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ELECTRICAL APPARATUS

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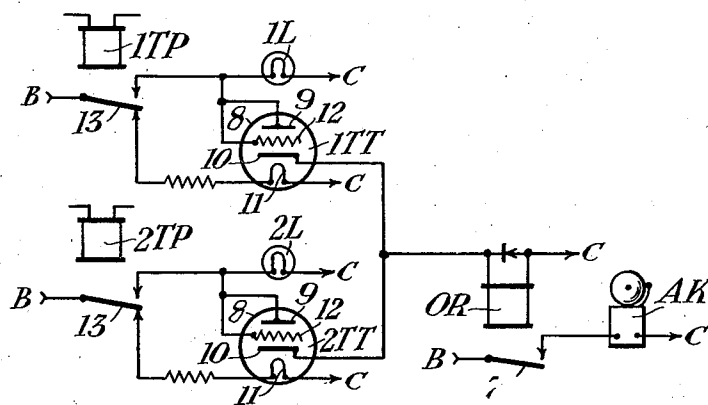


Fig. 1.

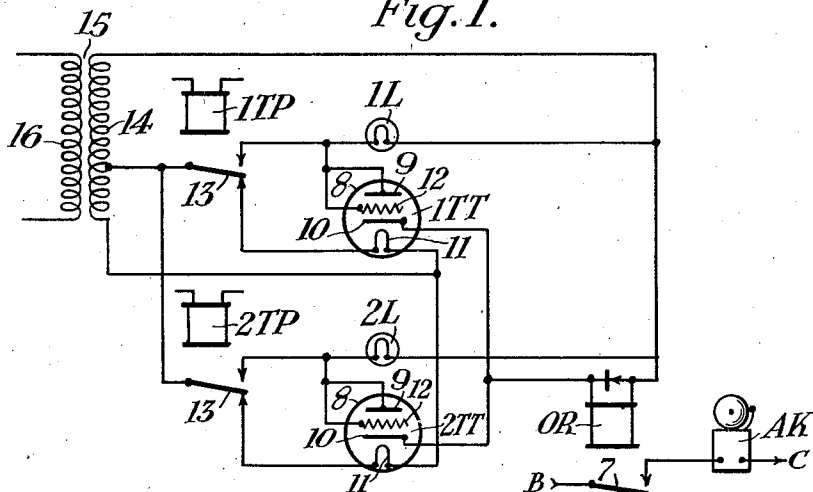


Fig. 2.

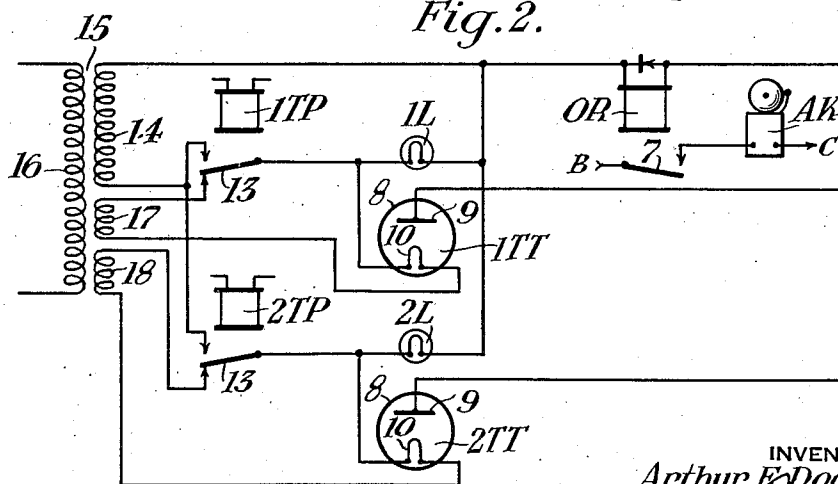


Fig. 3.

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ELECTRICAL APPARATUS

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1 Claim. (Cl. 177-311)

My invention relates to electrical apparatus, and it has particular reference to the organization of such apparatus into indicating systems for indicating at a remote office station the movement of railway trains along a stretch of track. More particularly, my invention relates to the provision of indicating systems involving electrical apparatus arranged to provide a momentary indication upon the occurrence of an event.

It has been found desirable in railway signal and traffic controlling systems to provide at a remote or central office station indications relating to traffic conditions existing on a stretch of track, and other indications relating to a change in such traffic conditions. Such systems ordinarily are employed in conjunction with a stretch of railway track divided into several insulated track circuits, and such systems ordinarily incorporate a plurality of indicators, usually of the visual type such as an electric lamp, one for each of the track sections to indicate the occupancy of such section, and a distinctive indicator, usually of the audible type such as an electric bell, for indicating each change in traffic conditions in the stretch. These indications are, in accordance with the usual practice, so controlled that each visual indication is caused to be displayed as long as its associated section is occupied, and an audible indication is provided momentarily each time a section becomes occupied.

Various schemes have been proposed heretofore involving apparatus arranged to effect control of each visual indication as long as its associated section is occupied, and to provide a momentary operation of the audible indication whenever a section becomes occupied. My present invention has for an object the provision of novel and improved means for effecting control of indicators in the above described manner.

Another object of my invention is the provision of novel and improved means for effecting a momentary control upon the occurrence of an event.

A further object of my invention is the provision of novel and improved means for enabling any one or all of a plurality of control devices to effect a momentary operation of an indicator device.

An additional object is the provision of novel and improved electrical apparatus involving a thermionic tube arranged to effect only a momentary energization of the device upon operation of a control device.

The above-mentioned and other important objects and characteristic features of my invention which will become readily apparent from the following description, are attained in accordance with my invention by controlling an indication device through the medium of thermionic tubes each cooperating with a control device arranged to control the application of heating energy to the heating element of the associated tube in such manner as to remove energy from the heating element and at the same time impress a voltage across the anode and cathode elements of such tube to cause current to flow across the intervening tube space and through the indicating device during the cooling interval of the heating element of the tube.

I shall describe three forms of apparatus embodying my invention, and shall then point out the novel features thereof in the claim.

In the accompanying drawing, Fig. 1 is a diagrammatic view illustrating one form of apparatus embodying my invention. Figs. 2 and 3 are each diagrammatic views illustrating modified forms of the apparatus represented in Fig. 1, and each also embodying my invention. In each of the several views, similar reference characters have been employed to designate corresponding parts.

Referring to Fig. 1, the reference characters TP with suitably distinguishing prefixes designate control relays, each governed by a condition, such as the occupancy of an associated section of railway track not shown. Each relay TP, as shown, is normally deenergized, and upon occupancy of its associated track section each relay is caused to be energized in a manner well known to the art and therefore not illustrated in the drawing.

Each relay TP has associated therewith a first indication device, such as an electric lamp, designated by the reference character L with a prefix corresponding to the prefix employed in the reference character of the associated control relay. Each lamp L is normally deenergized and dark, and is caused to be illuminated whenever its associated relay TP is energized to close its front contact and complete for the associated lamp L an obvious circuit easily traced in the drawing and including a suitable source of current, such as a battery not shown but having its opposite terminals designated by the reference characters B and C.

The control relays TP also have associated therewith a second indication device controlled in common by all of the relays. The second in-

dication device may, for example, comprise an audible indicator in the form of an electric bell, designated by the reference character AK. The bell AK is normally deenergized, and is energized and caused to exhibit its indication when an operating relay OR is energized to close its front contact to complete an obvious circuit for bell AK.

The operating relay OR is normally deenergized, and is caused to be momentarily energized each time a relay TP operates from its normally released position to its picked-up position. The means for causing momentary energization of relay OR comprise a plurality of thermionic tubes designated by the reference character TT with a suitably distinguishing prefix, one for each control relay TP.

Each thermionic tube TT comprises an evacuated or gas filled container 8 in which are disposed an anode element 9 and a cathode element 10, and each tube is characterized by the fact that one of the tube elements must be heated in order to cause an electron or ion emission. As shown in Figs. 1 and 2, the tube employed may be of the indirectly heated cathode type tube in which a filament element 11 is heated and in turn causes the cathode element 10 to be heated, or as shown in Fig. 3 the cathode element 10 may be directly heated. Also, the tube TT may be of the two-element rectifier type as represented in Fig. 3, or of the grid controlled type shown in Figs. 1 and 2. If the latter type tubes are used, however, the grid elements 12 are preferably connected in circuit with the anode elements 9.

The apparatus is arranged, as represented in the drawing, in such manner that when a control relay TP is in its normal released position, the heating element of the associated thermionic tube TT is energized. For example, heater element 11 of tube TT1 shown in Fig. 1 is energized over an obvious circuit including back contact 13 of the associated control relay 1TP and a source of current, such as a battery not shown in Fig. 1 but having its opposite terminals designated by the reference characters B and C. In Fig. 2 the heating energy is derived from a portion of a secondary winding 14 of a transformer 15 having its primary winding 16 connected to a suitable source of alternating current, such as a generator not shown in the drawing. In Fig. 3, separate secondary windings 17 and 18 provided for transformer 15 are employed one for each of the cathode elements of the tubes employed.

When a relay TP is caused to be energized and picked up, its associated first indicator L is energized and accordingly displays an illuminated indication as long as the relay remains picked up, and in addition, each time that a control relay TP becomes picked up, operating relay OR is energized during the cooling interval of the heating element of the thermionic tube TT associated with such relay. For example, when relay 1TP of Fig. 1 is picked up, back contact 13 of relay 1TP opens to deenergize heating element 11 of the associated thermionic tube 1TT, and front contact 13 of relay 1TP closes to complete the obvious energizing circuit for the associated lamp 1L. The source of current is also impressed across anode element 9 and cathode element 10 of tube 1TT and causes a current to flow through the intervening tube space and the winding of relay OR during the cooling interval of heating element 11 of the tube. Relay OR accordingly becomes energized and picks up to close its front contact 7 and complete the obvious energizing

circuit of indicator AK, whereupon that device is caused to exhibit its indication until the heating element 11 of tube 1TT cools and cuts off the electron emission of the tube, whereupon relay OR becomes deenergized to in turn deenergize device AK.

It is, of course, readily apparent that when another control relay, such as relay 2TP of Fig. 1, becomes picked up to cause its associated indication lamp 2L to display its illuminated indication as long as the relay remains energized, relay OR also is momentarily energized during the cooling interval of the heating element 11 of the associated thermionic tube 2TT. Indication device AK accordingly is caused to exhibit its indication momentarily when relay 2TP picks up.

When a control relay TP releases, however, its associated indication lamp L is caused to become deenergized but operation of the common indicator AK is not affected. For example, when relay 1TP releases, front contact 13 opens to deenergize lamp 1L, and to remove the voltage applied across the anode and cathode elements of tube 1TT. It follows, therefore, that when back contact 13 of relay 1TP closes and heating element 11 of tube 1TT is energized to condition the tube to be in its conducting condition, energy is not passed by the tube since its plate circuit is now on open circuit, hence operation of relay OR and indicator AK are not effected.

It is, of course, to be understood that any number of control relays TP may be introduced into the system for effecting control of the common indication device AK, provided that each control relay TP has associated therewith a thermionic tube arranged as shown in the drawing. In addition, it is apparent that the apparatus of Figs. 2 and 3 will function to control the individual indicator L and the common indicator AK in a manner substantially corresponding to that described in detail in connection with the apparatus of Fig. 1, it being noted that in Figs. 2 and 3 the tubes TT function as rectifier tubes and pass current of only one polarity to relay OR.

An advantage of the apparatus embodying my invention is the provision of means whereby a single dependent front and back contact arrangement on a control relay may be utilized to control an indicator individual to the relay and an indication device common to a plurality of relays, without requiring special contacts or contact adjustments on the control relays. Any number of control relays may be employed, and the indication may be operated on either direct or alternating current. By utilizing the cooling interval of the thermionic tubes, ample time margins are provided for energizing the common indicator, and all requirements for rapid relay operation are dispensed with. Furthermore, the apparatus is arranged to effect only single direction operation of the common indicator, that is, the common indicator AK is caused to operate only when a section becomes occupied but not when it becomes unoccupied.

Although I have herein shown and described only three forms of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claim without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

In an annunciating system of the class wherein a plurality of relays each governed by a condition control a plurality of first indicating de-

vices one for each of said plurality of conditions and a second indicating device common to all of said conditions to provide a continuous first indication relating to each of said conditions and a momentary second indication each time one of said conditions changes from its normal to another condition, the combination with said relays and said indicating devices of a plurality of thermionic tubes one for each of said relays, a plurality of circuits one for each relay and each including a normally closed contact of said relay for supplying heating energy to the cathode of the associated thermionic tube, and a plurality of circuits one for each relay and each including a normally open contact of said relay for supplying

energy to the associated first indicating device and for impressing energy across the anode and cathode elements of the associated thermionic tube in series with said second indicating device, each of said thermionic tubes functioning as a time limiting device to pass current to said second indicating device only during the cooling off interval of the associated cathode and as an asymmetrical device to prevent feed-back of current from said second indicating device to the first indicating device associated with such tube when another tube is passing current to said second indicating device.

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