April 20, 1937. F. LUBBERGER 2,077,947

TELEPHONE PARTY LINE SYSTEM

Filed May 11, 1935

FIG. 1

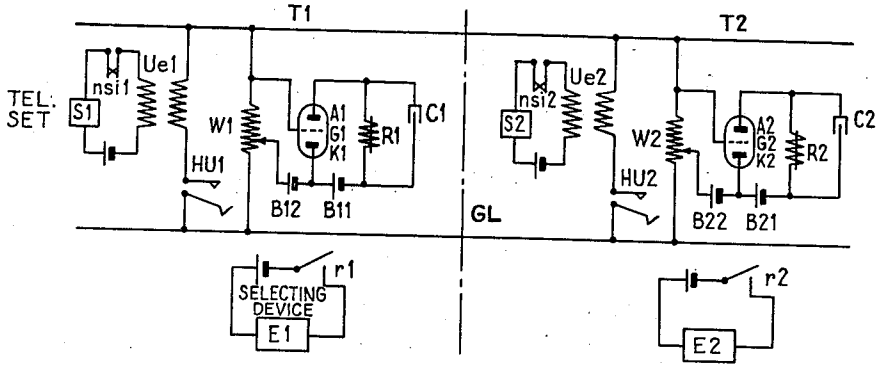


FIG. 2

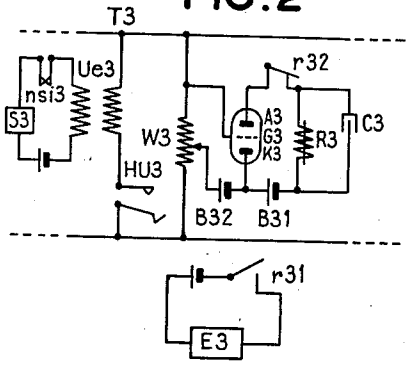


FIG. 3

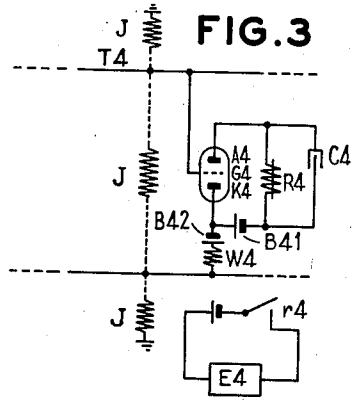
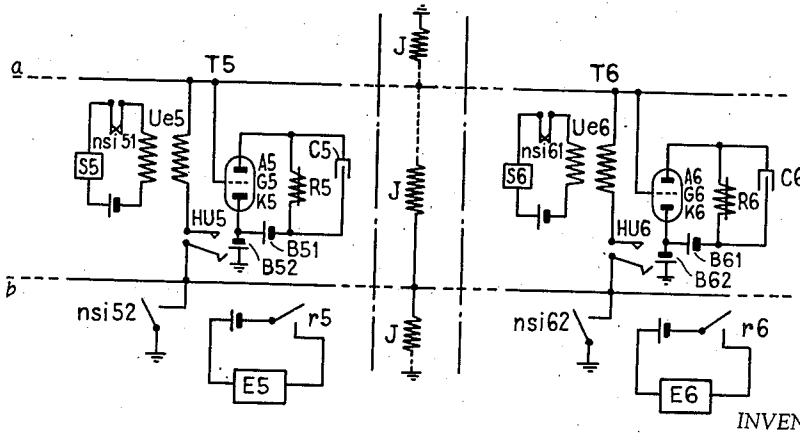


FIG. 4



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TELEPHONE PARTY LINE SYSTEM

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3 Claims. (Cl. 179—28)

The invention concerns a circuit arrangement for long distance communication systems, particularly for telephone systems with party lines.

In party lines in which the selective call results through impulses transmitted from a sending station, electromagnets have previously been used as receiving devices which directly or indirectly control the selecting devices at the branch stations. In the case of long lines with many branch stations, however, the reliability of such systems is endangered, because the selecting impulses, whose distribution on the line varies according to the particular sending station, are considerably weakened by the many bridge and line resistances. If sensitive relays are used, which energize from the weak currents, the disadvantage of the greater susceptibility to break down of these relays must be reckoned with. If such relays are avoided and greater energy used in transmission, the limits imposed for the protection of the system (insulation of the leads and apparatus) render this remedy unsatisfactory. It has already been proposed to make use of the impulse receiver used for controlling the selecting devices, with the aid of discharge tubes arranged in each station, having a pre-applied potential. But even with this arrangement, though to a less extent than with the use of electromagnets there exists the undesirable effect of varying current distribution.

The invention aims at making the control of the selecting devices practically independent of the current distribution on the common line and achieves this in that, for the operation of the selecting devices at the branch stations of the common line, grid controlled discharge tubes are provided, whose grid elements are influenced by the potential produced at a sending station through selection impulses.

By the arrangement according to the invention it is possible, even in the case of long lines with many branch stations, to accomplish a reliable influencing of the selecting devices which is free from objection, since on account of the control over the grid of the discharge tube practically no potential drop occurs on the line. The grid controlled glow lamps are suitably used as discharge tubes, whose grids are connected to the common line through high resistance bridges serving as potential dividers.

The sending potential need not be too high; if, however, higher sending potentials are used, a further insurance against difficulties arising from induced potential is attainable for use in this case the receiving devices are not made so sensitive.

In systems in which the branch stations are connected through repeaters to the common line so as to check the influence of high potentials, etc., in order to prevent the repeater winding from being permanently connected to the common line and thus influencing the current distribution on the line in an undesirable manner, arrangements can be provided which connect the repeater winding only to the selecting station during the selection. The connection is indicated diagrammatically in the embodiment, through the switchhook contacts HU1, HU2, etc. These contacts can be operated in any known way, either mechanical or electrical, or can be locked on the engagement of the party line.

The discharge tubes controlling the receiving devices can be the usual amplifying tubes. For economical use, grid controlled glow lamps are particularly suitable. These glow lamps in the normal condition of the system are under the influence of pre-applied potential and are only illuminated by the application of additional potential to the grid. The glow lamps can be extinguished as is shown in the embodiment, for example, for influencing the potential on the grid of the glow lamps, or also by interrupting the anode circuit of the latter.

The invention is not limited to the embodiments illustrated in the attached drawing, in which only those details necessary for understanding the invention are shown. It is, for example, immaterial in which way the impulses are generated or transmitted; any suitable kind of impulse sender can be used. It is thus also immaterial how the selecting devices at the receiving station for signalling the same are constructed, for example they may be in the form of stepping switches, relay selectors or the well known Gill selectors which close a signalling circuit in response to a particular code of impulses. Also the device E1 may be a stepping indicator which in one position indicates a call for that station. The devices serving for sending and selection, as well as those for calling and speaking, are therefore only diagrammatically shown in Figs. 1 to 4.

In Fig. 1 a party line GL is shown, to which a number of branch stations including T1 and T2 are connected. Each branch station is equipped with means for sending and receiving. In the branch station T1, the sending portion consists, for example, of the repeater Ue1 whose primary winding is included in a circuit with the speak-

ing device or telephone set S1 and the sending device or impulse sender *nsi1*, while the secondary winding forms a bridge across the line through the switching contact HU1 of the telephone hook-switch. The receiving device is formed by the high resistance W1 connected as a bridge across the line which acts as a potential divider and is connected to the grid G1 and the cathode K1 of the glow lamp; and also by the condenser C1 and the relay R1, which transmits the impulses received to the selecting device E1. Thus the signalling means at each station may comprise a relay R, a device E1, and a suitable signal operated thereby.

During a selection, impulses are transmitted over the line from the calling subscriber after the removal of his telephone receiver, which serve to characterize the called subscriber. The impulses thus set up in the primary winding of the repeater Ue1, on the opening or shutting of impulse contact *nsi1*, produce high current potentials in the secondary winding which are transmitted over the high resistances W1, W2, etc., which form bridges on the line at all the branch stations, and thereby influence the grids of all the glow lamps. The glow lamps, which in the normal condition of the system are subjected to pre-applied potential from batteries B11, B21, etc., are illuminated as soon as the pre-applied potential, set up between the grid G1 and cathode K1 of the glow lamp by batteries B12, B22, which counteracts the illuminating potential and in the normal condition of the system prevents the illumination of the glow lamps, is removed by the potential applied to the party line at the sending station. Such a counteraction of the pre-applied potential takes place, in the case of the arrangement according to Figure 1, as soon as the sender impulse contact *nsi1* is closed at a calling station, and a potential is thus induced in the particular direction on the party line by the impulse thus produced in the secondary winding of the impulse repeater Ue1.

The switching procedure for a selection operation is as follows: The potential produced by the impulse occurring on the first opening of the impulse sending contacts is transmitted over the bridge resistances W1, W2, etc.; it does not, however, illuminate the glow lamp and is inoperative on the receiving apparatus since it only reinforces the effect of the batteries B12, B22 supplying the pre-applied potential; the subsequent impulse on the closing of the impulse contacts first causes the illumination of the glow lamp. In the case of branch station T2 a current then flows from battery B21 to the condenser C2, which is rapidly charged, while the relay R2 in parallel with the condenser is connected but cannot energize on account of the shortness of the impulses. When the glow lamps are extinguished and the anode current is thus interrupted by the impulse occurring on the opening of the sending contact *nsi1*, the condenser C2 discharges through relay R2, while now definitely energizes and controls the selecting device E2 by its contact *r2*. On further impulses the same process is repeated and the selecting device E2 is operated to position to signal the called station.

In Figure 2 an arrangement is shown which corresponds essentially to Fig. 1, and is only distinguished by the arrangement of the receiving device. Only a single branch station is shown. A glow lamp is used as a discharge tube, which after once having been switched on remains operated, even if the potential is considerably reduced. In order to effect the switching off of the glow lamp during the impulse pause a contact is provided for the impulse repeating relay R3 which on energizing opens the circuit of the glow lamp and thus extinguishes the latter.

Fig. 3 concerns an application which can be used with lines whose insulation resistance between the leads, and to earth, is smaller than the high resistance bridge at the branch stations. The sending device, which can be constructed as in Figs. 1 and 2, is omitted for the sake of clearness, while the insulation resistances are indicated diagrammatically by the resistances J. In the normal condition the glow lamps are prevented from being illuminated by the battery B42 providing the pre-applied potential to the grid; but when potential is applied to the party line at a sending station by the closing of the impulse sender contacts, the pre-applied potential existing between the grid and the cathode is removed so that the glow lamp lights up. After the end of the sending impulse the glow lamp is again extinguished.

The arrangement shown in Fig. 4 can be used in those cases in which there is no danger of influence from earth currents. At the sending station there is also arranged the contact *nsi52*, in addition to those provided in the two previous examples, which connects the lead *b*, which is not connected to the grid of the glow lamp, of the common line, to earth in accordance with the impulses.

It is also possible with the embodiments shown to dispense with the batteries applying the pre-applied potential to the grid; in such cases, the potentials of the batteries (B11, B21, B31, etc.) are so chosen that they are less than the illuminating potential of the flow lamps. The potential impulses brought to the grid by impulsing then raise the potential of the glow lamps to the illuminating potential and effect their illumination and thereby the repeating of the selecting impulses to the selecting devices.

The extinguishing of the glow lamps results from the reduction of the potential at the latter, which is effected either on the termination of the sending impulse, or on the reception of the subsequent potential impulse in the opposing direction occurring on the opening of the sending contacts, or which can be brought about by the suitable adjustment of the condensers and relays in the anode circuit of the glow lamps.

Having described the invention, what is considered to be new and is desired to be protected by Letters Patent will be set forth in the following claims.

What is claimed is:

1. In a telephone party line, a grid discharge tube at each station connected to one side of said line, said line having certain insulation resistance between the two sides thereof, an impulse sender at each station connected to said line, a signaling device at each station, means controlled by said discharge tube for operating said signaling device, said discharge tube normally having a pre-applied potential applied to its grid, and means responsive to the operation of an impulse sender at a calling station for connecting impulse potentials to one side of said line to complete the grid circuit of said discharge tubes through said insulation resistance and a ground connection at said sending station over the other side of said line, said discharge tubes upon operating controlling their respective

signaling devices through the medium of said means.

2. In a telephone party line, a grid discharge tube at each station connected to said line, an impulse sender at each station connected to said line, a signaling device at each station, the grid of each discharge tube normally having a pre-applied potential connected to it, switching mechanism for controlling said signaling devices connected to the anode of each discharge tube, and means responsive to the operation of the impulse sender at a calling station for transmitting a potential over said line to said discharge tubes to render the grid circuits of the same effective and operate the tubes, said switching mechanism operated from the anode of the operated tubes to control the signaling devices, said switching mechanism upon operating also causing the extinguishing of the discharge tubes.

3. In a telephone party line, a plurality of branch stations connected to said line, each station comprising a telephone set including a switchhook and impulse sender, a repeating coil having its secondary winding connected across said line through the switchhook and its primary winding connected through said impulse sender and the telephone set, a grid discharge tube, a high resistance comprising a potential divider connected across said line and to said discharge tube, said discharge tube having a pre-applied potential on its grid, the removal of the telephone receiver connecting the secondary winding of the repeating coil across the line, means responsive to the operation of the impulse sender for transmitting high potential impulses through said repeating coil over said line, said high potential completing the grid circuit of said discharge tube through said high resistance to operate the tube in accordance with the impulses received, a relay connected to the anode of said discharge tube, a signaling device controlled by said relay, and means responsive to each operation of said discharge tube for operating said relay to control said signaling device.

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