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RADIO WARNING SIGNAL

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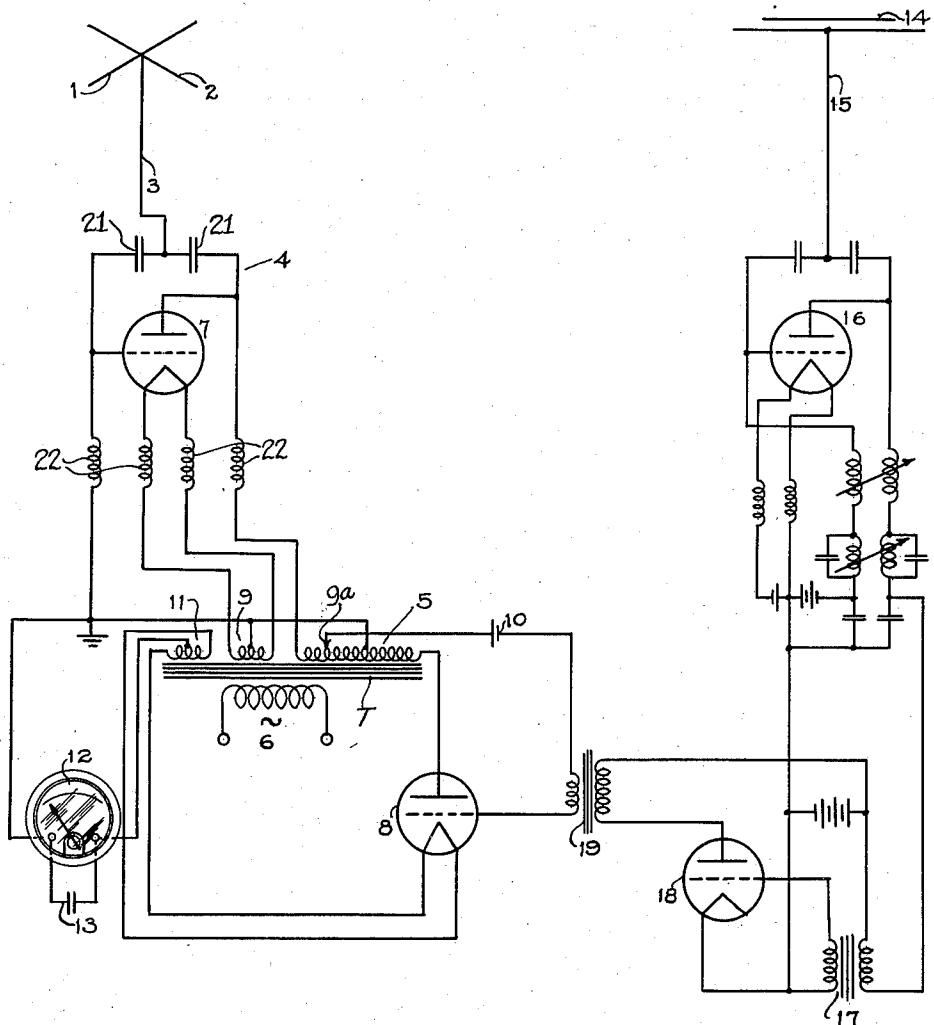


Figure 1

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## UNITED STATES PATENT OFFICE

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## RADIO WARNING SIGNAL

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3 Claims. (Cl. 250—9)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment of any royalty thereon.

5 Our invention relates to a combination transmitter and receiver for use on mobile objects; both receiver and transmitter operate on the same radio frequency, and both operate, in effect, simultaneously without interference.

10 In this invention, the transmitting set operates in "push-pull" fashion with a rectifying tube in the output of the receiving set, the plate return of this tube carrying an indicating instrument, the grid voltage being supplied from the push-pull power source such that the indicating instrument reads zero until a signal is received from a second mobile object. Other uses for our invention will be more clearly understood by reference to the following description and diagrammatic 15 drawing.

Fig. 1 represents one form of our invention. Here 1 and 2 represent a non-directional transmitting antenna system connected by means of a transmission line 3 to a radio transmitter set 25 which may consist, as one example, of tuning condensers 21 connected across the grid and plate of the three element transmitting tube 7. The transmission line 3 is connected to the common lead between the two condensers 21 and 22 and terminates at the nondirectional antenna system 1 and 2. Chokes 22 are placed in the grid, plate and filament supply leads of the tube 7. A transformer T has a primary 6 connected to a source of alternating current and secondaries 5, 9 and 11. The secondary 9 supplies the filament of the tube 7 and the plate of said tube is connected to one end of the secondary 5 of the transformer T.

A three element rectifying tube 8 has its filament supply from the secondary winding 11, its plate is connected to the other end of the secondary 5 and its grid return connected by means of a variable contact 9a to the secondary 5. A small bias battery 10 may be placed in the line 40 from the contact 9a to the grid of the tube 8. The plate return of the tube 8 is to the filament of said tube through a secondary 11, which supplies said filament, and passes through a direct current indicating instrument 12 shunted by an audio bypass condenser 13. 14 is a receiving antenna of directional type connected through a transmission line 15 to a receiving set 16 which may be of the super-regenerative type. The output of the set 16 is passed through an 45 audio transformer 17 to the grid of the three

element tube 18 in the output circuit of which is connected the primary of a transformer 19. The tube 8 acts as a rectifier tube, because the plate current flows during every positive half-cycle of the audiofrequency voltage delivered to its grid by the secondary of the transformer 19.

5 The circuit functions as follows: The bias battery 10 is so chosen that by adjusting the tap 9a the voltage on the grid of the tube will be sufficiently negative when the plate is positive, to reduce the plate current, as indicated by the indicator 12 to zero, when no signal is fed in on the grid of the tube 8 from the transformer 19. When this condition exists the plate of the tube 7 is negative so the transmitter set 15 4 is not functioning, while any decrease in the negative voltage of the grid of the tube 8, such as will occur on every positive half-cycle of a signal coming in through the transformer 19, will cause a plate current to flow in the tube 20 8 and the needle of the indicator 12 will deflect, indicating the proximity of a second mobile object transmitting a signal. When the plate of the tube 7 goes positive on the next half cycle 25 of voltage applied at 6, the transmitter tube 7 functions, sending out a signal. This signal will not be indicated on the indicator 12 as the plate of the tube 8 will be negative during this half-cycle and thereby prevent any plate current from flowing through the indicator 12. Thus when 30 the transmitter is functioning (every half-cycle of voltage supplied through the primary coil 6) the circuit thus indicates that 12 is, in effect, open, when the transmitter is not functioning (every intermediate half-cycle of voltage through the primary coil 6) then the circuit through the indicator 12 is closed by virtue of the plate of the tube 8 being positive and any signal coming in 35 on the grid of the tube 8 will cause a plate current to flow and 12 will indicate it.

40 The foregoing description comprehends only a general and preferred embodiment of our invention and changes may be made within the scope of those claims which may be allowed. Therefore our claims are not intended to be restricted 45 to the specific details of our invention as disclosed herein.

What we claim is:

1. In an apparatus for collision prevention, the combination on a mobile object of a radio transmitting set having a radio transmitting tube having grid, filament and plate electrodes and tuned to operate on a definite radio frequency, a non-directional antenna system connected to the output of said radio transmitting set, a radio receiv- 50 55

ing set having input and output terminals tuned to receive on the same said definite radio frequency, a receiving antenna connected to said input terminals, a current rectifying means with grid filament and plate electrodes, said grid electrode being connected to the said output terminals of said receiving set, a current indicating means in the plate circuit of said plate electrode, a source of alternating current, means for supplying a positive voltage to said plate of said transmitting tube and to said grid electrode of said rectifying means, and a negative voltage to said plate electrode of said rectifying means during every half cycle of said source of alternating current, and a negative voltage to said plate of said transmitting tube and to said grid of said rectifying means, and a positive voltage to said plate electrode of said rectifying means during every other half-cycle of said source of alternating current.

2. In an apparatus of the class described, the combination with a radio transmitting set of an antenna connected thereto, a radio receiving set having input and output terminals, a source of alternating current, a rectifier tube having grid filament and plate electrodes, said grid electrode being connected to said output terminals of said receiving set, a current indicating means connected in series with said plate electrode, means for applying said alternating current in differ-

ential fashion to said transmitting set and said plate electrode of said rectifier tube.

3. In an apparatus of the class described, the combination with a radio transmitting set containing an electron tube with grid filament and plate electrodes, of an antenna connected to the output of said transmitting set, a radio receiving set having an input with antenna connected thereto, output terminals, a transformer with a primary and a center tap secondary, a source of alternating current, said primary being connected to said source of alternating current, a rectifier tube having grid filament and plate electrodes, said center tap being connected to said filament electrode of said rectifier tube and said filament in said electron tube in said transmitting set, said grid electrode of said rectifier tube being connected to said output terminals of said receiving set, and to one side of said center tap on said secondary, said plate electrode being connected to the other side of said center tap on said secondary, said plate electrode of said electron tube in said transmitting set being connected on the same side of said center tap as the grid electrode of said rectifier tube, a current indicating means connected in series with the plate electrode of said rectifying tube.

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