Nov. 13, 1923. 1,474,293

F. REYNOLDS

THERMIONIC VALVE

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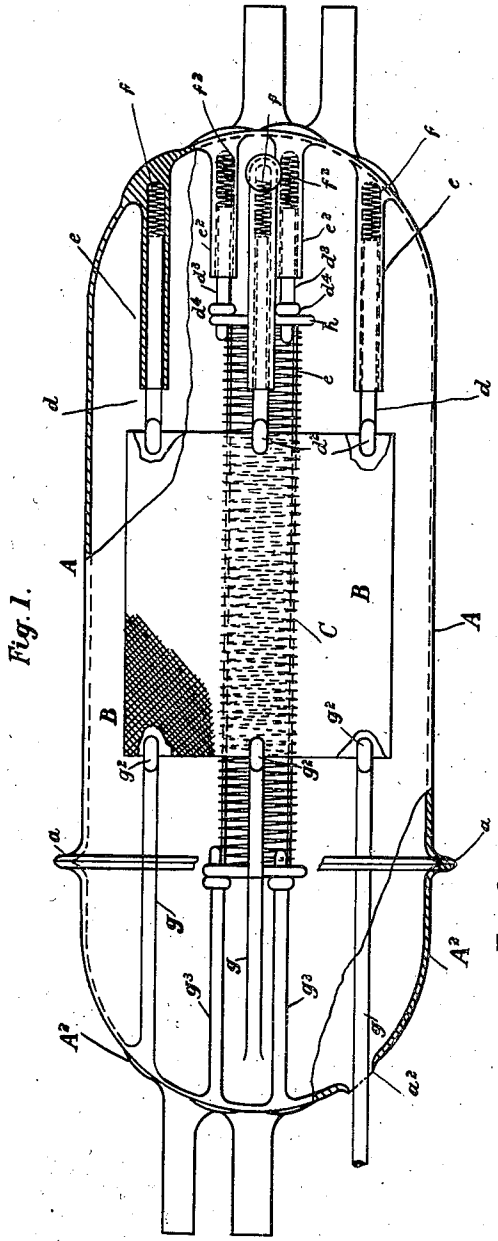


Fig. 1.

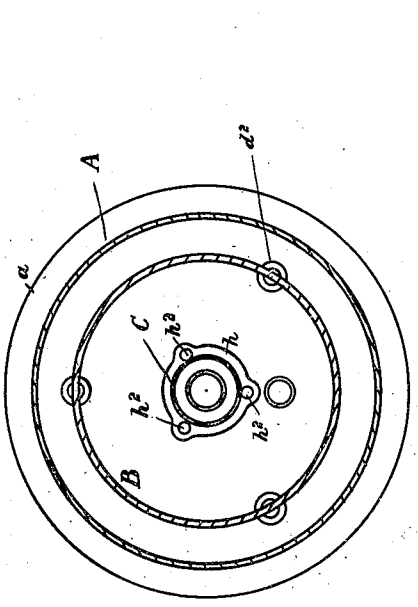


Fig. 2.

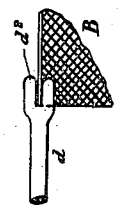


Fig. 4.

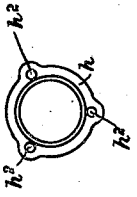


Fig. 3.

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Fig. 5.

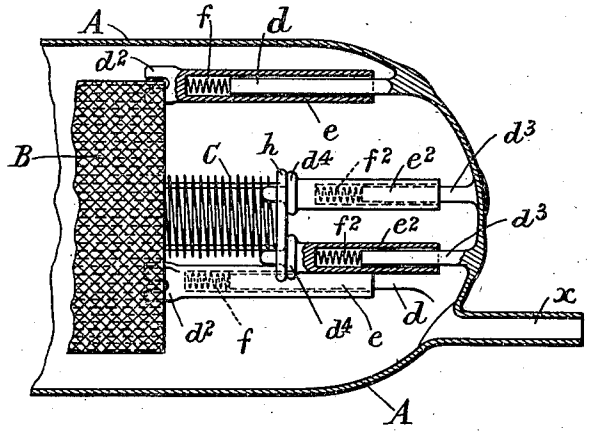
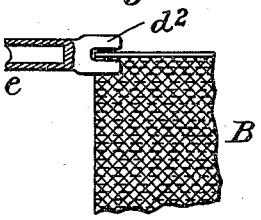


Fig. 6.



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Patented Nov. 13, 1923. 1,474,293

UNITED STATES PATENT OFFICE.

FREDERICK REYNOLDS, OF WALKERVILLE-ON-TYNE, ENGLAND, ASSIGNOR OF ONE-HALF TO THE SILICA SYNDICATE LIMITED, OF WESTMINSTER, LONDON, ENGLAND, A COMPANY OF GREAT BRITAIN.

THERMIONIC VALVE.

Application filed November 10, 1921. Serial No. 514,424.

To all whom it may concern:

Be it known that I, FREDERICK REYNOLDS, a subject of the King of Great Britain, residing at 14 Rosewood Crescent, Walkerville-on-Tyne, in the county of Northumberland, England, have invented new and useful Improvements in Thermionic Valves, of which the following is a specification.

This invention relates to high-power thermionic valves in which the electrodes are enclosed in a vacuum envelope made of any suitable material such, for instance, as fused quartz-glass, and the electrodes are supported by resilient supports or ordinary glass, the object of the present invention being to provide simple and efficient means for supporting the grid and anode, both of which are rigid in such manner that the vacuum envelope can be cut open for access to the interior without breaking, or disconnecting from the vacuum envelope, any part of the supporting means, which comprise springs whereby allowance is made for free expansion and contraction of the metal parts under changes of temperature without such strain as would be liable to result in fracture.

To support the electrodes I according to this invention provide what may be termed telescopic spring arrangements which allow only for resiliency in longitudinal direction and are constructed as follows:—I fuse by one of their ends, to the end of the vacuum envelope, preferably at equal distances apart, any suitable number (say three) of tubes, hollow rods, or other suitable guides, (of quartz-glass, or other suitable glass, or material), which I will refer to as tubes. In each of these tubes is a spring, such, for example, as a short length of a coiled spring of molybdenum, or tungsten, wire and on each of these springs bears one end of a rod, of quartz-glass, or other suitable glass, or material, which can slide in the said tube the other, or protruding, end of the said rod extending beyond the end of the tube and being forked, or otherwise adapted to fit onto, or into, or otherwise engage with, or attached to, the respective electrodes. If desired, the aforesaid method of construction may be reversed that is the rods may be fused, in any desired number, to the vacuum envelope and the tubes be adapted to slide on these rods, and be acted upon by the springs, the ends of the tubes next the electrodes being adapted to fit onto, or into, or engage with, or be attached to, the electrodes. The other ends of the electrodes can be supported from the other end of the vacuum envelope by rods and tubes of quartz-glass, or other suitable glass, or material, in either of the hereinbefore described ways; or by rods, or tubes, fused directly to the vacuum envelope at this end without employing any sliding arrangement and springs as described with regard to the other end.

These rods, or tubes, can be inserted from outside the vacuum envelope through holes in the said envelope, which holes are afterwards closed onto, or fused to, the rods, or tubes, so as to secure them in position.

I will describe, with reference to the accompanying drawing, a manner in which this invention may be carried into effect premising that I do not limit myself to the precise details which I shall describe.

Figure 1 is a plan partly in section and Figure 2 is a transverse section showing so much of a thermionic valve as is necessary to illustrate the application of this invention thereto, Figures 3 and 4 showing details and Figs. 5 and 6 modifications, as hereinafter described.

The body of the vacuum envelope of the valve is marked A. It is shown as being cylindrical with dome-shaped ends A^2 and as being made in two parts joined together at *a* after the internal fittings have been put in place, but it may, of course, be of any suitable shape and construction.

The anode is marked B and the grid is marked C each being shown as of cylindrical form. To avoid complication I have not shown the filament and its adjuncts as they may be of the usual kind and their illustration is not necessary to the understanding of the present invention.

The anode is supported at one end by three rods *d* of quartz or glass, the said rods being forked at one end to engage the anode as shown at d^2 and more clearly in the detail Figure 4, the other ends of the said rods sliding in tubes *e* fused to the walls of the vacuum envelope. A spring *f* of any suitable metal (such for example as tungsten, or molybdenum) is inserted into the tube *e* and bears at one end on the bottom of the said

tube and at the other end upon the end of the rod d. The other end of the anode is supported by the three rods g which, at one end, g^2 are forked like the rods d to engage the edge of the anode B and at the other end are fused to the vacuum envelope. The rods g can be readily fixed in place by making holes in the vacuum envelope as shown at a^2 in such position that, when the rods g are passed through them the said rods g will be in, or about in, line with the rods d, the said rods g being sufficiently long to leave a part projecting (as shown at the lower part of Figure 1) sufficiently to allow of their being adjusted from the exterior of the vacuum envelope before they are fused to the said envelope. When the seal is being made pressure is applied to the rods g so as to compress the springs f. The anode B is thus held firmly in position in the valve and expansion and contraction in the glass, or quartz, or in the anode are compensated for by the said springs. The grid C is supported in the vacuum envelope by means similar to those described with regard to the rods, tubes and springs of the anode support, each end of the grid C being provided with a stout metal ring h (shown separately in Figure 3) provided with three equi-distant eyes, or loops, h^2 and into each of these eyes or loops at one end of the grid fits the end of a glass, or quartz, rod d^3 each rod being provided with a shoulder d^4 the end of the rod beyond this shoulder engaging one of the eyes, or loops, h^2. The other ends of the rods d^3 slide in the tubes e^2 and bear against the springs f^2 as hereinbefore described with regard to the anode support. The other end of the grid C is supported by quartz, or glass, rods g^3 each formed with a collar the ends beyond the collars passing through holes in the vacuum envelope and into the eyes or loops in the metal ring h at this end of the grid.

It will be understood that the yieldable supports can be at the end A^2 and the rigid rods at the opposite end and that I can, if desired, fit the tubes e and e^2 to the grid and anode and the rods d and d^3 to the vacuum envelope and that the rods d and d^3 and the tubes e and e^2 with the springs f and f^2 may be fitted at both ends of the valve instead of at one end only.

If desired the vacuum envelope may be a simple tube open at both ends and with a dome-shaped piece at each end to close the openings in the manner hereinbefore described with regard to one end only.

Figs. 5 and 6 are views corresponding to the right hand end of Fig. 1 and to Fig. 4, respectively, illustrating how the rods may be secured to the envelope, and the tubes slidable on these rods may be formed with the parts which engage the electrodes. The parts shown here which resemble those shown in the other figures are marked with the same reference letters, and call for no further description.

In Fig. 5 a tube is shown at X, which tube is provided for attachment to vacuum creating means for exhausting the device, and is sealed up after the vacuum is established in the usual manner of exhausting and sealing-up vessels.

What I claim is:—

1. In a thermionic valve, rigid electrodes and telescopically engaged supporting members for each of said electrodes, together with spring means operatively interposed between the telescopically engaged supporting members to permit said supports to yield telescopically with relation to each other.

2. In a thermionic valve, rigid electrodes and telescopically engaged supporting members for each of said electrodes, together with spring means operatively interposed between the telescopically engaged supporting members to permit said supports to yield telescopically with relation to each other, in combination with a vacuum envelope surrounding the electrodes and carrying one of the telescopic members of each of the electrode supports.

3. In a thermionic valve, rigid electrodes, a plurality of telescopic supports for each of said electrodes, together with spring means operatively interposed between the elements of each telescopic support to permit said elements to yield telescopically with relation to each other.

4. In a thermionic valve, rigid electrodes and telescopically engaged supporting members of insulating material for each of said members, together with spring means operatively interposed between the telescopically engaged supporting members to permit said supports to yield telescopically with relation to each other.

5. In a thermionic valve, a grid electrode, and a support therefor comprising telescopically engaged members of insulating material, and a spring in compression between the same tending to thrust one element of said telescopic support against the grid.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK REYNOLDS.

Witnesses:

WILLIAM CRAIG,

A. L. MOORE.