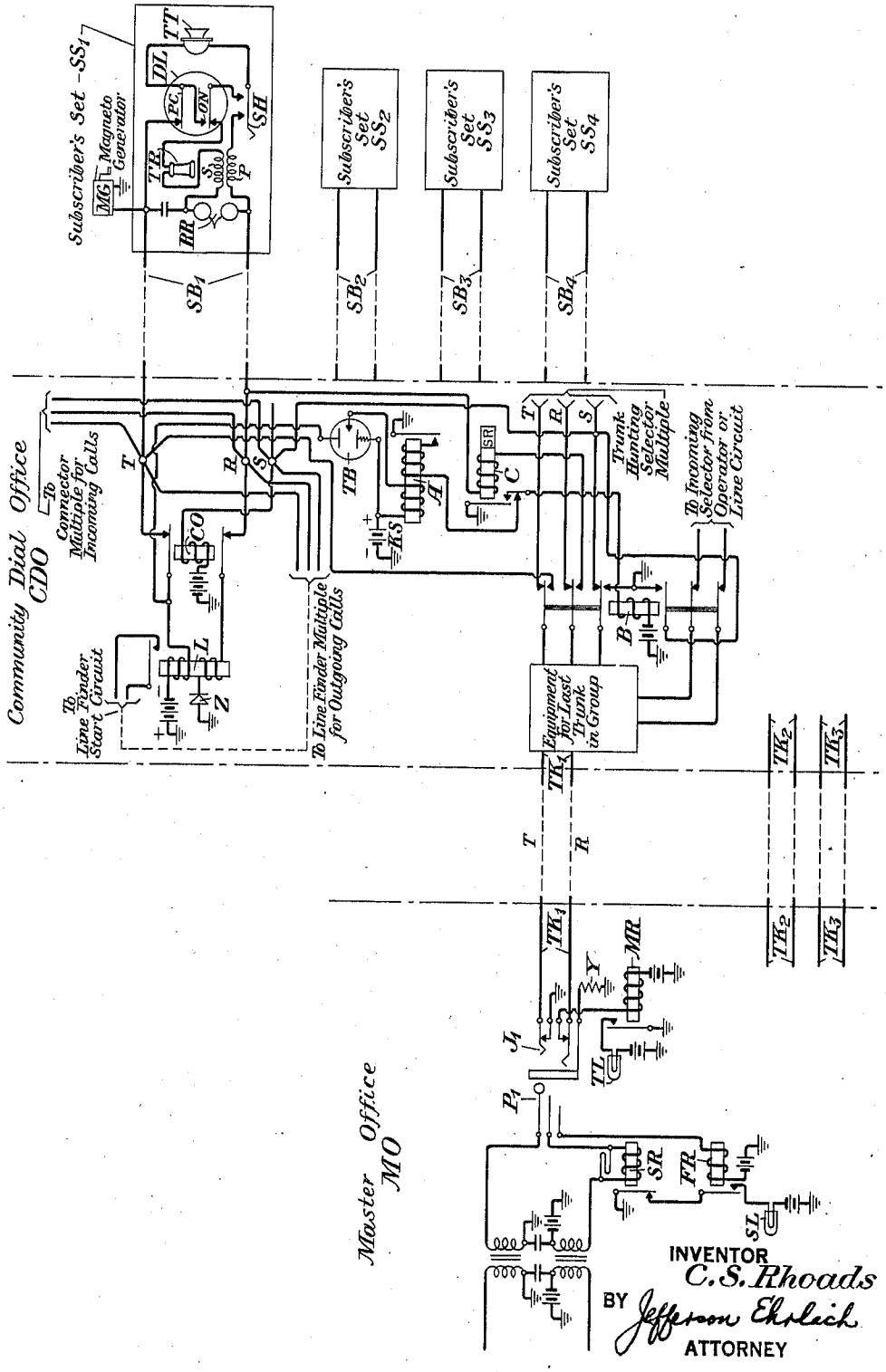
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RIGHT-OF-WAY TELEPHONE SYSTEM

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RIGHT-OF-WAY TELEPHONE SYSTEM

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This invention relates to telephone systems. More particularly this invention relates to switching apparatus for telephone systems. Still more particularly, this invention relates to arrangements for enabling a party to seize a busy line and permit him to signal over the line.

When a telephone office such as community dial office and a telephone office such as an operator or master office are arranged to render service to telephone subscribers, a number of trunks are interposed between the two offices so that the subscribers in the community dial area, for example, may communicate with subscribers in the area of the operator or master office. In an emergency it may happen that an urgent call must be made by one of the community dial office subscribers to the operator at the operator or master office or to a subscriber in the latter area but all trunks between the two offices may be busy at that time. It is also possible that all links or switches in the community dial office are busy. In that event the urgent call must await the liberation of one of the several trunks or links or switches. Any such delay may perhaps be quite unfortunate.

In order to overcome the difficulty referred to, and to provide service in any such emergency, it is proposed to set up apparatus at the community dial office and at the operator or master office to enable a subscriber to seize one of the trunks—which may be a preassigned trunk—when the trunk is busy, interrupt whatever existing service there may be over the seized trunk, and connect the subscriber's set to that trunk. This arrangement will connect the subscriber to the operator at the master (or operator) office and so permit the subscriber to communicate with the operator during the period of emergency.

In accordance with this invention the subscriber who is to be permitted to seize an assigned trunk will have a magneto generator connected to one of the conductors of his line which, when operated, will fire a gas tube at the dial office. The firing of the gas tube will set certain relay apparatus into operation to interrupt existing service over the preassigned trunk, render that trunk busy to all other calls, and at the same time connect the subscriber's set to that same trunk. A lamp or other indicating device may be employed at the master office to apprise the operator that a call is being made over the trunk.

The proposed arrangement thus will give right-of-way to a subscriber at a time when all lines, links or switches are busy. The apparatus required to practice the invention is simple, of low cost and may be of value for use in emergency conditions.

This invention will be better understood from the more detailed description hereinafter following when read in connection with the accompanying drawing showing one embodiment of the invention merely for illustrative purposes.

Referring to the drawing, a plurality of subscribers' lines SB_1, SB_2, SB_3 are shown connected to a community dial office CDO and the community dial office CDO in turn is connected to a master or operator office MO by a plurality of trunks TK_1, TK_2. There are in general more subscribers' lines, such as SB_1, extending to the office CDO than there are trunks, such as TK_1 between the office CDO and the office MO. It is well known in the art that any subscriber's line such as SB_1 or SB_2 may be connected to any one of the trunks such as TK_1 or TK_2 through the equipment at the community dial office CDO and that signaling may take place over any one of the lines and any one of the trunks in tandem.

For example, when the telephone receiver TR of the subscriber's set SS_1 is removed from its hook, the line relay L at the community dial office CDO will be operated over a circuit including battery, the upper winding of relay L, the upper armature and back contact of the cut-off relay CO, the upper conductor of the subscriber's line SB_1, the pulsing contact PC of dial DL, the transmitter TT, the switch-hook SH, the winding P of the induction coil, the lower conductor of line SB_1, the lower armature and back contact of the cut-off relay CO, the lower winding of relay L, rectifier Z and ground. The closure of the contact of relay L operates the line finder start circuit so that a line finder (not shown) may be actuated to find the calling line. As is well known, when the calling line is found, ground is applied to the sleeve contact S, whereupon the cut-off relay CO becomes operated by the completion of an obvious circuit. The cut-off relay CO disconnects the windings of relay L from the calling subscriber's line SB_1. Dial tone is also applied in a well known manner through the line finder from its associated first selector (not shown) to the subscriber's line SB_1 to indicate to the subscriber that the apparatus is ready for dialing. The subscriber may then dial the desired number and talk over the line finder circuit for outgoing calls, as is well known. The outgoing call may be completed over any one of the various trunks, such as TK_1 which may happen to be selected by the dial office equipment. While the subscriber's line SB_1 may be connected to a

trunk such as TK_1, for example, other subscribers' lines may be connected to other trunks either for incoming or outgoing calls.

Suppose, however, that the dial DL of the subscriber's set SS_1 is operated to dial "0" or some other preassigned code to reach the operator (at the master office MO). The dial office equipment will hunt over the group of trunks assigned to that level in a well-known manner and if all of the trunks or all switch paths are busy, the trunk hunting selector (not shown) will return a busy tone to the subscriber. Under such conditions it it possible to signal the operator in accordance with this invention by operating a hand generator MG at the local station. The generator MG controls a gas tube TB at the office CDO and other equipment employed for seizing a predetermined or preassigned trunk such as TK_1, disconnecting all service over that trunk, and rendering the trunk busy to all parties except the one operating the hand generator MG. The subscriber's telephone transmitter TT and receiver TR will be connected to the trunk TK_1 to enable the subscriber to communicate with the operator or other desired party. This will now be explained in greater detail.

The hand or magneto generator MG may be operated by the subscriber while his receiver TR is retained on the switch-hook SH. When operated the generator MG supplies a substantial alternating voltage to the upper or tip conductor T of line SB_1, this alternating voltage being applied over a circuit including the upper armature of relay CO, the control electrodes of tube TB, the battery KS, and ground. The alternating voltage of generator MG and the voltage of battery KS together are sufficient to fire the tube TB, that is, to ionize the gas within tube TB. When tube TB is fired, the relay A will be operated over a circuit which includes battery KS, the left-hand winding of relay A, the anode and upper control electrode of tube TB, the upper armature of relay CO, the upper or tip conductor T of line SB_1, the generator MG and ground. As the left-hand winding of relay A becomes energized to operate the relay, relay A will become locked in its operated position over a circuit which includes the armature and contact of relay A, the right-hand winding of relay A, the make-before-break contact of relay C, the winding of relay B, battery and ground. Thus, relay A will be operated in response to the reception of the alternating wave of generator MG and it will be locked in its operated position.

It will be observed that the winding of relay B is included in the locking circuit of relay A. Consequently relay B will be operated in response to the operation of relay A. The opening of the back contacts of the three upper armatures of relay B will disconnect the trunk hunting selector multiple tip T, ring R and sleeve S arch from the trunk TK_1. The uppermost armature of relay B will be connected to the tip T or upper conductor of the subscriber's line SB_1 and thereby establish a conductive path between the upper or tip conductors of trunk TK_1 and line SB_1. The next uppermost armature of relay B will be connected through the winding of relay C to the ring R or lower conductor of line SB_1 and thereby establish a conductive path between the lower or ring conductors of trunk TK_1 and line SB_1. The trunk TK_1 will thus be electrically connected to the subscriber's line SB_1.

The closure of the contact of the lower inner armature of relay B in response to the operation of relay B will apply ground to the sleeve arc S of the trunk hunting selector multiple so that this trunk TK_1 will test "busy" for all subsequent outgoing or incoming calls. This same ground will be applied to the upper terminal of the winding of the cut-off relay CO, causing relay CO to operate. The operation of relay CO will remove the subscriber's line SB_1 from the line finder start circuit and thus prevent actuating a line finder when the subscriber on line SB_1 removes his receiver from the switch-hook. Ground on the sleeve conductor is also extended to the connector multiple to prevent incoming calls from being completed over the subscriber's line SB_1. The two lower outer armatures of relay B will disconnect the incoming selector from the operator's circuit (or other line circuit) connected to trunk TK_1 and interrupt any call being made over this circuit.

The lower or ring conductor R of line SB_1 is shown connected to the make contact of the upper intermediate armature of relay B through the winding of relay C. While relay B remains operated, current will flow through the winding of relay C to hold it operated. The armature of relay C applies ground to the winding of relay B to hold relay B operated. Inasmuch as relay C is of the slow-release type, relay C will hold relay B operated oven when the subscriber moves his switch-hook SH back and forth to flash the operator. Moreover the operation of relay C will open the locking circuit of relay A and allow relay A to release without causing relay B to release.

It has been pointed out that by operating generator MG, the relay B becomes operated to interconnect the subscriber's line SB_1 with trunk TK_1. Upon the completion of this interconnected circuit, relay MR at the master office MO, which is connected to trunk TK_1, will become operated because the winding of this relay is included in the interconnected circuit. Upon the operation of relay MR, the trunk lamp TL will be illuminated to attract the operator's attention. The operator may then insert her plug P_1 into jack J_1 to answer the call. The insertion of plug P_1 into jack J_1 will cause relay MR to release and thereby extinguish lamp TL. At the same time the winding of the supervisory relay SR of the operator's cord circuit will be energized and relay SR will remain energized as long as the receiver TR at the subscriber's set SS_1 is removed from its switch-hook SH.

The winding of relay FR is included in series with the sleeve contacts of plug P_1 and jack J_1 and resistance Y. Relay FR will therefore be operated as soon as the operator inserts her plug P_1 into jack J_1. If in the meantime the subscriber moves his switch-hook SH back and forth to attract the operator's attention, the relay SR will be released when the circuit is broken by the switch-hook SH and re-operated when the circuit is recompleted. When the back contact of relay SR is closed upon the release of relay SR, the supervisory lamp SL will be illuminated by the completion of a circuit which includes battery, lamp SL, the armature and make contact of relay FR, the armature and back contact of relay SR and ground. The lamp SL will be extinguished whenever relay SR releases. Hence lamp SL will be repeatedly flashed to notify the operator that the subscriber desires to communicate with her. The operator of course may connect the subscriber to any other party.

When lines SB_1 and TK_1 are interconnected as already described, the subscriber may talk to

the operator or to any other party connected to the line by the operator. The talking path is a normal two-way path from which all previously connected lines have been disconnected. The interconnected circuit is also held "busy" for all other calls. When the conversation has been completed the subscriber will return his receiver TR to its switch-hook SH. This will open the circuit to the winding of relay C and hence relay C will release. The release of relay C will release relay B by opening the locking circuit for relay B at the armature and make contact of relay C. The release of relay B will restore trunk TK_1 to its normal or released condition. The trunk TK_1 will then be free for use by any other subscriber.

A hand generator MG located at the subscriber's substation SS_1 and a gas tube TB and apparatus controlled by the gas tube located at the community dial office CDO are added to the existing telephone system to enable a subscriber to seize a preassigned "busy" trunk TK_1 when trunk TK_1 and all other trunks are "busy." The preassigned trunk TK_1 will be seized whether it is "busy" or not. The arrangement gives to the subscriber a right-of-way not heretofore provided in telephone systems. The additional equipment required to practice the invention is simple and readily available and its initial cost as well as the cost of maintenance are quite small. The operation and control of the apparatus in response to the subscriber's manually operated generator MG is positive and free from any interference either by the operator or by the other subscribers. Moreover, the seizure of trunk TK_1 is accompanied by secrecy in that all other subscribers of the office CDO are disconnected from trunk TK_1 and cannot hear the conversation thereover. The value of the arrangement during emergencies is considerable. Because of its simplicity the arrangement can be easily applied to many types of telephone systems with very little modification.

Although the magneto generator MG is shown connected to one of the conductors of the subscriber's line SB_1, it does not vary the impedance of the line or affect transmission over the line while it is unoperated. As is well known the magneto-generator becomes effectively connected to the line only during the time in which the crank handle is rotated by the subscriber. Although the generator is associated with the subscriber's set SS_1, similar generators may be associated with other of the subscriber's sets, but each such generator will require apparatus to respond to the generated current to interrupt service over other of the trunks and at the same time to render the interconnected lines and trunks assigned for seizure "busy." Although gas tube TB is also connected to the subscriber's line SB_1, the tube has no effect upon transmission until the gas enclosed within its envelope becomes ionized. The gas becomes deionized as soon as the crank of the generator is stopped.

The device Z is inserted in series with the winding of line relay L so that only unidirectional current may flow therethrough. Because of its unidirectional characteristic, alternate halves of the current generated by the magneto device MG will traverse the device Z. The device Z will therefore substantially reduce any flutter of the armature of relay L and prevent false operation of the apparatus controlled by the relay L. The device Z will also serve to confine practically all of the generated alternating voltage to the gas tube TB to aid in firing the tube. Any well known rectifier or varistor may be used for this purpose. A thermistor may also be used for this purpose, but the thermistor will operate to reduce flutter by means of its slow-acting characteristic.

The gas tube TB is shown connected to the tip conductor T of line SB_1 between the upper armature of relay CO and the upper winding of relay L. The tube is therefore disconnected from the generator MG after the relay CO has operated to prevent its occasional false operation. If desired, the tube may be connected between the upper or tip conductor T of line SB_1 and the upper armature of relay CO. In the latter position the tube will be connected to generator MG even after relay CO has operated.

Although this invention has been shown and described in certain particular arrangements merely for illustrative purposes, it will be understood that this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. The combination of a central office, a first subscriber's circuit connected by a telephone line to the central office, a second subscriber's circuit, means for enabling the second subscriber to seize the telephone line extending to the first subscriber, said means including a gas tube at the central office, means controlled by the second subscriber to fire the gas tube, and means responsive to the firing of the gas tube to disconnect the first subscriber's circuit from the telephone line and substitute the second subscriber's circuit therefor.

2. The combination of two telephone offices, a plurality of trunks interconnecting said offices, means for enabling a subscriber to one of said offices to communicate with the other office over a predetermined one of said trunks, said means comprising a generator to be operated by said subscriber, a gas tube connected to said generator and fired when said generator is operated, and means including a relay responsive to the firing of said tube to seize said predetermined trunk and to interrupt all other service over said trunk.

3. The combination of an operator office, an auxiliary office, a trunk interconnecting said offices to which telephone subscribers may have access, a gas tube, means to fire said gas tube and seize said trunk to preempt it for use by a particular subscriber, said means including means to interrupt service by all other subscribers over said trunk.

4. The combination of a main office, an auxiliary office, a line interconnecting said offices, means for preempting service over said line, said preempting means including a gas tube, and means responsive to the firing of said tube to interrupt any existing communication over said line.

5. The combination of two telephone offices interconnected by a line over which communication normally takes place, a gas tube, a relay controlled by said tube to interrupt service over said line, and means for firing said tube.

6. The combination of two telephone offices interconnected by a line which is available to numerous subscribers of said offices for communication purposes, means for interrupting any existing service over said line and seizing it for use by a particular subscriber, said means comprising a source of potential, a relay controlling said line, and means including a gas tube respon-

sive to the potential of said source for firing said gas tube and operating said relay.

7. The combination of an operator office, an auxiliary office, a trunk line extending to said operator office, a plurality of subscribers' lines each of which may be connected to said trunk line, means to enable a subscriber to seize said trunk line when it is busy and connect his own line thereto, said means including a source of voltage supplied from one of said subscriber's lines, a gas tube controlled by said source of voltage, and means controlled by said gas tube to render said trunk line busy to all subscribers' lines except the subscriber's line which supplies said source of voltage.

8. In a signaling system, the combination of first and second stations connected to each other by a line so as to be in communications with each other, a third station, means to connect said third station to said line to establish communications between said first and third stations, said means including means to produce an alternating potential of predetermined magnitude to be applied to said line, and a device responsive to said potential to interrupt communication between said first and second stations.

9. In a signaling system, the combination of a central station, a plurality of auxiliary stations, a line terminating at said central station, means for connecting any one of said auxiliary stations to said line to establish communication with the central station, means at one of said auxiliary stations for seizing said line for communication to said central station, said means including means for producing a potential of predetermined magnitude and means responsive to said potential for interrupting communication over said line and for preventing any of the other auxiliary stations from being connected to said line.

10. The combination of a plurality of trunks interconnecting two telephone offices, means for seizing a predetermined one of said trunks whether or not that trunk or all other trunks are busy, said means comprising a source of voltage, a gas tube controlled by the voltage of said source, and apparatus controlled by said gas tube to seize said predetermined trunk.

11. The combination of two offices connected to each other by a line for signaling purposes, said line being available to various parties at said offices for signaling purposes, means for preempting said line to render said line available for special service with privacy whether or not said line is busy, said means including a gas tube, means to fire said gas tube, and means responsive to the firing of said gas tube to preempt said line for said special service.

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