

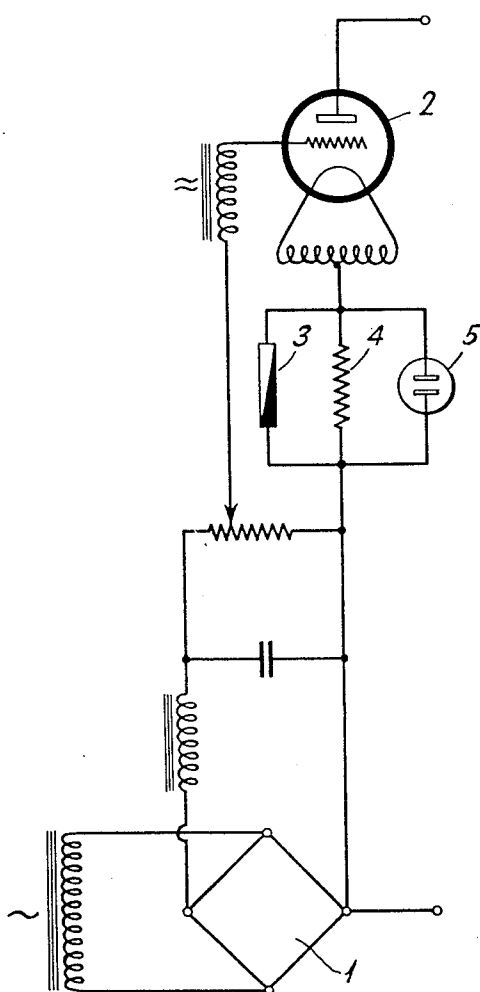
Nov. 26, 1940.

F. SCHIERL

2,222,784

PROTECTION CIRCUIT

Filed March 2, 1938



INVENTOR
FRIEDRICH SCHIERL
BY *H. S. Sover*
ATTORNEY

UNITED STATES PATENT OFFICE

2,222,784

PROTECTION CIRCUIT

Friedrich Schierl, Berlin-Tempelhof, Germany,
 assignor to Telefunken Gesellschaft für Draht-
 lose Telegraphie m. b. H., Berlin, Germany, a
 corporation of Germany

Application March 2, 1938, Serial No. 193,443
 In Germany March 6, 1937

2 Claims. (Cl. 179—171)

In amplifier tubes operated with a fixed grid bias voltage, i. e. with a grid bias voltage that is independent of the plate current such as furnished for example by a special rectifier, danger exists that while the plate voltage and the heating voltage are present the grid bias voltage is absent, or fails, such as may happen when the rectifier furnishing the grid bias voltage has burned out. This signifies, however, in ordinary tubes, that a very large plate current flows, causing such an excessive load in the tube that it becomes defective within a short time.

It has already been proposed to eliminate this danger by the use of combined rectifier tubes and amplifier tubes and by providing filaments connected in series for the detector system and amplification system. If the filament of the detector system burns out, obviously, also the heating current for the amplification system will be interrupted, and there is no danger to the tube.

The invention eliminates this danger by other means, namely, in that in the cathode circuit of the tube, a resistor is inserted which is bridged by a safety fuse adapted for carrying continuously the normal plate current. Now, if the plate current increases due to the absence of grid bias voltage and the fuse melts through, the resistor is no longer bridged. The plate current now passing through this resistor produces the required grid bias voltage. The resistor is preferably so dimensioned that a grid bias voltage is produced in tubes in class-A circuit, which is equal to that supplied by the fixed biasing voltage source, while in the case of the class B circuit the resistor is suitably so chosen that due to the freed cathode resistor the tubes are connected in class A. In order readily to find out whether the safety fuse has burned out or whether it is still effective, it is advisable to connect a glow tube in parallel to the resistor in the cathode circuit and whose ignition potential is lower than the voltage produced at the resistor so that the tube begins to glow when the safety fuse has burned out.

The figure shows an example embodying the idea of the present invention. The rectifier 1 fed from the network supplies the grid biasing potential for the tube 2. In the cathode circuit of the tube 2 the parallel connection is inserted which comprises the fuse 3, the resistor 4 and the glow tube 5. The fuse is so chosen that it can carry the operating plate current. Since it has practically zero resistance, the entire plate current flows through the fuse. As soon as the fuse 3 melts through, for instance, owing to the absence of the grid biasing potential, a voltage drop

appears through the resistor 4 which shifts the working point of tube 2 so far into the negative region that the plate current cannot assume values by which the tube 2 may be endangered.

I claim:

1. In amplifying apparatus a space discharge tube having an anode, a cathode and a grid electrode, external circuits associated with said tube elements and forming an input circuit and an output circuit for the tube, said input circuit and output circuit having a common portion, a source of bias potential in said input circuit only and arranged to provide bias potential for the grid electrode, an impedance element in said common portion arranged to provide an automatic biasing of the grid electrode with respect to the cathode when anode current flows therethrough and a low resistance circuit including a circuit breaking device shunted across said impedance device, capable of passing substantially all of the normal anode current of said tube, said circuit breaker device being arranged to break the low resistance circuit when the anode current flowing therethrough exceeds a predetermined value whereby the output current is made to flow through said impedance device and thereby provide automatic biasing of said grid electrode, and a glow tube connected across said impedance element, said glow tube having an ignition potential which is lower than the voltage produced across said impedance element to thereby provide an indication of the break of said low resistance circuit.

2. In amplifying circuits and the like an electronic tube having an anode, a cathode and a grid electrode, a substantially fixed voltage source connected between the grid electrode and the cathode for biasing the grid electrode with respect to the cathode, a cathode resistor for said tube arranged so that said grid electrode is biased by the voltage drop across said resistor when plate current flows through said resistor and a fuse means shunted across said cathode resistor, said fuse means being proportioned so that it is capable of carrying substantially all of the normal operating anode current for said tube but burns out when the plate current exceeds a predetermined value thereby causing the plate current to flow through the cathode resistor and act to bias the grid electrode, and a glow tube connected across said cathode resistor having an ignition potential which is lower than the voltage produced across the resistor to thereby provide an indication of the burning out of said fuse.

FRIEDRICH SCHIERL.