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ALTERNATING CURRENT RELAY

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Fig. 1

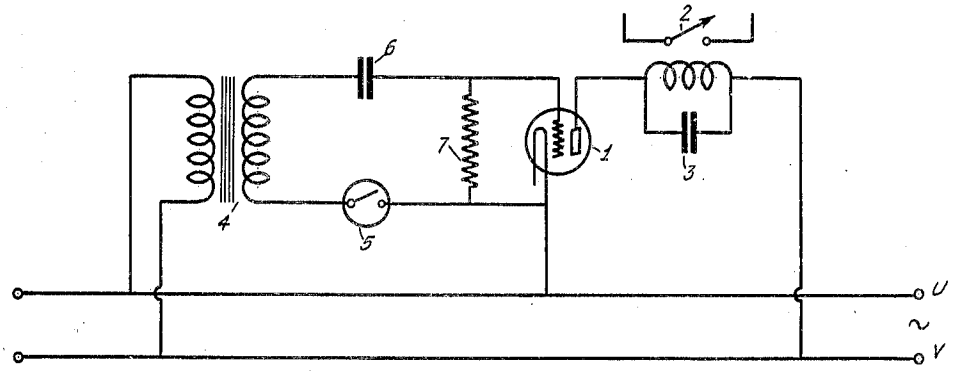
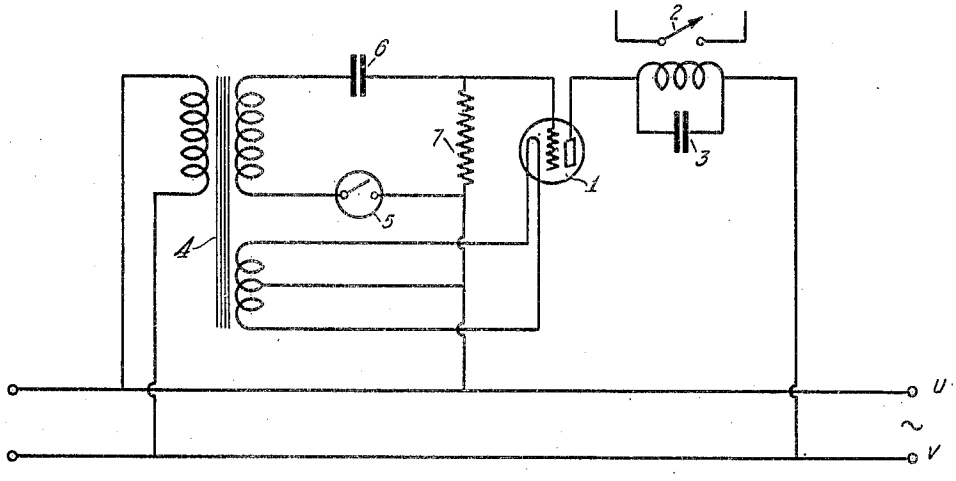


Fig. 2



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ALTERNATING CURRENT RELAY

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2 Claims. (Cl. 175—320)

This invention relates to amplifier circuit arrangement for current-impulses which are released from electric contact-makers capable of carrying only feeble loads.

In many branches of engineering work, it is necessary to cause switching and circuit-changing processes by the agency of extremely sensitive contact-makers which are able to carry only very weak loads. Inter alia, there could be cited here electric contact-type thermometers, contact manometers, high-sensitiveness relays, etc., in short all such arrangements which are of sensitive and delicate construction, or which though they possess only a slight mechanical directive power, are expected to cause circuit making and breaking in great numbers and with great safety or reliability. It is known in the prior art that in cases of the said nature, it has become customary to cause the contact-maker to control first a thermionic tube whose grid circuit is not required to handle appreciable energies so that the establishing of a contact can be effected absolutely free from sparking and also with great reliability even in the presence of high contact resistances at the circuit-making element. Now, there are many cases where such an arrangement is required to be practically constantly in operation, and then the inconvenience arises that for such a circuit scheme, direct current sources have to be provided from which the grid potential and the plate potential of the thermionic tube to be controlled are derived. For example in transmitters in use to-day, a crystal is used to maintain the oscillation generator operating at constant frequency. The crystal is to obtain best results held at a constant temperature. This may be accomplished by a relay of the type herein disclosed.

In fact it will be feasible only in rare instances to take these direct current potentials from a supply-line which is permanently in operating state (alive); the mounting of batteries, on the other hand, requires constant maintenance and inspection of its operating condition.

Now, the present invention discloses ways and means adapted to insure connection of such a tube scheme with an alternating current network being reasonably reliable as to its operating state in a simple manner. The most essential feature of the invention consists in operating the thermionic tube both at the plate as well as at the grid end with alternating current, the relative phases of both potentials and currents being so chosen that in case of contact-closing of the contact-maker positive instantaneous potential at the grid is in time coincidence with a similar negative potential at the plate, and vice versa, with the result that the electron emission of the tube will always be perfectly zero or practically so, while upon opening or breaking of the contact the alternating current grid potential is cut off so that emission of electrons will occur during a half-cycle whereby the intended circuit-change or switching operation is occasioned either directly or by way of a relatively insensitive relay.

The principal feature of my invention will be described in detail in the specification which follows:

In describing my invention and the operation thereof reference will be made to the attached drawing in which Figure 1 shows a circuit diagram of an alternating current energized relay arranged in accordance with the present invention while Figure 2 shows a modification of the arrangement of Figure 1. In the circuit arrangement of Figure 2 the thermionic tube in the relay has all of its electrodes including the cathode energized by alternating current whereas the thermionic tube in the relay shown in Figure 1 had its control grid and anode only energized by the alternating current.

The drawing illustrates a key diagram in which the basic idea of this invention is incorporated. The amplifier tube 1 which is to be controlled is fed with plate potential (directly or else by way of a transformer) from the alternating current supply-line UV. Included in the plate lead is the element which is to be actuated, say, a relay 2 whose energizing winding preferably is shunted by a condenser 3.

The grid potential of the tube is furnished from a transformer 4 which is associated with the same supply-circuit, the secondary winding of said transformer being, on the one hand, united by way of the releasing contact-maker 5 with the filament of the said tube, and on the other hand, with the grid. The contact maker 5 may be of the thermometer type and might be located adjacent a crystal the temperature of which is to be maintained constant by means controlled by a circuit including switch 2. The drawing shows further a condenser 6 in the grid lead, and the purpose of the same is to preclude the grid direct current arising during the positive half from the sensitive contact-maker and to reproduce the phase shift or angle occurring in the plate circuit owing to the inductance introduced therein also in the grid circuit in order that phase opposition upon which the operation of the scheme is largely predicated, may be pre-

served. A leak resistance 7 causes the grid of the tube to assume a state of suitable rest potential (potential prevailing at unexcited state). The said resistance may be united with the cathode as shown or with the plate. For simplicity's sake it may be recommendable to insure the heating of the cathode also from the alternating current circuit or network and the heating winding required therefor is suitably wrapped on the core of transformer 4 as illustrated in Fig. 2.

I claim:

1. A temperature control system comprising, a thermionic tube having a grid electrode, a cathode and an anode electrode, a circuit including a relay winding connecting said anode and cathode to a source of alternating current, said relay being operable upon a variation of intensity of current flowing in said winding in said circuit, an input circuit including an inductance energized by alternating current connected by a switch and a phase shifting means between the control electrode and cathode of said tube, said phase shifting means comprising a capacity to offset the effect of the inductance in said circuits and insure that the alternating current potentials reaching said grid when said switch is closed are in phase opposition with respect to the alternating current potentials reaching said anode, and a resistance connected in parallel with said control electrode cathode impedance to apply an operating potential to said control grid when said switch is open.

2. An alternating current energized electrical control system comprising, an electron tube having a grid electrode, filament and anode electrode, a transformer having a secondary winding connected between said grid electrode and filament, a source of alternating current connected with the primary winding of said transformer, an output circuit connected between said anode electrode and filament and with said alternating current source to apply alternating current potentials from said source to said anode, a relay winding included in said output circuit, a temperature control switch in said input circuit between said secondary winding and said filament, means for energizing said filament from said source of alternating current, a phase shifting means in said input circuit to insure that the alternating current potentials reaching said grid electrode are out of phase with respect to the alternating current potentials reaching said anode when said switch is closed, and a resistance connected in parallel with the cathode to grid impedance of said tube to apply operating potentials to said grid electrode when said switch is open to cause current to flow in said anode circuit when the alternating current potentials applied to said anode are positive, thereby energizing said relay winding.

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