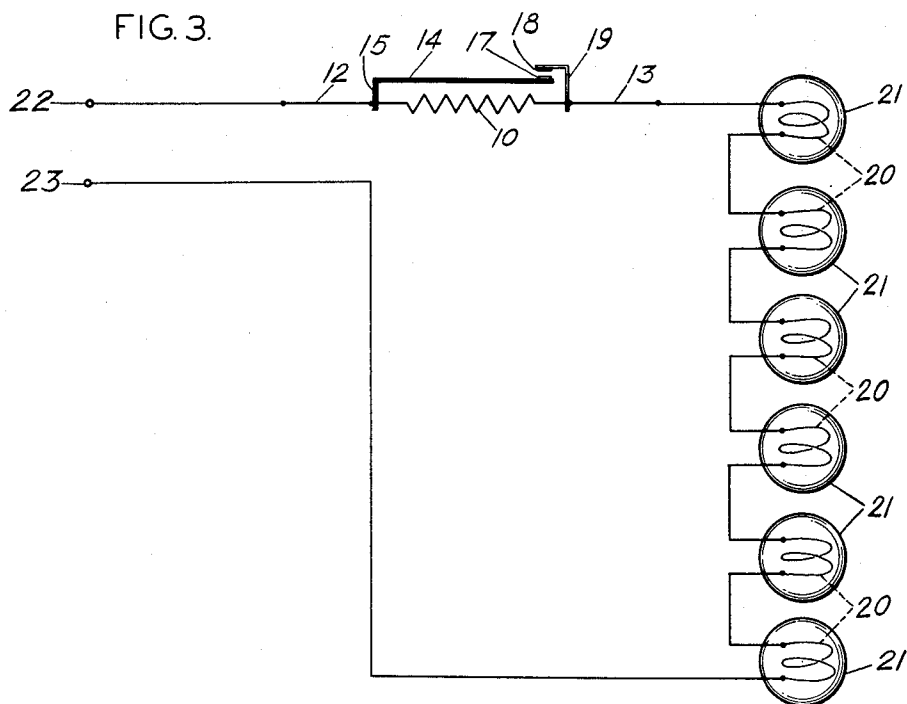


FIG. 3.



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

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3 Claims. (Cl. 200—122)

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This invention relates to a device for prolonging the life of electron tubes, electric light bulbs, and the like, by prolonging the life of their current-energized filaments.

As recited in my copending application, Serial No. 365,030, filed June 30, 1953, now Patent No. 2,756,382, filamentary current-receiving elements when cold are subject to severe shock by initial full energization. It is a function of the device of that invention to effect initially produced energization of filamentary elements to lessen, or substantially eliminate, the shock to them. Elimination of shock to filaments is also my primary object in the present instance. However, in this instance, the mechanism accomplishing the end is even simpler and more universally useful than the mechanism described in my copending application. Moreover, the device of the present invention may be made extremely compact. It is easily installed in commercial receivers and, at the same time, it is inexpensive to make and may be made from conventional, commercially available elements. Furthermore, its construction does not require great precision, although as the accuracy with which current control is achieved is increased, the dimensions must be controlled much more closely.

Broadly speaking, the present invention consists of a circuit element for use in a filamentary circuit to initially limit a current and subsequently to permit full-rated current to flow. The element consists of a structure having parallel circuit branches, one of these branches contains a heat-producing current-limiting resistance and the other branch contains a thermomotive member having a relatively small resistance. This thermomotive member must be positioned to be heated by the current-limiting resistance. A pair of normally open contacts are employed, one of which is supported by the thermomotive member, in such position that the movement of the thermomotive member, in response to heating by the current-limiting resistance, will cause the contacts to close. The resistance of the thermomotive member must be sufficient to cause the current passing through it to generate enough heat to keep the thermomotive member in closed contact position once the contacts have been closed and as long as current continues to flow through the circuit.

For a better understanding of the present invention, reference is made to the following drawings, in which

Fig. 1 is a plan view from above of a preferred form of the present invention;

Fig. 2 is a side elevational view of the device of Fig. 1, showing the movement involved in its operation; and

Fig. 3 is a circuit diagram showing schematically the use of the device of the present invention.

Referring to Figs. 1 and 2, a high-resistance, heat-producing element 10 is preferably embedded in a rigid, elongated refractory body 11, which will become sufficiently heated by the heating of the resistance 10 to cause actuation of the thermomotive member. The resistance element 10 has terminals 12 and 13 extending out the opposite ends of the elongated refractory member 11. Refractory member 11 is preferably a rectangular solid

preferably having an essentially square cross section. The square cross section provides flat surfaces against any one of which the thermomotive member 14 may be mounted.

The thermomotive member 14 is preferably bimetal and it may extend, as shown, around the end of the refractory body in portions 15 and 16. Portion 15 is firmly connected to the terminal 12 and portion 16 provides a clamp-like action in order to aid holding the thermomotive member in place and prevent its rotation relative to square body 11. Any other suitable arrangement can be used and the thermomotive member need be only a part of the structure 14, 15, 16. Moreover, the thermomotive member need not be a bimetal strip, but may be of any other suitable form or any other type of thermomotive element such as a bellows.

At the end of the thermomotive member is a contact 17 which lies opposite contact 18 which is supported on angle bracket 19, which is in turn supported on terminal 13. Bracket 19 is of such dimension that the contact 18 is normally spaced from contact 17 since the thermomotive member is preferably made to normally lie flat against the refractory body. When the refractory body is heated by a flow of current through the resistance element 10, the bimetal thermomotive member 14 is readily heated and, because of its thermal properties, tends to flex upward into the position shown in dotted lines, eventually causing contacts 17 and 18 to close. At this point, current flows through the path 15, 14, 17, 18, 19 instead of through resistance 10.

The thermomotive member 14 must be selected from a variety of materials and of such dimensions that the current flowing through it will produce sufficient heating to keep it flexed into close contact position.

The circuit shown in Fig. 3 includes the device of the present invention shown somewhat schematically but with all its essential elements present. The resistance 10 is shown without a refractory body but it could be used without a refractory body in certain instances and, if it were desirable to enclose the unit within a vacuum envelope or within a gas filled envelope, it would probably be desirable to eliminate the refractory body. The thermomotive member 14 could, of course, be supported on some rigid insulator and have a lead connected between it and terminal 12 instead of having the bend 15 in the bimetal member fixed to terminal 12 of the resistor 10. The device as a unit has its terminal leads 12, 13 placed in series with the filaments 20 within bulb envelopes 21, and the bulbs 20—21 are illustrated schematically without showing other tube elements, which may or may not be present. They would not be present, for example, if the structures shown were electric light bulbs rather than vacuum tubes.

In operation, current is applied across terminals 22—23. This current flows through resistor 10 which has the effect of limiting the current flow reaching the various filaments 20. As the current-limiting impedance 10 heats up, however, the heat which it generates causes thermomotive member 14 to flex so that its contact 17 eventually touches contact 18. Since the resistance of path 15, 14, 17, 18, 19 is much lower than resistance than current-limiting impedance 10, most of the current will then tend to flow through the thermomotive member. This current will be sufficient to heat member 14 which has such selected dimensions and physical properties that it will be heated sufficiently by current flowing through it to keep the contacts 17, 18 closed.

The size of the current-limiting resistance 10 is selected to reduce current sufficiently that the filaments 20 will not be severely shocked. The size of resistance selected in different instances for different application will depend upon the types of filaments employed and their rated cur-

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rent and the voltage applied across them normally. It may be desired to change the time which it takes the device to operate and this can be done by choice of a refractory body which has a thermal conductivity sufficiently great or small to produce heating at the desired rate. It will also be accomplished in part by the choice of the materials used in the bimetal element 14 and the dimensions of the element. All of these factors will determine how long after the initial application of voltage across terminals 22—23 it will take for the contacts 17, 18 to close and hence for essentially the full-rated voltage to be applied across the tube filaments.

Although the form of the device shown in Figs. 1 and 2 may be modified, and even the form shown in Fig. 3 may be modified slightly, the choice of the elements 10, 14 and their position relative to one another is limited as previously described. However, many changes within the scope of these limitations are possible and are intended to be within the scope and spirit of the present invention.

I claim:

1. A circuit element for use in a filament circuit to initially limit current and subsequently to permit full rated current to flow comprising a structure having parallel circuit branches one of which contains a heat producing, current limiting resistance and the other of which contains a thermomotive member having a relatively small resistance and positioned to be heated by the current limiting resistance and a pair of normally open contacts one of which is supported by the thermomotive member in such position that the movement of the thermomotive member in response to heating by the current limiting resistance will close the contacts, the resistance of the thermomotive member being sufficient to cause the current passing therethrough to generate enough heat to keep the thermomotive member in closed contact position.

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2. The circuit element of claim 1 in which the thermomotive member is a bimetal strip one end of which is fixed relative to the current limiting resistance and the other end of which is free and supports one of the contacts and in which the other contact is fixed relative to the resistance in such position that the free end will move toward said fixed contact upon being heated.

3. A circuit element comprising a current limiting resistance in an elongated rigid body which heats as current heats the resistance and having terminal leads extending from opposite ends of the body, a bimetal strip positioned adjacent the body, fixed at one end to one terminal and bearing a contact at its other end on the side remote from the body and a contact support fixed relative to the rigid body, connected to the other terminal and supporting a contact in position to be contacted by the contact on the bimetal strip when the strip is heated by the elongated rigid body, the bimetal strip having sufficient resistance for the current passing through it to generate enough heat to keep the bimetal bent away from the elongated body and the contacts closed.

References Cited in the file of this patent

UNITED STATES PATENTS

283,492	Kinsman	Aug. 21, 1883
1,701,757	Lea	Feb. 12, 1929
1,806,796	Gates	May 26, 1931
1,898,174	Dubilier	Feb. 21, 1933
1,960,408	Brach	May 29, 1934
2,185,130	Morrill et al.	Dec. 26, 1939
2,774,845	Lituchy	Dec. 18, 1956

FOREIGN PATENTS

1197/31	Australia	Mar. 16, 1931
458,020	Great Britain	Dec. 10, 1936