

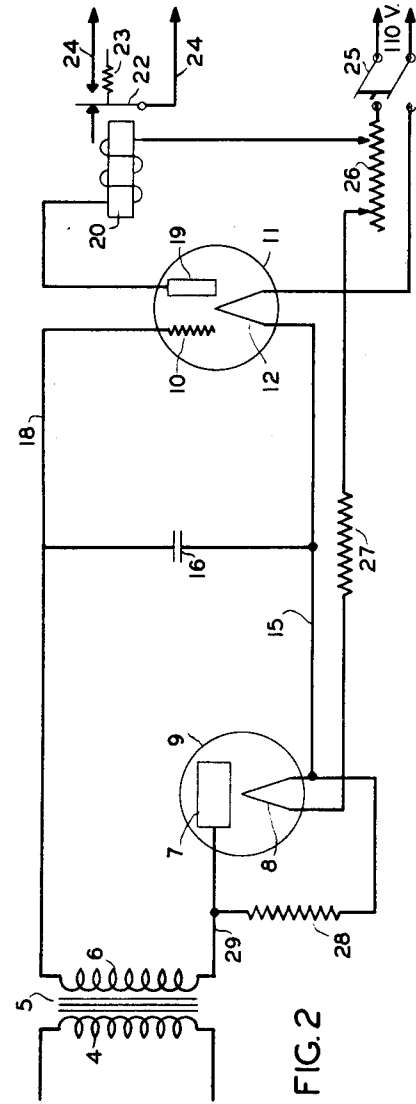
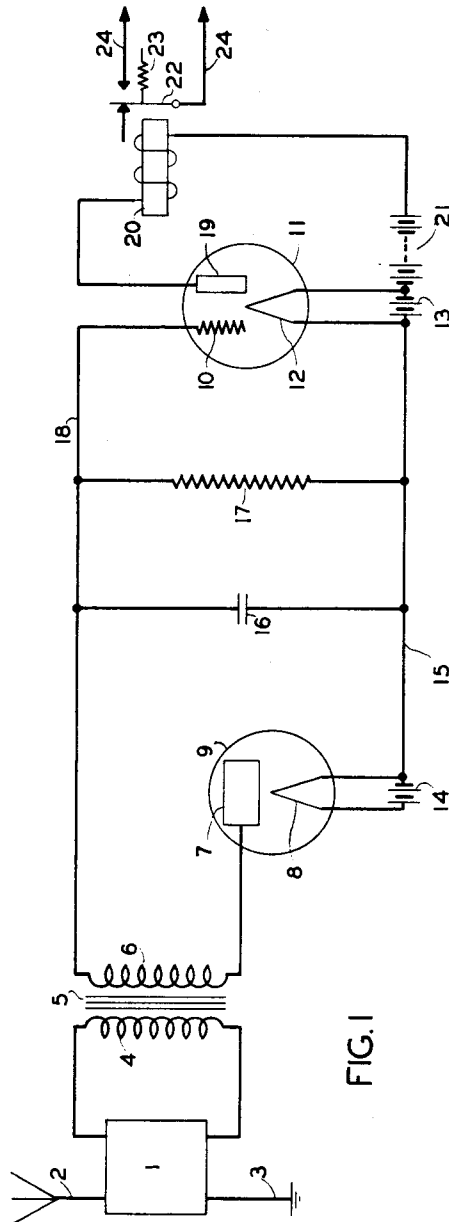
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RELAY RECEIVING CIRCUIT FOR CARRIER TELEGRAPH SIGNALS

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RELAY RECEIVING CIRCUIT FOR CARRIER TELEGRAPH SIGNALS

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This invention relates to receiving apparatus for carrier telegraph signals and has particular reference to the amplification of signals after they have been rectified. The output of the circuit is utilized in the operation of a relay from which any desired type of telegraph receiver may be controlled.

One of the principal difficulties experienced in the past in operating a printing telegraph from signals received by radio or over channels upon which carrier waves have been impressed, is that the signal strength as received varies within quite wide limits, so that the stability of the rectifying and amplifying circuits is not easily maintained. The primary object of this invention is to provide a rectifying and amplifying circuit of extreme stability, advantage being taken of a condition in which a normally fixed plate current energizes a relay during the absence of a signal, and when the signal is received, this current is so reduced by a negative bias on the grid of the amplifier tube that the relay will be released. Since an excessively strong signal can do no more than arrest the flow of current in the relay-to-plate circuit, the desired stability is obtained.

In carrying out this invention, an ordinary receiving set responsive to radio frequency oscillations may be used, and the output thereof when converted into audio frequency may be first rectified and then amplified so as to operate the controlling relay.

Referring to the drawing:

Figure 1 shows diagrammatically the rectifying and amplifying circuits.

Fig. 2 shows an alternative arrangement of these circuits.

The radio-receiving set 1 is represented with its antenna 2 and ground 3. The output from the radio receiver will be understood to be in the form of audio frequency oscillations which pass through the primary 4 of a transformer 5. The secondary 6 of this transformer is connected at one terminal with the plate 7 of an ordinary two-element rectifier tube 9. This tube includes a filament 8 which receives its current from the battery 14. The other terminal of the transformer coil 6 connects with the grid 10 of a three-element

amplifier tube 11. The filament 12 of this amplifier tube is energized by a battery 13, the positive pole of which connects with the negative pole of the battery 14. The connecting lead 15 between these two batteries is tapped for a condenser 16 and a high resistance 17, these two elements being shunted across to the grid lead 18 which connects between the transformer coil 6 and the grid 10. The plate 19 of the amplifier tube is connected to the winding of a relay 20, and this plate circuit has impressed upon it the usual potential as from a B battery 21. The relay armature 22 is normally held against its front contact by a current flowing from the B battery 21 through relay 20 and across from the plate 19 to the filament 12. When this current is suppressed by the tube action, the relay armature is retracted by the spring 23 so as to complete a circuit to the telegraph receiver as represented by the leads 24.

Referring to Fig. 2, the alternative circuit will now be described. The transformer 5 with its primary winding 4 and secondary winding 6 is shown in Fig. 2 the same as in Fig. 1. The grid lead 18 is the same. The condenser 16 is likewise connected across between the grid lead 18 and the filament connection 15. The circuit through relay 20 connects similarly with the plate 19. The armature 22 in the telegraph receiver circuit 24 is the same. Two principal differences are apparent: One source of energy, preferably 110 volts direct current, supplies both the filament potential and the plate potential. This current passes through the switch 25, the positive lead connecting with an adjustable resistance 26, taps from which connect respectively with the winding of relay 20 and with an additional resistance 27. This last resistance reduces the voltage, making it suitable for the tube filaments 8 and 12. These filaments are in series, connected by the lead 15. One terminal of the filament 12 connects with the negative side of the energizing source. A resistance 28 is connected between the filament 8 and the conductor 29, the latter being a connection from the transformer winding 6 to the plate 7.

It is obvious that in place of the tubes as

shown, it would be possible to use tubes adapted for operation with alternating current applied to the filaments.

The operation of this invention is as follows:

When no signal is being received (or, in other words, during a "spacing" interval), the rectifier tube 9 will be inactive because no current can pass from the plate 7 to the filament 8 except that which is generated by the transformer 5. This is evident from the fact that no potential greater than that of the filament is otherwise impressed upon the plate circuit 18. Under these conditions therefore, it is possible to adjust the space current in the tube 11 from the plate 19 to the filament 12 so as to energize the relay 20 and hold its armature 22 in an open circuit position with respect to the telegraph receiver circuit 24. When, however, the signalling impulse is received and converted by the radio receiver 1 into audio frequency, the impress of this signal upon the transformer winding 4 provides an inductive effect upon the winding 6, the oscillations from which are passed to the plate 7 and rectified. A negative bias is thereby impressed on the grid 10 of the amplifier tube and the space current from the plate 19 to the filament 12 of this amplifier tube 11 is immediately reduced to the point where relay 20 deenergizes, allowing its armature to be retracted by the spring 23 so as to close the telegraph receiver circuit 24. The "marking" signal is thus communicated to the telegraph receiver.

It will be noted that a positive and dependable action of the relay 20 is obtained in this manner. The reason for this is that a definite space current is established from the plate 19 to the filament 12 according to the characteristics of the tube itself and the plate potential. The operation of the transformer 6 in association with the rectifier tube 9 can have only one effect regardless of the strength of the input signal, that is, to negatively bias the grid 10 and reduce the space current from the plate 19. Referring to Fig. 2 the same conditions prevail as hereinbefore described with reference to Fig. 1. The maintenance normally of a zero potential on the grid 10 with respect to the filament 12 is effected by the use of the high resistance 28 in series with the secondary 6 of the transformer 5. During the spacing interval when no current is generated by the transformer, the grid 10 of the amplifying tube 11 is also at zero potential with respect to its filament. Under this condition a certain current is flowing in the plate circuit of the amplifying tube 11 through the receiving relay 20. The spring 23 of this relay is adjusted so as to be overpowered by the ampere turns of its coil and pull the armature against the front contact. The impress of the signal biases the grid 10 negatively, thus re-

ducing the current in the plate circuit and causing the relay 20 to release.

The half-waves which are rectified by the tube 9 are flattened out by the action of the condenser 16 so as to have substantially the same effect as a continuous current.

I claim as my invention:

1. Apparatus for rectifying and amplifying telegraph signals comprising a transformer, a rectifier connecting therewith, an amplifier tube the grid circuit of which is connected to said transformer, a neutral relay connecting with the plate of said amplifier tube, means normally to maintain a definite potential on said grid with respect to its filament and to impress upon said grid in response to a received signal a purely negative charge from the circuit which includes said transformer and rectifier tube.

2. In a telegraph receiving network, a rectifier, a resistance in the output circuit of said rectifier, a thermionic amplifier having a grid and a plate circuit, a neutral relay included in said plate circuit and energized by a normal flow of current therein, means for supplying signal impulses to said rectifier, and means for applying the variation of the potential between the terminals of said resistance to said grid circuit during the continuance of said signals for the purpose of suppressing the current in said plate circuit and de-energizing said relay.

3. In a telegraph receiving network, a rectifier having an output circuit, a thermionic amplifier having an input circuit including a grid and a filament, and an output circuit, a resistance in the output circuit of said rectifier and the input circuit of said thermionic amplifier, said resistance having one terminal connected to said grid and another terminal connected to said filament, and a neutral relay included in said amplifier output circuit and energized by a normal flow of current therein.

4. In a telegraph receiving network, the combination of a rectifier having an output circuit, and a resistance bridged across said circuit, a relay, an amplifier having an input circuit connected to the output circuit of said rectifier and an output circuit connected to said relay which is energized by the normal flow of current in said circuit.

In witness whereof, I hereunto subscribe my name this 30th day of June, 1930.

FREDERICK G. HALLDEN.