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AMPLIFYING SYSTEM

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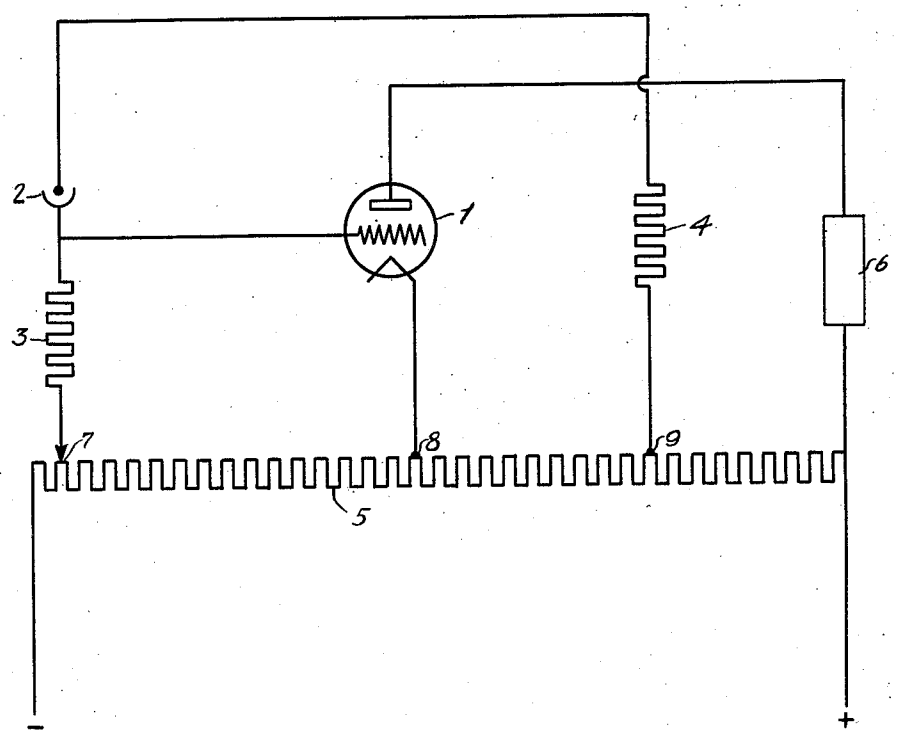

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AMPLIFYING SYSTEM

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This invention relates to amplifying arrangements particularly for photoelectric currents. The circuit arrangements hitherto known have the great drawback that the amplifier arranged behind the photoelectric cell is overloaded.

According to the invention this drawback is avoided by interposing an ohmic resistance in series with the photocell in the input circuit of the amplifier.

The invention will be more clearly understood by reference to the accompanying drawing representing, by way of example, one embodiment thereof.

In this drawing 1 denotes an amplifying tube in whose input circuit is inserted a photocell 2 whose resistance varies in accordance with the light variations to be transmitted. The electrodes of the cell are connected to the input electrodes i. e. the cathode and the control electrode of the amplifying tube through a source of potential. In this case part of the source of anode voltage of the amplifier is used as the said source of potential. Furthermore a resistance 3 is inserted between the grid of the tube 1 and a point 7 of the source of anode voltage. This point has such a negative potential with respect to the cathode that if the photocell is not struck by light no current flows in the output circuit 6 of the amplifier. On exposing the cell its resistance decreases and since the voltage applied to the grid depends on the ratio between the resistance 3 together with the grid-cathode resistance of the tube which resistance is in parallel with them, and the sum of the resistances 2 and 4, the voltage applied to the grid of the tube 1 is increased. It will be readily appreciated that this follows from the fact that we have here a series circuit made up of two series elements, the resistance 4 and the photocell 2, connected in series with a parallel circuit made up of the resistance 3 and the grid cathode impedance of the amplifier tube 1. In general, the resistance between the points 7 and 8 of the voltage divider 5 may be neglected since as is well known in the art, the voltage divider resistance is generally low compared with the resistance of the circuits connected to it. If now the photocell's resistance is decreased by light falling upon it, the distribution of potential between the points 7 and 9 will be changed and since the ratio of the resistance of the parallel circuit comprising the resistor 3 and the grid cathode resistance of the tube 1 to the total resistance is increased, increased voltage will be fed to the grid of the tube 1.

In the absence of the resistance 4 provided according to the invention, the grid voltage might attain a very high value with a very strong exposure of the cell, this value substantially corresponding to the voltage of the point 9 of the anode battery with respect to the cathode. Due to this the tube would be loaded to an undue extent. According to the invention this is avoided by inserting a resistance 4 in series with the photocell. By this resistance the voltage applied to the grid is decreased, since the resistance between the grid and the point 9 is increased and because furthermore the decrease of the resistance in the input circuit due to the increase of the grid potential (i. e. small grid cathode resistance) exerts a strong influence due to the fact that the grid cathode resistance is non-linear and increases rapidly as the potential of the grid becomes more positive as is well known in the art. The increase of resistance in the branches between the grid and the point 9 as well as the decrease of the grid-cathode resistance render the grid voltage less high.

Preferably, the resistance 4 has such a size that the anode current of the tube does not exceed the allowable maximum value even if the cell be substantially short-circuited.

Having now described the invention, what I claim is:

1. An amplifying system for photoelectric currents which comprises a photoelectric cell having a resistor connected in series with each terminal thereof, a voltage source, an amplifier tube having its cathode connected at a predetermined intermediate point on the voltage source and its control electrode connected between one resistor and one terminal of the photoelectric cell, and a connection between the free end of each resistor and predetermined intermediate points of the voltage source such that the resistors connect at respective points positive and negative with respect to the cathode each of said resistors being separate elements from the voltage source.

2. An amplifier system comprising a thermionic tube having a plurality of electrode elements, a voltage divider for supplying operating voltage to the tube, said tube having its cathode connected to an intermediate point on the voltage divider and its output electrode connected to a point on the voltage divider positive with respect to the point of cathode connection, a photoelectric tube adapted to be exposed to light to produce output currents in the said thermionic tube, a pair of resistor elements separate and independent from those of the voltage divider con-

nected at one terminal with predetermined intermediate points on the voltage divider positive and negative respectively with respect to the point of the cathode connection and connected at their other respective terminals with the electrode elements of the photoelectric tube, and a connection between the point of connection of one resistor element and one electrode of the photocell to the control electrode of the thermionic tube whereby for conditions when the photocell is short-circuited no overload conditions take place in the amplifier.

3. An amplifier system comprising a thermionic tube having a plurality of electrode elements, a voltage divider for supplying operating voltage to the tube, said tube having its cathode connected to an intermediate point on the voltage divider and its output electrode connected to a point on the voltage divider positive with respect to the point of cathode connection, a photoelectric tube adapted to be exposed to light to produce output currents in the said thermionic tube, a pair of resistor elements separate and independent from those of the voltage divider connected at one terminal with predetermined intermediate points on the voltage divider positive and negative respectively with respect to the point of the cathode connection and connected at their other respective terminals with the electrode elements of the photoelectric tube and a connection between the point of connection of the resistor element connected to a point on the voltage divider negative with respect to the cathode and one electrode of the photocell to the control electrode of the thermionic tube whereby for conditions when the photocell is short-circuited no overload conditions take place in the amplifier.

4. An amplifying system comprising a photocell, an amplifier, a single source of energy, means for energizing the amplifier from the source of energy, means for simultaneously energizing the photocell through a load impedance, and a separate independent protective impedance from the same source of energy, and means to control the amplifier directly in accordance with energy from the load impedance.

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