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PEAK OR OVERLOAD INDICATOR FOR
SPEECH CIRCUITSJohn B. Moore, Riverhead, N. Y., assignor to
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6 Claims. (Cl. 177—311)

This invention relates to circuit arrangements for indicating excessive voltages or currents and has, as one of its objects, to provide a simple and highly efficient peak voltage or overload indicator for communication circuits.

The specific advantages and improvements will be apparent from the following detailed description taken in connection with the accompanying drawing wherein there is shown, diagrammatically, a portion of a radio transmitter circuit with which there is associated a preferred form of indicator circuit embodying the principles of the present invention.

Although this invention is hereinafter described with special regard to speech communication circuits, it should be distinctly understood that the invention is not limited thereto since the principles thereof are equally applicable to telegraphy, and to other and different types of circuits which have need for indicators, but which may have no direct bearing on the transmission of intelligence.

Referring to the drawing, there is illustrated a radio transmitter arrangement comprising audio frequency amplifier equipment 2 connected on one side to an input circuit 1 and on its output side to transmitter equipment 4 and antenna 5 and also to a circuit 13 which is adapted to feed the signal waves to the indicator circuit 7, shown within the dotted lines. Input circuit 1 may be any suitable speech circuit or telegraph circuit whose voltages, which exceed a predetermined value dependent upon the biasing potential of the grid controlled glow discharge tube 10 to be described later, it is desired to indicate.

An important feature of the indicator circuit is the grid controlled glow discharge tube 10 which is adapted to trip off and pass current upon the receipt of a wave whose voltage or amplitude exceeds the voltage value for which the grid 15 is biased. The biasing of this grid may be regulated to any desired value by means of the potentiometer arrangement 11 and variable rheostat 8.

Glow tube 10 consists of a hot cathode 16, a grid 15 and an anode 17, the whole being enclosed in an envelope within which there is a small amount of inert gas. A characteristic of this tube is that once an arc has been started therein by the application of a positive potential to the grid, which is of sufficient value to overcome any predetermined biasing potential, the grid loses control of the tube and the arc or glow produced can then only be stopped either by removing the anode voltage or else reducing same to a value below the critical value necessary to continue the glow. A detailed description of such glow tube is given in

an article by Dr. A. W. Hull entitled "Hot cathode thyatron" in the July 1929 issue of the General Electric Review, pages 390 to 399 inclusive.

In the output circuit of tube 10 and connected to the anode thereof is any suitable indicator device 18 which is connected with a make contact 23 of a relay 19, the break contact 24 of which is in circuit with the control grid 20 of a vacuum tube 21 whose anode 22 is serially connected to the energizing winding 25 of relay 19. Normally, vacuum tube 21 is arranged to pass current and to operate relay 19 so that armature 28 touches contact 24 in the manner shown in the drawing. Indicator device 18 may be any desired arrangement, such as a lamp as indicated, a meter, or an alarm.

In the grid circuit of vacuum tube 21 and associated with the break contact 24 of relay 19 is a resistance-capacity circuit, comprising resistances R_1 and R_2 and condenser C, this circuit having a time constant of several seconds. The circuit is designed normally to bias the grid of tube 21 to permit the flow of current in the anode circuit thereof. In a practical embodiment of this invention a two megohm resistance was used for R_2 and a two microfarad condenser for C.

The advantage of this time constant arrangement is that there may be obtained an indication lasting any desired length of time even though the peak of the input voltage has a duration of but a small fraction of a second. Hitherto, devices which have been used for indicating voltages in speech circuits have had the disadvantage of being either too slow to respond to these peaks of such short duration or giving an indication only for the length of time that the voltage is above a certain value.

In the operation of the circuit, the receipt of any message wave in the input circuit 1 which produces a signal pulse in circuit 13 whose voltage is of the desired polarity and whose peak overcomes the negative biasing voltage applied to the grid of glow tube 15, will raise the grid to a positive potential and cause the glow to strike after which the grid 15 loses control. The passage of current over a circuit including the anode 17, battery 26, armature 28 of relay 19, break contact 24 and resistance R_1 will develop a negative potential on the grid 20 of vacuum tube 21 which is sufficient to lower the voltage on the grid 20 an amount necessary to cut off the anode current flowing through the vacuum tube and through the winding 25 of relay 19. Relay 19 will, of course, then release and permit armature 28 to engage contact 23, thus closing a circuit

to actuate indicator 18, which may be traced from the positive terminal of source 26 through the indicator lamp 18, resistance 27, make contact 23, and armature 28 of relay 19 to the negative terminal of source 26. Indicator 18 will remain operated until relay 19 is again actuated. It will thus be seen that the contacts of relay 19 will not only break the anode supply to the thyatron 10 and permit the glow tube circuit to return to normal but also operate indicator device 18. Condenser C will charge up with a negative potential which can only leak off through the slow time constant circuit. This negative charge on the condenser and grid circuit 20 of vacuum tube 21 will gradually leak off after a period of perhaps two or three seconds, during which time relay 19 remains unenergized. After this period the current through vacuum tube 21 will again flow, thus causing the re-energization of the relay 19 through its winding 25 and a return to the normal operative position of the armature 28 against the break contact 24, at which time voltage is again supplied to the anode 17 of the glow tube 10. The device is now ready to respond to another peak of input voltage.

The arrangement just described may be used with excellent results in conjunction with a volume indicator of the usual type as employed in broadcasting and radio telephone systems wherein the simultaneous use of the two indicators permits the percentage of modulation on a radio telephone transmitter to be kept up to the maximum permissible value without the danger of serious overloading on instantaneous peaks.

I claim:

1. In combination, a glow discharge device having a cathode, a grid, and an anode, the glow in said discharge device being arranged to strike upon the application of a positive potential of predetermined value to the grid thereof, an input circuit coupled to said grid, an output circuit including a source of potential and the contacts of an electromagnetically operated circuit interrupter connected to said anode, an indicator, and a vacuum tube having its control electrode in circuit with the output of said glow tube and its anode in circuit with the coil of said interrupter, said tube being responsive to the flow of current in said output circuit for controlling said interrupter to break said output circuit and to operate said indicator.

2. In combination, a glow discharge device having a cathode, grid and anode, the glow in said discharge device being arranged to strike upon the application of a positive potential of predetermined value to the grid thereof, an input circuit coupled to said grid, an output circuit including a source of potential connected to said anode, an indicator, an electron discharge device relay comprising an electron discharge device in circuit with an electromagnetic circuit interrupter, said relay being connected to said output and responsive to a flow of current therein for interrupting said output circuit and for connecting said source of potential to said indicator for operating same.

3. In combination, a glow discharge device having a cathode, grid and anode, the glow in said discharge device being arranged to strike upon

the application of a positive potential of predetermined value to the grid thereof, an input circuit coupled to said grid, an output circuit including a source of potential connected to said anode, an indicator, a normally operated relay having an energizing winding, an armature and a make and a break contact, said source of potential being connected to said armature, a vacuum tube normally arranged to pass current having a control electrode and an anode, said control electrode being in circuit with the output of said glow tube and with said source of potential through the break contact and armature of said relay, said anode of the vacuum tube being in series circuit with the winding of said relay, and said indicator being connected on one side to one terminal of said source of potential and on the other side to the make contact of said relay whereby engagement of said armature with said make contact will actuate said indicator from said source, said relay being responsive to a cessation of current flow through the anode circuit of said vacuum tube for disconnecting said source of potential from the control grid of said vacuum tube and for connecting said source to said indicator for operating same.

4. A combination as defined in claim 3 including a time constant circuit connected to the control electrode of said vacuum tube, said time constant circuit comprising a resistance located between said control electrode and the output circuit of said glow discharge device, and a condenser between said control electrode and ground.

5. In combination, a glow discharge device having a cathode, grid and anode, the glow in said discharge device being arranged to strike upon the application of a positive potential of predetermined value to the grid thereof, an input circuit coupled to said grid, an output circuit including a source of potential connected to said anode, an indicator, an electron discharge device relay comprising an electron discharge device in circuit with a normally operated electromagnetic circuit interrupter, said relay being connected to said output circuit, said electron discharge device being responsive to a flow of current in said output for interrupting the current in said electromagnetic interrupter and for opening said output circuit, whereby said source of potential is connected to said indicator for operating same.

6. In combination, a glow discharge device having a cathode, grid and anode, the glow in said discharge device being arranged to strike upon the application of a positive potential of predetermined value to the grid thereof, an input circuit coupled to said grid, an output circuit including a source of potential connected to said anode, an indicator, means in circuit with said output and responsive to a flow of current therein for interrupting said output circuit and for connecting said source of potential to said indicator for operating same, and a time constant circuit for prolonging the interruption of said output circuit and the actuation of said indicator, said time constant circuit comprising a resistance in shunt with a condenser connected to said means.

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