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RADIO RECEIVING SYSTEM

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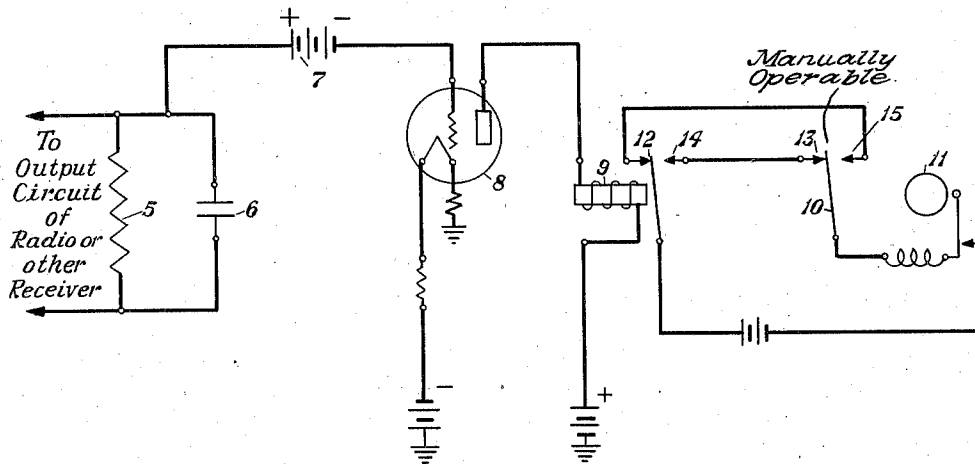


Fig. 1

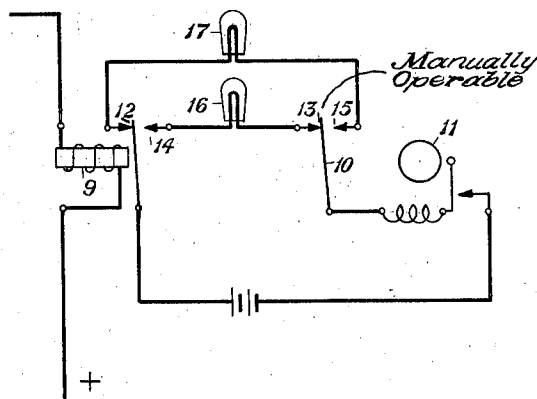


Fig. 2

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RADIO RECEIVING SYSTEM

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2 Claims. (Cl. 177—311)

This invention relates to radio receiving or signaling systems, and more particularly to switching means for the purpose of operating a signaling device to indicate when a carrier wave or radio message is received, and also to indicate when said wave or message no longer arrives.

In radio signaling systems, for example, it is frequently desirable to receive and monitor at a common point the signals received from one or more transmitting stations. It has been found that loud speakers connected or coupled to the various receivers will fill the monitoring room with noise, and this noise will be especially acute whenever atmospheric conditions become poor. When the static effect due to such atmospheric conditions causes appreciable current in the loud speakers, this current will virtually mask any signals that may be received, and consequently the task of monitoring will at such times become difficult.

One of the objects of this invention is to obviate these difficulties by providing a monitoring system which will indicate with precision the start or receipt of carrier current or other radio signals. As will be apparent from the subsequent description of the apparatus of this invention, the monitoring room will always be free from noise from the loud speakers when atmospheric noise is high and when there is no signal on the receiver or receivers to cut down the noise. Moreover, the proposed arrangement will indicate immediately that the carrier or other signal has come on or gone off. Without employment of the features of this invention it would be practically impossible to learn of the presence or absence of carrier or other signals during bad weather conditions unless the operator is constantly and carefully monitoring the circuit.

This invention will be better understood from the following description, when considered in connection with the accompanying drawing, in which Figure 1 shows one embodiment of the invention in which an audible alarm is sounded to denote the presence and absence of a carrier wave; and Fig. 2 is a circuit diagram showing a modification of Fig. 1 in which the audible signal, and also visual signals, are operated upon the reception and removal of the carrier wave.

Referring to the drawing, a resistor 5 and condenser 6 connected in parallel are shunted across the plate circuit of a vacuum tube receiving system (not shown) as, for example, in the plate circuit of a second demodulator of such a system, said plate circuit including a high series resistance. These parallel elements have high direct

current resistance. The parallel elements 5 and 6 are connected in series with a battery 7 in the grid circuit of a vacuum tube 8. The plate circuit of the latter tube includes the winding of a relay 9. The armature and contact of relay 9 act as a switch which, together with a switch 10, control the operation of a bell or sounder 11 or other indicating device.

The resistor 5 is of such a value that when no carrier is received by the system the grid bias will be practically zero, and a large plate current will flow through the winding of relay 9, holding this relay operated. The armature of the relay will then close contact 12. The operator may move switch 10 against contact 13 so that no current may then flow through the sounder 11.

When the carrier current comes on a change will be produced in the voltage drop across the resistor 5 by this current and this change in voltage drop will increase the effect of battery 7 to render the grid appreciably negative with respect to the filament. The plate current of tube 8 will then become reduced to a value which is less than is required to maintain relay 9 operated, and therefore the armature of this relay will be released to contact 14. Current will then flow through the sounder 11 over the circuit which includes the armature of relay 9, its back contact 14, contact 13, switch 10 and sounder 11. The sounder 11 will be operated either until the carrier current subsides or until the operator moves switch 10 to contact 15.

Should the operator transfer switch 10 to contact 15, the sounder 11 will cease operating until the carrier ceases. Immediately upon cessation of the carrier, the electrical condition previously described in connection with the circuit when no carrier is received by the system will be resumed.

The relay 9 will operate when carrier current is not received and will release as the carrier comes on. As the operator moves the key 10 between its contacts 13 and 15 he can, by listening to the sounder 11, instantly determine the presence or absence of the carrier current. This may be made an important adjunct of modern radio broadcasting or other signaling systems.

In arrangements in which this invention has been employed the resistor 5 was of 100,000 ohms and was inserted in parallel in the plate circuit of an auxiliary second demodulator of a receiver, the tube having a high plate resistance. The condenser 6 was of 2 microfarads capacity, the battery 7 was 130 volts, of small capacity because of the lower negligible normal drain. The filament circuit of the tube 8 included a battery of 20

volts and a resistor of 32 ohms. The tube 8 was the 101F type. The battery in the plate circuit of the tube 8 was also of 130 volts, and when no carrier was received by the system the latter battery supplied 8 milliamperes of current to the winding of the relay 9, dropping to a value of 2 milliamperes when carrier was received. As the received signal arrived, the plate circuit meter reading of the second demodulator increased 20 microamperes corresponding to a weak signal. Average signals provide a deflection of the order of 100 microamperes. These values are quoted to show the sensitivity of this device. Current values obtained in the plate circuit of the auxiliary second demodulator were 18 microamperes with the carrier off and 90 to 100 microamperes with the carrier on. The relay 9 was a Western Electric relay of the "R" type and operated on 4 milliamperes.

The particular application above mentioned illustrates the necessity of and the advantage to be derived from the use of tube 8 and its associated circuits. In this application, a radio receiver was used which had seven stages of intermediate frequency amplification. The gain preceding the final demodulator tube was much greater than that obtained in the usual superheterodyne receiver. Yet, between conditions of "carrier on" and "carrier off" for a weak signal, the change in plate current of the demodulator tube associated with tube 8 was less than 100 microamperes. This current change applied directly to the winding of a relay such as 9 is insufficient for the proper operation of this relay. When tube 8 and its associated circuits were added, however, the change in current through the winding of relay 9 was 6000 microamperes for the two conditions referred to and the relay functioned satisfactorily. Thus by the use of tube 8, it was possible to use a relay of ordinary sensitivity for relay 9 instead of one of very high sensitivity which would be more difficult to adjust and to maintain in proper adjustment.

It will be apparent that the condenser 6 is employed for the purpose of preventing static crashes from operating the alarm apparatus of this invention. It will be clear, also, that the parallel circuit of elements 5 and 6 may include inductance and capacitance tuned to be resonant at a predetermined frequency so that carrier current of that frequency may alone be effective in operating the alarm apparatus.

In Fig. 2 of the drawing the lamps 16 and 17 may provide visible signals for indicating whether

the carrier current is on or off. Thus, when the carrier current comes on the lamp 16 will be lighted, and when the carrier current ceases the lamp 17 will be lighted, but in either event the sounder 11 will be operated. The elements 16 and 17 may be of different coloration as, for example, green and red, respectively.

It will be apparent to those skilled in the art that several arrangements similar to those illustrated in Figs. 1 and 2 may be associated with a plurality of radio receivers which are to be monitored from a common point. In that case only one sounder will be required to indicate when any one of the various carriers has started or stopped, but a lamp such as the one designated 16 or 17 will indicate to the operator which of the various carriers has started or stopped.

Although this invention has been described with respect to a monitoring circuit for a radio receiver it is, of course, equally applicable to monitoring a radio transmitter or any other signaling circuit or system. It is merely necessary that a resistor such as 5 be connected to some portion of a signaling or other circuit so that the presence or absence of a signaling current will produce an appreciable potential resistance difference across the resistor 5.

What is claimed is:

1. Apparatus for indicating instantly at a radio receiving apparatus whether or not modulated or unmodulated carrier current is being received, comprising a resistive device directly coupled to said apparatus through which the direct current in the output circuit of a final demodulator flows, a source of potential, a vacuum tube detector having grid, plate and cathode electrodes, the grid and cathode electrodes of the tube being connected in series with said source of potential and said resistive device, and means responsive to the current flowing between the plate and cathode electrodes for giving one signal when modulated or unmodulated carrier current is being received and for giving another signal when said carrier current ceases.

2. The method of instantly indicating at a receiving station when carrier current is applied and removed, which consists in amplifying and detecting part of the carrier current when it is applied, producing one signal instantly in response to said amplified and detected carrier current, and producing another signal instantly upon the removal of said carrier current.

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