Arrangement for Amplifying Alternating Voltage Variations

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ARRANGEMENT FOR AMPLIFYING ALTERNATING VOLTAGE VARIATIONS

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In practice it repeatedly occurs that the voltage, for example, of a source of alternating current is subject to variations produced either purposely or not, and that this variable voltage is utilized for controlling in accordance with its variations a device which is connected in some manner with the said source of alternating current.

Thus, for example, it is known to control the excitation of an alternating current generator in accordance with the generator voltage at the terminals thereof. In this case it may occur that the produced voltage variations are too weak to answer the purpose in view and in such a case it is desirable to provide an arrangement for amplifying said voltage variations.

The invention has for its object to provide a simple expedient for obtaining such an amplification.

According to the invention, in series with the variable voltage source is connected a resistance whose value varies, though in opposite sense, with the magnitude of the alternating voltage and an impedance from which the amplified voltage variations are taken off.

Conveniently, the said resistance is formed alternately during each half-period by the internal resistance of either of two discharge tubes in which the anodes are connected cross-wise to the cathodes, both incandescent cathodes being fed by the source of voltage.

The invention will be set forth more fully with reference to the accompanying drawing in which:

Figure 1 represents schematically and by way of example one embodiment of the invention.

Figure 2 shows a circuit-arrangement in which use is made of the device according to Figure 1.

Figure 3 is a view of a mode of realization of a component of the system.

Referring to Figure 1, to terminals 1 and 2 is connected a source of variable voltage the variations of which are to be amplified. In series therewith is connected a resistance constituted by the internal resistances of two discharge tubes 3 and 4 whose anodes 5 and 7 are cross-wise connected to cathodes 6 and 8. 9 is an impedance, for example, a transformer from which the amplified voltage fluctuations are taken off. The cathodes 6 and 8 are fed by the source of voltage via a transformer 10 comprising separate secondary windings 11 and 12 connected respectively to said cathodes.

When an alternating voltage is connected to the terminals 1 and 2, the discharge tube 3 will allow current to pass during each half-period in which the terminal 1 is positive relatively to the terminal 2 whereas at the inverse voltage across the terminals it is the tube 4 which functions. The discharge tubes consequently afford passage to an alternating current the intensity of which depends on the voltage across 1 and 2 and on the internal resistance of the discharge tubes 3 and 4. If the said resistances were constant, an increase of voltage across the secondary winding of the transformer 9 would occur, at an increasing voltage across the terminals 1 and 2 which increase would be directly proportional to the primary voltage variation.

Since, however, the cathodes of both discharge tubes are supplied by the source of variable voltage and the internal resistance of a discharge tube decreases with an increasing filament current, an increase of the voltage between 1 and 2 will cause a decrease of the internal resistances of the discharge tubes 3 and 4. Owing to this the voltage across the secondary winding of the transformer 9 will be subject to much higher percentage variations than that of the source.

Figure 2 shows a method of regulating the voltage of an alternating current generator, in which use is made of a device according to Figure 1.

In accordance with operation set forth with reference to Figure 1, the current in the primary of the transformer 9 falls proportionally much more, this strong decrease being communicated to the filament current of the said diode 16 whose internal resistance consequently considerably increases. Owing to this and to the presence of the current limiting resistance 11, the field current in the winding 15 increases and the generator voltage increases correspondingly: the current decrease has been reduced.

It will be evident that the anodes 5 and 7 and the cathodes 6 and 8 (Fig. 1) need not be mounted in two tubes but that it is very easy to manufacture a single discharge tube in which the four electrodes are all of them arranged. Figure 3 shows a mode of realization of such a tube in which the parts similar to those of Figure 1 are designated by the same reference numerals.

What I claim is:

1. In a system for amplifying alternating voltage variations, a source of alternating voltage the...
variations of which are to be amplified, two discharge tubes each comprising an incandescent cathode and an anode, the cathode of the first tube being connected to the anode of the second tube and the anode of the first tube being connected to the cathode of the second tube, the anode-cathode spaces of the two tubes forming an impedance, an output impedance for the amplified voltage variations in series with the first-mentioned impedance, the series combination of the two impedances being connected in multiple to said voltage source, and means for energizing said cathodes from said source.

2. In a system for amplifying alternating voltage variations, a source of alternating voltage the variations of which are to be amplified, two discharge tubes each comprising an incandescent cathode and an anode, the cathode of the first tube being connected to the anode of the second tube and the anode of the first tube being connected to the cathode of the second tube, the anode-cathode spaces of the two tubes forming an impedance, an output impedance for the amplified voltage variations in series with the first-mentioned impedance, the series combination of the two impedances being connected in multiple to said voltage source, and a transformer having a primary winding connected in parallel with said voltage source and having two secondary windings to supply heating current for the respective cathodes of said tubes.

3. In a system for amplifying alternating voltage variations, a source of alternating voltage the variations of which are to be amplified, space-discharge means comprising two cathodes and an anode spaced from each other, each of said cathodes, each of said anodes being connected with one of said anodes, the discharge spaces between the cooperating anode-cathode members forming an impedance, an output impedance for the amplified voltage variations in series with the first-mentioned impedance, the series combination of the two impedances being connected in multiple to said voltage source, and a transformer having a primary winding connected in parallel with said voltage source and having two secondary windings to supply heating current for the respective cathodes of said tubes, an exciting winding for the generator, a resistance connected in series with said exciting winding and a discharge tube provided with a cathode and an anode connected in parallel with said exciting winding, the last-mentioned cathode being connected to said output impedance to be heated in accordance with the voltage thereacross.

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