

Jan. 18, 1944.

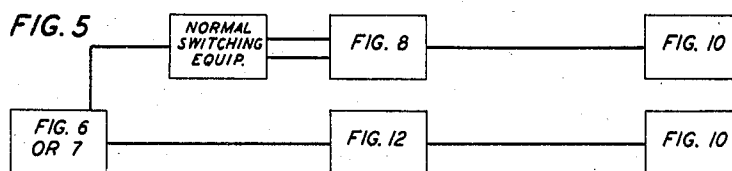
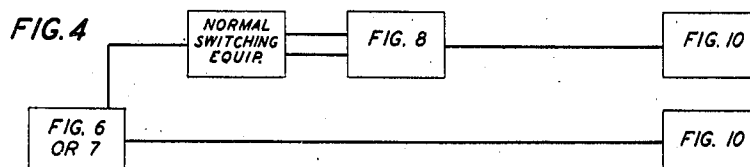
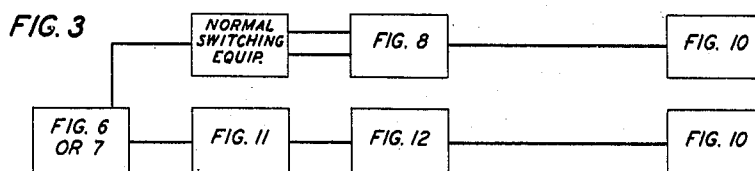
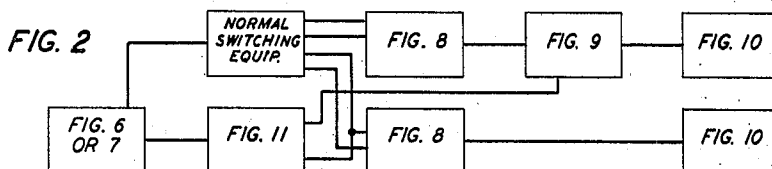
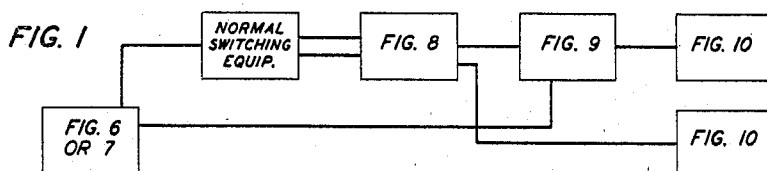
J. BAUMFALK

2,339,669

COMMUNICATION SYSTEM

Filed Aug. 4, 1942

5 Sheets-Sheet 1



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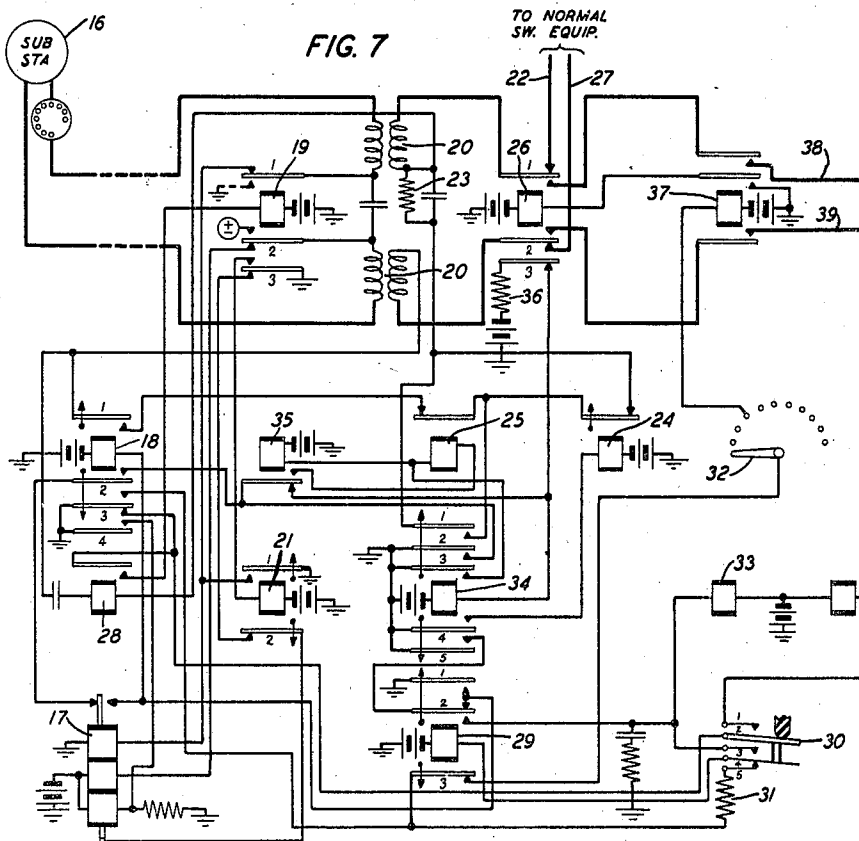
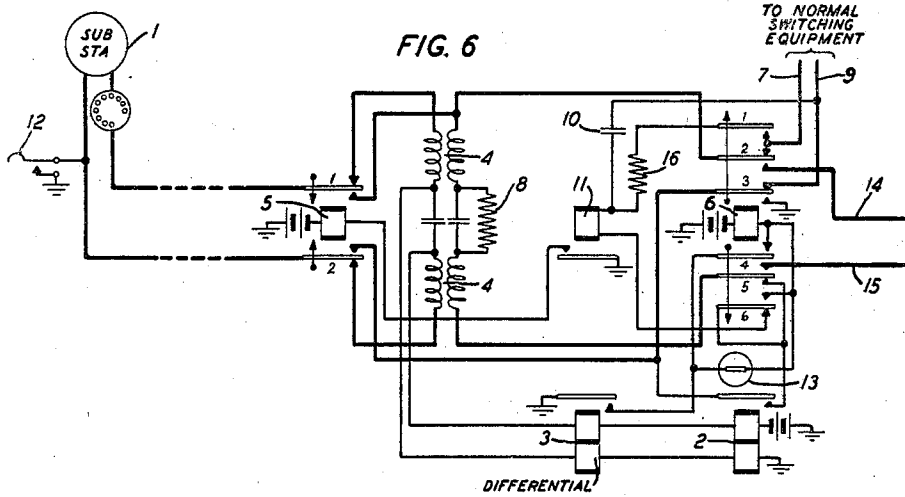
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COMMUNICATION SYSTEM

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5 Sheets-Sheet 2



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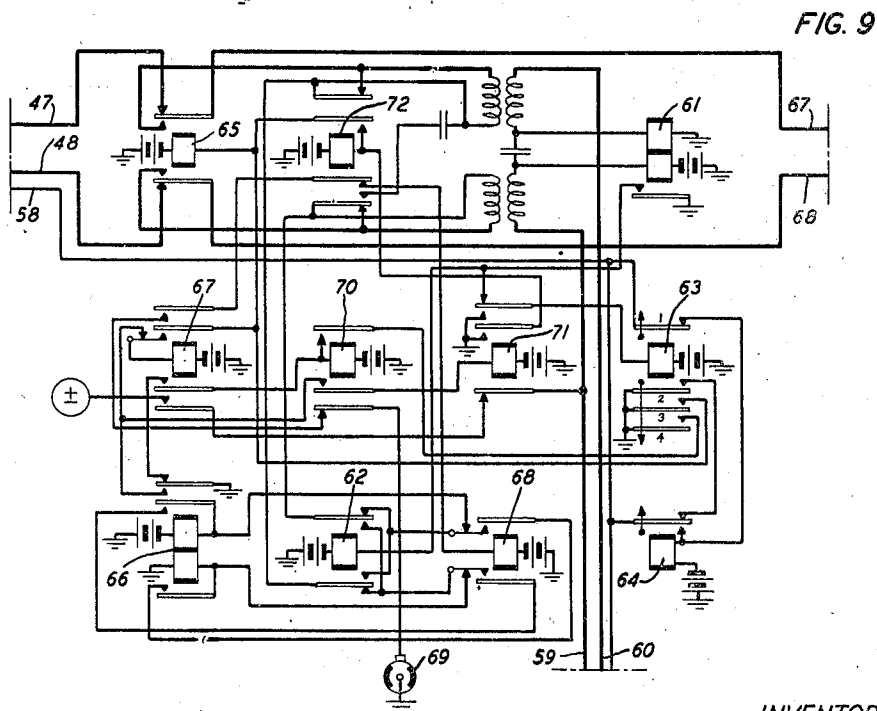
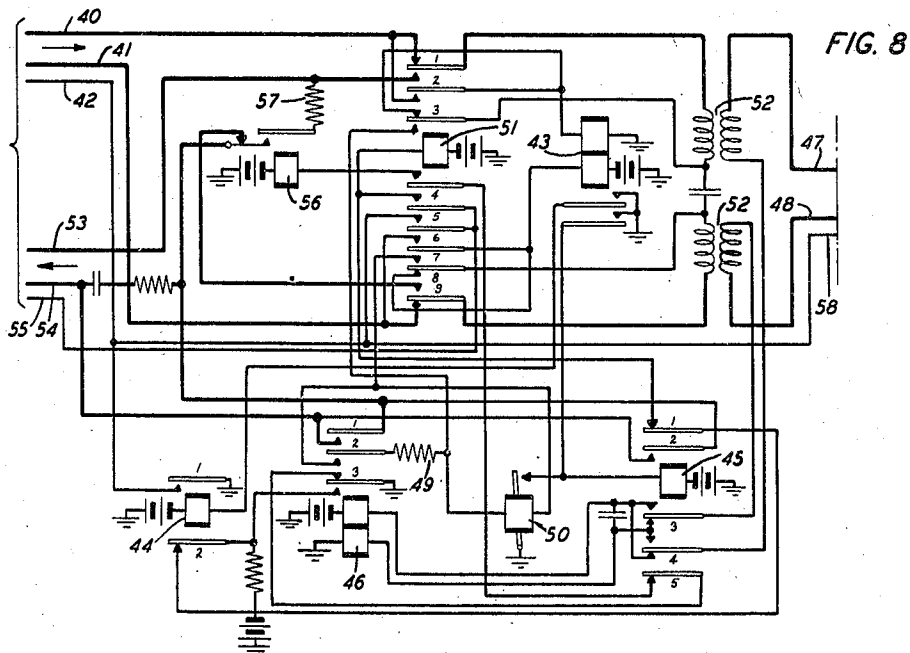
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COMMUNICATION SYSTEM

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5 Sheets-Sheet 3



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2,339,669

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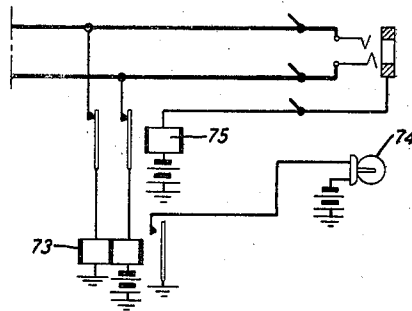


FIG. 10

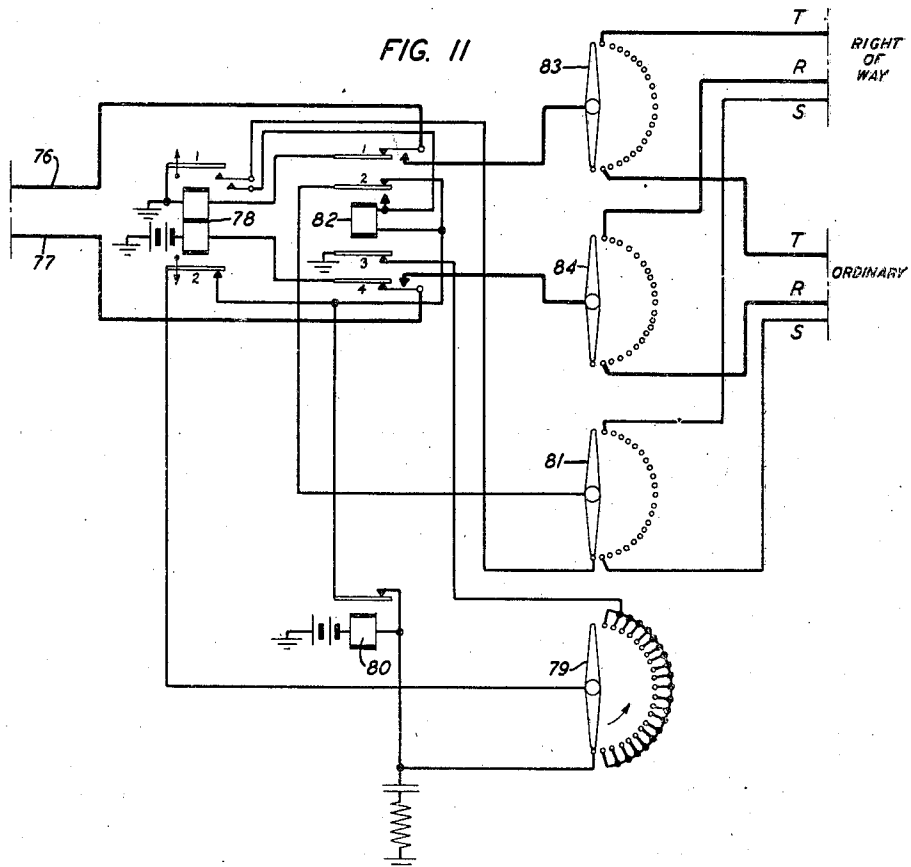


FIG. 11

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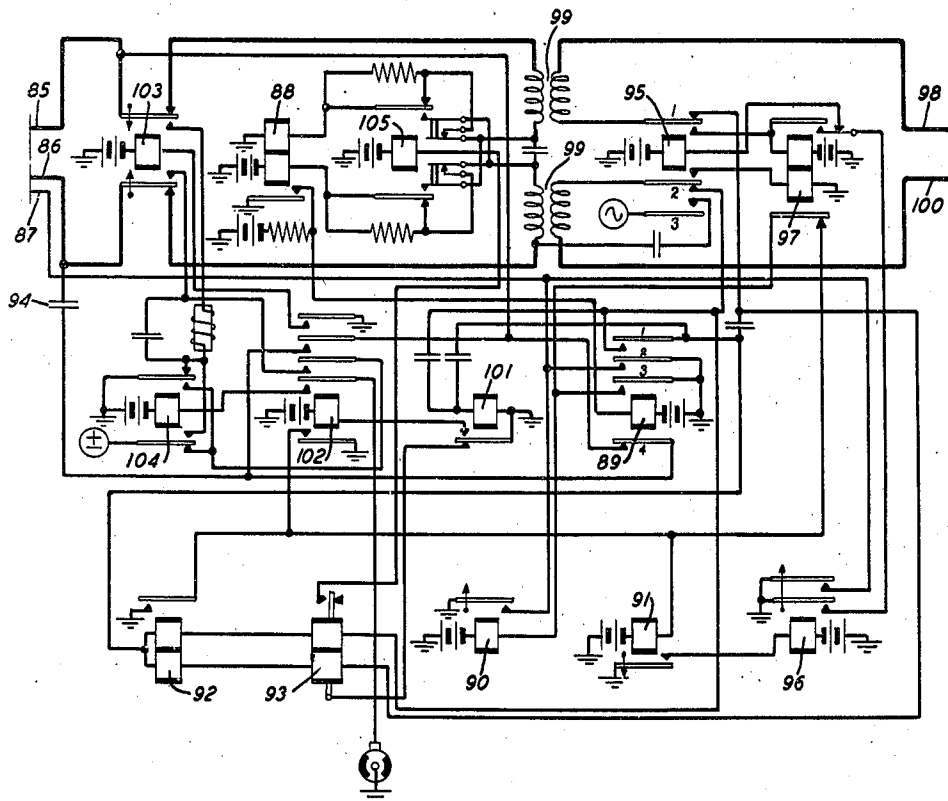
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COMMUNICATION SYSTEM

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5 Sheets-Sheet 5

FIG. 12



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## UNITED STATES PATENT OFFICE

2,339,669

## COMMUNICATION SYSTEM

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Application August 4, 1942, Serial No. 453,522

6 Claims. (Cl. 179-27)

This invention relates to communication systems and particularly to special service telephone systems.

The object of the invention is to provide means to establish emergency connections from certain preferred lines in a group served by machine switching means regardless of the busy conditions of the trunks leading from such group of lines and in some cases regardless of the busy conditions of the lines themselves.

For certain emergency conditions it is necessary that connections be established from certain given lines without delay. Where such lines are in what is known as a community dial exchange it may be found that, when an emergency arises and a particular line is urgently required for immediate service, the line itself is in use or that all trunks outgoing from the exchange are busy. It is the object of the present invention to provide means for establishing a connection to a distant point irrespective of such otherwise adverse conditions.

This invention provides means supplementary to the means disclosed in my copending application Serial No. 453,521, filed Aug. 4, 1942, where a communication system in which an operator may establish a connection to a wanted station regardless of the busy condition of the station or the paths leading thereto is disclosed.

In general, when emergency outgoing service is required, the subscriber at a preferred station performs an additional operation which results in transferring his line to a special service equipment. This responds by selecting a trunk to a distant point and if all trunks are found busy then it selects a particular trunk designated for this service and summarily dismisses any other connection thereto so as to give emergency service to this preferred subscriber's line.

In accordance with the preferred embodiment of the invention the preferred subscriber's station is provided with an emergency switch, generally in the form of a push-button, which upon operation, regardless of the busy or idle condition of the station will immediately transfer the line to a special equipment. The normal connection between the line and the regular switching facilities is summarily broken and a clear path to a distant point is established.

In accordance with another form of the invention where the arrangement of the circuits is such that the emergency switch cannot be used, the usual subscriber's dial is operated to send a predetermined signal by means of which the same result may be accomplished.

A feature of the invention is a means under control of a calling subscriber to seize a trunk, summarily dismiss any other connection thereto and gain a clear communication channel to a distant point.

Other features will appear hereinafter.

The drawings consist of five sheets having twelve figures as follows:

Figs. 1 to 5, inclusive, are block diagrams showing how the remaining Figs. 6 to 12 may be combined to illustrate various alternative arrangements of the present invention. For purposes of clarity the circuit diagrams of Figs. 6 to 12 will be described first.

Fig. 6 is a circuit diagram of a substation circuit equipped with a special key at the substation for routing a call outgoing therefrom in either a normal or an alternative direction. Fig. 7 is a similar circuit diagram showing how the selection of a normal or alternative outgoing path may be controlled by an ordinary substation dial. Fig. 8 is a circuit diagram of an operator's two-way trunk circuit which may be employed to extend calls from the regular switching equipment of an exchange over a normal path toward a distant manual office. Fig. 9 is an applique circuit which may be introduced between the outgoing end of the two-way trunk of Fig. 8 and the line wires extending to the distant manual office. This applique circuit is for converting the trunk to right-of-way service so that the trunk may be seized and used on an emergency call regardless of its busy condition in normal service. Fig. 10 is a circuit diagram showing a simple trunk termination at a distant manual office. Fig. 11 is a circuit diagram showing a trunk termination by which a call extended thereto may be distributed to any one of a number of other terminations. Fig. 12 is a one-way outgoing trunk circuit by means of which the calls may be extended from an exchange to a distant manual office.

Figs. 1 to 5, inclusive, are applique diagrams indicating the various combinations of the figures above described to produce various alternative forms of the present invention.

By combining the figures designated as shown in Fig. 1 a communication system may be illustrated in which an emergency connection may be extended from a given special substation to a distant manual office. Either of the substation circuits of Fig. 6 or 7 may be used in regular service to extend a connection through the normal switching equipment of the exchange and is through a two-way operator's trunk circuit as

shown in Fig. 8 to the distant manual office shown in Fig. 10. It will be understood that the showing of Fig. 10 is practically schematic in nature since it shows an ordinary line and cut-off relay arrangement and does not illustrate the more complicated circuits which are in use and which perform a number of additional functions. Since it is only necessary here to indicate that the connection is actually extended beyond the two-way trunk of Fig. 8 the simple circuit diagram of Fig. 10 will be sufficient for this purpose.

If an emergency call is to be extended from one of the substations equipped for this special service and all of the trunks to the central office are found to be busy then the special operation to be described hereinafter in connection with Figs. 6 and 7 will be performed whereby the connection through the normal switching equipment will be cut off and the busy trunk shown in Fig. 1 as extending from Fig. 8 through Fig. 9 to Fig. 10 will be approached through the block circuit of Fig. 9. Regardless of the busy condition of this trunk the connection will be extended directly from Fig. 6 or Fig. 7 through Fig. 9 to Fig. 10 so that access to the distant manual office will be gained immediately.

Fig. 2 shows an alternative arrangement of the invention in which the greater scope is given to the calling subscriber. In this case also the calling subscriber may go through the normal switching equipment, that is, through a two-way operator's trunk to a distant exchange. If, however, no available paths are found then through the special operation consisting of the operation of an emergency button at the substation shown in Fig. 6 or an operation of the dial at the substation as shown in Fig. 7, a distributing switch shown in Fig. 11 will be seized which will thereupon hunt for an idle outgoing trunk to the distant manual exchange. In this arrangement all of the outgoing trunks reached by the distributing switch of Fig. 11, with the exception of the last one will be arranged ordinarily. The last trunk, however, will be a right-of-way trunk so that connection will now be established from the substation through the distributing switch to the applique circuit of Fig. 9 where a busy trunk is seized and appropriated for emergency use and thence to the distant manual exchange. It will be understood that all the trunks reached by the distributing switch of Fig. 11 do not necessarily extend to the same distant manual exchange but may extend to various exchanges so that the right-of-way call may have a better opportunity of being established equally.

In Fig. 3 an arrangement is shown in which the distributing switch has access to outgoing trunks to various manual exchanges whereas the normal traffic flows through the same channels as hereinbefore described. This is illustrated by the blocks in Fig. 3 showing the possibility of establishing a connection from the substation circuits through the distributing switch of Fig. 11 through the outgoing trunk of Fig. 12 to a manual office termination of Fig. 10. In this case the distributing switch has access only to outgoing trunks and it will, therefore, continue to hunt until an idle trunk is encountered even though the brushes of the switch may have to rotate through several complete movements.

Fig. 4 shows a simple arrangement in which the right-of-way connection is established directly to a manual office termination instead of going through a trunk provided for normal use.

Fig. 5 shows a simple arrangement in which a

particular outgoing trunk of the kind shown in Fig. 12 is set aside for emergency use exclusively according to the arrangement of Fig. 5, a call may be extended from either of the substations of Fig. 6 or Fig. 7 through the normal switching equipment over a two-way trunk to a distant manual office or through the special operation for right-of-way calls may be extended over a one-way trunk to a distant manual office.

The manner in which these various connections are established in detail will be understood from the following detail description of Figs. 6 to 12, inclusive.

Fig. 10 is a circuit showing a subscriber's line equipped with a non-locking key for grounding the line to initiate an emergency call. The subscriber's line is connected to a circuit designed for use as an auxiliary line circuit where it is desired to provide priority service to emergency calls outgoing from the subscriber's station. When the receiver is removed from the switchhook at station 1 a circuit is established from battery, upper winding of line relay 2, upper winding of differential relay 3, lower left-hand winding of repeating coil 4, back contact and armature 2 of relay 5 over the line circuit to station 1 back to armature 1 and back contact of relay 5, upper left-hand winding of repeating coil 4, lower winding of differential relay 3, lower winding of line relay 2 to ground. Relay 3 does not operate in this circuit since its windings are connected differentially but line relay 2 responds. Relay 2 establishes a circuit from the tip conductor 7 leading to the normal switching equipment over the back contact and armature 2 of relay 6, upper right-hand winding of repeating coil 4, resistance 8, lower right-hand winding of repeating coil 4, armature 5 and back contact of relay 6, contact and armature of line relay 2, armature 3 and back contact of relay 6 to the ring conductor 9 leading to the normal switching equipment. Thus, a bridge is placed across conductors 7 and 9 to cause the normal operation in the switching equipment beyond. If dialing is required to establish a connection, dial pulses are repeated by line relay 2 when the receiver is placed on the switchhook. Relay 2 releases, restoring the circuit to normal.

On a normal incoming call to station 1 ringing current passes through condenser 10 and relay 11 to operate relay 5 which thereupon connects the conductors 7 and 9 to the front contacts and armatures 1 and 2, respectively of relay 5 so that the ringing current will reach the substation 1. When the subscriber answers the line relay 2 will operate as hereinbefore described.

The subscriber may originate an emergency call at any time the receiver is off the hook by operating momentarily the emergency key 12. This grounds the line unbalancing the windings of relay 3 which thereupon operates and closes ground through the thermistor 13 to the winding of relay 6. The thermistor 13 is provided to slow down the operation of relay 6 so that it will not operate and lock falsely due to momentary operations of relay 3 on searches. When thermistor 13 slips sufficiently to lower its response to the proper value, relay 6 operates. Relay 6 operated (1) disconnects the bridge through resistance 8 and repeating coil 4 from the subscriber's line circuit used for normal operation, opening any connection established thereby; (2) connects this bridge and talking

path to the manual subscriber line or outgoing trunk for emergency operation connected to conductors 14 and 15 causing the origination of a call thereon; (3) closes an immediate short circuit around thermistor 13 to start cooling it down and to make the slow release feature of relay 6 effective; (4) closes a locking path to the contacts of relay 2 which may or may not remain operated with the emergency key operated, and (5) bridges resistance 16 and condenser 10 across the subscriber's line circuit leading to the normal switching equipment to provide a termination for the continuity test of the terminating marker in the crossbar offices so as to avoid false trouble indications on terminating calls to this circuit while an emergency call is in progress. When the emergency key 12 is released at the station the differential relay 3 releases and the line relay 2 reoperates if it has released. Relay 5 is made slow to release so that it will hold after relay 3 releases until its locking path is closed by the line relay 2. The switchboard termination of the connected line or trunk circuit for emergency operation will be called with suitable auxiliary signals to attract the immediate attention of the operator. The emergency key connection at the station is such that the answer of the operator may be heard even with the key operated. When the receiver is replaced on the switchhook at the calling station the line relay 2 releases releasing relay 6 and restoring the circuit to normal. No busy condition is placed on the subscriber's line circuit for normal operation while this circuit is in use on an emergency call and hence terminating calls under this condition will encounter a rather "don't answer" condition.

Relay 5 is made slow to operate so that it will not be operated by momentary operations of relay 11 during dialing or flashing. Resistance 8 is required to prevent premature tripping on false operations of relay 2 to the line discharge. Transmitter battery is supplied through the windings of line relay 2 and the usual current limiting resistance (not shown).

Fig. 11 shows a circuit similar in function to that of Fig. 10 except that the emergency connection may be established through the operation of the ordinary subscriber's dial rather than through the use of special emergency key. When the subscriber at station 16 removes his receiver from the hook relay 17 operates in turn operating the first slow relay 18. The circuit for relay 17 may be traced from ground, the upper winding of relay 17, back contact and armature 1 of ringing relay 19, upper left-hand winding of repeating coil 20 over the line circuit to station 16 through the lower left-hand winding of repeating coil 20, armature 2 and back contact of ringing relay 19, the middle winding of line relay 17 to battery. Relay 18 is operated from ground, armature 3 and back contact of ringing relay 19, back contact and armature 2 of relay 21, armature and right-hand contact of line relay 17 through the winding of relay 18 to battery. Relay 18 completes the supervisory path to the central office with a circuit which may be traced from tip conductor 22, back contact and armature 1 of relay 26, the upper right-hand winding of repeating coil 20, resistance 23, back contact and armature of relay 24, armature and back contact of relay 25, front contact and armature 1 of relay 18, lower right-hand winding of repeating coil 20, armature 2 and back contact of relay

26 to ringing conductor 27. Relay 18 also removes ground normally connected over its armature 3 and back contact to the armature of relay 28 to prevent interference in case this relay should kick up during pulsing. Relay 18 through its armature 3 and front contact increases the bias of relay 28 to insure satisfactory pulsing. Relay 18 also operates the second slow relay 29 in a circuit from the winding of relay 29, springs 4 and 5 of the off-normal contacts 30, resistance 31, front contact and armature 3 of relay 18. Relay 29 follows the code selector indicated by wiper 32 through its armature 1 and front contact, relay 29 holds the pulsing relay 18. Relay 29 also provides a pulsing path for the rotary magnet 33 under control of relay 34. When the calling subscriber dials relay 17 follows the dial pulses removing ground from relay 18 and operating relay 34 on each pulse of each digit. During the dialing of the first digit relay 29 holds relay 18 but during subsequent digits relay 18 will hold from the front contact of relay 34 and the back contact of relay 29. Upon the first release of the line relay A a circuit is established from ground armature 3 and back contact of relay 19, back contact and armature 2 of relay 21, armature and left-hand contact of relay 17, armature 2 and front contact of relay 18, armature and back contact of relay 35, winding of relay 34 to battery. Relay 34 operated locks over its front contact and armature 2 under control of relay 35 and closes the supervisory bridge in parallel with the armature and back contact of relay 34. Relay 34 also closes a parallel path for holding relay 18 operated and operates relays 35 and 24. Relay 35 operated opens the locking circuit 4 and releases relay 34 which thereupon releases slowly due to the shunting effect of resistance 36. Relay 35 prepares a locking circuit for itself in series with relay 25 under control of the left-hand contact of relay 17. Relay 34 released, opens the pulsing loop, releases relay 24 and allows relay 25 to operate in series with relay 35 opening the pulsing loop at a second point to insure a prompt disconnect at the end of the call. Relay 24 released, closes the pulsing loop.

When the line relay 17 reoperates at the end of the pulse relays 35 and 25 release and prepare the circuit for the operation of relay 34 on the next pulse. Relays 34 and 24 are slow in releasing and normally relay 24 is not fully released until relays 35 and 25 have released at the end of the pulse. On fast pulsing relay 24 does not release. Therefore, the release of relay 34 controls the length of closure of the repeated pulse. At low dial speeds relay 24 releases, reclosing the pulsing loop and thereby controlling the open period of the pulse and disconnect relays 35 and 25 remain locked up to the back contact and to the left-hand contact of line relay 17 after relay 24 releases. This insures the opening of the supervisory path to the central office in a minimum time after the pulsing loop is opened thus insuring a fast disconnect.

In order to get an emergency connection to an operator's office certain digits are reserved for each office to which a connection is desired. When the subscriber seizes this circuit relays 17 and 18 operate as described for a regular call. The circuit functions as on regular call with the following added functions. Relay 18 operated, operates relay 29 which holds the relay 18 and provides a pulsing path for the rotary magnet 33 under control of relay 34. When the pulse grounder functions relay 34 follows pulsation.



On the first pulse the rotary magnet operates stepping the code selector one terminal and operating the off-normal springs 30. During subsequent pulses relay 29 holds operated in parallel with the rotary magnet. When the first digit is completed relay 29 releases connecting ground from armature 3 and front contact of relay 18 over armature 3 and back contact of relay 29 to wiper 32. If the digit dialed was one assigned for emergency service to a particular office then relay 37 associated with that terminal will operate. Relay 37 operated operates relay 26. With relays 26 and 37 operated the subscriber is disconnected from his line circuit in the normal switching equipment and connected through conductors 38 and 39 for emergency service over circuits to be described hereinafter.

Disconnection takes place in the usual way. When relay 18 releases relays 26 and 37 release and the code switch restores to normal.

Fig. 12 is a circuit diagram of a two-way trunk circuit with repeating coil transmission to a manual or toll office. It is arranged for tandem connections over other or similar two-way trunk circuits to a manual or toll office and to give a class of service tone signal to the call operator.

When this trunk is seized over its tipping and sleeve conductors 40, 41 and 42, the relay 43 operates and causes the operation of the first slow relay 44 and relay 45. Relay 44 operated grounds the sleeve conductor 42 to busy the trunk to other calls. Relay 45 operated reverses battery and ground from relay 46 toward the trunk to operate a polarized relay at the distant end as a calling signal. Further description of the operation on a call toward the central office over this trunk will not be given as it forms no particular part of the present invention.

On incoming calls when the operator seizes this trunk over conductors 47 and 48, relay 46 operates. Relay 46 closes the pulsing circuit, places a resistance shunt 49 about the winding of relay 50 and operates relay 51. Relay 51 grounds the sleeve over a circuit which may be traced from ground, armature 3 and front contact of relay 46, armature 2 and back contact of relay 44, armature 1 and back contact of relay 45, front contact and armature 5 of relay 51, armature 6 and front contact of relay 51 to the sleeve conductor 42. The operation of relay 51 also transfers the inside terminals of the repeating coil 52 from the windings of relay 43 to the winding of relay 50 and transfers the outside terminals of the repeating coil to the tip and ring of the incoming selector in which the conductors 53, 54 and 55 terminate. Relay 51 also connects the tip and ring conductors 40 and 41 to the windings of relay 43 and prepares a circuit for operating relay 56. Relay 51 locks through its own contacts to the sleeve conductor 55.

Relay 46 follows the pulses transmitted by the operated dial and repeats these pulses to the switches ahead. On the first release of relay 46, relay 56 operates and due to its slow release features remains operated during the dialing of each digit. Relay 56 opens the ring lead to the repeating coil and closes the loop toward the incoming selector through the resistance 57.

It should be noted that at the right-hand end of the circuit diagram the tip and ring conductors 47 and 48, respectively, are associated with a sleeve conductor 58. In the case where the two-way trunk is used for ordinary service only the tip and ring conductors will be extended to a distant office. In case, however, this trunk is to

be used for right of way service then the circuit diagram of Fig. 13 is inserted between this trunk and the conductors leading to the distant exchange. Thus, the three left-hand conductors of Fig. 13 have been numbered 47, 48 and 58, respectively to indicate that they are used for extending the two-way trunk of Fig. 12.

The circuit diagram of Fig. 13 is for use as an auxiliary trunk circuit to give right of way to certain stations on emergency calls to the operator office. When this circuit is seized by a subscriber over the conductors 59 and 60 which may correspond to the conductors 14 and 15, respectively of Fig. 10 or conductors 38 and 39, respectively of Fig. 11, relay 61 is operated. Relay 61 operated, causes the operation of relays 62 and 63 and this latter relay through its armature 2 and front contact and over the back contact and armature of relay 64 grounds the sleeve conductor 58 to act as a busy condition in the normal switching equipment. Relay 63 operated provides a holding ground for other relays in the circuit and operates the transfer relay 65 whereby the talking circuit toward the central office is disconnected from the tip and ring conductors 47 and 48 and transferred to the conductors 59 and 60. Relay 62 operated sends a seizure signal to the distant office by reversing battery and ground over the tip and ring. Relay 66 which supplies battery and ground to the trunk conductors 67 and 68 responds to the answer of the operator at the distant end. Assuming that this trunk was seized over the conductors 59 and 60 during its use in some other connection than upon the operation of relay 65, relay 66 will immediately respond since the operator at the distant office is already in on the connection. Relay 66 operated, operates relay 67. Relay 67 in turn locks to the first slow relay 63 and sends audible ringing to the originating subscriber and causes relay 68 to operate intermittently in accordance with the interrupter 69. Relay 68 alternately reverses battery and ground to the distant office to flash the disconnect signal in the distant office as an emergency disconnect signal. When the operator thereat disconnects, relay 66 releases, operating relay 70 which locks to relay 63 and opens the flashing lead restoring relay 68 to normal. The answering lamp will light steadily until the operator will answer the call whereupon relay 66 again operates operating relay 71 at this time. Relay 71 operated removes audible ringing, holds relay 63 operated and operates relay 72. Relay 72 operated, closes the transmission circuit and locks to relay 63.

This connection is under the control at both ends. When the originating ends disconnect relay 61 releases, releasing relay 62. Relay 62 released reverses battery and ground toward the distant office as a disconnect signal. When the distant office disconnects relay 66 releases in turn releasing relay 71. Relay 71 released, releases relay 63 which in turn releases relays 67, 70, 72 and 65. Relay 63 also removes ground from the sleeve lead restoring the circuit to normal.

Fig. 14 is a circuit arrangement showing a line termination at a distant central office. This is a conventional circuit having a line and cut-off relay and an answering lamp and will do in the present instance as an indication of some means by which the attention of the distant operator may be attracted. Under normal conditions the ground and battery from the line relay 73 will be opposed to like connections in the trunk so

that the relay 73 will not be operated. However, when the trunk is seized as described in connection with Figs. 12 and 13 the ground and battery from the trunk is reversed and this will cause the operation of line relay 73 which will result in the operation of the line lamp 74. When the operator answers the cut-off, relay 75 will respond and open the circuit to the windings of line relay 73 in the usual manner. It will be understood that more complicated trunk circuit terminations may be used at the central office end in order to perform additional functions but this circuit will suffice for the present purposes.

Fig. 15 is a circuit for use in establishing connections from subscribers to an operator office and is used as will be more fully explained hereinafter to insure that a subscriber making an emergency call will properly reach an available trunk to the central office. The tip and ring conductors 76 and 77 may be variously matched to the tip and ring conductors 14 and 15 of Fig. 10 or conductors 38 and 39 of Fig. 11. When the circuit is seized a loop is closed across the tip and ring leads operating the line relay 78. Relay 78 operated opens the circuit to brush 79 of the selector and closes a circuit to the stepping magnet 80 through brush 81 and armature 2 and back contact of the cut-off relay 82. This operates the stepping magnet which steps the brushes to the first terminal in the multiple bank. The connection from the normal terminal of brush 79 to the winding of the stepping magnet is provided to prevent the switch from stepping over the first terminal even if it is idle due to the adjustment of the line relay being such that it operates slowly. If the first terminals are busy the sleeve terminal is grounded and this operates the stepping magnet which breaks its own circuit and continues stepping until the idle sleeve terminal is found. When the idle sleeve terminal is found relay 82 operates from ground at the make contact of the line relay 78 to battery in series with the stepping magnet 80. The stepping magnet does not operate in series with the cut-off relay 82. The operation of relay 82 closes the originating loop through wipers 83 and 84 to the circuits selected. The circuit selected operates and in turn holds ground over the sleeve lead and brush 81. The operation of relay 82 allows relay 78 to release. Relay 78 is designed to release slowly in order to hold ground on the sleeve until the holding ground is returned over the sleeve lead.

When the holding ground is removed from the sleeve lead relay 82 releases. This opens the connections to brushes 81, 83 and 84 and grounds the bank terminals for brush 79 which operates the stepping magnet and returns the switch to its normal position.

Fig. 17 is a circuit diagram of a trunk circuit outgoing from a step-by-step office to a distant A switchboard or manual office. When this circuit is seized over its tip, ring and sleeve conductors 85, 86 and 87, the line relay 88 will be operated and this in turn will operate the auxiliary line relay 89 which will ground the sleeve 87. Relay 89 also energizes the sleeve relay 90 and the holding relay 91 and short-circuits the upper windings of relays 92 and 93. Relay 89 also removes condenser 94 from its normal connection across the tip and ring leads 85 and 86 and closes the talking circuit through the back contacts of relay 95. The sleeve relay 90 grounds the sleeve when operated and is slow to release to maintain the ground potential on the sleeve

during momentary releases of the line relays 88 and 89. Relay 91 operated, operates relay 96 which grounds the sleeve and operates relay 95 to the back contacts of relay 97. Relay 95 closes the audible ringing tone circuit and throws battery and ground through the windings of relay 97 and to the trunk. Relay 97 does not operate at this time but the battery and ground through its windings causes the trunk lamps at the incoming ends to be lighted.

When the operator answers a high resistance bridge at the distant end is removed and battery is placed on the ringing conductor and ground on the tip conductor. This battery and ground aid the battery and ground of relay 97 and relay 97, therefore, operates. Relay 97 locks to ground from the relay 96 and at the same time opens the circuit of relay 95. Relay 95 releases and removes the audible ringing tone to the calling subscriber and at the same time opens the windings of the relay 97 toward the distant end. Relay 95 through its back contacts connects a dry bridge on the trunk. Thus at the present time a circuit may be traced from conductor 98 through the upper right-hand winding of repeating coil 99, armature 1 and back contact of relay 95, lower winding of relay 93, lower winding of relay 92, armature 1 and front contact of relay 89, back contact and armature 2 of relay 95, lower right-hand winding of repeating coil 99 to conductor 100. Relay 92 operates from the battery and ground at the distant end and holds relay 91 operated. Relay 91 is slow to release so as to remain operated from the time its energizing path was opened by the operation of relay 97 until it is again energized by the operation of relay 92.

This trunk circuit is provided with a ring back feature whereby the calling subscriber or seized trunk may be called. When the distant operator throws her ring back key, ringing current is transmitted over the ring conductor of the interoffice trunk. Relay 101 responds and causes the operation of relay 102 which in turn causes the operation of relay 103. Relay 103 connects ringing current from the contacts of relay 104 to the tip and ring conductors 85 and 86.

Should the subscriber disconnect first relay 88 releases and opens the operating path for relay 89. Relay 89 releases and in turn removes the short circuit from around the upper high resistance windings of relays 92 and 93 giving the operator a disconnect signal and opening the talking bridge. The sleeve relay 90 releases after the relay 89 has restored to normal. Relays 92 and 93 release if operated when the operator disconnects. The release of relay 93 releases the reversing relay 105 and the release of relay 92 releases relay 91 and in turn relay 96. Relay 96 removes ground from the sleeve and releases relay 97.

Should the operator disconnect first, relays 92 and 93 release. The release of relay 92 releases relays 91 and 96. This causes relay 97 to release which completes the path for reoperating relay 91 from the contacts of relay 89. Relay 91 then reoperates relay 96 which energizes relay 95 throwing battery and grounds to the windings 87 on the trunk which relights the trunk lamp. Should the operator answer before the calling ends has disconnected the circuit functions as hereinbefore described. When the calling end disconnects before the operator answers relays 88, 89, 90, 91, 96 and 95 release restoring the circuit to normal.

What is claimed is:

1. In a communication system, a group of lines, machine switching means for interconnecting said lines, trunks leading from said group to a distant point, special service means for giving a preferred one of said lines a clear channel over one of said trunks comprising means under control of the subscriber on said preferred one of said lines for summarily disconnecting said line from its normal connection to said machine switching means and connecting said line to an idle one of said trunks.

2. In a communication system, a group of lines, machine switching means for interconnecting said lines, trunks leading from said group to a distant point, special service means for giving a preferred one of said lines a clear channel over a predetermined one of said trunks comprising means under control of the subscriber on said preferred one of said lines for seizing said predetermined trunks and summarily dismissing any existing normal connection thereto.

3. In a communication system, a group of lines, machine switching means for interconnecting said lines, trunks leading from said group to a distant point, special service means for giving a preferred one of said lines a clear channel over one of said trunks comprising means under control of the subscriber on said preferred one of said lines for summarily disconnecting the said line from its normal connection to said machine switching means, for connecting the said line to the first idle one of said trunks, and means responsive to the busy condition of all of said trunks for seizing a predetermined one of said trunks and summarily dismissing any normal connection thereto.

4. In a communication system, a group of lines, machine switching means for interconnecting said lines, trunks leading from said group to a distant point, an auxiliary line circuit for a preferred one of said lines comprising a transfer relay, a normal connection through the contacts of said relay between said line and said machine

switching means, an alternate connection through the operated contacts of said relay between said line and a special service line, said special service line and means controlled thereover to establish a clear communication channel over one of said trunks to said distant point, and means effective during the busy or idle condition of said preferred one of said lines for operating the said transfer relay of said auxiliary line circuit.

5. In a communication system, a group of lines, machine switching means for interconnecting said lines, trunks leading from said group to a distant point, an auxiliary line circuit for a preferred one of said lines comprising a transfer relay, a normal connection through the contacts of said relay between said line and said machine switching means, an alternate connection through the operated contacts of said relay between said line and a special service line, said special service line and means controlled thereover to establish a clear communication channel over one of said trunks to said distant point, and a special service switch under control of the subscriber at the substation on said preferred one of said lines for controlling said auxiliary line circuit.

6. In a communication system, a group of lines, machine switching means for interconnecting said lines, trunks leading from said group to a distant point, an auxiliary line circuit for a preferred one of said lines comprising a transfer relay, a normal connection through the contacts of said relay between said line and said machine switching means, an alternate connection through the operated contacts of said relay between said line and a special service line, said special service line and means controlled thereover to establish a clear communication channel over one of said trunks to said distant point, said auxiliary line circuit being under control of the substation dial at the substation on the said preferred one of said lines.

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