March 22, 1932. H. P. DONLE 1,850,981

RECTIFIER

Filed Nov. 28, 1924

Fig. 1.

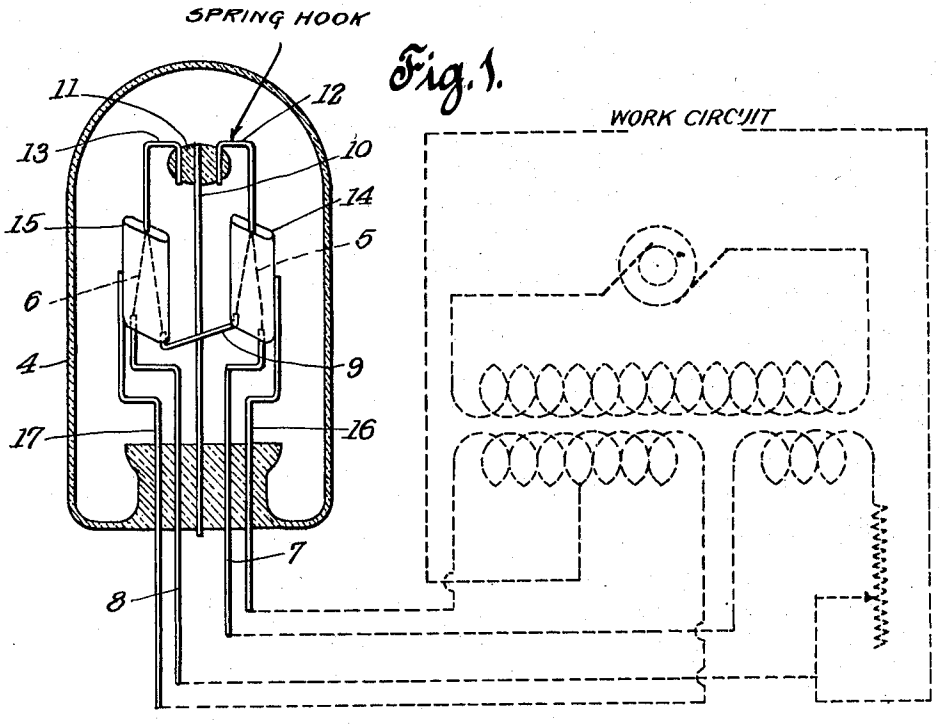
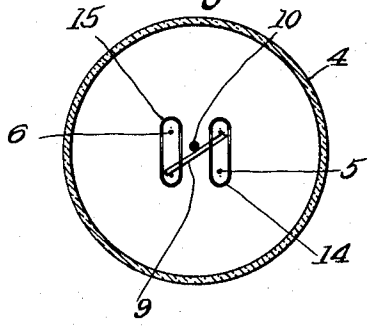


Fig. 2.



INVENTOR

Harold P. Donle

BY

ATTORNEY

Patented Mar. 22, 1932 1,850,981

UNITED STATES PATENT OFFICE

HAROLD POTTER DONLE, OF MERIDEN, CONNECTICUT, ASSIGNOR TO RADIO INVENTIONS, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

RECTIFIER

Application filed November 28, 1924. Serial No. 752,591.

The main object of my invention is to provide a simple, inexpensive, but reliable and efficient device for what is sometimes called full wave rectification of alternating currents.

In carrying out the invention I utilize the properties of vacuum tube devices having hot cathodes and relatively cold anodes. To accomplish the desired result I provide two anodes so constructed and arranged with respect to the cathode as to shield their respective fields from each other.

Fig. 1 illustrates, more or less diagrammatically, one form of a device embodying the improvements of my invention.

Fig. 2 is a transverse sectional view of the tube of Figure 1.

The tube 4 may be of any suitable construction exhausted or evacuated to a suitable degree. Inert gas may be present at a corresponding pressure.

The cathode or filamentary body has two emitting sections 5 and 6 which may be of any suitable material such as tungsten or other refractory metal. The outer ends of these sections are supported by conductors 7 and 8 suitably sealed in the "press" of the tube. The adjacent ends of the sections 5 and 6 in the form shown are connected to a crosspiece 9 supported on a central member 10. The wire or rod 10 and the crosspiece or spreader 9 serve as means for mechanically supporting the inner ends of the cathode sections at fixed points and the crosspiece 9 also electrically connects the adjacent ends of the cathode sections. This support 10, at its outer end carries an insulating button 11, for instance of glass, which in turn carries brackets or supports 12 and 13 which are connected to the midpoints of the doubled or inverted V filament sections 5 and 6.

The anodes 14 and 15 surround the active portions of the cathode sections. They may be formed of suitable metal and supported by conductors 16 and 17. Nickel is one metal which I consider suitable.

In each case the anodes laterally surround the respective cathode sections and act as shields so as to prevent the fields from interfering with each other. The resistance and impedance of the tube are thus kept at a minimum. Unless the filament sections are surrounded or substantially surrounded by the anodes, it has been found that the impedance is very high and when one anode is positive and the other negative to an equal potential, the negative electrode greatly reduces the flow of current to the anode, thus increasing the resistance of the tube. By using the anodes as shields and disposing the parts symmetrically, I have found it possible to obtain substantial full wave rectification with a maximum efficiency. It will be seen that each anode encloses a cathode section to the exclusion of the other cathode section and that the rectification consequently takes place alternately within the respective anodes. It is thus possible to provide a single compact tube which can be readily handled and which is particularly suitable for supplying high potential for radio receiving sets.

In the preferred form of Figs. 1 and 2, by doubling the filament sections and flattening the anodes I am able to make the device for a given power much more compact. By making it compact it is not only easier to make it rugged but it facilitates handling and shipment, and provides the advantages inherent in relatively small constructions without the disadvantages sometimes resulting from a reduction in size.

The inverted V-shaped filament is less likely to sag sideways than an ordinary straight one and by making the supporting brackets 12 and 13 in the form of spring hooks the cathode sections are resiliently supported and I can take up all the expansion of the filaments and hold them tight. By flattening the anodes their surfaces can be brought close to the filaments so as to secure a low resistance.

I claim:

1. A full wave rectifier comprising a tube, a supporting member mounted therein, two discrete double filament sections connected together at their inner ends, means for supporting an intermediate part of each section from the outer end of said supporting member, conductors supporting the outer ends of said filament sections, external means of electrical connection to said filament sections, an anode

surrounding each of said filament sections to the exclusion of the other filament section, said anodes being insulated from each other and each anode electro statically shielding its filament section from the electro static field of the other anode and means of electrical connection to each anode independently of the other anode.

2. A full wave rectifier comprising a tube having an internal press at one end, two anode leads and two cathode leads and a supporting wire all sealed in said press, two anodes of flattened tubular form, mounted side by side and extending longitudinally of the tube and supported by the anode leads, an insulator supported by said supporting wire, an inverted V-shaped cathode section mounted within each of the tubular anodes with its plane substantially parallel to and in the approximate center of its anode, supporting wires anchored in the insulating member and connected to the mid points of the respective cathode sections to support the same, means for mechanically supporting and electrically connecting the inner ends of the two cathode sections, the opposite outer ends of the cathode sections being mechanically and electrically connected to the cathode leads, each of said cathode sections being enclosed laterally by the respective anodes.

3. A full wave rectifier comprising a tube having an internal press at one end, two anode leads, and two cathode leads all sealed in said press, two anodes of flattened tubular form, mounted side by side and extending longitudinally of the tube and supported by the anode leads, an insulator, means supporting said insulator adjacent said anodes, an inverted V-shaped cathode section mounted within each of the tubular anodes, with its plane substantially parallel to and in the approximate center of its anode, supporting wires anchored in the insulating member and connected to the mid points of the respective cathode sections to support the same, a cross wire mechanically connected to the means which supports said insulating member and having its opposite ends electrically and mechanically connecting the inner ends of the two cathode sections, the opposite outer ends of the cathode sections being mechanically and electrically connected to the cathode leads, each of said cathode sections being enclosed laterally by the respective anodes.

4. A full wave rectifier comprising a tube, two anode lead members, two cathode lead members, and a supporting member, each member having a portion sealed in one end of the tube, two tubular anodes each supported by one of said members and electrically connected to one of the anode lead members, two inverted V-shaped cathode sections having their inner ends electrically connected together and their outer ends electrically connected to said cathode leads, an insulator carried by said supporting member, wires connected to said insulator and supporting the mid points of the respective cathode sections, said anodes being disposed substantially parallel to the axis of the tube and laterally enclosing substantially all the respective cathode sections.

5. A thermionic rectifying tube of the polyanodic type wherein all the internal members are supported by, and derive their electrical connection to the exterior thereof through a single press, including means forming two discrete anodic structures and also including two discrete hairpin glowing cathodes, each of said anodic structures laterally surrounding and substantially shielding one hairpin cathode within it from the electrostatic field of the other anodic structure, both of said glowing cathodes being supplied with electrical energy from a common pair of conductors, and said anodic structures being insulated from one another and adapted to carry transient potentials opposite in sign with respect to the cathodes.

6. A full wave rectifier comprising an envelope, having four conductors sealed in a press at one end of the tube, a pair of flattened tubular anodes rigidly supported, each by one of said conductors and parallel to each other, supporting means carried by said press including an insulating member, an inverted V-shaped filamentary cathode section mounted inside of each tubular anode and resiliently suspended from the insulating member of said supporting means, one end of each section being electrically connected to and positioned by one of the conductors sealed in said press, the opposite ends of the two sections being electrically connected together and mechanically secured to said supporting means, each anode providing an electrostatic field shielding its respective cathode section from the electrostatic field of the other anode.

7. A full wave rectifier comprising an envelope having a press at one end, a central supporting wire sealed in said press, a transverse spreader carried by said supporting wire beyond the end of the press, an insulator carried by said supporting wire, two filamentary cathode sections suspended from said insulator and each having one end connected to said spreader, two conductors sealed in said press and connected to the other ends of said cathode sections, two discrete flattened tubular anodes, each anode embracing substantially all of one of the cathode sections, anode supporting wires sealed in the outer edges of said press and supporting said anode spaced apart from each other and substantially parallel to the axis of the envelope.

8. A full wave rectifier comprising an envelope having a press at one end, four wires sealed in said press and constituting conductors having external electrical connections,

two discrete flattened tubular anodes supported by two of said conductors and spaced apart from each other, an insulator, means for supporting said insulator in the envelope beyond the outer ends of the anodes, two inverted V-shaped filamentary cathode sections suspended by said insulator entirely within said anodes on opposite sides of the center of the envelope, adjacent ends of the two sections being electrically connected together, means for holding said connected ends in place below the anodes, the opposite ends of the two cathode sections being connected to two of said conductors, said anodes providing electrostatic fields each anode shielding its cathode section from the electrostatic field of the other anode.

HAROLD POTTER DONLE.