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SIGNALING SYSTEM

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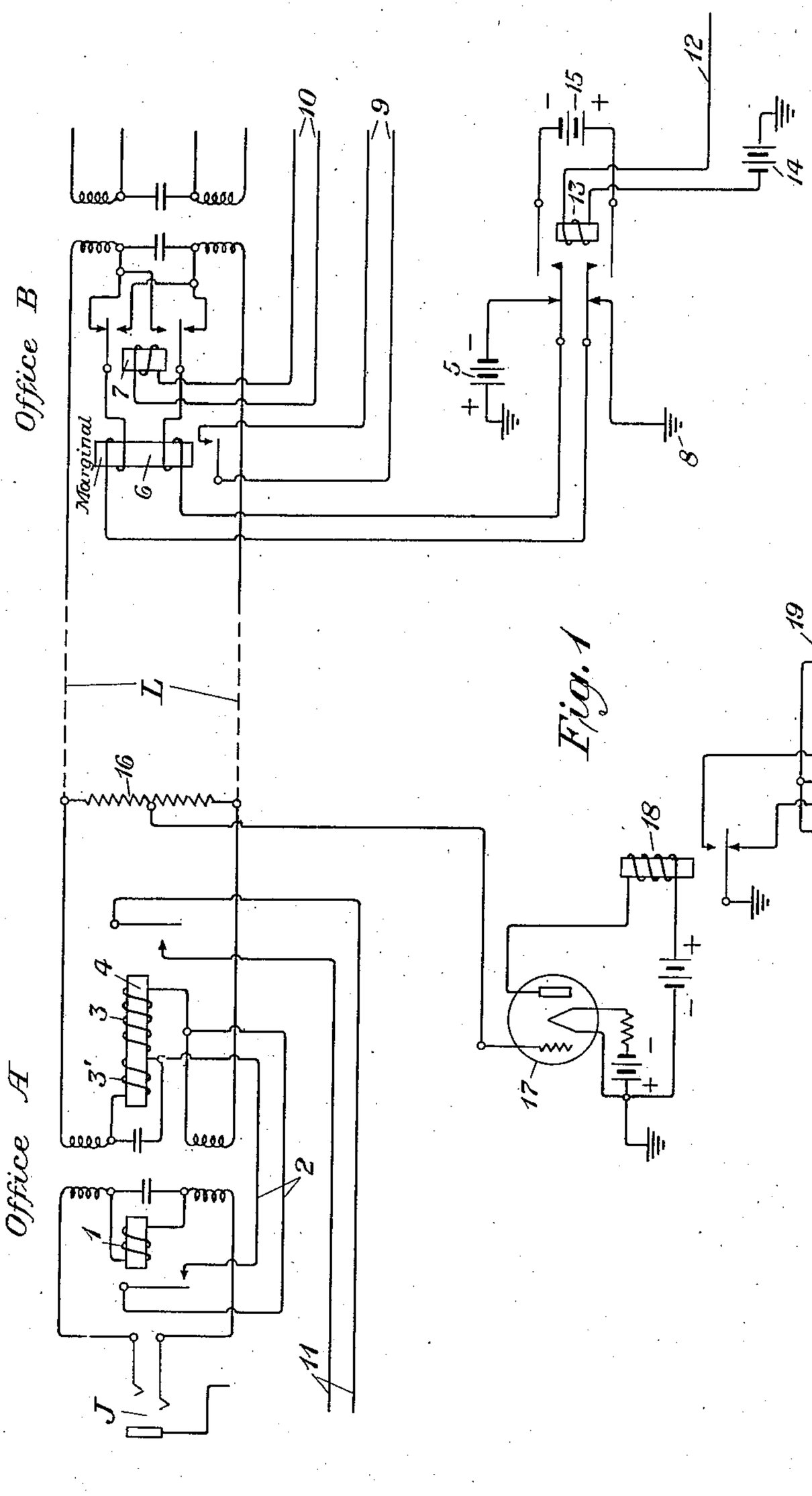

Fig. 1

Fig. 2

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SIGNALING SYSTEM

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4 Claims. (Cl. 179—84)

This invention relates to signaling systems and more particularly to signaling systems adapted to be used in conjunction with certain types of transmission lines.

In certain types of transmission lines, for example lines used to interconnect certain types of offices in telephone systems, the supervisory signals at each end of the line may be controlled by current obtained from a grounded common battery supply. With such a source of supply a circuit interconnecting two offices would be supplied with supervisory signaling current by a grounded battery connected at one office to one side of the circuit, and ground connected to the other side thereof at said office. With such a type of grounded common battery circuit it would be very difficult to make use of either of the conductors of the circuit individually to provide an additional signaling circuit between the interconnected offices, as such use might involve grounding the conductor utilized for such purpose and this would interfere with the normal use of the circuit for supervisory signaling. The primary object of the arrangements of the invention is to provide an arrangement whereby one of the conductors of a circuit supplied with grounded common battery for supervisory signaling may be utilized individually to provide an additional signaling circuit without any interference with the normal use of the original circuit for supervisory signaling. In the arrangements of the invention, this is accomplished by bridging a high resistance across the circuit at one end thereof and connecting its midpoint to the grid of a three-element vacuum tube. The filament of such a tube would be grounded. Under such conditions the grounded common battery at the other end of the circuit will apply a negative biasing voltage to the grid of the tube sufficient to block it. Means would be provided at the battery end of the circuit to disconnect the grounded battery from the circuit and connect in its place a non-grounded battery of like voltage. This would cause no interference in the use of the circuit for normal signaling purposes but it would remove the negative biasing voltage from the grid of the tube and thus cause it to operate. The plate circuit of the tube could control a desired signal. With such an arrangement an additional signaling path may be provided over a certain type of circuit without causing interference with the normal use of the circuit. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the Figures 1 and 2 of which the invention is illustrated. Fig. 1 is a circuit diagram embodying a preferred form of the invention. Fig. 2 is a circuit diagram illustrating certain principles of operation of the invention. Similar reference characters have been used to denote like parts in both figures of the invention.

In Fig. 1 the arrangements of the invention are shown as applied to a line L interconnecting two telephone offices A and B which line utilizes a common grounded battery 5 for supervisory signaling purposes. Office B might be a community dial office and office A a central office and the line would be termed a loop dial trunk. Such a trunk would include supervisory signaling apparatus operating in the following manner. Normally the following circuit would be completed over the line: from grounded central office battery 5 at the community dial office B, lower winding of marginal relay 6, ring conductor of line L, high resistance winding 3 and low resistance winding 3' of polar relay 4 at the central office, tip conductor of line L, upper winding of marginal relay 6, to ground 8. In other words, the negative pole of grounded battery 5 is connected to the ring side of the line L and ground is connected to the tip side of the line L. Due to the inclusion in the circuit of the high resistance winding 3 of polar relay 4 the marginal relay 6 is not operated at office B and, due to the direction of current flow, the polar relay 4 at office A is not operated. When the operator at office A makes a connection with jack J the relay 1 will be operated and will close a short circuit 2 around the high resistance winding 3 of polar relay 4. This will increase the current flow through marginal relay 6 at office B and cause it to operate. The operation of relay 6 will close circuit 9 and operate supervisory signal apparatus at office B. Subsequent to the operation of this supervisory signal the subscriber answers and circuit 10 will be closed at office B. This will cause the operation of relay 7 which will connect battery 5 to the tip side of the line and ground 8 to the ring side of the line and thus reverse the direction of current flow through polar relay 4 at office A. This will operate relay 4 and its operation will close circuit 11 to operate a supervisory signal at office A. The foregoing type of line is well known in the art and has been described merely to illustrate one specific type of line to which the arrangements of the invention are applicable. However, it is understood that the arrangements of the invention are applicable

to other types of circuits using a grounded battery for supervisory signaling or other purposes.

From the foregoing description of circuits, such as line L, using grounded battery for supervisory signaling purposes it will be seen that any attempt to use one of the conductors of line L, such as the ring or tip conductor, as an additional signaling circuit between offices A and B by the connection thereto of ground or other potentials would cause false operation of the supervisory signals at the offices and prevent normal supervisory signaling between such offices. Accordingly in accordance with the arrangements of this invention there would be connected across line L at one of the offices, such as A, a high resistance 16, which might be two megohms. The mid-point of this resistance would be connected to the grid of a vacuum tube 17. The filament of tube 17 would be grounded and a responsive device, such as relay 18, connected in the plate circuit of the tube. Under such condition there would exist an arrangement such as is shown schematically in Fig. 2 when key 20 is closed. As battery 5 is connected to the grid of the tube and is grounded, and as the filament of the tube is grounded, the battery 5 and a portion of resistance 16 will be connected between the filament and grid, as shown in Fig. 2, and a potential will be thus applied to the grid which will be sufficiently negative to block the tube. Such an arrangement would have no effect on the normal transmission of supervisory signals between offices A and B. If it should now be desired to send a signal in addition to normal supervisory signals between the offices the circuit 12 at office B would be closed and relay 13 would be operated. Circuit 12 might be closed by any desired device. It would, for example, be a desirable circuit to connect to an alarm device operated by failure of apparatus at office B. It might be closed by an ordinary telegraph key if desired. When relay 13 operates it disconnects the grounded battery 5 from the line L and connects the metallic or non-grounded battery 15 across the line. This would give a circuit arrangement similar to that shown in Fig. 2 if the key 20 was open. As the battery 15 is not grounded it will not be connected between the grid and filament of the tube 17 and will have no effect on the potential on the grid. The removal of grounded battery 5 from the line will, however, remove the negative bias from the grid of the tube and allow current to flow in the plate circuit of the tube to operate relay 18. The relay 18 might control any kind of a responsive device, such as a telegraph sounder or the alarm arrangements shown. In the arrangements shown, the operation of relay 18 would operate the buzzer 19. This would indicate to the operator at office A that the circuit 12 at office B had operated. As pointed out heretofore, circuit 12 might be operated by an alarm device at office B. Upon the operation of the buzzer 19 the operator at office A could operate key K. This would short-circuit the buzzer and operate lamp 21. When the circuit 12 at office B is now opened, relay 13 will release. This will disconnect non-grounded battery 15 from the line and reconnect grounded battery 5 to the line. This will again put a negative bias on the grid of tube 17 and cause it to be blocked. This will release relay 18 and open the circuit of the lamp 21. The buzzer 19 would now be operated over the left-hand contact of key K. The key K would now be restored to normal to restore the alarm or responsive apparatus at office A to normal. It is pointed out that relay 13 disconnects grounded battery 5 from the line L and connects non-grounded battery 15 thereto over make-before-break contacts so that there will be no interruption of the continuity of current flow for supervisory signaling purposes over the line.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable it is understood that it is capable of embodiment in many other and widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A circuit over which supervisory signals are transmitted, means at one end of the circuit for connecting grounded battery thereto to provide current for the operation of said supervisory signals, a resistance bridged across the other end of said circuit, a vacuum tube having its grid so connected to said resistance that a negative potential sufficient to render said tube inoperative will be applied to said grid by said grounded battery when it is connected to said circuit, means for disconnecting said grounded battery from said circuit whereby said negative potential will be removed from the grid of said tube and it will be rendered operative and for simultaneously connecting a non-grounded battery to said circuit to provide current for the operation of said supervisory signals, and responsive means controlled by said tube.

2. A circuit over which supervisory signals are transmitted, means at one end of the circuit for connecting grounded battery thereto to provide current for the operation of said supervisory signals, a resistance bridged across the other end of said circuit, a vacuum tube having its grid so connected to said resistance that a negative potential sufficient to render said tube inoperative will be applied to said grid by said grounded battery when it is connected to said circuit, a signaling circuit associated with said first circuit at the end thereof where said grounded battery is located, means controlled by said signaling circuit for disconnecting said grounded battery from said first circuit whereby said negative potential will be removed from the grid of said tube and it will be rendered operative and for simultaneously connecting a non-grounded battery to said first circuit to provide current for the operation of said supervisory signals, and a second signaling circuit controlled by said tube.

3. A circuit over which supervisory signals are transmitted, a relay having make-before-break contacts associated with one end of said circuit, a grounded battery normally connected to said circuit over the break contacts of said relay, a high resistance bridged across the other end of said circuit, a vacuum tube having its filament grounded and its grid so connected to said resistance that a negative potential sufficient to render said tube inoperative will be applied to said grid by said grounded battery when it is connected to said circuit by said relay, said tube being adjusted to be operated in the absence of said negative potential on its grid, a non-grounded battery adapted to be connected to said line over the make contacts of said relay when operated, a signaling circuit for operating said relay and a second signaling circuit controlled by said tube.

4. A loop dial trunk interconnecting a community dial office and a central office, a grounded common battery at said community dial office normally connected to said loop dial trunk, supervisory signaling means at each of said offices con-

trolled by current from said grounded common battery, a high resistance bridged across said trunk at said central office, a vacuum tube having its filament grounded and its grid connected to said resistance whereby the connection of said grounded common battery to said trunk will cause a negative potential to be placed on said grid sufficient to render said tube inoperative, an alarm device controlled by said tube, a non-grounded battery at said community dial office, an alarm circuit at said community dial office responsive to a failure of equipment thereat, and means controlled by said last mentioned alarm circuit for disconnecting said grounded battery from said trunk whereby said negative potential will be removed from said grid to render said tube operative and to operate the alarm circuit controlled by said tube, said last mentioned means also operating to simultaneously connect said non-grounded battery to said trunk to supply current for the normal control of said supervisory signaling means.

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