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L. E. MELHUISH
CARRIER TELEGRAPH RECEIVER
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2,043,355

FIG. 1

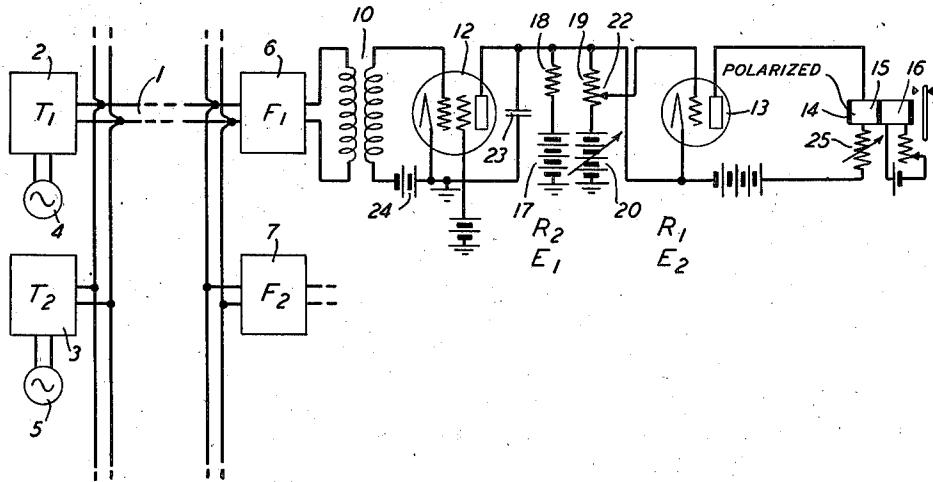
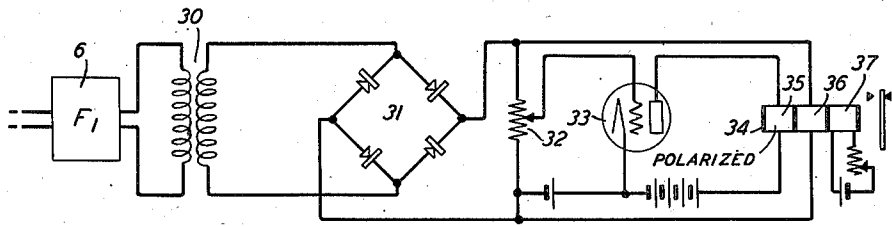


FIG. 2



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CARRIER TELEGRAPH RECEIVER

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1 Claim. (Cl. 178—66)

The present invention relates to signaling and more particularly to the reception of signal waves or impulses by rectification.

The invention will be described with particular reference to carrier telegraphy although it is capable of more general use. In signaling systems, such as in carrier telegraphy, variations in line equivalent tend to give rise to faulty reception on account of the variation in strength of received signals. It is difficult to set a receiving printer or other recorder to be equally responsive to received impulses of widely differing strength. Consequently, it is customary for an attendant from time to time to change the adjustments of a receiver to suit the different line current conditions.

It is an object of the present invention to provide a signal receiving circuit which will respond equally to received current impulses that vary in strength from time to time.

This object is attained in accordance with the invention by providing in the circuits that operate the receiving relay, two circuit branches that are mutually opposed in their effects on the relay, and so adjusting these effects that the resultant is substantially constant throughout a range of received signal strengths.

In the drawing, to which reference will now be made for a more complete understanding of the nature and objects of the invention,

Fig. 1 is a schematic circuit diagram illustrative of a system to which the invention is applicable; and

Fig. 2 shows a modified type of receiving circuit in accordance with the invention.

In Fig. 1 the line 1 is shown terminating at the left in a transmitting station and at the right in a receiving station. The transmitting station is indicated as comprising a number of transmitters of which two are shown at 2 and 3 each provided with a source of carrier waves as at 4 and 5, respectively. Other similar transmitters may be provided. It will be understood that each of these transmitters will include any suitable means for controlling the carrier wave in accordance with signals to be transmitted such as an interrupter or other suitable type of sender together with any filtering elements that may be required, all in accordance with well-known practice in this art.

At the receiver filters are provided as at 6 and 7, for separating received currents into various channels, there being as many of these filters as there are channels to be received at this station. These filters may be the usual type of band filters

or tuned circuits or other suitable selective networks. Only the channel associated with the filter 6 is shown in detail, it being understood that the other receiving channels will be similarly equipped.

The output of the filter 6 is connected through transformer 10 to the input circuit of a tube 12 which serves as an amplifier for the received signals. The tube 12 is shown as of the screen grid type. A screen grid or pentode or similar type of tube having a high amplification is preferably employed. The output of the amplifier tube 12 is connected to a rectifier or detector tube 13 containing a polarized relay 14 in its output. Space current for the tube 12 is supplied from battery 17 through resistance 18. This combination of battery 17 and resistance 18 is in parallel with battery 20 and resistance 19 for a purpose to be described presently. Condenser 23 is a by-pass condenser for the alternating component of the received amplified waves.

When there is no incoming signal from the filter 6 the grid of the tube 12 is made so far negative by the grid battery 24 that no space current flows through this tube. Under these conditions the voltage of the battery 20 is adjusted to such a value with respect to the resistances 18 and 19 that current is forced to flow from the battery 17 through resistances 18 and 19 in series and into the battery 20 against the voltage of that battery. There is thus a voltage drop produced in the resistance 19 in such a direction as to make the grid of the detector tube 13 negative with respect to the filament. The slider 22 on resistance 19 and the other elements of the circuit, if necessary, are proportioned or adjusted so that under these conditions the space current of the tube 13 is zero and the winding 15 of the relay 14 is therefore without current. The bias winding, supplied with suitable current from a battery through a regulating resistance, as shown, is used to keep the armature against the spacing contact under these conditions.

An incoming signal through the filter 6 is applied through the high step-up ratio transformer 10 to the grid of tube 12 driving the grid in a positive direction and reducing the internal impedance of the tube 12 to a low value. Plate current is thus drawn from the battery 17 through the resistance 18 causing a substantial voltage drop in resistance 18 sufficient to permit the battery 20 also to supply space current to the tube 12 through its resistance 19. The consequent reversal of current through the resistance 19 changes the potential of the grid of tube 13 from

its normal highly negative value to a positive value operating the relay 14 to its marking contact.

The elements of the circuit are proportioned 5 preferably so that the detector tube 13 will be subject to grid voltage swings beyond normal capacity, for example, grid swings of the order of ± 20 volts. This will result in a space current through the tube 13 of zero value on spacing and of a value limited chiefly by the value 10 of the resistance 25 for the marking condition. The bias current in the winding 16 of the relay is set at the optimum value for this current. The constants of the vacuum tube circuit including the interstage elements are preferably 15 proportioned so that the space current of the tube 13 is changed from its zero value to its maximum value by any input voltage in excess of a definite minimum operating voltage. This results in the relay 14 receiving substantially the 20 same operating current for both weak and strong received line current signals.

In the alternative receiving circuit shown in Fig. 2, the output of the filter 6 leads through 25 transformer 30 to a rectifier 31 which is shown as of the solid element type in bridge circuit configuration. The rectifiers are preferably of the copper-oxide type although any suitable type of rectifier may be used. The direct current terminals of the rectifier 31 are connected across 30 a high resistance 32 and also to the terminals of winding 36 of receiving relay 34. The resistance 32 is so high that for any given rectified signal substantially all of the current flows 35 through the winding 36 and very little flows through the resistance 32.

A vacuum tube amplifier 33 has its grid circuit connected across a variable portion of high resistance 32 and has its plate circuit connected 40 to the winding 35 on relay 34. Relay 34 is a polarized relay having a biasing winding 37.

In the operation of the circuit of Fig. 2 when there is no incoming signal the grid bias of the amplifier tube 33 is so far negative that no current flows through the winding 35. Since there 45 is also no rectified output from rectifier 31 there is no current in the winding 36. Under these conditions the current in the bias winding 37 holds the armature against the spacing contact.

50 Upon the receipt of signal waves through the filter 6, these waves are rectified at 31 and the rectified current flows through the winding 36 causing the relay 34 to operate to shift its armature from the spacing to the marking contact. 55 Some of the rectified output flows through re-

sistance 32 and produces a voltage on the grid of the tube 33 in a direction to permit current to flow through the tube 33 and through the winding 35. The effect of this current in the winding 35 opposes the effect of the rectified current in the winding 36 so that the resultant effect of 5 both of these windings on the relay 34 is a differential effect, the effect of winding 36 always predominating.

As the line equivalent of the line 1 changes 10 and the strength of the received signals varies from time to time, it will be apparent that the adjustments of the circuit may be so made that stronger current in the winding 36 resulting from stronger signals are opposed by stronger current in the winding 35, tending to give a net 15 resultant effect on the relay 34 which may be made substantially constant over a wide range of variation of strength of the received signals. The relay 34 is in this way made to respond 20 substantially equally to both weak and strong received signals.

It is contemplated that amplifiers will be introduced into the circuits of Figs. 1 or 2 as may 25 be required either at the transmitter or at the receiver or both. In Fig. 2 particularly, it will be necessary in practice to use amplification in order to provide a requisite amount of energy for properly operating the rectifier 31 and for 30 making up the losses in the rectifier.

It will be understood that the invention is not to be construed as limited to the specific details that have been shown and described, but that the invention is susceptible to variation or 35 modification within the scope and spirit of the appended claim.

What is claimed is:

In a receiving circuit for a system having a transmission equivalent subject to change, a rectifier for the received signal waves, a relay, the 40 output current from said rectifier including a winding on said relay for actuating the relay, a vacuum tube having in its output circuit a winding on said relay for opposing the effect of 45 said first winding, the input of said vacuum tube being connected to the output circuit of said rectifier, the circuit elements being proportioned such that the effect on the relay operation of the second mentioned winding is always weaker 50 than that of the first winding whereby a differential effect on the relay is produced which is substantially constant over a range of variation of received signal strengths.

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