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ELECTRIC DISCHARGE TUBE AND THE LIKE

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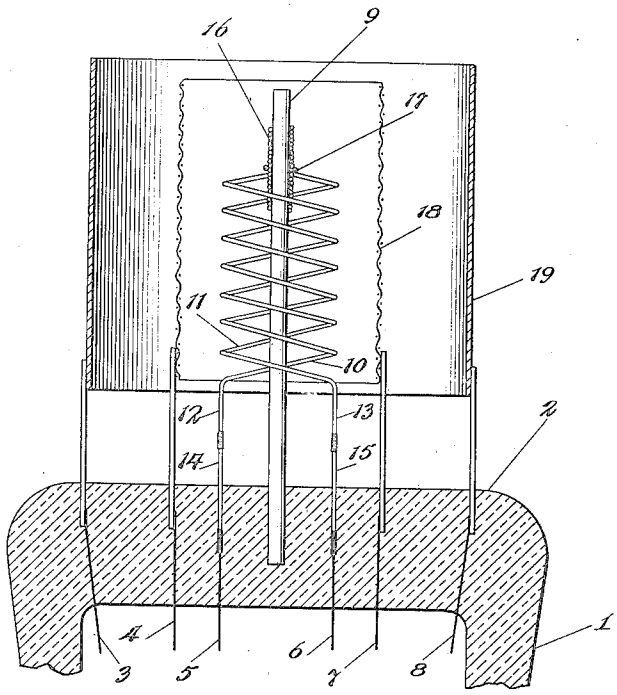


Fig. 1.

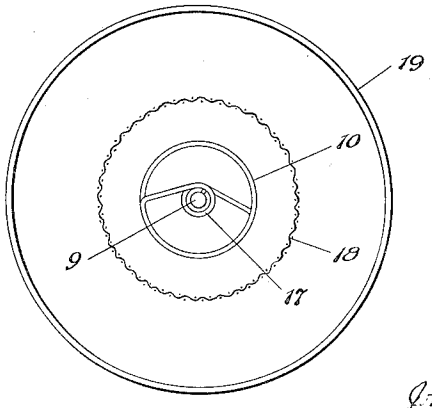


Fig. 2.

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ELECTRIC DISCHARGE TUBE AND THE LIKE

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7 Claims. (Cl. 250—27.5)

This invention relates to electric discharge tubes and with particularity to improvements in filament structures.

A principal object of the invention is to provide an improved manner of supporting the glowing filament of a lamp, tube or similar device.

In certain types of devices for example in radio tubes employing heated filaments, much difficulty has been encountered heretofore in supporting the filament to take care of its expansions and contractions. Various expedients in the form of springs or the like have been proposed to take up slack in the filament, and while this prior type of resilient support may be useful under certain conditions, it has been found that the spring tension varies and when relatively stiff springs are employed, there is considerable danger of the spring breaking the filament.

Accordingly another object of the present invention is to provide means for supporting a heatable filament whereby the danger of subjecting the filament to excessive tension is avoided.

Another object is to provide an improved filament assembly for lamps or tubes wherein the filament is frictionally supported to allow it to expand and contract.

Another object relates to a filament of springy material normally having a natural period of vibration in conjunction with means for modifying the natural period so that the vibrations of the filament are of a predetermined frequency whether audible or inaudible.

A feature of the invention relates to a novel manner of supporting a filament of coiled tungsten or similar material without the aid of springs whereby the tendency of the filament to vibrate is substantially eliminated.

Another feature relates to a novel form of frictional dampening device for preventing microphonic vibrations of a heatable filament support for coiled electrodes generally.

Another feature relates to a relatively cheap and highly efficient frictional sleeve to provide adequate support to a heatable filament without introducing appreciable heat losses.

A still further feature relates to the novel organization, arrangement and relative location of parts which go to make up a filament assembly which is highly rugged and substantially free from microphonic vibrations.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed description and the appended claims.

While the invention will be disclosed herein as embodied in one diagrammatic representation of a space discharge tube, it will be understood that this is done merely for purposes of explanation and not by way of limitation.

Accordingly in the drawing, Fig. 1 shows in schematic form a typical mount for a three electrode space discharge tube embodying features of the invention.

Fig. 2 is a top plan view of the electrode assembly of Fig. 1 showing more clearly the manner of supporting the filament according to the invention.

Referring more particularly to Fig. 1 the numeral 1 represents the stem portion of any form of lamp, tube or similar device. Stem 1 may terminate in a press 2 into which may be sealed the various lead-in and support wires 3 to 8 and the central filament support post 9. It will be understood of course that the stem 1 may have sealed thereto any well known form of enclosing bulb or envelope which may be evacuated or gas-filled depending upon the type of tube or lamp in which the filament assembly according to the invention is to be used. Preferably, although not necessarily, the filament consists of a length of wire wound or otherwise formed to provide two oppositely pitched helices 10 and 11. The individual turns of the helices are intermeshed and spaced apart a sufficient distance to prevent their contacting with each other when the filament is normal and also during the normal expansion and contraction of the filament. The ends 12, 13, of the filament are welded or otherwise fastened to the respective filament support wires 14 and 15.

For the purpose of supporting the upper end of the reversely coiled filament, there is provided the post 9 on the upper end of which is carried a helically wound wire 16. Coil 16 is preferably wound for example on a mandrel of the same diameter as the post 9 so that the coil 16 is frictionally held in place on the post 9 as shown in the drawing, while the post 9 may be of any desired material preferably it is of a metal such as tungsten or the like, and likewise the coil 16 is preferably of tungsten or other refractory metal. As will be clear from the showing of Fig. 2 the upper end of the filament 11 is provided with a small loop 17 which is preferably of a diameter corresponding to the outer diameter of the coil 16 so that the coil 16 may be threaded into the loop 17 whereupon the said loop is frictionally held between adjacent convolutions of the coil 16. If desired the loop 17 may be made slightly

smaller in internal diameter than the outer diameter of coil 16 so that there is substantially no tendency for relative slipping between the loop 17 and the said coil 16. If the filament 11 is of tungsten or other similar springy metal, or is of a less springy metal having sufficient thickness to be self-supporting, then the engagement of the loop 17 with the coil 16 holds the latter coil in predetermined normal position on the post 9. If the coil 16 has been previously wound relatively tightly on a mandrel of the same diameter as the post 9, and with adjacent turns touching, when said coil 16 is released the turns will naturally spring slightly to a larger diameter to provide the desired clearance between the coil 16 and the post 9, so that said coil 16 may slide freely on the post 9. With this arrangement therefore, the coil 16 may be considered as tightly coupled to the loop 17 so that the said coil 16 merely acts as a centering sleeve which moves as a unit and bodily with the loop 17. If desired, however, the loop 17 may be proportioned so that it is capable of sliding relatively to the coil 16. That is to say, the diameter of loop 17 may be proportioned with respect to the diameter of coil 16 that the adjacent turns of the coil 16 provide a slight frictional retarding force opposing the tendency of the filament to vibrate longitudinally. It will be obvious of course that this frictional retardation may be supplemented by proportioning the coil 16 so that it frictionally engages the post 9 and if additional frictional retardation is desired, the post 9 may be roughened or corrugated.

In either case the reversely coiled filament 11 is slidably supported at its upper end and the coil 16 in conjunction with the post 9 subjects the filament to a frictional dampening thus avoiding any microphonic disturbances or rattling of the filament. That is to say, with the manner of support disclosed in the drawing, mechanical shocks, jars or contractions and expansions of the filament due to heat variations are dampened out.

It will be obvious that the foregoing described filament assembly is capable of embodiment either in a lamp or in an electric discharge tube or any similar device. Thus as shown in the drawing the filament 11 may be of thoriated tungsten or may be coated with electron-emissive material to cooperate with one or more surrounding foraminous electrodes 18 and one or more plates or anodes 19. The manner of supporting the various electrodes which cooperate with the filament are well known in the art and detailed description thereof is not believed to be necessary herein.

It will be obvious of course that while the dampening and supporting means is disclosed in connection with a reversely coiled filament that it is capable of use with any other well known type of filament, for the purpose of supporting and dampening out any tendency of the filament to vibrate or rattle. Accordingly various changes and modifications may be made herein without departing from the spirit and scope of the invention. Thus the invention is not limited to any particular size or weight for the member 16. However, one of the important features of the invention is that the member 16 may be so designed in mass with respect to the mass of the filament proper, that the natural frequency of the filament can be given any desired value either in the audible or inaudible ranges. This feature is of particular importance where the filament is to be energized by alternating current in which event the member 16 is preferably so designed that the natural frequency of vibration of the filament as a whole is such that it is not in a mechanical resonance either with the frequency of the alternating current source or any harmonic thereof.

What I claim is:

1. In combination a press, a coil filament, a pair of fixed supports sealed into said press and connected to the terminals of the filament, a support post sealed into said press, said filament being provided with a loop slidably encircling said post and frictional means between said loop and post to dampen out the tendency of said filament to vibrate relative to said post while said frictional means slides on said post.

2. In combination a central support post, a coiled filament mounted with the coils of the filament surrounding said post, friction means closely fitting said post and slidable thereon, and means for coupling said filament to said friction means to dampen out the tendency of said filament to vibrate relatively to said post during longitudinal expansion of the filament.

3. In combination a filament comprising reversely wound helices, a support post passing centrally through said helices, said helices terminating at one end in a common loop of reduced diameter, a sleeve encircled by said loop said sleeve being slidably mounted on said post.

4. The combination according to claim 3 in which said sleeve comprises a tightly wound wire coil encircling said post.

5. In combination, a heatable filament, means to fasten the filament at its end to a fixed support, a guide rod fastened to said support, a sleeve surrounding said rod and slidable thereon said sleeve having a frictional outer surface engaging the free end of the filament to provide the sole support for said free end on said rod.

6. In combination, a heatable filament, means to anchor said filament at its lower ends, means slidably supporting said filament at its upper end, the last-mentioned means including a guide post and a sleeve slidable on said post, said sleeve having a roughened outer surface along which the upper end of the filament can ride.

7. In combination, a heatable coiled filament, a support post substantially coaxial with said filament, a sleeve separate from the filament mounted for sliding movement on said post, means to anchor the lower ends of the filament to fixed supports, the said filament being provided at its upper end with a turn of reduced diameter for frictionally coupling said filament to said sleeve during the sliding movement of said sleeve on said post.

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