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SCREEN GRID TUBE

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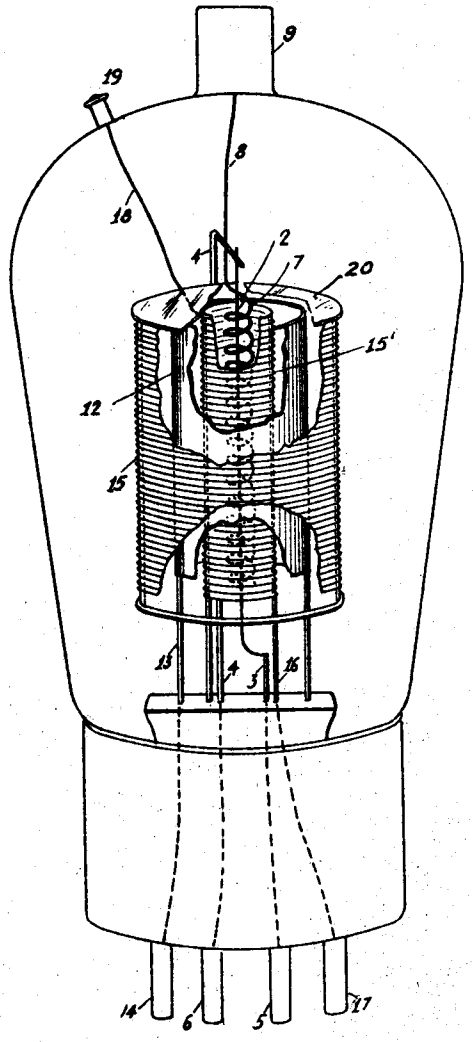

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SCREEN GRID TUBE

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This invention relates to tubes and more particularly to tubes of the screen grid type.

In radio work the high frequencies of the electrical oscillations have resulted in efforts to neutralize the capacity coupling existing between the various electrodes of the electron discharge tube. As we increase the frequency with which we work the greater is the effect of this capacity and the greater is the extent to which we must shield the electrodes in order to avoid undesirable coupling. One of the means for reducing the capacity coupling between the electrodes is to insert a screen between the plate and grid to avoid the undesirable feedback of energy from the plate to the grid. At the extremely high frequencies used, for example, in five meter work, it has been found that a screen as ordinarily applied is not sufficient. This is due to the fact that the leads to this screen, though in the form of pieces of straight wire, have appreciable self-inductance, making it difficult to apply a radio frequency short circuit between screen and filament.

To avoid this inductance, I have introduced a very short lead to the screen grid which has a terminal on top of the tube. The shield grid is grounded for radio frequencies through this short lead, and it has been found that this more effective grounding reduces the inter-electrode coupling between plate and control grid.

The invention is more fully described in connection with the accompanying figure which shows a diagrammatic arrangement of the various elements in a tube according to my invention.

In the figure is shown a tube with a bulb or envelope of the usual type enclosing a filament 2 having lead wires 3 and 4 sealed into the press of a reentrant stem of the usual type and extending through the stem tube to the base of the tube where they are connected to terminals 5 and 6. About the filament is shown the input electrode or grid 7. This grid has a lead 8 connecting with the terminal 9 on the top of the tube. The plate 12 surrounds the grid and has a lead wire 13 which is sealed into the press of the stem and connects with the terminal 14 also on the base of the tube. The shield grid 15′ acts as a screen between the plate 12 and the input electrode or grid 7. The shield 15′ has a long lead 16 sealed into the press of the stem and extending through the stem tube to the base of the tube to a bottom terminal 17.

As is well known, the shield or screen reduces the effective capacity between the plate electrode 12 and the input or grid electrode 7. The variations in the plate voltage on the electrode 12 would be transferred by capacity coupling to the grid 7 if there were no shield 15′ between them to effect a grounding of the capacitive current. In tubes of this construction as commonly used the screen or shield 15′ is kept at a constant potential, usually a positive potential, through the lead 16.

The outer portion 15 and the inner portion 15′ of the screen are electrically connected to each other through the metal disc 20.

It has been found that at these extremely high frequencies, such as are used for wave lengths of five meters or less, the reactance of the long lead 16 was such that the tube persistently oscillated when the plate and grid circuits were brought into resonance. The construction of the tube will not permit the shortening of the lead 16, which extends from the lower edge of the screen 15 through the press and stem tube to the base terminal 17, and which ordinarily has a length of between two and three inches. To reduce the reactance of this screen grid lead I have provided a short additional lead 18 going out through the wall of the glass envelope at a point remote from the stem and preferably near the top to a top terminal 19. The length of this lead 18 is approximately an inch. With this construction the positive biasing potential is applied through the usual lead 16, and the ground connection to the screen 15 is applied through the short lead 18. The more effective grounding has resulted in a more effective screening action of the shield 15 and has reduced oscillation of the tube. This permits working the tube at higher frequencies.

As in the usual type of screen grid tube

both the positive biasing potential and the ground are applied through the lead 16, so in this construction according to my invention both the positive biasing potential and the ground may be applied through the short lead 18 and the use of the long lead 16 may be dispensed with entirely. In such a construction the long lead 16 may be omitted or else no connection may be provided for the terminal 17, both the grounding and the positive potential being applied to the short lead 18 through the terminal 19.

This invention may be applied to tubes used for either transmitting or receiving. The particular arrangement of electrodes shown in the figure is merely illustrative and the electrodes may have forms and relative positions other than those shown.

Claims:

1. A vacuum tube comprising an electron emitting cathode, a plate, a grid between the cathode and plate, and a screen between the plate and the grid, the screen being provided with two terminals, one at the bottom of the tube and one at the top of the tube, a long lead connecting said screen to said terminal at the bottom of the tube and a short lead not substantially longer than one half the length of said long lead connecting said screen to said terminal at the top of said tube.

2. A vacuum tube consisting of an electron emitting cathode, a grid, a plate, and a screen between the plate and grid, the cathode and plate being connected to terminals at the bottom only of the tube, and the screen and grid being connected to terminals near the top of the tube.

3. An electron discharge device comprising a bulb having a reentrant stem with a press on the inner end, a cathode, grid, and plate mounted on said stem, a screen mounted on said stem to be between said grid and said plate, and a lead shorter than the distance from the end of said screen adjacent said press to the outer end of said stem extending through the wall of said bulb from the other end of said screen.

4. An electron discharge device comprising a bulb having a reentrant stem with a press on the inner end, a cathode and a plate mounted on said stem, leads for said cathode and plate extending thru said press to the outer end of said stem, a grid mounted adjacent said cathode, a screen mounted between said grid and said plate, and a lead shorter than either said cathode lead or plate lead extending thru the wall of said bulb remote from said stem and connected to said screen.

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