April 12, 1927. 1,624,562

V. L. RONCI

ELECTRON DISCHARGE DEVICE

Filed Dec. 19, 1923

Fig. 1

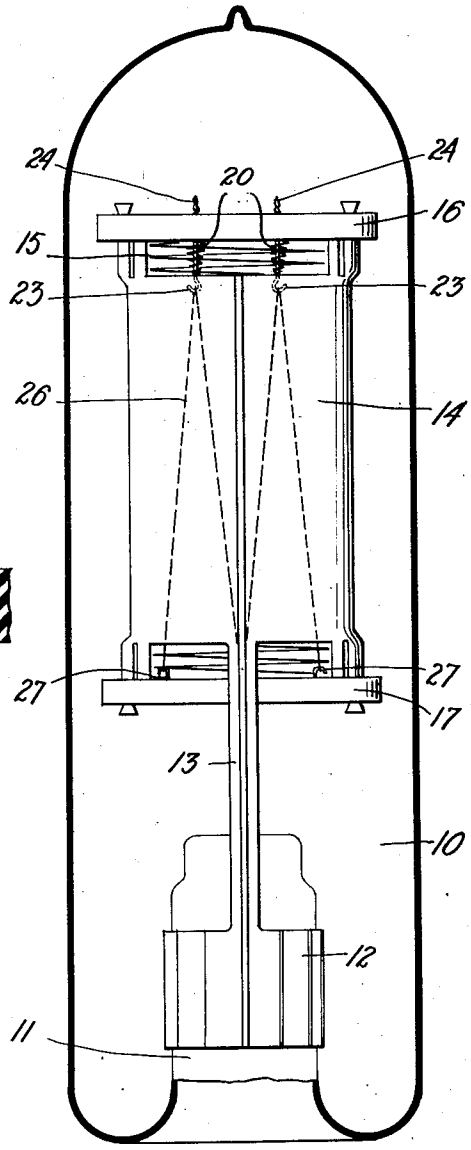


Fig. 2

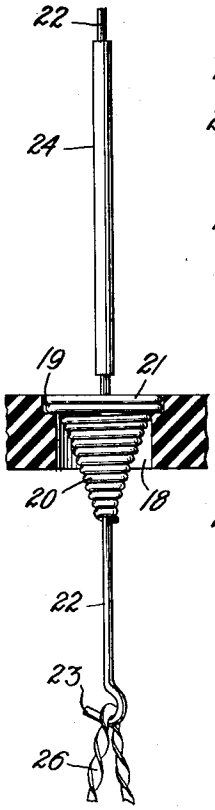
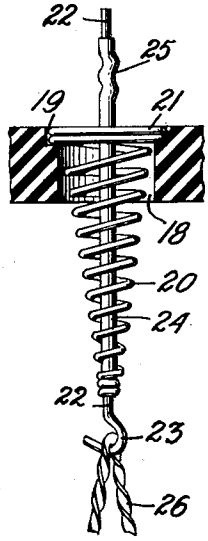


Fig. 3



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UNITED STATES PATENT OFFICE.

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ELECTRON-DISCHARGE DEVICE.

Application filed December 19, 1923. Serial No. 681,590.

This invention relates to electron discharge devices, and more particularly to resilient supports for the filament electrode therefor.

The object of this invention is to provide a spring member in tension which requires a minimum of space and further provides an easily assembled device, which eliminates entirely the "top-heavy" difficulty experienced with certain types of compression spring supports heretofore used. This "top-heavy" difficulty appears especially with compression springs in which the axial length of the spring is great compared to the diameter of the helix. The spring tends to bend sideways at its free end, thus drawing the filament supporting member and consequently the filament, away from its proper position along the axis of the spring. This type of compression spring is inherently in a state of unstable equilibrium.

The tension spring of this invention, on the other hand, overcomes the "top-heavy" difficulty experienced with the compression spring, since the forces acting between spring and filament support, tend to hold the filament support in line with the axis of the spring. The tension spring of this invention is inherently in a state of stable equilibrium at all times.

This object is attained by providing the filament with a resilient support, comprising an inverted conical tension spring which is provided with an enlarged portion seated in a countersunk aperture in an insulating plate, the greater portion of the spring projecting below the insulating plate. This arrangement positions the tension spring nearer the filament than is practicable with the compression type of spring. A filament hook is certainly positioned in the conical spring and a tubular metallic sleeve encircles the shank of the hook within the conical tension spring. The conical spring is extended by forcing down the tubular sleeve and when the proper tension is secured, the free ends of the shank and the tubular sleeve are crimped together.

This construction entirely eliminates all possibility of friction between the filament hook and the spring, furthermore, it facilitates placing the spring closer to the filament since the hook is attached underneath, instead of above the insulating plate. A further advantage obtained with this construction, consists in having the spring always under tension, whereby it tends to pull the filament into a position determined by the stationary support of the spring. This insures the filament always being held in the proper space relation with respect to the other electrodes, thereby eliminating the possibility of sagging of the filament, which is undesirable in the operation of this device.

Referring to the drawings, Fig. 1 illustrates an electron discharge device embodying this invention. Fig. 2 is a detailed view showing the several parts in their inoperative position. Fig. 3 is a detailed view of this invention in its operative position.

Referring to Fig. 1, an electron discharge device is illustrated, comprising an enclosing vessel 10 with a reentrant neck 11. Frictionally attached to the neck 11 is a metallic collar 12. A ribbed support 13 projects from the collar 12 and supports plate electrode 14. The plate 14 which is integral with support 13 and metallic collar 12 is formed of a single metallic sheet. Within the plate electrode 14 is a grid electrode 15. The plate 14 is provided with projections which fit into apertures in the insulating plates 16 and 17. These projections securely attach the insulating plates 16 and 17 to the plate electrode 14.

The insulating plate 16 is provided with apertures 18 and countersunk portions 19. A conical spring 20, consisting of closely wound graduated turns of resilient wire and a plurality of turns 21 of a larger diameter integral with the graduated portion of the spring 20, constitutes the resilient member of this invention. The turns 21 provide a seating arrangement for the spring 20, and when inserted in the countersunk portion 19 of the insulating plate, is substantially flush with the upper surface thereof. The filament hook, a cylindrical metallic member 22, having a hook shaped formation 23 at one end, is centrally positioned in the conical spring 20. The insertion of the filament hook 22 into the conical spring 20, closes the lower opening of the spring.

A tubular sleeve 24, preferably of metal, is slipped over the cylindrical shank of member 22. The method of extending the conical spring 20, comprises rigidly holding the filament hook 22, sliding the tubular sleeve 24 on the filament hook 22, within

the conical opening in the spring 20 thereby stretching the turns of the spring until the desired tension is obtained, then crimping the free ends of the filament hook 22 and the tubular sleeve 24 at 25 with a pair of pliers or a crimping tool. The excess portion of the filament hook 22 may then be cut off adjacent the crimped portion 25.

The M-shaped filament 26 is centrally positioned with respect to the grid 15 and plate 14 and is supported between insulating plates 16 and 17, by resilient hooks 23 and rigid hooks 27.

What is claimed is:

1. In an electron discharge device, containing an apertured insulating plate, a filament support comprising a suspension spring having a conical portion and a cylindrical portion, said spring being seated in said apertured insulating plate, said cylindrical portion being substantially flush with the top of said insulating plate, said conical portion extending through said insulating plate, a suspension member centrally positioned in said spring, and a sleeve for said member engaging the lower end of said spring and having its other end secured to said member.

2. In an electron discharge device containing an apertured insulating plate, a filament support comprising a tension spring having a conical opening therethrough, said spring being seated in said apertured plate, and a suspension member extending through said conical opening, said suspension member being supported at its lower end by said spring.

3. In an electron discharge device containing an insulating plate having an aperture, a filament support comprising a conical spring, a seat in said plate for said spring, said spring extending through said aperture and projecting below said plate, and a suspension member extending through and being supported by the lower end of said spring.

4. In an electron discharge device containing an insulating plate having a countersunk aperture, a filament support comprising a conical spring having its larger end seated in said countersunk portion, the greater part of said spring extending through said aperture and projecting below said plate, a suspension member extending through said spring, and a sleeve for said member engaging said spring at its smaller end and tensioning the same, said sleeve and member being secured together at their upper ends.

5. A suspension device comprising a conical helix, a suspension member, a sleeve therefor, said suspension member and said sleeve being centrally disposed in said conical helix, one end of said sleeve engaging said helix and the other end being joined to said suspension member.

In witness whereof, I hereunto subscribe my name this 14th day of December, A. D. 1923.

VICTOR L. RONCI.