

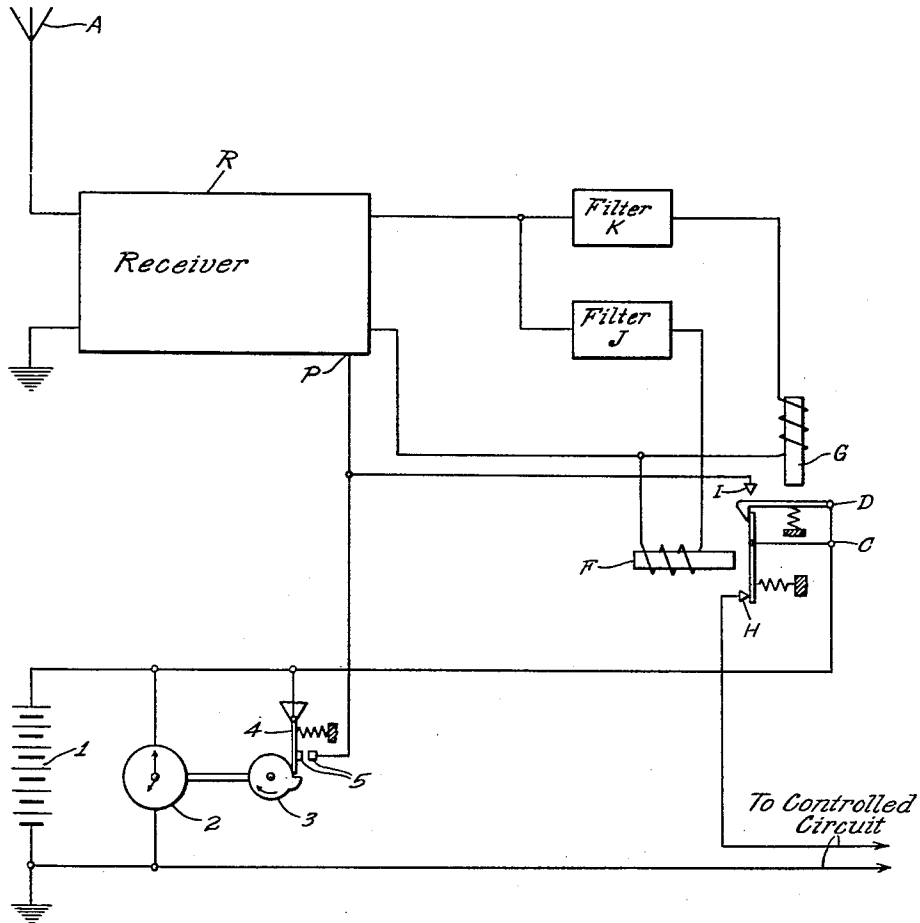
April 2, 1946.

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2,397,539

REMOTE CONTROL SYSTEM

Filed Aug. 27, 1941



WITNESSES:

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2,397,539

REMOTE-CONTROL SYSTEM

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Application August 27, 1941, Serial No. 408,455

2 Claims. (Cl. 177—353)

My invention relates to arrangements for the remote control of various devices by electric current and, in particular, it relates to the remote control by radio of electrical systems which incorporate their own source of driving power, such as, for example, an electric battery. My arrangement is an improved system for carrying out the control of devices such as are described in application Serial No. 339,453, of Willis A. Pennow, for Control for seadrome lights, filed June 8, 1940.

One object of my invention is to provide an arrangement whereby one or a plurality of lights or other devices may be turned on and off by radio or other electrical control energized from a distant point.

Another object of my invention is to provide a system for controlling electric circuits from a distant point which shall be operable from a battery or other power source of limited energy capacity and which shall be subject to substantial continuity of control over long periods of time without exhausting the energy of said source.

A particular object of my invention is to provide a control system in which a receiver of signal energy located at a point remote from the transmitter shall draw substantial power from its local power-supply only for short periods separated by longer intervals, but which can be altered by an appropriate signal so that a receiver is continuously active for any desired period, thereby permitting the continuous control of the local circuit by the distant transmitter at any time desired during the said period.

Other objects of my invention will become apparent upon reading the following description taken in connection with the single figure of drawing which is a schematic diagram of the circuits of the remotely-located load device, such as a seadrome light, operated in accordance with my invention.

As is pointed out in the above-mentioned Pennow application, it is desirable, where ports at which seaplanes are expected to land must be ready for use whenever wanted by an incoming plane at night, to provide marker buoys embodying beacons and other light sources at intervals along the margins of the landing surface. Such landing surfaces for seaplanes may be referred to as seadromes. However, it would be wasteful of power if it were necessary to maintain the individual beacons continuously lighted, and this presents particular difficulties in view of the fact that it is desired to supply the beacons with electric power for operating their lamps from local

batteries, which are necessarily of limited power, embodied in the beacons themselves.

I have, accordingly, devised an arrangement whereby a plurality of such beacons, each provided with its local operating battery, may be controlled by a radio transmitter located on the shore or at any other desired point. By my arrangement, the lights of individual beacons are normally extinguished, but may be turned on for use at any desired time by sending out a proper signal from the above-mentioned radio transmitter.

It is an important feature of my invention that the radio receiver, of which one is located at each beacon to receive the signal and turn on the light, is not continuously energized but is energized only for a short time at comparatively frequent periodic intervals.

Referring in detail to the drawing which shows the circuit arrangements at the remote seadrome light, an antenna A is arranged to transmit to a receiver R, which may be of any suitable conventional type for the reception of radio signals, the output of a signalling transmitter which is located at a shore station. As in the case of the above-mentioned Pennow application, this transmitter is energized, when it is desired to turn on the lights, to send out signals for a period of at least equal to one revolution of a cam 3 described below. A local battery 1 supplies the entire energy required to operate the receiver and the beacon light or lights. The battery 1 supplies energy to a spring wound motor of conventional form for a clock 2. Such conventional motors are switched into circuit with the supply battery 1 when the clock-spring becomes unwound and operate only long enough to bring the spring to the rewound condition, whereupon the motor is switched out of circuit. The clock 2 rotates a cam 3 which acts upon a follower 4 to close a contact 5 which is connected in series between the battery 1 and the filament and plate circuit supply terminal P for the tubes in receiver R. The same terminal of the battery 1, which is connected to the follower 4, is likewise connected to a pair of terminals C and D of a pair of relays F and G. The other contact H of the relay F is connected to any desired circuit to be controlled, such as the energizing circuit for the seadrome light, the other side of said circuit being connected to the battery 1.

The radio receiver R has one of its output terminals connected through a filter J, which transmits only currents of frequency f_1 to the energizing winding of the relay F and also through a

second filter K which transmits currents only of frequency f_2 to the energizing winding of the other relay G. The second contact of the relay G is connected to the contact 5 already mentioned.

The armature of the relay G is so arranged that when the latter is deenergized, it will latch the armature of the relay F into its closed-circuit position whenever the relay F has been energized. The armature of relay G is biased to the above-described latching position, and the armature of the relay F is biased to its open-circuit position.

The mode of operation of the above-described system is as follows: The clock 2 continually rotates the cam 3 which is so shaped that its contact 5 is closed for only a comparatively short time during each revolution; for example, the contact 5 may be closed for five seconds out of every ten-minute period. As long as the contact 5 is open (provided the relay G is not being energized), the radio receiver R will transmit no current through either the filter J or the filter K and the relays F and G will remain deenergized. When it is desired to light the seadrome lights, a radio wave modulated with the frequency f_1 , to which filter J alone is conductive, is sent out continuously for at least ten minutes. At some time during this ten-minute interval, the clock 2 will close the contacts 4, 5, thereby energizing the receiver R and causing the latter to send a current through filter J which energizes relay F. Energization of relay F moves its armature to close the contact H, thereby causing current to flow from battery 1 through terminal C and contact H to the seadrome lights or other control circuit. The armature of the relay G will immediately latch the armature of the relay F in this closed-circuit position, and current will continue to flow from battery 1 through the seadrome lights, notwithstanding the open circuiting of the contacts, 4, 5 and, consequently, deenergization of the receiver R.

This energized condition of the control circuit will continue until a signal of frequency f_2 is sent out from the transmitter for a ten-minute interval. At some time during this interval, the filament and plate circuit of the receiver R will be energized by the action of the clock 2 in closing the contacts 4, 5 for a five-second interval. In consequence of this energization of the receiver R, the filter K will pass current of frequency f_2 and energize the relay G. The latter will raise its armature, unlatching the armature of the relay F and permitting the bias of the latter to open a circuit from battery 1 to the control circuit, thereby putting out the seadrome lights. At the same time, the closure of the armature of the relay G against its contact I causes current to flow from the battery 1 to energize the filament and plate circuit of receiver R continuously, notwithstanding the opening of the contacts 4, 5, by the clock 2. Therefore, the receiver R remains energized as long as a modulation of frequency f_2 is impressed on the radio wave being sent out by the shore transmitter.

If now the transmitted radio wave is likewise modulated with the frequency f_1 , the relay F may be reenergized to close the contact H between the battery 1 and the controlled circuit. The armature of the relay F will not, however, latch in this closed position because the armature of the relay G is in its raised position. Therefore, when the modulation of frequency f_1 is stopped at the radio transmitter, the relay F will permit the bias spring to move its armature to open the contact H, thereby cutting off the controlled cir-

cuit and seadrome lights from the battery 1. It will thus be evident that the flow of current from the battery 1 to the controlled circuit is completely under the control of the shore transmitter so long as the latter is being modulated at frequency f_2 . Whenever the transmission of the frequency f_2 by the shore transmitter is stopped, its bias spring moves the armature of relay G to open the circuit from the battery to the filament and plate circuit of the receiver R, and to permit the said armature to act as a latch for the armature of relay F. In short, cutting off the modulated frequency f_2 of the shore transmitter returns the entire system to the initial condition in which it stood at the time this explanation of its operation was begun.

It will be seen that the above-described arrangement provides a system in which no current which flows from the local battery 1 to either the radio receiver or the seadrome lights except for five seconds out of each ten minutes at times when the seadrome lights are standing extinguished. This enormously decreases the size of the local battery which it is necessary to provide for the seadrome unit, as compared to a system in which the radio receiver is energized by the local battery at all times. In most practical instances, the seadrome attendant will know at least ten minutes in advance that a plane desires to land. Hence, by sending out the frequency f_1 he will be able to turn on the seadrome lights, and once turned on they will stay on unless he desires to shut them off. However, for certain purposes it is sometimes desirable to be able to blink the lights or for the station attendant to turn them on or off at frequent intervals. In such cases, the attendant will send out the frequency f_2 after he was turned the lights on and then, in accordance with the foregoing description, be able to turn the lights on and off as he desires by turning on or off the radio frequency f_1 from the transmitter. When the attendant desires to return the entire system to its standby condition, he interrupts the flow of the modulated frequency f_2 , and the system automatically returns to its deenergized or standby condition.

I have described above a particular modification of my invention as required by the patent statutes, but its general principles are obviously of broad application in ways which will be evident to those skilled in the art.

I claim as my invention:

1. In combination with a load intended to be operated by a local source of energy under control from a remote point, a switch, means which cause said switch to close periodically for only a relatively short portion of each of its periods, a signal-receiving device transparent to currents of two different frequencies and substantially opaque to currents of other frequencies, said signal-receiving device being provided with means by which it is deenergized when said switch is open, a first relay and a second relay, the armature of said first relay being provided with means by which it is biased to open-circuit position, the armature of said second relay being provided with means to latch the armature of said first relay in its closed-circuit position when said second relay is deenergized, the circuit of said load being provided with means by which it is energized from said local source only when said first relay is in closed-circuit position, and the contacts of said second relay being provided with means to short-circuit said switch only when

said second relay is energized, said relays being respectively provided with means causing them to be energized by the above-mentioned two frequencies transmitted by said receiver.

2. A system for controlling from a remotely-located radio transmitter a load which it is desired to supply with energy solely from a local source, a switch, means which cause said switch to close periodically for only a relatively small portion of each of its periods, said switch being connected to energize by its closure a radio receiver from said local source, a first filter transparent substantially only to one frequency and a second filter transparent only to another frequency

5 connected in the output circuit of said receiver, a first relay connected to be energized through said first filter, a second relay connected to be energized through said second filter, said first relay having an armature biased to open-circuit position, means by which said armature is latched in closed-circuit position as long as said second relay is deenergized, a contact closed by the armature of said first relay upon energization thereof and connected to control current flow to a load circuit from said local source, and a contact closed when said second relay is energized and acting to short-circuit said switch.

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