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CONTROL ELECTRODE STRUCTURE FOR CROSSED-FIELD AMPLIFIER

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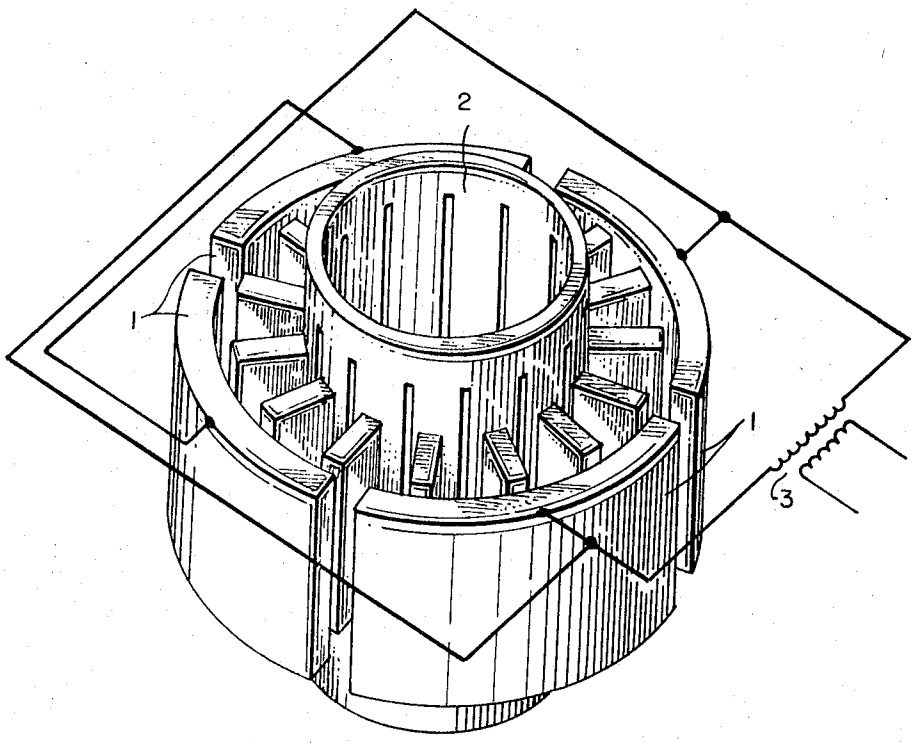


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# CONTROL ELECTRODE STRUCTURE FOR CROSSED-FIELD AMPLIFIER

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## ABSTRACT OF THE DISCLOSURE

A cathode-control electrode structure for crossed-field amplifier tubes is disclosed. The cathode-control electrode structure is used in crossed-field amplifiers that operate from a DC power supply with heaterless cathodes. The disclosed cathode is a segmented cathode. The segments of the cathode are electrically insulated from each other. Positive pulses are applied to alternate segments of the cathode at the termination of an RF input pulse. The positive cathode segments attract the electron current and immediately cut-off the cathode current flow.

This invention relates to crossed-field amplifiers, and more particularly to a cathode-control electrode structure for crossed-field amplifier tubes.

My novel cathode-control electrode is used in crossed-field amplifiers that operate from a DC power supply with heaterless cathodes. In this type of amplifier no current is obtained from the cathode until an RF input signal causes back bombardment of the cathode. The back bombardment of the cathode causes copious secondary emission current. The current will ordinarily continue to flow between cathode and anode after the termination of the RF input, and the tube will either oscillate or put out noise.

Prior to my invention no completely satisfactory means to cut-off current in crossed-field amplifiers after termination of the RF input had been devised for crossed-field amplifiers having slow wave circuits of many sections or for crossed-field amplifiers with high peak power capabilities. My invention which basically comprises a segmented cathode provides highly effective cut-off even for crossed-field amplifiers having extremely high peak power capabilities and for crossed-field amplifiers having slow wave circuits consisting of many sections.

Therefore, an object of my invention is to provide means to cut-off current flow in crossed-field amplifiers at the termination of the RF input.

Another object of my invention is to provide means to cut-off current flow in crossed-field high power amplifiers at the termination of an input pulse.

A further object of my invention is to provide means to cut-off current flow, at the termination of the RF input, in crossed-field amplifiers having slow wave circuits of many sections.

The above mentioned and other objects of my invention will be apparent by reference to the following detailed description and accompanying drawing in which:

The single figure is a perspective of my invention as it is utilized in the type of crossed-wave amplifier tube that has the cathode surrounding an inverted circular electric mode anode.

The single figure shows part of a well known type of crossed-field amplifier tube in which a circular shaped

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cathode 1 surrounds a circular anode slow wave structure 2. In this type of crossed-field amplifier a DC voltage (not shown) is normally applied between the anode and the cathode. The cathode is operated as a cold cathode, therefore no current is obtained from the cathode until an RF input signal causes back bombardment of the cathode. This back bombardment causes copious secondary emission current. The current will ordinarily continue to flow between cathode and anode after the termination of the RF input and the tube will either oscillate or put out noise. For many applications of crossed-field amplifiers it is not only desirable but essential for proper operation that the cathode current be cut-off at the termination of an input pulse.

Prior to my invention no method for effectively cutting-off current flow at the termination of an input pulse had been devised for crossed-field amplifiers having high power capabilities or for crossed-field amplifiers having slow wave circuits of many sections. The prior art methods for cutting-off current flow operate satisfactorily only if utilized in relatively low power crossed-field amplifiers having a limited number of sections in their slow wave circuits. My invention can be utilized with any type of crossed-field amplifier regardless of the power capabilities of the amplifier or the number of sections in the slow wave circuit. Referring to the figure, my invention comprises fabricating the cathode into the segments numbered 1. Cathodes of crossed-field amplifiers are normally fabricated as continuous rings or cylinders. At the termination of an RF input pulse, positive pulses are applied between alternate segments 1 of the cathode by means of transformer 3. Any suitable coupling means other than transformer 3 may of course be used. It is obvious that the positive cathode segments immediately attract the electron current and cut-off the cathode current flow.

While my invention is shown as being used with a particular type of crossed-field tube it is obvious that it can be utilized with any type of crossed-field tube. It should also be obvious that the cathode can be divided into more than four segments provided that an even number of segments is maintained. Up to a point a larger number of segments will enhance cut-off control.

I claim:

1. A crossed-field amplifier tube comprising: a centrally located anode slow wave structure; a cold cathode divided into an even number of segments surrounding said anode; and transformer means to apply a pulsed voltage between alternate segments of said segmented cold cathode at the termination of an input pulse to said amplifier.

2. A crossed-field amplifier as described in claim 1 wherein said number of segments is greater than 2.

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