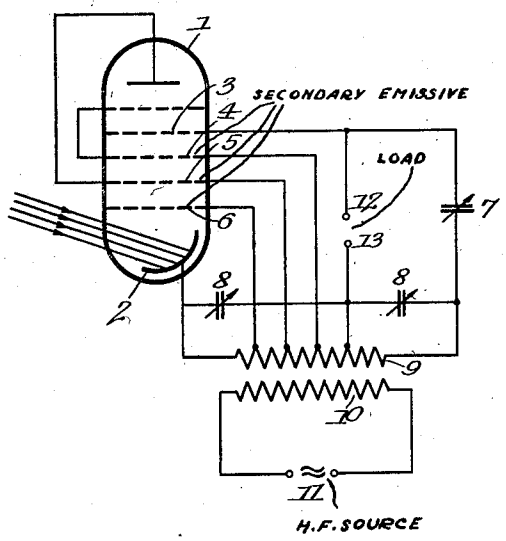
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MODULATION CIRCUIT USING A MULTIGRID PHOTOELECTRIC CELL

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MODULATION CIRCUIT USING A MULTI-GRID PHOTOELECTRIC CELL

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5 Claims. (Cl. 179—171.5)

The invention relates to an arrangement for modulating high frequency by means of low frequency and deals more particularly with arrangements in which a photo-electric cell delivers the modulating frequency, as for example, in television.

It has been proposed to apply an alternating voltage in the nature of a suction or booster voltage ('saugspanning') to a photo-electric cell the frequency of which at the same time determines the carrier frequency which is intended to be further amplified; in this case the procedure is to produce a carrier frequency voltage at the amplifier terminals by illuminating the photo-electric cell, the amplitude of said carrier frequency being proportional to the amount of incident light. Since in most television methods the quantities of light available are very small, the carrier frequency voltage available at the amplifier likewise will be very small. Since on the other hand however, the photo-electric cell receives only the carrier frequency voltage in the nature of a booster voltage, and since the said carrier frequency must have a value of about 100 volts, it is necessary to provide a very exact compensation for the carrier frequency.

It is however possible to overcome this drawback by using a photo-electric cell which effects multiplication of the photo-electrons by means of secondary emission, so that the ratio of effective voltage to booster voltage is improved. Such cells heretofore have always been connected to direct current obtained from a battery or a device connected to the power line. This results in the successive grids of the photo-electric cell receiving a potential which increases from stage to stage. However, if an alternating voltage of carrier frequency is applied to the cathode and anode of such a cell while the other grids retain their direct current voltage the result will be that the efficiency of the arrangement will not increase to the degree expected but will rather be decreased.

In order to achieve a usable result the circuit according to the invention, is so arranged that the voltages required for the multiplying grids are taken off from a coil which is disposed in bridged circuit relation with a condenser and the photo-electric cell. That is, the photo-cell 1 and condenser 7 form adjacent bridge arms, with the tapped transformer coil 9 acting as the remaining two arms, with load 12, 13 in one conjugate arm and transformer primary 10 the other, and condensers 8 used to accurately balance the parts of transformer coil 9 used as arms.

The drawing shows an embodiment of the subject matter of the invention.

A photo-electric cell 1 contains a photo cathode 2, an anode 3, and a number of multiplying grids 4, 5, 6. The voltage for the photo-electric cell is taken off from a transformer secondary coil 9, which is disposed in bridged circuit relation together with condenser 7 and photo-electric cell 1. The amplifier is connected to the terminals 12 and 13, whereas the carrier frequency produced at 11 is impressed on primary winding 10 inductively connected to the transformer secondary coil 9. The tap-off points for the multiplying grids 4, 5, 6 are so disposed that the amplitude of the carrier frequency increases from grid to grid in the direction of the anode.

In order to equalize the phases accurately, condensers 8, e. g. differential condensers are used, whereas a condenser 7 serves to equalize the amplitude, and said condenser may form a bridged branch circuit. Coil 9 obviously may also be replaced by suitably disposed resistances.

I claim:

1. Means for modulating a carrier with a beam of energy comprising a balanced bridge circuit including a multiplier photo-cell with a plurality of secondarily emissive apertured electrodes disposed between a photosensitive cathode responsive to said beam of energy and a collecting anode, and a variable capacitance as adjacent arms; a tapped secondary coil arranged, when energized, to progressively energize said secondarily emissive electrodes and anode forming a second pair of adjacent arms, a primary coil inductively associated with said tapped secondary coil and forming a conjugate bridge arm, output connections disposed across said variable condenser and a portion of said tapped secondary coil forming a second conjugate bridge arm, and phase-controlling condensers shunted across each portion of said tapped coil.

2. Means for utilizing a multiplier photo-cell, having a plurality of secondarily emissive grids disposed between a photo-cathode and a collecting anode, for modulating a carrier with a beam of energy to which said photosensitive cathode is responsive, comprising a balanced bridge circuit wherein a tapped secondary coil inductively coupled to a source of energy at carrier frequency is arranged to progressively energize said secondarily emissive grids and said anode and forms a pair of adjacent bridge arms, said cell and a variable capacitance forming a second pair of adjacent bridge arms; and an output circuit connected between said anode and tapped secondary

coil, each of the adjacent arm portions of said tapped secondary coil having a phase equalizing variable capacitance disposed thereacross.

3. In a bridge network including a source of periodically varying potential a portion of which lies in one arm of said bridge network and another portion in another arm of said bridge network, an electron discharge device in a third arm of said bridge network adjacent one of said portions of said source of periodically varying potential, said electron discharge device having an anode and cathode and an intermediate electrode, and means for applying operating potentials from said adjacent portion of said source of periodically varying potential to said intermediate electrode and said anode.

4. In a bridge network, a source of periodically varying potential divided between two arms of said bridge network, an electron discharge device having a cathode, anode and intermediate electron multiplying electrodes, said electron discharge device being connected by its cathode and anode in another arm of said bridge network, and means for deriving operating potentials for said electron multiplying electrodes from said source of periodically varying potential.

5. In a bridge network, a source of periodically varying potential divided between two arms of said bridge network, an electron discharge device having a photo-sensitive cathode, an anode and intermediate electron multiplying electrodes, said electron discharge device being connected by its cathode and anode to another arm of said bridge network adjacent an arm including a portion of said source of periodically varying potential, and means for deriving operating potentials for said electron multiplying electrodes from said source of periodically varying potential.

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