

# PATENT SPECIFICATION



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## COMPLETE SPECIFICATION.

### Improvements in Electric Vacuum Tubes.

We, ARCTURUS RADIO TUBE COMPANY, of 260, Sherman Avenue, Newark, New Jersey, United States of America, a corporation organised under the laws of the State of Delaware, United States of America, (Assignees of WALTER LOUIS KRAHL, of 73, Orange Road, Montclair, New Jersey, United States of America), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in electric vacuum tubes and more particularly to electric vacuum tubes of the type comprising a cathode, an anode, a control grid and a shield or screening grid located between the control grid and the anode. In this type of electric vacuum tube it has been proposed to provide an additional or outer shield in the form of a grid outside the anode in addition to the screen interposed between the control grid and the anode. The present invention is concerned with the improved form of such additional screen.

In accordance with the principal feature of the present invention this outer shield which is in the form of a grid is made longer than the anode, control grid and inner screen, so that the latter parts do not project beyond the outer screen at either end. The cathode is provided with a heater adapted to be energised by fluctuating current.

In accordance with a further feature of the invention complete shielding is obtained by the provision in association with the extended ends of the outer shield or screen of disc like shields disposed at both ends of the outer shield or screen. The use of disc like shields at both ends of an outer shield or screen is not novel per se.

In accordance with a still further feature, the outer screen is of non-foraminous material.

The invention is illustrated in the accompanying drawing in which

Fig. 1 is a sectional side elevation of a tube embodying the invention :

Fig. 2 is a side view partly in section

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of the elements of the tube shown in Fig. 1; and

Fig. 3 is a plan view of the elements as shown in Fig. 1.

Referring more specifically to the drawings, 10 is an envelope mounted in the usual base 11 which is adapted to carry the terminals for making the necessary connections to the elements of the tube. The regular elements of the tube comprise a plate 13, a grid 14, a cathode 15, and a heater 16, these elements being all supported from the press 12 in a manner to be hereinafter explained.

The plate 13 is preferably made cylindrical and is provided at opposite sides thereof with supporting wires 17 and 18 which are welded to the plate and which extend downwardly below the same and are welded respectively to supports 19 and 20 which are sealed in the press 12.

The grid 14 comprises the usual helix, on opposite sides of which are welded uprights 21 and 22, the same extending to a point slightly above the top of the helix, and at the upper ends thereof these supports are welded respectively to horizontal conductors 23 and 24, respectively, which pass outwardly beyond the side of the plate and are welded to downwardly extending arms 23<sup>1</sup> and 24<sup>1</sup> sealed in a glass bead 25 which is supported from the press 12 by means of an upright 26 sealed in the bead and extending downwardly to a point somewhat below the plate and grid, where it is welded to a support 27 which is sealed in the press 12. These uprights 21 and 22 are supported solely at the upper ends thereof and form the only support for the grid 14.

The cathode 15 is preferably a cylindrical shell of nickel or other conducting metal and is mounted concentrically within the grid and plate and may be supported at its upper end by a strip 28 which is welded around the top of the cathode and extends to the upright 26, to which it may be welded. The lower end of the cathode is also preferably provided with a strip 29 which is welded around the end of the cathode and which in turn is welded to a support 30 sealed in an upright position in the press 12.

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The filament 16 may be supported at its upper end by means of a spring 31 which is welded to the top of the filament and to the upper end of the support 26 and which is maintained in a deformed position in order to place the filament under tension to compensate for variations in the length thereof due to temperature changes. The lower end of the filament may be welded directly to a supporting wire 32 which is sealed in the press 12 at substantially the center thereof.

On the inside of the plate 13 and between the plate and the grid 14 we have provided a shield 33 comprising a helix of conducting wire wound with more turns than the helix of the grid 14 and extending above and below the grid 14. The shield 33 is supported by means of two uprights 34 and 35 which are placed on opposite sides thereof and which extend down below the lower end of the helix and are bent outwardly as at 14<sup>1</sup> toward the sides of the tube being offset to avoid the uprights 17 and 18 and are then welded respectively to curved strips 36 and 37 which are sealed in the press 12. Around the outside of the plate 13 we have provided an additional shield 38 formed by two semi-cylindrical plates provided with flanges at their ends by means of which they may be welded to uprights 39 and 40 which are bent outwardly at the lower ends thereof just below the lower ends of the shield 38 and may be welded to the curved supports 36 and 37 respectively. Thus the lower end of the shield 38 is rigidly supported in spaced relation to the anode 13, and for maintaining the spaced relation for the upper end of the shield a pair of angle supports 41 and 42, which have their ends sealed in the bead 25, may be welded to the uprights 39 and 40 respectively.

At the upper end of the shield 38 we have provided a disc 43 which is attached to the uprights 39 and 40 for the shield 38 by means of flanges 44 and 45 respectively which are bent upwardly and may be welded to the supports 39 and 40. An opening 46 is provided in the center of the disc 43 large enough to permit the cathode 15 and the supports 21 and 22 for the grid to pass upwardly therethrough without contacting therewith. Notches 47 and 48 may be provided in the periphery of the opening 46 in the disc to receive the upper ends of the uprights 34 and 35 which may be held in alignment, thereby providing means to space the upper end of the shield 33 from the plate 13. We have provided another disc 49 at the lower end of the elements, which is supported upon the lower ends of the uprights 34 and 35 and is attached to the lower end

of the helix forming the shield 33. This disc has an opening 50 in the center thereof to permit the cathode 15 to pass downwardly therethrough without contacting therewith and is large enough in diameter to extend to a point almost beneath the edge of the anode 13.

The base of the tube 11 is provided with four terminals 51, 52, 53 and 54, by which the necessary connections to the elements of the tube are made. The terminal 51 is connected by means of a wire 55 to the support 32, forming the connection for the lower end of the filament. The terminal 52 is connected by means of a wire 56 to the support 27 which forms the connection for the upper end of the filament and also for the upper end of the cathode, and the lower end of the cathode is connected by means of a wire 57 which is connected between support 30 and the terminal 52. The terminal 53 is connected to the plate or anode 13 by means of a wire 58 which is connected to the support 20, and the terminal 54 is connected by means of a wire 59 to the support 37, thus forming the connection for the inner shield 33, the outer shield 38, the disc 43 forming the upper shield, and the disc 49 forming the lower shield, which are all connected together as has been described above.

An additional terminal is provided at the top of the tube for making the grid connection, and this terminal comprises a cap 60 which may be cemented upon the top of the tube and to which a wire 61 may be soldered being brought out through the sealing tip 62. The wire 61 is preferably more or less flexible so that it in no wise supports the grid 14 but may be welded merely to one of the grid supports, as for instance, the angle 22, so as to make the necessary grid connection.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In an electric vacuum tube, comprising an anode, a cathode, a control electrode, a heater for said cathode adapted to be energized by fluctuating current, an inner shield interposed between said control electrode and anode and extending above and below the same and an outer shield in the form of a grid on the opposite side of said anode, the feature that the said outer grid shield is made longer than the anode, control grid and inner shield, so that the latter parts do not project beyond the outer screen at either end.

2. In an electric vacuum tube as claimed in claim 1 the provision of disc like plates

at the extended ends of the outer grid shield.

3. In an electric vacuum tube, an anode, a control electrode, a cathode, a heater for  
 5 said cathode adapted to be energized by fluctuating current, a press, means to support said anode, cathode and heater on  
 10 said press, a terminal mounted on the top of said tube, and means connecting said terminal with said control electrode said  
 15 means being spaced from the other elements and connections in said tube, a shield interposed between said anode and  
 said control electrode, means to support the lower end of said shield from said  
 20 press, a second shield on the opposite side of said anode and connected to said first shield at the lower end thereof, such  
 second shield being longer than the anode, control electrode and inner shield  
 so that the latter parts do not project be-

yond said second shield at either end, an annular plate connected to said second shield and bridging the space between said  
 25 two shields above said anode, and a second annular plate at the lower end of said first shield and extending to a point adjacent  
 said cathode.

4. An electric vacuum tube constructed and arranged substantially as described  
 30 with reference to the annexed drawing.

Dated this 25th day of May, 1929.  
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 Agents for the Applicants.

Reference has been directed, in pursuance of Section 8, Sub-section 2, of the Patents and Designs Acts, 1907 to 1928, to Specification No. 294,125.

[This Drawing is a reproduction of the Original on a reduced scale.]

