

Oct. 22, 1935.

W. E. KÜHLE ET AL

2,018,071

SHORT WAVE TUBE

Filed Sept. 29, 1934

Fig. 1

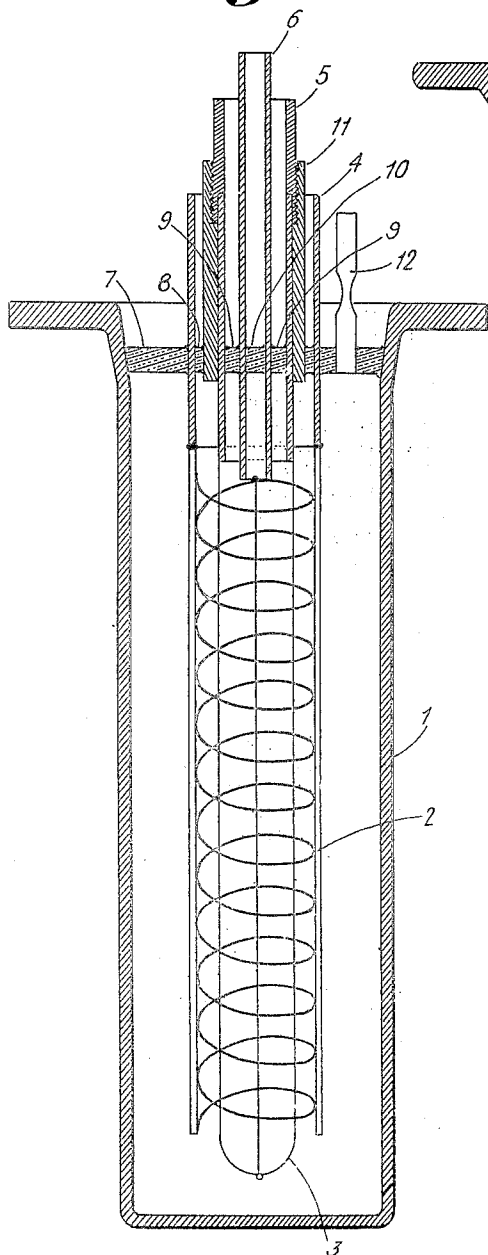


Fig. 2

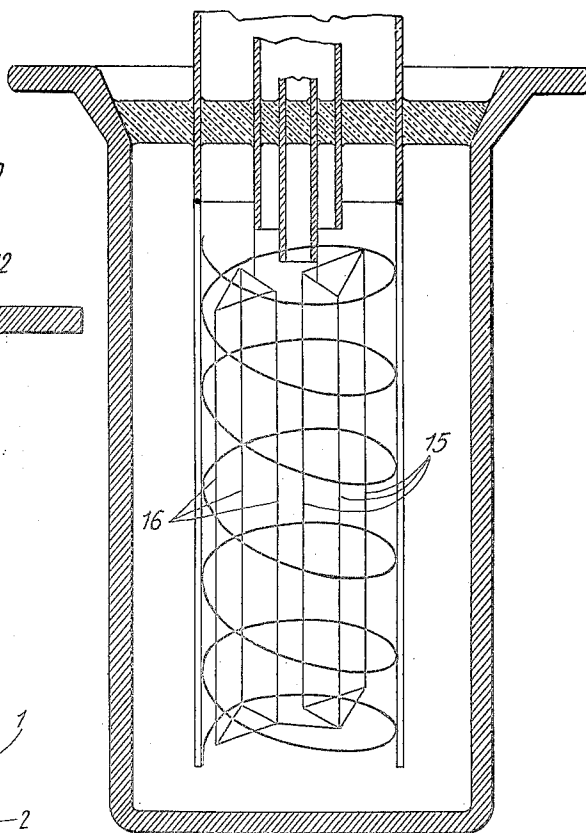
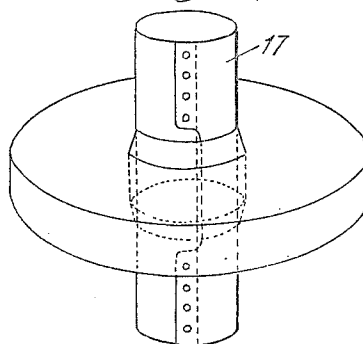


Fig. 3



INVENTORS
WILHELM EBERHARD KÜHLE
DIETRICH PRINZ

BY
Charles McClair
ATTORNEY

UNITED STATES PATENT OFFICE

2,018,071

SHORT WAVE TUBE

Wilhelm Eberhard Kühle and Dietrich Prinz,
Berlin, Germany, assignors to Telefunken Ge-
sellschaft für Drahtlose Telegraphie m. b. H.,
Berlin, Germany, a corporation of Germany

Application September 29, 1934, Serial No. 746,215
In Germany October 7, 1933

4 Claims. (Cl. 250—27.5)

This invention relates to electron discharge tubes particularly suitable for use at high and ultrahigh frequencies.

An object of our invention is to provide an improved type of electron discharge device intended for use at high and ultrahigh frequencies and having concentric tubular leads.

According to our invention ceramic material is employed in place of glass and the concentric leads are hermetically sealed into a disc or plate of ceramic material by annular seals. The use of ceramic material makes it possible to provide a closure and supporting means in the form of a plate or disc and corresponding to a press into which several concentric metal tubes may be hermetically sealed by annular seals very little if at all longer than the thickness of the disc, and to unite the ceramic and the tube envelope with a vacuum-tight connection. In the finished structure rings of ceramic insulating material are positioned between the metal tubes or leads and the overall length of the closure and supporting member is a minimum.

The novel features which we believe to be characteristic of our invention are set forth with particularity in the appended claims, but the invention itself will best be understood by reference to the following description taken in connection with the accompanying drawing in which Figure 1 is a longitudinal cross section of an electron discharge made in accordance with our invention; Figure 2 is a longitudinal cross section of a modification of the electron discharge device shown in Figure 1 and embodying our invention; and Figure 3 shows a detail of construction.

In Figure 1 the tubular metal anode envelope 1 has positioned within it the grid 2, and the cathode 3. The electrodes 4, 5, and 6, in the form of concentric tubes, are supported in spaced relation by concentric ceramic rings 7, 8, and 9, which, with the ceramic plug 10 in the base of the tubular conductor 6, form a flat or disc-like inset plug corresponding to a press in a conventional tube. The leads are extended perpendicular from the closure and supporting member into the envelope, and form in the space outside the envelope a co-axial tubular system which is free from radio frequency radiations. The electrodes are supported within the metal envelope solely by the leads. By choosing a suitable length for the tube, conditions can be made so that a voltage node will be set up at the closure member of insulating material, whereas a voltage loop is formed at the lower end of the electrode system. An arrangement of this kind has the ad-

vantage that only slight dielectric losses take place in the insulation material forming the closure member. It will be seen that leads 5 and 6 which support the cathode can be removed as a unit, in the event a replacement is necessary, by unscrewing lead 5, to which lead 6 is secured by member 9, from the tubular member 11 which is internally threaded to receive lead 5. An exhaust tube 12 is embedded preferably in the outer annular member 7.

It may be desirable in some cases to employ a cathode such as shown in Figure 2, comprising so-called twin or double prism filamentary cathodes 15 and 16 each consisting of three or more spaced parallel current-carrying filaments connected together at their ends so that they lie in the edges of an imaginary prism. The filaments which define a pair of prisms are all interconnected at the bottom as shown and supported solely by the lead conductors. As a result, no central rod is required for supporting the cathode, thereby eliminating the possibility of such a rod forming an oscillatory system with the electron emitting filaments of the cathode.

To make good seals between the ceramic insulating members and the tubular leads molybdenum tubes, which have proven especially suitable, are preferred. Inasmuch as it is difficult to make seamless molybdenum tubes, it is preferable to make them by riveting the edges of sheet molybdenum together, the riveting being done as best shown in Figure 3, only along the edges of the tube 17 not embedded in the ceramic insulator. A tube formed by riveting the edges of the molybdenum sheet together in this way may then be simply fused to the ceramic insulator, provided the molybdenum tube has a sufficiently thin wall.

While we have indicated the preferred embodiments of our invention of which we are now aware and have also indicated only one specific application for which our invention may be employed, it will be apparent that our invention is by no means limited to the exact forms illustrated or the use indicated, but that many variations may be made in the particular structure used and the purpose for which it is employed without departing from the scope of our invention as set forth in the appended claims.

What we claim as new is:—

1. An electron discharge tube for use at high frequencies and comprising a tubular metal envelope open at one end, member of ceramic material closing the open end of said envelope, a plurality of concentric tubular leads imbedded in

said member, and electrodes supported solely by said leads within said envelope.

2. An electron discharge tube for use at high frequencies and comprising a tubular metal envelope open at one end, a member of ceramic material closing the open end of said envelope, a plurality of concentric tubular lead conductors imbedded in said member and supported in spaced relation with each other and with the envelope by said press, and electrodes supported on said lead conductors within the envelope.

3. An electron discharge tube for use at high frequencies and comprising a tubular metal envelope open at one end, an inset plug of ceramic material closing the open end of said envelope, a plurality of concentric tubular lead conductors imbedded in said inset plug, and electrodes including a cathode comprising a plurality of par-

allel filaments arranged to define a pair of prisms supported by said lead conductors within the envelope.

4. An electron discharge tube for use at high frequencies and comprising a tubular envelope open at one end, a flat inset plug of ceramic material closing the open end of the envelope, a plurality of concentric tubular lead conductors imbedded in said inset plug and comprising tubes made of thin molybdenum sheet extending perpendicularly from both sides of said inset plug with the edges of the tube riveted together only on the extended portions of the tube, and electrodes supported on said lead conductors within said envelope.

WILHELM EBERHARD KÜHLE.
DIETRICH PRINZ.