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RADIOPRINTING TELEGRAPH SYSTEM

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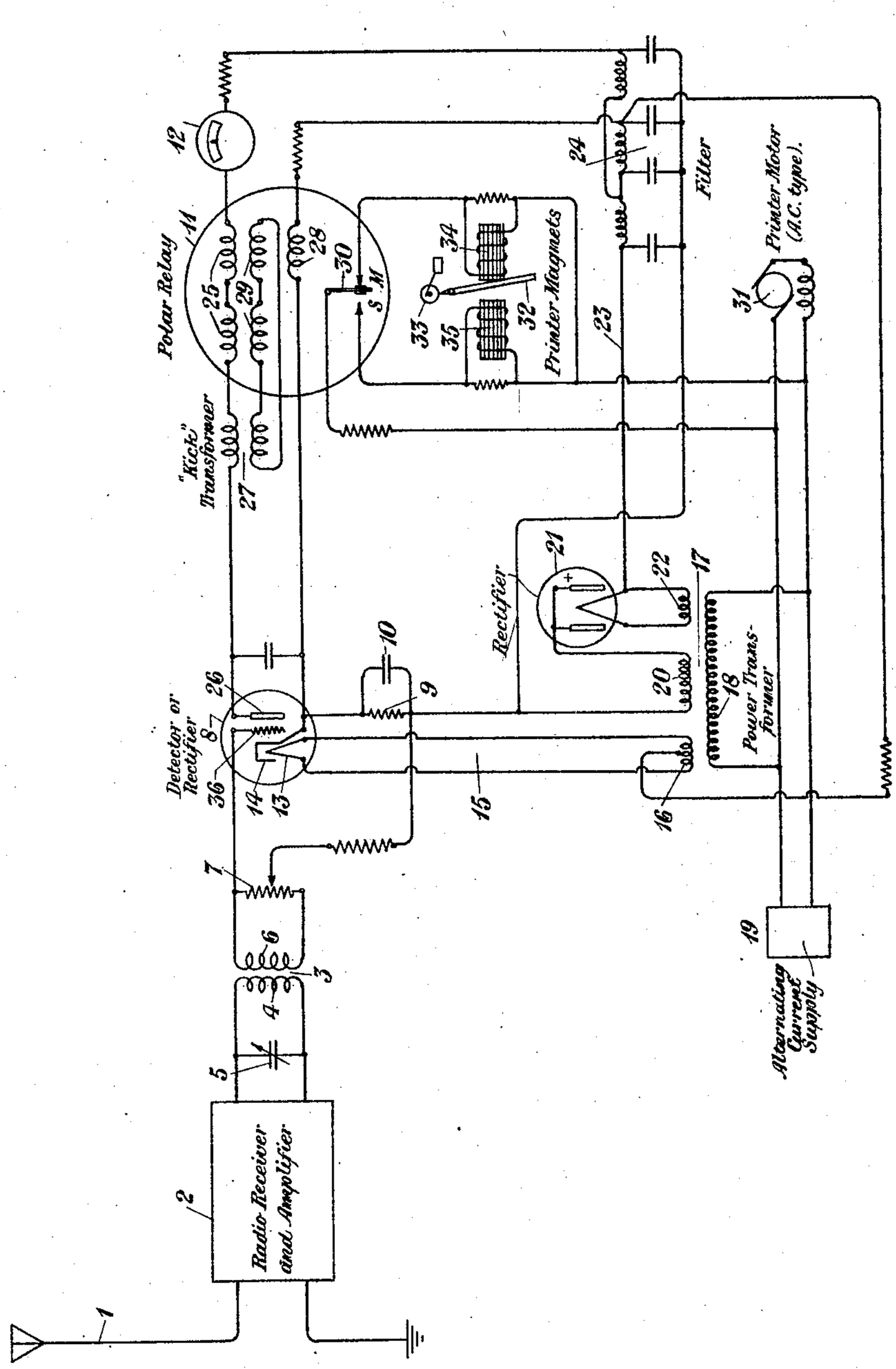

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RADIO PRINTING-TELEGRAPH SYSTEM.

Application filed December 29, 1924. Serial No. 758,710.

This invention relates to printing telegraph systems and particularly to a system of that type arranged for operation in connection with a radio signaling system.

As is well known to those skilled in the art, owing to improvements made in printing telegraph apparatus and circuits a printing telegraph system is a desirable medium for the transmission of news matter. Heretofore, printers have been used in connection with wire lines. It is believed, however, that there may be a demand for a radio printer service in which the news matter would be broadcast from a central transmitting station to the newspapers subscribing for such service, each of which would have receiving apparatus comprising a radio receiver and printing telegraph apparatus. In the co-pending application of R. S. Ohl, Serial No. 757927, filed December 24, 1924, is described a system characterized by the use of ultra high frequencies for transmitting printing telegraph signals, which renders it practicable to use relatively inexpensive receiving antennae and also possesses other advantages.

One of the objects of this invention is to provide a printing telegraph system which may be used in connection with any radio receiving system, and is well adapted for use with the system described in the said application of R. S. Ohl, the said printing telegraph system being characterized by the employment of alternating current instead of direct current for the energization of the apparatus of the system. Since it is difficult in small communities to obtain direct current the ability to use alternating current in the operation of my system renders it unnecessary to employ storage batteries which are expensive in first cost and also to maintain in operation.

Other objects of this invention will be apparent from the following description when read in connection with the attached drawing showing schematically a form of embodiment of the invention.

In the drawing, the antenna 1 is connected with a radio receiver and amplifier 2, which may be of any well known type, for the reception and amplification of high frequency signals. The circuit of the radio receiver is not shown in detail inasmuch as various types of radio sets may be employed. The radio set should be suitable for the wave length of the signal to be received and should have sufficient amplification so that the signal subsequently detected will be capable of operating a polar relay. The output of the radio receiver is coupled by means of the transformer 3 with the input side of the vacuum tube detector or rectifier 8. The primary winding 4 of transformer 3 and the condenser 5 serve to tune the input circuit. The secondary winding 6 has connected therewith a potentiometer 7, one terminal of which is connected with the grid of the tube 8, and the movable contact of the potentiometer is connected with a terminal of the resistance 9, which is connected in the plate-cathode circuit of the rectifier, the purpose of doing which will be fully described hereinafter. The transformer 3 may be of either the radio frequency or the audio frequency type, depending upon the character of the radio receiver 2. If the output of this receiver is a high frequency current the transformer must of necessity be of the high frequency type. If, on the other hand, the output current of the radio receiver is within the limits of audio frequency the transformer would then be of the latter type. The potentiometer 7, connected across the secondary of the input transformer, controls the strength of the input current to the detector 8 and thereby controls the current through the polar relay 11. The potentiometer should be adjusted while a continuous marking signal is being received by the radio receiver until the reading of the milliammeter 12, which is connected in series with the line winding of the polar relay, indicates the required current strength to operate this relay.

The detector tube 8 is of the unipotential cathode type. In tubes of this type the cathode is rendered thermionically active by direct conduction or radiation of heat thereto or by bombardment of electrons from a source separate and distinct from the cathode itself. A desirable form of tube of this type comprises a cylindrical cathode having its exterior coated with electron-emitting paste and having a heating element inserted in the cylinder. In tubes of this type an alternating current may be employed to energize the heating element per se without introducing any detrimental effect in the operation of the tube, that is to say, in its detecting function. Thus, the

heating element 13 which is enclosed within the cathode 14, is connected by means of the circuit 15 with the winding 16 of the transformer 17. The primary winding 18 of this transformer is connected across a lighting circuit, as, for example, the ordinary 110 volt house-supply system. Another winding 20 of this transformer has one of its terminals connected with the plates of the rectifier 21. The other terminal thereof is connected through the resistance 9 with the cathode 14 of tube 8. The cathode of the rectifier 21 is connected with the winding 22 so as to be energized by the alternating current from the source 19. The same cathode is also connected by conductor 23 with the filter 24, which is made up of three sections, of which the last two are in parallel each with the other and each is in series with the first section. The positive side of the first and third sections is connected through the milliammeter 12 and through the windings 25 of the polar relay 11 with the plate 26 of the rectifier 8. This connection also includes one of the windings of the kick transformer 27. In like manner the positive side of the first and second sections of the filter is connected through the winding 28 of the polar relay with the cathode 14 of the tube 8. The windings 29 of the polar relay are connected with the secondary winding of the kick transformer 27, the function of which is to insure quick operation of the polar relay. The armature 30 of the polar relay which is connected with the alternating current circuit is also adapted to swing between two contacts, each of which is connected with a magnet of the printer. Thus the magnet windings may be energized by the alternating current supply circuit. Also connected with the alternating current circuit is a printer motor 31 of the alternating current type. The armature 32 of the printer magnet is facilitated in its operation by means of the jockey roller 33. This armature and the printer motor 31 control mechanically a printer, such as, for example, the Western Electric tape printer or the Morkrum "Teletype" tape printer.

Having in mind the foregoing description of the apparatus employed in this schematic circuit, the manner in which the object of the invention is attained will now be apparent. When a switch connected with the alternating current house-supply system is closed current will flow through the various circuits connected therewith and energize the parts. Thus, alternating current acting through the winding 16 will energize the cathode 14 of the detector 8 and similarly the cathode of the rectifier 21 will be energized. Whenever the plates of the rectifier 21 are rendered positive by the winding 20 of the transformer 27, current will flow from the plate to the cathode, thence over conductor 23 and through the first branch of the filter 24, there dividing, part of the current flowing through the windings 25 of polar relay 11 to the plate 26 of the rectifier 8, thence to the cathode 14 and through the resistance 9 to the opposite, that is to say, the negative terminal of the winding 20; and the remainder of the current flowing through the winding 28 of the polar relay 11 and resistance 9 to the negative terminal of the same winding.

Since the return path for both of these circuits embraces the resistance 9 the voltage drop through this resistance may be used as the negative potential for the grid circuit of the tube 8, thus eliminating the usual C battery. The winding 28 of relay 11 should have fewer turns than the main windings 25 and should be magnetically opposed to the latter. The current through this biasing circuit may then be considerably greater than that through the plate circuit of the detector 8 so that variations in the current in the plate circuit will have but little effect on the voltage applied to the grid circuit. This effect is further reduced by the large condenser shunted around the resistance. The grid potential should be adjusted to reduce the plate current substantially to zero when no radio signals are being received. Then, whenever a train of waves representing a radio signal is applied to the grid, the waves will be rectified. Thus every marking signal serves to increase the current in the plate circuit and thereby to operate the polar relay. The condensers and the kick transformer in the plate circuit serve in a well known manner to improve the operation of the relay. Since the biasing winding 28 serves to keep the armature 30 normally on its spacing contact, the effect of a marking signal is to increase the current through the windings 25 and to move the said armature to its marking contact. This permits the flow of current from the source 19 through the armature 30 and through the winding 34 to the opposite side of the alternating current supply circuit. The effect of this is to move the armature 32 to its marking side. The movement of the armature is facilitated by the jockey roller which is arranged to assist the movement of the armature whenever the latter has moved beyond its center position. The movement of the armature mechanically controls the printing telegraph apparatus which is of a well known type and need not be described herein in detail. The receipt of the spacing impulse diminishes the plate current, which flows through the windings 25, and thereby permits the biasing current through the winding 28 to move the armature 30 to its spacing contact. This movement of the armature 30 causes the flow of current from

the source 19 through the printer magnet 35, thereby causing the movement of the armature 32 to its spacing contact, and in like manner affecting the printing telegraph apparatus.

The form of signal best adapted for the operation of this circuit consists of a train of unmodulated high frequency currents of such amplitude as to operate the polar relay when amplified and rectified. While no particular form of apparatus has been shown for the transmission of these marking impulses, it will be understood that any well known form of transmitter such as is now used in wire printing telegraph service may be readily adapted for the control of similar wireless service.

It will be apparent from the foregoing description that a system such as I have shown is adapted for use wherever an inexpensive type of radio printing telegraph system is desired. An important feature of the invention resides in the fact that it is capable of operation from the alternating current lighting circuit usually found in small communities.

While the invention has been disclosed as embodied in a particular form it is to be understood that it is capable of embodiment in other forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a radio printing-telegraph system, the combination with a radio receiver having means to change the frequency of the printing telegraph impulses to an intermediate frequency above the limits of audibility, of means to amplify the detected impulses, and a printing-telegraph printer containing a polar relay, the armature of which is adapted to control the energization of the magnets of the said printer, and a detector adapted to control the said polar relay by the variation of the space current resulting from the application to the said detector of the intermediate frequency signaling currents.

2. In a radio printing-telegraph system, the combination with a radio receiver having means to reduce the radio frequency currents to an intermediate frequency and to amplify the intermediate frequency current, of a printing-telegraph printer having a polar relay controlling the magnets of the said printer, a detector having its input circuit connected with the said radio receiver and its output circuit with the polar relay of the said printer, the input circuit containing a potentiometer to control the current through the said polar relay, a rectifier, a source of alternating current connected with the cathodes of the said detector and the said rectifier and also connected with the magnets of the said printer, and means to apply rectified alternating current to the windings of the said polar relay and the plate electrode of the said detector.

3. In a radio printing-telegraph system, the combination with a printer of means for mechanically driving the said printer, an alternating current magnet the armature of which controls the application of impulses to the said printer, a source of alternating current for energizing the said magnets and the said motor, a polar relay controlling the alternating current magnet, a unipotential cathode vacuum tube detector controlling the current through the said polar relay and having its cathode rendered emissive by means connected with an alternating current source, and a rectifier also energized by the said source and arranged to apply a direct current potential to the windings of the said polar relay and the plate electrode of the detector.

4. In a radio printing-telegraph system, the combination with a radio receiver having means to amplify the radio frequency signaling currents, of a detector having a unipotential cathode, a heating element therefor and plate and grid electrodes, a polar relay connected with the output side of the said detector, a rectifier, a source of alternating current connected with the heating element of the said detector and with the cathode of the said rectifier to render the cathodes of each device electron-emitting, the said source being also connected with the said rectifier so as to produce a rectified voltage, and means to apply the said rectified voltage to the windings of the said polar relay and to the plate electrode of the said detector.

5. In a radio printing-telegraph system, the combination with a radio receiver characterized by the use of unipotential cathode vacuum tubes, of a source of alternating current to render said cathodes electron-emitting, and a printer responsive to the rectified impulses produced by said radio receiver.

6. In a radio printing telegraph system, the combination with a vacuum tube detector having a grid, plate and unipotential cathode, of a rectifier having a source of alternating current connected therewith, a polar relay having an operating winding connected between the positive side of the rectifier and the plate of the vacuum tube and a biasing winding connected between the positive side of the rectifier and the cathode of the vacuum tube, the cathode being connected through a resistance with the negative side of the said rectifier, and a potentiometer connected with the said resistance and the grid of the vacuum tube.

7. In a radio printing telegraph system, the combination with a vacuum tube detector having a grid, a plate, and a unipotential cathode, of a source of telegraph signal impulses each consisting of a train of oscillations effectively connected across the said

grid and the said cathode, a source of rectified alternating current, a polar relay having an operating winding connected between the positive side of the said source and the plate of the vacuum tube and having a biasing winding connected between the positive side of the said source and the said cathode, a resistance connected between the said cathode and the negative side of the said source, and means to apply to the said grid such portion of the potential drop through the said resistance as to reduce the plate current substantially to zero when no signals are being received.

In testimony whereof, I have signed my name to this specification this 26th day of December 1924.

GILBERT S. VERNAM.