

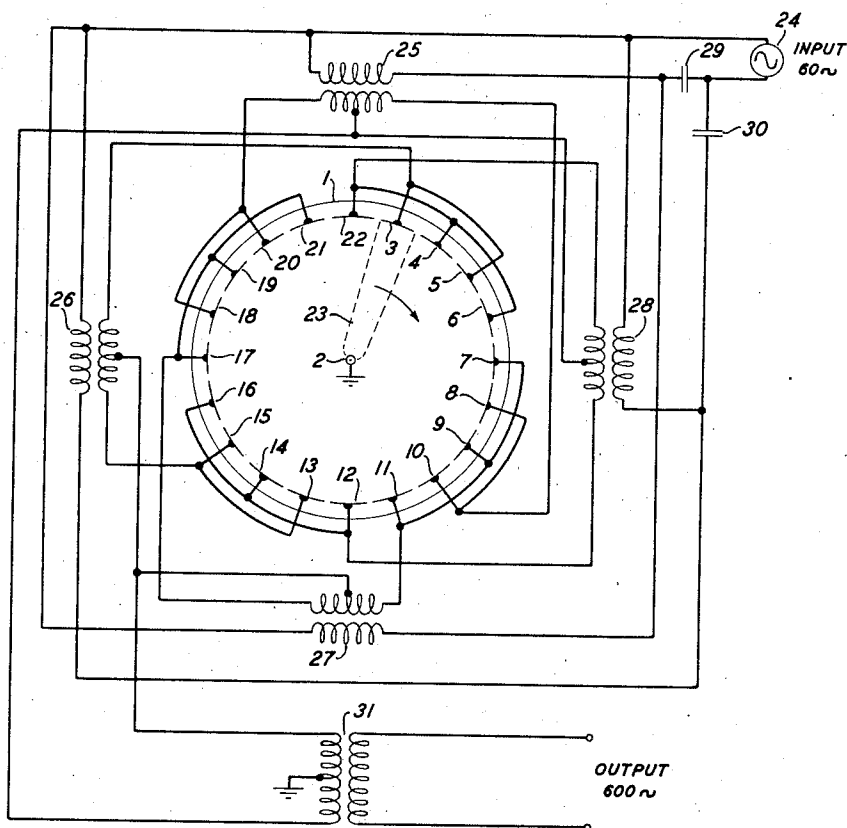
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ELECTRONIC DEVICE

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ELECTRONIC DEVICE

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2 Claims. (Cl. 172-281)

This invention relates to electron discharge apparatus and more particularly to electronic switches and distributors.

My prior Patent No. 2,217,774, granted October 15, 1940 shows an electron discharge device of the rotating radial beam type which is capable of use as a frequency multiplier. The present invention is an improvement on my prior arrangement, and consists of a combination including a radial beam tube and a circuit arrangement whereby the tube in its operation automatically rectifies an alternating current to supply the necessary beam producing potential. Thus all external sources of potential are eliminated and a frequency multiplier is provided having no movable parts or elements requiring maintenance or replacement.

An object of the invention is to provide a simple and economical device for producing an alternating current having a frequency within the limits of the ordinary musical scale which may be used as a source of tone for signaling purposes and which device will consist wholly of mechanically inert apparatus.

A feature of the invention is an electronic device having a cathode and a plurality of targets or anodes mounted in a cylindrical boundary encompassing the cathode and coaxial therewith wired in a circuit arrangement such that an electron beam from the cathode rotates, passing over the anodes in succession and functions both to commutate the alternating current supplied thereto to produce a beam directing direct current and to produce a multiplied frequency alternating current in an output circuit.

Another feature is a rotating beam multiple anode electronic tube in a self-rectifying circuit.

Other features will appear hereinafter.

The drawing consists of a single figure showing a circuit diagram with a schematic representation of a radial beam tube such as that described in my patent hereinbefore referred to. In this diagram the numeral 1 designates the envelope of a tube in which a central electrode 2 and a plurality of anodes 3 to 22, inclusive are shaped around the surface of the envelope. If an internal rotating electrostatic field is used with the normal rotating magnetic field, only one beam, that indicated by the dotted line 23, is produced. By shaping the anodes around the periphery of the tube which produces the internal rotating electrostatic field it is possible to obtain either a rectified direct current without appreciable ripple or various frequencies of al-

ternating current. In the particular example herein given a 600-cycle output is desired and to obtain this 20 anodes equally spaced around the periphery are used. These are connected in two groups of 10 alternately spaced and phased through a transformer so that the pulses from one group are 180 degrees out of phase with respect to those of the other. In addition, each group of 10 anodes is separated into four groups (two groups of three and two groups of two) for the application of two-phase alternating potentials.

The input comprises a source 24 of 60-cycle alternating current. This is connected to a stator comprising four coils in quadrature, these being designated 25, 26, 27 and 28, the coils 25 and 27 being supplied through the condenser 29, and the coils 26 and 28 being supplied through the condenser 30. Adjacent to each of these coils another center-tapped coil acts in the capacity of the secondary of the transformer of which the first coil is the primary. The primary coils are connected to the single phase 60-cycle input through the condensers 29 and 30 so that the currents in these coils are 90 degrees apart in phase.

By this arrangement there is produced within the tube a rotating electrostatic field in phase with the rotating magnetic field so that only a single beam is produced and this beam impinging upon the different anodes in succession produces in the secondary of the transformer 31 a 600-cycle output which is very nearly sinusoidal.

The beam 23 rotating in the direction indicated acts to commutate the current flowing thereover. That is, the actual current in the beam 23 is direct in nature but since the alternate anodes in which it is associated in its rotation are connected to opposite points the effect is to alternately pass current through the upper and lower halves of the primary winding of transformer 31 and the result that an alternating current is produced in the secondary thereof. By way of example, a circuit may be traced from ground through the cathode 2, the beam 23, anode 3, the upper half of the secondary winding associated with coil 26, the upper terminal of the primary of transformer 31 to ground. As the beam then moves to the anode 4, the current may be traced from ground, cathode 2, beam 23, anode 4, the upper terminal of the secondary coil associated with coil 28, the lower terminal of the primary of transformer 31 to ground. Since the current in the beam 23 is always in the same direction, the current in the primary of the transformer 31 is

therefore reversed each time the beam moves from one anode to another.

The 60-cycle input is therefore translated into a 600-cycle output.

It should be particularly noted that this tube is self-rectifying in that no outside source of potential to produce and maintain the beam is necessary. This forms a convenient device spoken of as a static generator and may be usefully employed as a source of tone for various purposes.

What is claimed is:

1. A device for multiplying the frequency of an alternating current comprising an electronic tube having a cathode and a plurality of targets or anodes mounted in a cylindrical boundary encompassing the said cathode and coaxial therewith, a circuit arrangement for said tube including coils in quadrature for producing a rotating magnetic field, a source of alternating current connected to said coils, a secondary coil in transformer relation with each of said coils, said secondary coils being connected to said anodes in a pattern to produce a commutated direct current through the rotating beam in said tube, an output circuit and connection between said output circuit and said secondary coils to trans-

form the impulses of said commutated direct current into an alternating current of a frequency a given multiple of the frequency of said supply current.

2. A device for multiplying the frequency of an alternating current comprising an electronic tube having a cathode and a plurality of targets or anodes mounted in a cylindrical boundary encompassing the said cathode and coaxial therewith, a circuit arrangement for said tube including coils in quadrature for producing a rotating magnetic field, a source of alternating current connected to said coils, a secondary coil magnetically coupled with each of said first coils, the terminals of said secondary coils each being connected to a plurality of said anodes, said connections being alternated in a pattern to produce a direct current through a rotating beam in said tube, an output transformer and a center tap to each of said secondary coils connected to said output transformer, for transforming the commutated pulses of said direct current into a multiplied frequency alternating current, the multiplication factor between the frequency of said supply source and said output depending on the number of said anodes.

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