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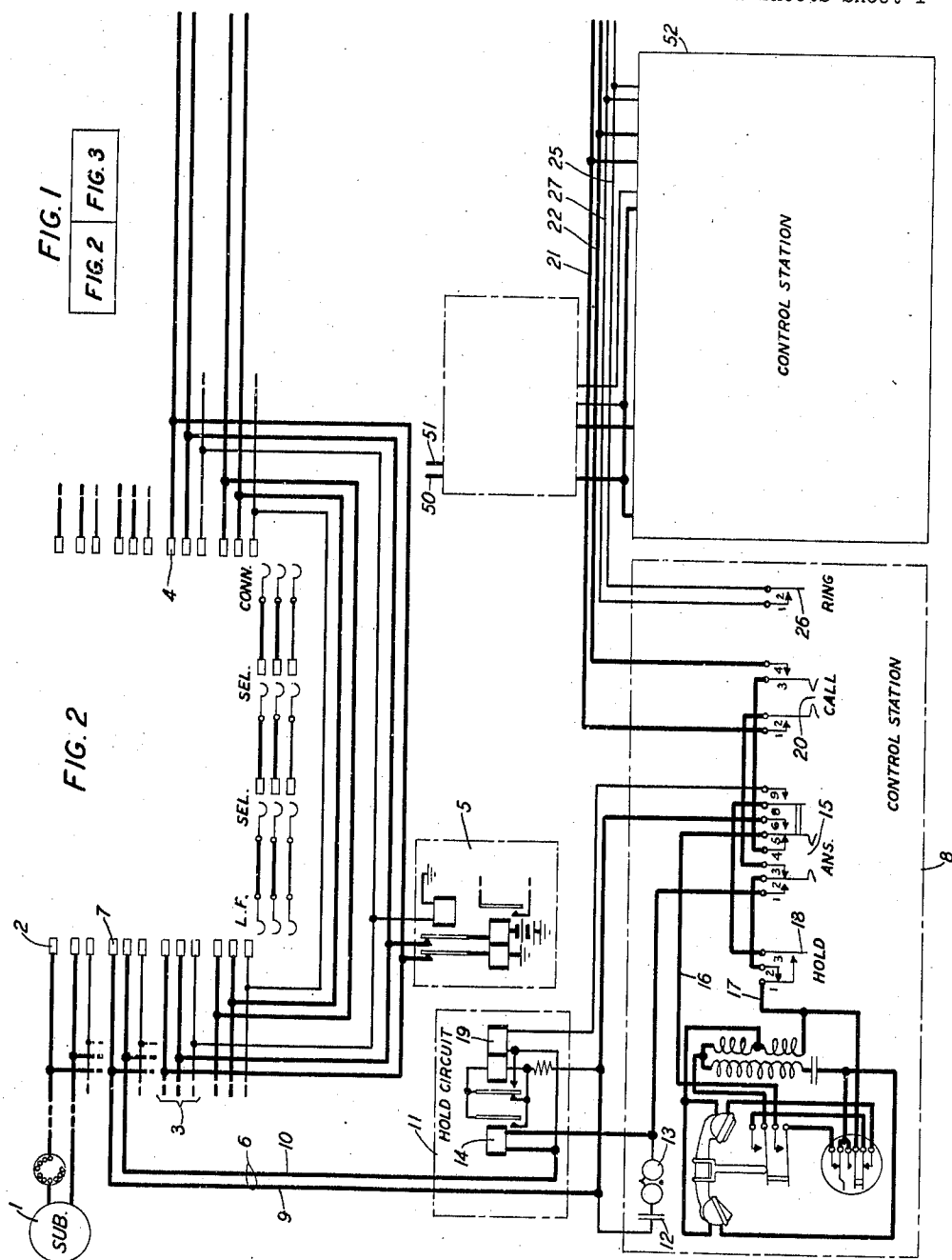
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2,333,140

COMMUNICATION SYSTEM

Filed Jan. 12, 1942

2 Sheets-Sheet 1



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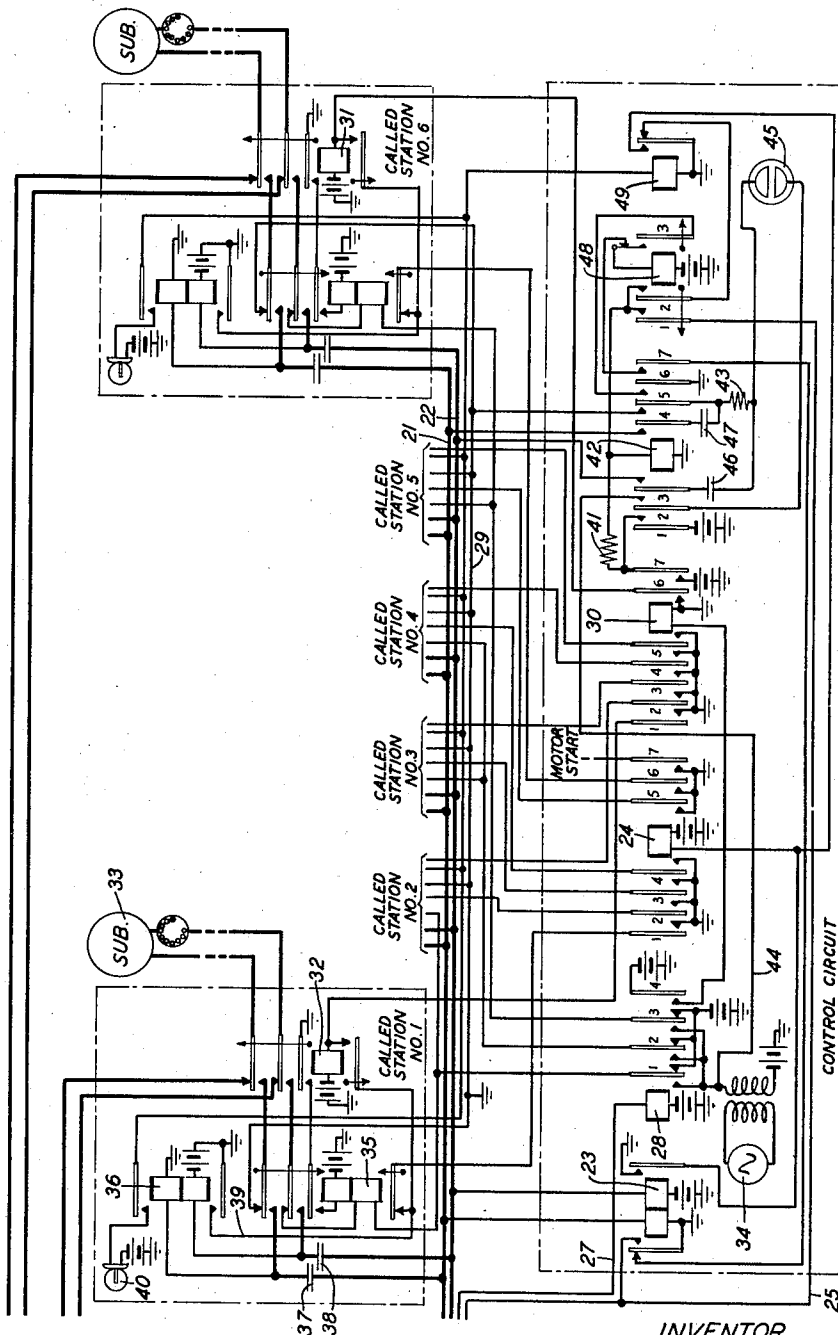
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FIG. 3



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COMMUNICATION SYSTEM

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5 Claims. (Cl. 179-27)

This invention relates to communication systems and particularly to special service telephone systems where facilities for emergency service are provided.

The object of the invention is to provide improvements in emergency conference circuits such, for example, as that shown in Patent 2,270,915 to Abbott et al., issued January 27, 1942. The present invention, like the said prior art system, provides means whereby an operator in charge of some organization, who wishes to communicate instantly with a selected group of subordinates, may establish a conference circuit. Connections are immediately established to the selected substations whether or not they are at the time engaged in some other connection. In case such substations are busy the established connections thereto are broken and they are forcibly connected to the said conference circuit. In case such substations are idle, they will be immediately called. The operator in charge has before him a signal for each such station which will indicate whether or not such station has answered the conference call and is at the time connected effectively to the conference circuit.

In accordance with the present invention a new feature is added to such a system. The operator in charge may wish to prevent the start of the conversations among the conferees until such time as he deems proper. Accordingly a warning tone is placed on the conference circuit as a signal for the conferees to remain quiet. When the operator in charge deems the time to start the conference has arrived he may then cause the removal of such tone.

A feature of the invention is means automatically responsive to the initiation of a conference call to superimpose a warning tone on the conference circuit.

Another feature is to hold a warning tone on a conference circuit under control of the operator who has initiated the conference call.

Another feature of the invention is the use of a first relay responsive to the effective connection of any one or more of the stations to the conference circuit, a second relay which locks under control of the first relay in response to the operation of the calling means for summoning the stations associated with the conference circuit and which connects a source of warning tone to the conference circuit and a third relay which locks under control of the first relay in response to a momentary interruption of the line circuit to the controlling station and which acts

to disconnect the said source of warning tone from the conference circuit.

The drawings consist of two sheets of circuit diagram which when placed together as indicated in Fig. 1 will comprise a complete circuit diagram illustrating the invention.

In the upper part of Fig. 2 there is indicated schematically an automatic telephone system. A subscriber's line 1, for instance, is connected to a set of line finder contacts 2. The line 3 shows how each of the lines of this system is provided with a multiple connection to connector contacts 4. Each line in the same manner is provided with a line and cut-off relay combination which performs the usual functions in a system of this kind. In this showing a line 6 terminating in the line finder contacts 7 extends to a station generally designated 8. The tip and ring conductors of this line numbered 9 and 10, pass through a holding circuit 11 and then into the station circuit 8. In the same manner that line 3 is multiplied to its connector contacts, the line 6 will appear in such connector multiple so that this line may call or be called.

On an incoming call ringing current will be connected to the tip and ring conductors 9 and 10 and will pass through a condenser 12 and ringer 13 and through the winding of relay 14 in the holding circuit. The attendant at this control station will answer the summons of this ringer by operating the answering key 15 whereupon the tip and ring conductors are connected through the contacts of such answering key and the telephone substation circuit connected to conductors 16 and 17.

If the subscriber at this station wishes to hold a call while he is attending to some other business, he operates the holding key 18 which establishes a connection from the tip conductor 9 over conductor 16 thence back over conductor 17 and contacts 1 and 3 of key 18, thence through contacts 8 and 9 of key 15 to the right-hand winding of relay 19 and thence directly to the ring conductor 10. Relay 19 operates and establishes a holding circuit from the tip conductor 9 through the left-hand winding of relay 19, its armature and front contact to the ring conductor 10. There is a mechanical connection between the hold key 18 and the answering key 15 whereby operation of the hold key 18 will release the answering key 15 to its normal position. Therefore the relay 14 is released at the time that relay 19 is locked across the line. When the attendant again wishes to establish connection to this line he operates the answer-

ing key 15 and this by causing the operation of relay 14 will release the holding relay 19 so that the holding circuit is now restored to its normal position.

When an emergency arises, the attendant at the control station 8 will be advised of it by an incoming call which will be answered by operating the answering key 15. Then the attendant will immediately establish a connection to a selected number of other subscriber stations, by operating the call key 20. This will connect his telephone line to the conductors 21 and 22 and talking current will be supplied through the windings of relay 23. Relay 23 will operate and through its right-hand armature and front contacts cause the operation of relay 24. Relay 23 will also place ground on conductor 25 so that if the control station attendant now operates the ringing key 26, ground will be extended back over conductor 27 to cause the operation of relay 28. Through its armature 4 and front contact relay 28 connects battery to the winding of relay 30 thus causing its operation. Relay 30 places ground on a number of conductors each going to the winding of a relay such as 32 in each of the circuits individual to the selected telephone stations which are called on this emergency circuit. Relay 32 in the left-hand called station circuit No. 1 leading to substation 33 will thus be operated and the connection from the substation 33 leading normally through the upper armatures and back contacts of relay 32 to the connector and line finder multiples will be broken. If the subscriber on station 33 is involved in an established connection, this connection will be immediately interrupted. At the same time relay 28 connects battery which is characterized by a super imposed ringing current from the source 34, on to the lower winding of relay 35 thence over the back contact and middle upper armature of relay 35, the front contact and middle upper armature of relay 32 over the loop of the subscriber substation 33, the upper outer armature and front contact of relay 32, the upper outer armature and back contact of relay 35 to ground. The establishment of this circuit causes the operation of relay 35 which thereupon locks through its upper winding, its front contact and inner upper armature of relay 32 to ground. The subscriber at substation 33 is now supplied with talking current through the windings of relay 36 and is connected in a conversational circuit to the calling control substation through the condensers 37 and 38. When relay 36 operates ground is placed on conductor 39 leading to the lower armature of relay 32 so that relay 32 will remain locked under the control of substation 33 even after relay 30 under control of substation 8 is allowed to release.

If the substation 33 is idle, then the current supplied over the front contacts of relay 28 from the source of ringing current 34 will result in the ringing of this substation. When the substation answers relay 35 will respond and thus connect the substation to the conference circuit.

Upon the operation of relay 30 hereinbefore described a circuit is established from battery, front contact and armature 7 of relay 30, resistance 41 and the winding of relay 42. Relay 42 operates and establishes a connection from ground conductor 29 through the front contact and armature 5 of relay 42 to resistance 43. A

connection from the ringing current source is now extended through conductor 44, the front contact and armature 2 of relay 42 to one element of the tube 45. Upon each negative and positive half wave of this ringing current, the tube will break down and cause a current flow through the resistance 43 to ground. Through the condensers 46 and 47 bridged across the resistance 43, a tone caused by the intermittent current flow through resistance 43 and the harmonics of the ringing current source is connected across the conductors 21 and 22 comprising the conference circuit so that the subscriber at each of the substations which has answered will hear this tone and recognize it as a signal that the conference has not started. When the control operator is satisfied by the illumination of the signal lamps such as 40 that either all of the subscribers to the conference circuit or those which he particularly wishes to speak to have answered, he will momentarily depress his receiver hook or momentarily release the call key 20 so that relay 23 releases. Upon the release of this relay, a circuit is established from ground through the left-hand armature and back contact of relay 23, armature 7 and front contact of relay 42, the normal contacts of armature 3 of relay 48, winding of relay 48 to battery. Relay 48 operates and locks through its armature 3 to ground over the front contact and armature 6 of relay 42.

Relay 49 operates over the upper armature and front contact of relay 36 so that this relay is operated whenever any one of the called substations has answered. Relay 49 now assumed to be operated extends ground over its armature and front contact to the winding of the off-normal relay 24 in parallel with the ground supplied by the front contact and right-hand armature of relay 23. Relay 42 will release as soon as relay 23 is operated again since ground will be extended from the left-hand armature and front contact of relay 23 over armature 1 and front contact of relay 48 to short-circuit the winding of relay 42. Upon the release of relay 42, relay 48 releases and thus the tone circuit is disconnected from the conference circuit. Should the control station attendant wish to connect tone to the conference circuit again, he may operate his ringing key 26 whereby the start relay 30 will again be momentarily operated to cause the operation of relay 42 in the manner hereinbefore described.

In case the call is abandoned before the attendant has released the tone and all of the called subscribers with the exception of the control station operator hang up, then relay 49 will be released and will extend ground through its armature and back contact and over the armature 2 and front contact of relay 48 to cause the short circuit and release of relay 42.

In this manner therefore all of the substations which are selected for this service will be called in. It should be noted that in Fig. 3 six called station circuits are shown or indicated but this invention is not limited to this number.

When the conference has terminated each of the substation lines involved will be restored to its normal circuit when the subscriber thereon opens his substation loop and allows the associated talking current feed relay 36 to release. The control substation may be released by replacing the handset on the cradle or by releasing the call key 20. Thereupon relay 23 will be re-

leased causing the return to normal of the off-normal relay 24. Relay 28 of course releases as soon as the ringing key 26 is released. It will thus be understood that the conference circuit may be maintained in any one or more substations and is not completely released until all substations have hung up.

The operator at the control station may ring and rering at will. As each substation answers the call to the conference, its lamp 40 will light up as a signal that that substation is in on the conference connection. If all of the substations do not immediately respond the operator at the control station 8 may rering by operating the ringing key 26. Those stations which have answered will not be affected as the application of ringing current by the relay 28 is ineffective but any station which has not answered will be rung again.

It should be noted that a plurality of control stations may be provided. Thus a control station 52 coming from a line denoted by its tip and ring conductors 50 and 51 may have control over the conductors 21, 22, 25 and 27 in the same manner as control station 8.

What is claimed is:

1. In a communication system, a conference circuit arrangement comprising a controlling station, a conference circuit and a plurality of subordinate stations, means under control of said controlling station for simultaneously calling all of said subordinate stations, and means responsive to said last means for superimposing a warning tone on said conference circuit.

2. In a communication system, a conference circuit arrangement comprising a controlling station, a conference circuit and a plurality of subordinate stations, means under control of said controlling station for simultaneously calling all of said subordinate stations, means responsive to said last means for superimposing a warning tone on said conference circuit, and means at said controlling station for removing said warning tone from said conference circuit.

3. In a communication system, a conference circuit arrangement comprising a controlling sta-

tion having conventional switchhook facilities, a conference circuit and a plurality of subordinate stations, means under control of said controlling station for simultaneously calling all of said subordinate stations, means responsive to said last means for superimposing a warning tone on said conference circuit and means responsive to a momentary switchhook operation at said controlling station for removing said warning tone from said conference circuit.

4. In a communication system, a conference circuit arrangement comprising a controlling station, a conference circuit and a plurality of subordinate stations, a manually operated key at said controlling station for connecting said controlling station to said conference circuit, a manually operated ringing key at said controlling station effective only during the operation of said first key for simultaneously calling all of said subordinate stations, means responsive to said ringing key for superimposing a warning tone on said conference circuit, and means under control of the operator at said controlling station for removing said warning tone from said conference circuit.

5. In a communication system, a conference circuit arrangement comprising a controlling station, a conference circuit and a plurality of subordinate stations, a manually operated key at said controlling station for simultaneously calling all of said subordinate stations, a first relay responsive to the connection of any one or more of said stations to said conference circuit, a source of warning tone, a second relay responsive to the operation of said key and means for locking said second relay in operated position under control of said first relay, means controlled by said second relay for connecting said source of warning tone to said conference circuit, a third relay responsive to momentary interruption of the connection between said controlling station and said conference circuit for disconnecting said source of warning tone from said conference circuit and means for locking said third relay in operated position under control of said first relay.

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