June 11, 1946. R. C. DORRIS 2,402,030

ELECTRON DISCHARGE DEVICE

Filed May 11, 1944

Fig. 1.

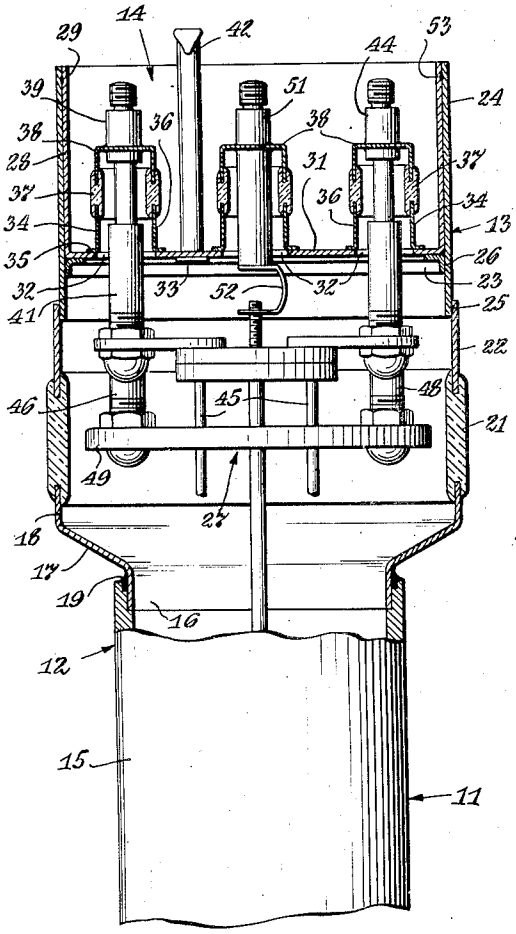
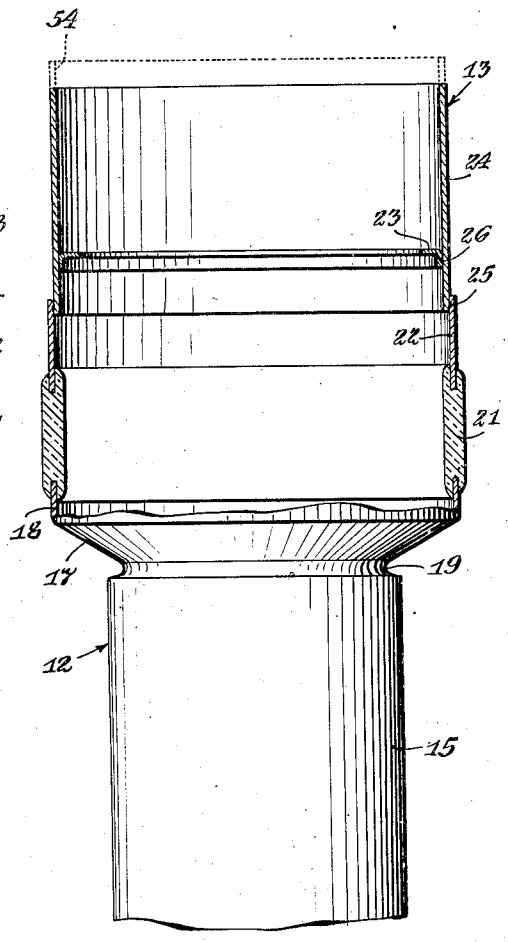


Fig. 3.



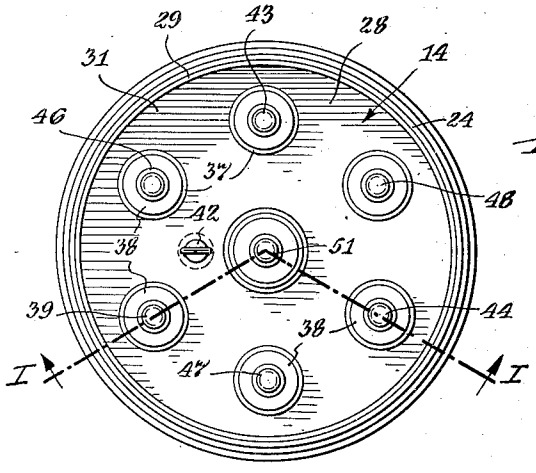


Fig. 2.

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ELECTRON DISCHARGE DEVICE

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9 Claims. (Cl. 250—27.5)

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This invention relates to discharge devices, and more particularly, to one which is semi-demountable.

The primary object of my invention, generally considered, is to provide an electron discharge device in which the envelope includes a hollow metal cylinder defining an opening, which carries mount-alignment means and receives a closely-fitting header which carries the mount of the device, whereby the outer edge portions only of said cylinder and header may be connected to thereby adapt the device for being conveniently opened upon cutting off the connected portions of said cylinder and header.

Another object of my invention is to provide a semi-demountable discharge device consisting of three major parts, first, the anode assembly, second, the mount-header-carrying assembly, and third, a mount-carrying header and lead assembly, all of said parts being ruggedly constructed, mainly of metal, thereby not only avoiding damage in use, but allowing for convenient opening and repair.

A further object of my invention is to provide a semi-demountable discharge device which is rugged, less expensive and cleaner than those of similar character heretofore manufactured.

An additional object of my invention is to provide a method of assembling a discharge device in order to adapt it for convenient removal of the mount, if such becomes necessary for salvage or repair purposes.

Other objects and advantages of the invention, relating to the particular arrangement and construction of the various parts, will become apparent as the description proceeds.

Referring to the scale drawing:

Fig. 1 is a fragmentary sectional view on the line I—I of Fig. 2, in the direction of the arrows, parts being shown in elevation.

Fig. 2 is a plan of the device shown in Fig. 1.

Fig. 3 is a view corresponding to Fig. 1, but showing the envelope of the device after the seam connecting the mount header thereto has been cut away and the header removed.

On account of the rapid progress made in the industrial application of electronic tubes, the need has arisen for one which is semi-demountable and of high power and rugged construction. The present invention, a particular embodiment of which will now be disclosed, is one which meets the above requirements as well as embodying several additional important features.

Referring now to the drawing in detail, like parts being designated by like reference characters, there is disclosed a discharge device 11 consisting of three major parts: first, that which may be called the "anode assembly" broadly designated as 12; second, that which may be called the "mount-header-holding assembly" broadly designated 13; and third, that which comprises the mount and its special holding header and lead assembly broadly designated 14.

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The anode assembly of the present embodiment comprises a metal, preferably copper, anode 15 formed as a hollow cylinder closed at one end. In the open end of said anode fits the small cylindrical end portion 16 of a metal collar 17, from which it flares and terminates in a relatively large cylindrical portion 18, coaxial with the portion 16. The collar 17 is desirably formed of the well-known "Kovar," which is a nickel-cobalt-iron alloy specifically defined in the Lempert et al. Patent No. 2,279,831, of April 14, 1942. The connection between the collar 17 and the anode 15 is desirably effected by silver brazing indicated at 19.

The cylindrical portion 18 of the "Kovar" collar 17 is sealed to one end portion of a hollow glass cylinder 21 making sure that the said cylinder is coaxial with the anode 15.

The assembly 13 in the embodiment illustrated consists of a desirably "Kovar" cylinder 22 and a metal, preferably steel, alignment or abutment ring 23 desirably angular in section as illustrated, and both connected, desirably by seam-welding to a metal, preferably steel, sleeve or relatively long hollow cylinder 24, as indicated respectively at 25 and 26. This assembly is then sealed to the free end of the glass cylinder 21, making sure that said metal cylinders are coaxial with the anode 15.

The assembly 14 may embody a mount 27 of desired character, such, for example, as that disclosed in the Dailey application, Serial No. 509,649, filed November 10, 1943, and owned by the assignee of the present application. Said mount is supported on a special header 28 and lead assembly comprising a relatively long hollow metal cylinder 29, desirably formed of steel, and closely fitting the steel cylinder 24.

The inner end of said cylinder 29 is closed by a lead-assembly-carrying circular plate 31, which normally abuts the alignment ring 23, as illustrated in Fig. 1.

The circular plate 31 is in the present embodiment formed with seven lead apertures 32, one of which is at the center and others of which are uniformly spaced therearound, and an exhaust aperture 33, as shown most clearly in Fig. 2,

Around the lead apertures 32 are metal eyelets 34, preferably formed of "Kovar," each eyelet having a flange 35, desirably projection welded or otherwise suitably connected to the plate 31, and a hollow cylindrical portion 36 sealed to a glass cylinder 37. Each cylinder 37 in turn is sealed to the free edge of the hollow cylindrical portion of a preferably "Kovar" thimble 38, to the circular closing web portion of which is secured, as by welding, an outer lead portion such as 39, and an inner lead portion such as 41. The exhaust aperture 33 receives a metal, desirably iron, exhaust tube 42 projection-welded or otherwise suitably connected thereto.

In the present embodiment three of the leads designated 39, 43 and 44 are relatively short and carry the filament supports 45, as fully described in the Dailey application previously referred to. The other three leads 46, 47 and 48 are relatively long and carry a grid-supporting disk 49. The center lead 51 is the shortest of all and carries a resilient member 52 providing a common return connection for the filaments (not shown). The outer end of each lead is desirably threaded, as illustrated, for connection with a suitable outside conductor. The final assembly is accomplished by pushing the mount-carrying header 14 into the steel cylinder 24 until it firmly seats against the alignment or support ring 23. The header is then sealed, desirably by seam-welding, to the cylinder 24 only at or near the outer edge thereof, as indicated by the reference character 53, and the device is ready for exhaust. After exhaust the metal tubulation 42 can be tipped off, either by a pinch-off weld or by the roller-pressure method.

From the foregoing disclosure it will be seen that there are several advantages of the design, the first of which is that the device is semi-demountable. By this term is meant that if a burnout or other damage should occur in service, the device can be returned to the factory and opened by simply cutting off the portion 54, shown dotted in Fig. 3, of the cylinder 24, and the corresponding portion of the cylinder 29, including the seam-weld 53. The header 28 and its mount 27 can then be removed, the elements repaired, and the assembly replaced in the cylinder 24. The header 28 and cylinder 24 can then be re-welded adjacent the new outer edge thereof. The cutting and re-welding operations can be repeated a number of times, the only requirement being that enough metal is left so that the welding wheels will not hit the thimbles 38. There is enough clearance between the leads and the cylindrical portion 29 for the wheels to pass therebetween.

A further advantage is that the device is rugged, as will be obvious from the design. This feature is especially important because of the wide industrial uses which are opening up for such devices. Industrial managers are hesitant to invest large sums of money in devices which have as fragile construction as is possessed by those of many previous designs. The construction of the present application, beside being strong because of the use of "Kovar" rather than feather-edged copper, is also less likely to be broken accidentally, because of the protection afforded the thimbles by the long flange or cylindrical portion 29 of the header 28.

It will also be clear that the tube will be less expensive, as the use of "Kovar" at the anode seal will eliminate the expensive feather-edging operation, such as shown in the design of the Dailey application previously referred to. It is also easier to "glass" and facilitates recovery operations. Anodes of former designs have to be re-feather-edged before reglassing.

The use of seam welds rather than glass seals at principal junctions reduces the number of hours of highly-skilled glass work required, the welding operations being much simpler to perform. In case of damage in the factory a tube can be quickly and inexpensively recovered by the method described for tubes which failed in service. The tube is self-aligning because of the ring 23, thereby eliminating the requirement for an expensive fixture for effecting proper alignment.

Since the mount will be sealed on a welder rather than on a glass lathe, no heating and resultant oxidation of the parts will occur, in contrast to the condition when gas flames are used.

This has a distinct advantage in shortening the exhaust time, especially when it is planned to reseal the tube several times, and provides a tube which is cleaner in that it is free from oxidation.

Although a preferred embodiment of my invention has been disclosed, it will be understood that modifications may be made within the spirit and scope of the appended claims.

I claim:

1. An electron discharge device comprising an enclosing envelope provided with a hollow metal cylinder defining an opening, alignment stop means secured to the interior surface of said cylinder, and a mount comprising a metal header fitting said cylinder, normally engaging said stop means, and with only its outer edge portion sealed to the outer edge portion of said cylinder, whereby said mount may be conveniently removed upon merely cutting off the sealed edge portions of said header and cylinder.

2. An electron discharge device comprising an enclosing envelope provided with a relatively long hollow metal cylinder defining an opening, a metal abutment ring secured to the interior surface of said cylinder, and a metal header formed as a transverse wall portion with a cylindrical flange portion of width substantially corresponding with the distance between the outer edge of said cylinder and said ring, fitting said cylinder, said transverse wall portion engaging said alignment ring, provided with holes to receive leads carrying a mount, and eyelets carrying said leads and secured around said holes, only the outer edge portion of said cylindrical header portion being sealed to the outer edge portion of said cylinder, whereby said mount may be conveniently removed upon merely cutting off the sealed edge portions of said header and cylinder.

3. An electron discharge device comprising an enclosing envelope formed as a hollow metal anode carrying a nickel-cobalt-iron alloy sealed to a hollow glass cylinder, the other edge portion of said cylinder being secured to a hollow nickel-cobalt-iron alloy cylinder carrying a hollow metal cylinder provided with a metal alignment ring secured to its interior surface, and a metal mount-carrying header fitting said cylinder, with an inner web portion engaging said ring, and with an outer deep flange portion sealed only adjacent its outer edge to the outer edge portion of said cylinder, whereby said mount may be conveniently removed upon merely cutting off the sealed edge portions of said header and cylinder.

4. An electron discharge device comprising an enclosing envelope consisting of three major portions; first, a nickel-cobalt-iron alloy collar brazed to a hollow copper anode and sealed to a hollow glass cylinder; second, a nickel-cobalt-

iron cylinder seam-welded to a steel sleeve and the latter having a steel alignment ring welded to the interior surface thereof; third, a mount carried on a special header and lead assembly, said header being formed as a hollow cylindrical flange portion fitting said steel sleeve, having a closing web engaging said ring, apertured to receive leads of said mount, and carrying eyelets secured thereto around said apertures, said eyelets in turn carrying glass cylinders to the outer ends of which are secured nickel-cobalt-iron alloy thimbles secured to said leads, said header having only its outer cylindrical edge portion seam-welded to the outer edge portion of said sleeve, whereby said mount may be conveniently removed upon merely cutting off the sealed edge portions of said header and cylinder.

5. In an electron discharge device, an anode assembly comprising a hollow copper cylinder closed at one end and having its other end brazed to a nickel-cobalt-iron alloy collar formed as an intermediate frusto-conical portion with coaxial cylindrical portions of different radii extending in opposite directions therefrom, the free edge of one of said cylindrical portions being sealed to one end of a hollow glass cylinder for holding the mount assembly.

6. In an electron discharge device, an envelope portion comprising a nickel-cobalt-iron alloy cylinder for connection to a glass cylinder of an anode assembly, a steel sleeve seam-welded to one end thereof, and a steel alignment ring welded to the inner surface thereof adjacent the connection with the alloy cylinder.

7. In an electron discharge device, a mount assembly comprising a header formed as a hollow metal cylindrical portion open at one end and closed at the other by a circular metal disk, said disk having a plurality of apertures, nickel-cobalt-iron alloy eyelets welded to said disk around said apertures, glass cylinders in adjacent edges of which the free edges of said eyelets are embedded, thimbles having cylindrical portions the free edges of which are embedded in the outer edge portions of said glass cylinders, and leads secured to said thimbles.

8. The method of making a semi-demountable electron discharge device comprising forming an enclosing envelope terminating in an aperture defined by a relatively-long hollow metal cylinder, closing said cylinder by a metal header comprising a deep flange portion extending from the periphery of a circular wall portion, fitting the same and carrying on said circular wall portion thereof the mount of said device, and securing said header in place by sealing only the outer edge portion of said deep flange portion to the corresponding outer edge portion of said cylinder, whereby said mount may be conveniently removed upon merely cutting the sealed edge portions of said header and cylinder.

9. The method of making a semi-demountable electron discharge device comprising forming an enclosing envelope terminating in an aperture defined by a relatively-long hollow metal cylinder carrying a metal abutment ring, closing said cylinder by a hollow cylindrical metal header fitting the same in engagement with said ring and carrying on an end closing circular wall portion thereof the mount of said device, and securing said header in place by sealing only the outer edge portion thereof to the corresponding outer edge portion of said cylinder, whereby said mount may be conveniently removed upon merely cutting the sealed edge portions of said header and cylinder.

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