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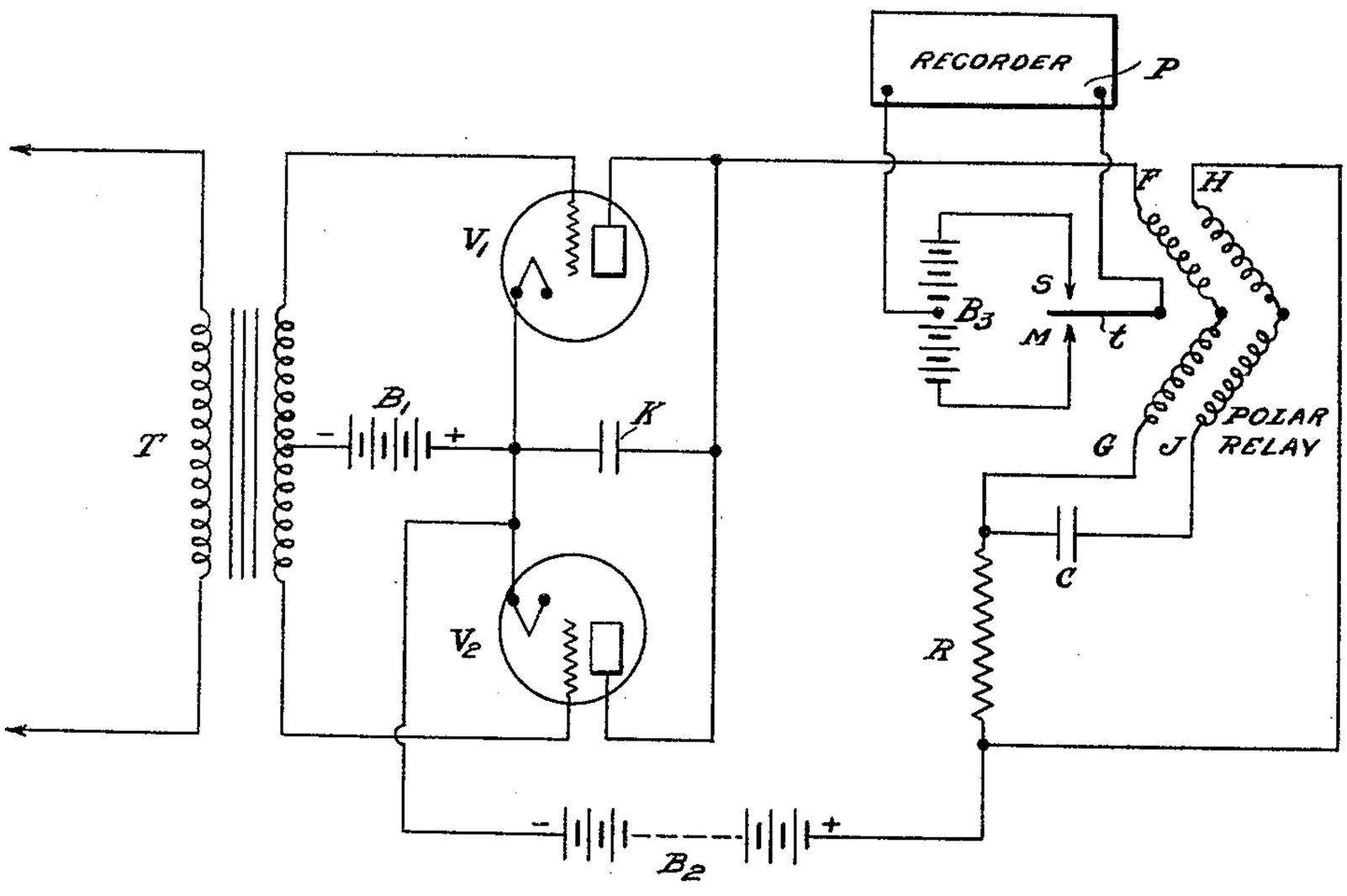
SELF BIASING RELAY CIRCUIT

Filed Aug. 12, 1930



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UNITED STATES PATENT OFFICE

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SELF-BIASING RELAY CIRCUIT

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This invention relates to a receiving circuit, and more particularly to a circuit in which a polarized relay may be operated by a unipolar interrupted signal wave of varying intensity, or of varying speed, or both.

An object of the invention is to devise a relay circuit employing a polarized relay in combination with means for automatically biasing the relay to the spacing position upon the cessation of the incoming signal.

My relay circuit may be employed for the detection of signals of varying intensity such as high frequency radio signals subject to fading. It may also be employed for the detection of signals transmitted over wires by carrier currents.

My invention is illustrated in the accompanying drawing in which is shown a circuit diagram of one form of the relay circuit.

Referring to the drawing V_1 and V_2 are two three-electrode vacuum tubes whose input circuits are connected in push-pull relation to the secondary of an input transformer T. The signals to be detected are supplied to the primary of transformer T. The common portion of the input circuit of the two vacuum tubes includes a biasing battery B_1 arranged to normally maintain the grids at a negative potential with respect to the cathodes. The two plate elements are connected in parallel, and a common plate circuit is completed through a winding FG of a polar relay, through resistance R and through battery B_2 to the filaments connected in parallel. A second winding HJ of the polar relay is connected in shunt to resistance R with a condenser C inserted in series therewith. The tongue *t* of the polar relay is arranged to operate between the marking and spacing contacts M and S, respectively, which are connected to opposite terminals of a battery B_3. The tongue *t* and the midpoint of battery B_3 are connected respectively to the operating terminals of any suitable recording apparatus P. A condenser K is connected between the plate and filament elements of the tubes to by-pass the high frequency component around the polar relay.

The value of the negative biasing voltage supplied by battery B_1 is such that normally when no signal is being received no plate current flows through the plate circuit. The two coils of the polar relay are so connected that the charging current taken by condenser C and flowing through coil HJ normally assists the plate current flowing through coil FG to move the armature *t* to the marking position.

Operation of the relay circuit is as follows:

When no signal is being received, no current flows in the plate circuit and, therefore, there is no drop in potential across resistance R. Under this condition, condenser C is in a state of discharge. Upon the receipt of a signal wave, unidirectional current is caused to flow in the plate circuit through resistance R and polar relay coil FG. Due to the difference in potential developed across resistance R a current is caused to flow through coil HJ to charge condenser C. The two currents flowing in the two coils of the relay act in a cumulative manner to move the tongue *t* to the marking contact M, thereby causing a marking signal to be recorded.

At the end of the signal, the plate current flowing through the relay drops to zero, and the condenser C is allowed to discharge through resistance R. Since the discharge current flows in a direction opposite to the charging current, the tongue *t* of the relay will be actuated to the spacing contact S, thereby causing a spacing signal to be recorded. This cycle of operation takes place for each signal wave received.

From the foregoing it will be observed that normally the tongue of the polarized relay is not biased to either position, but the biasing force tending to move the tongue of the relay to the spacing position is brought into play only after the signals have ceased. In other words, the circuit provides for the self-biasing of the relay, and the strength of the biasing force varies in accordance with the strength of the signal being received. This offers a considerable advantage over relays of the type in which the tongue is normally biased to the spacing position by a biasing force of constant magnitude, and in which the tongue is moved to the spacing position as soon as the signal strength drops below

the force tending to bias the relay to the spacing position. In my arrangement, by the inclusion of one coil of the relay directly in the plate circuit, the armature is caused to remain on the marking contact as long as the signal is of sufficient strength to exert the slightest force on the armature.

While I have shown two vacuum tubes arranged in push-pull relation with respect to the incoming signal circuit, it is obvious that the invention is not limited to the push-pull arrangement, but a single tube may be employed if desired. It is also obvious that a polar relay having a single winding may be operated by my circuit arrangement in which the winding is connected in the same position as winding HJ in the diagram. In this modification, the two plate elements would be connected directly to the upper terminal of the resistance R. In the operation of this modification, the charging current for condenser C flowing through the winding HJ operates the tongue to the marking contact M, and the discharging current which occurs at the end of the signal, operates the tongue to the spacing contact.

It is obvious that my invention may be employed for the detection of interrupted pulsating signal waves as well as modulated carrier waves.

I claim:

1. In a relay circuit, the combination of a polar relay having two operating windings, a vacuum tube relay, a plate circuit for said vacuum tube relay including one of said windings and a resistance element, a shunt circuit around said resistance including said second winding and a condenser in series, said windings being arranged to exert a cumulative action upon the tongue of said relay while said condenser is being charged.

2. In a relay circuit, the combination of a polar relay having an operating winding, a vacuum tube relay, a plate circuit for said vacuum tube relay including a resistance element, a shunt circuit around said resistance element including said operating winding and a condenser in series, a source of signaling current connected to the input circuit of said vacuum tube relay, means for normally biasing the input circuit of said relay to prevent the flow of plate current while no signal is being received.

3. In a relay circuit, the combination of a source of signaling waves, a pair of vacuum tube relays having their input circuits connected to said source in push-pull relation, and the output circuits connected in parallel relation, a resistance element connected in said plate circuit, a polar relay having an operating winding and a condenser in series therewith, said operating winding and condenser being connected in shunt to said resistance element, and means for normally biasing the input circuits of said vacuum tube relays to prevent the flow of plate current when no signal is received.

4. In a relay circuit, the combination of a source of signaling waves, a pair of vacuum tube relays having their input circuits connected to said source in push-pull relation, a polar relay having two operating windings, the plate elements of said vacuum tubes being connected together to a common plate circuit including one winding of said relay and a resistance element, and a path in shunt to said resistance element including the other winding of said relay and a condenser in series relation.

5. In a relay circuit, the combination of an input transformer, a pair of vacuum tube relays having their input circuits connected to the secondary of said transformer in push-pull relation, a polar relay having two operating windings, the plate elements of said vacuum tube relays being connected together to a common plate circuit including one operating winding and a resistance element, a path in shunt to said resistance element including the other operating winding and a condenser connected in series relation, and a source of potential for normally biasing the the input circuits of said vacuum tube relays to prevent the flow of plate current when no signal is received.

In testimony whereof I affix my signature.

LEON G. POLLARD.