June 24, 1947. W. T. GIBSON 2,423,066

METAL-GLASS AND THE LIKE SEALS

Filed July 17, 1944

FIG. 1.

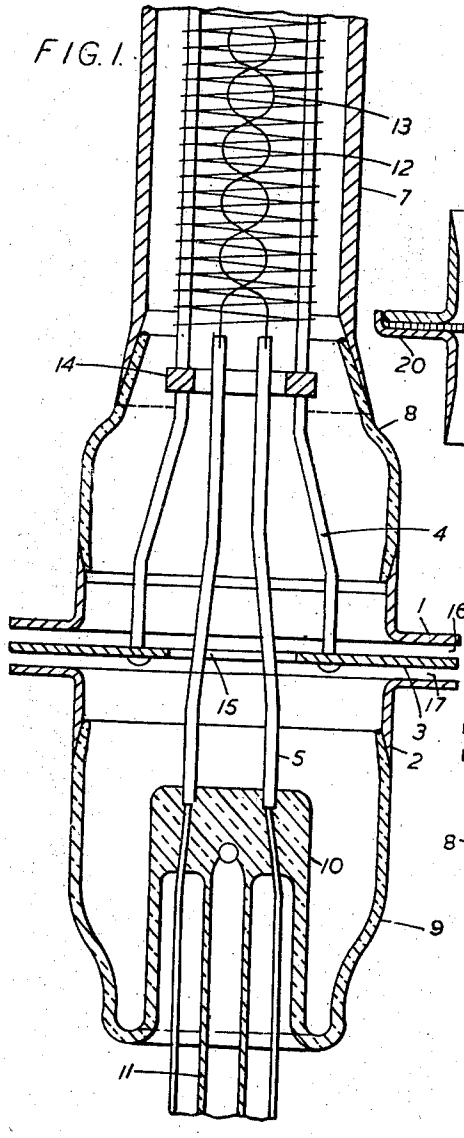


FIG. 2.

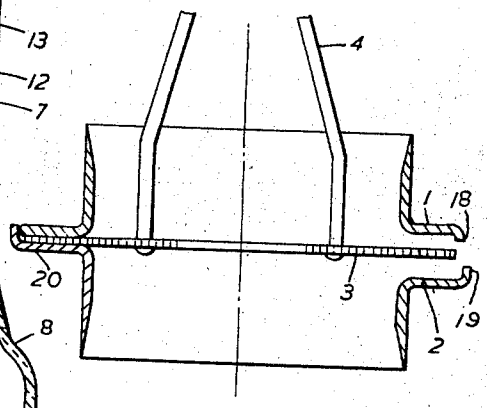


FIG. 3.

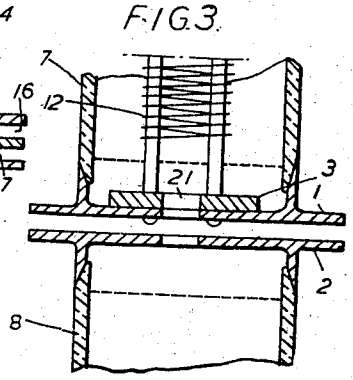


FIG. 4.

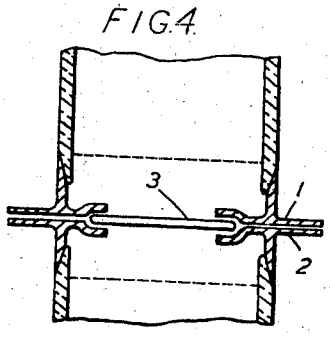
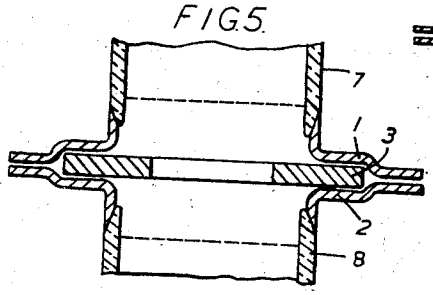


FIG. 5.



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METAL-GLASS AND THE LIKE SEALS

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4 Claims. (Cl. 250—27.5)

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The present invention relates to metal-glass and the like insulating material seals and is particularly, though not specifically, applicable to the construction of electron discharge devices of the kind in which a metallic disc is sealed between two glass portions of the envelope of the device.

In electron discharge devices of the multi-electrode type for use at very high frequencies, it is often desirable that the grid or other electrode lead be brought out in the form of an annular disc forming a ring seal and lying in an equatorial plane of the valve, as by this construction the inductance of the lead is reduced.

Various methods for constructing valves in this form are known. For example, the grid may be mounted on a thin copper disc sealed into the glass of the bulb by the method described in the specifications of United States applications Nos. 429,072 and 429,073. This latter method utilises a ring shaped copper member having in effect a T cross-section, each limb of the cross bar of the T being sealed into the end of the cylindrical wall, for example, of glass and the grid being connected to the vertical limb of the T. This method is highly satisfactory as it embodies a copper member of thickness adequate to provide rigid support to the grid. A disadvantage is that, whilst one edge is being sealed to the glass the other thin edge may be burned, and to prevent this happening it is advisable to machine the second copper edge after the first glass seal has been made.

To eliminate the machining operation and at the same time prevent burning of the second edge, according to the present invention two separate metallic tubular members are used each having transverse sections comprising an L or T shape, reversed in the one member with respect to the other, and one of the limbs of each of the L sections or the vertical limbs of the T sections are sealed individually into the ends of respective cylindrical walls of glass or other vitreous material. When the two seals have been completed the other limbs of the L sections or the cross-bars of the T sections are placed back to back, and secured together in a vacuum-tight joint, for example, as by brazing. The limb of the section which is sealed to the glass is, of course, treated in the same manner as in the known methods, and the sealing of the limb to the glass is as formerly.

More generally according to the present invention the method of making a double seal by inserting a member between two vitreous or the

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like members comprises utilising two subsidiary metal members which together form said metal member, sealing one of said subsidiary members into one of said vitreous or like members, sealing the other of said subsidiary members into the other of said vitreous or like members and securing together said subsidiary members by uniting them, for example as by soldering or brazing.

The invention will now be more fully described with reference to the accompanying drawings in which:

Figure 1 shows a view in elevation and partly in longitudinal section of an electron discharge device of the three electrode type which embodies the present invention.

Figure 2 shows a modification of part of Figure 1.

Figure 3 is a sectional view of part of an electron discharge valve showing the use of T-section tubular members supporting a wire wound grid.

Figure 4 is a partial sectional view of part of a valve showing the use of T-section tubular members supporting a flat grid.

Figure 5 is a sectional view of a valve showing an annular disc supported between two L-section tubular members.

Referring to Fig. 1, the vacuum tube, of which the upper part is shown cut away, comprises a tubular metal anode 7, preferably of copper, sealed in the well known manner to a glass portion 8 of the envelope, and a second lower glass portion 9 carrying the usual re-entrant press 10 with exhaust tube 11. Inside the anode is arranged a grid 12, and inside the grid a filament cathode 13 supported in the conventional way on rods or wires 5 serving as leads sealed through the press 10.

The grid 12 is fixed to a ring 14 mounted by rods 4 on an annular copper disc 3, having a central hole 15 large enough to allow the filament assembly to be passed through. The grid may be mounted on the disc in any other convenient way.

In accordance with the present invention: two tubular members in the form of copper rings 1 and 2 are provided, and are sealed respectively to the glass portions 8 and 9 of the envelope. These rings are in the form of short cylindrical portions of L-section with outwardly extending parallel flanges, and may easily be made by a spinning operation, for example, or in a punch press.

When assembling the parts of the tube, the disc 3 is sandwiched between the flanges of the two copper rings 1 and 2, as indicated, and the joints

at 16 and 17 are made vacuum tight by soldering, brazing, or the like.

In the modification shown in Fig. 2, the edges of the flanges of the rings 1 and 2 are turned over to form lips 18 and 19.

The diameter of the lip 18 should be such as to form a shallow cup into which the disc 3 just fits, and that of the lip 19 should just accommodate the lip 18. The parts then fit together as shown at 20. By this preferred arrangement the grid and other electrodes and parts of the tube are automatically centered, and only one vacuum tight soldered or brazed joint is necessary.

It will be seen that the parts 1, 2 and 3 are all very simple, and may be easily made by spinning or punch-press operations and all the glass working processes are simple.

Whilst the members 1 and 2 have been shown as of L-section they may be of T-section as shown for example in Figure 3.

In Figure 3 the members 1, 2 are of T section, and the disc 3 supporting the grid structure 12 is carried by the internal limbs of the cross-bar of the T section. The disc 3 is provided with a central aperture 21 to enable the cathode to be inserted in position within the grid. In this case the grid structure would be mounted in position before the anode 7 is sealed to the envelope, and before 1 and 2 are brazed or otherwise secured together in a vacuum tight manner. Alternately the disc 3 may be secured between the internal limbs of the T section tubular member as illustrated in Figure 4, or between the external limbs of the L-section members as in Figure 5.

The arrangement shown in Figure 5 is more suitable for supporting a wire wound grid, whilst the arrangement in Figure 4 is more suited for mounting a plain or flat type grid.

Whilst the invention has been described as applied to electron discharge devices it is equally applicable to other devices requiring a metal disc sealed into the wall of insulating material of the device.

By means of the method according to this invention applied to a multi-electrode electron discharge device of the kind having a flat or substantially flat grid electrode located in the aperture of a metal annulus such as 3 Figure 4 with the anode assembly on one side and the cathode assembly on the other side, it is possible to seal one metal annular L or T member to the portion of the glass envelope containing the anode assembly, and the other metal annular L or T member to the portion of the glass envelope containing the cathode assembly, the brazing or otherwise securing together of the discs in a vacuum-tight manner then being the last operation in putting the valve together. In the case of the electron discharge devices as those referred to, one of the metal members may be of T section and accommodate the grid while the other metal member need only be of L section the external limb of the L and the external cross-bar limb of the T being secured together in a vacuum, or gas-tight manner.

It will be understood that the end of the grid-supporting limb of the L section or one or both ends of the cross-bar of the T section may be provided with other limbs if desired forming a U-shaped section or partial section and the angles between the limbs of the L or U or T sections may be rounded off.

Whilst the metallic members have been referred to as made of copper, any other appropriate metals may be used and may be the same or different for the two seals. Furthermore, the invention is not limited to multi-electrode valves but may be practised in any case where a metallic disc is to be sealed between two walls of glass or like material. It will also be understood that the glass, or the like, portions on either side of the metallic member may be of different compositions; for example, hard glass may be used on the filament stem side in an electron discharge valve and soft glass on the other side of the metal member. Such might be the case, for instance if it were desired to use tungsten wire for the filament leads.

What is claimed is:

1. In an electron discharge tube of the type having an enclosing envelope comprising at least two tubular glass sections and an intervening tubular metal section, said intervening metal section being constituted of two tubular metal members each having a right-angled flange extending outwardly beyond the periphery thereof, said flanges having their external edges reversely bent and in overlapping relation relative to each other so as to provide only one exposed seam, said seam being sealed vacuum-tight.

2. An electron discharge tube according to claim 1 in which one of said tubular glass members has sealed thereto in a vacuum-tight manner a metal cup-shaped member which acts as an external anode of the tube, the other tubular glass member has a header through which a plurality of lead-in wires are sealed.

3. An electron discharge tube according to claim 1 in which an annular metal plate is sandwiched between the abutting opposed flanges of said two tubular metal members, said annular metal member serving as a pedestal support for an electrode positioned inside said enclosing envelope.

4. An electron discharge tube according to claim 1 in which an annular metal member is sandwiched between the opposed abutting faces of said flanges, said annular metal member having an outside diameter so as to fit closely within said overlapped edges to center said annular metal member with respect to the longitudinal axis of the tube.

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