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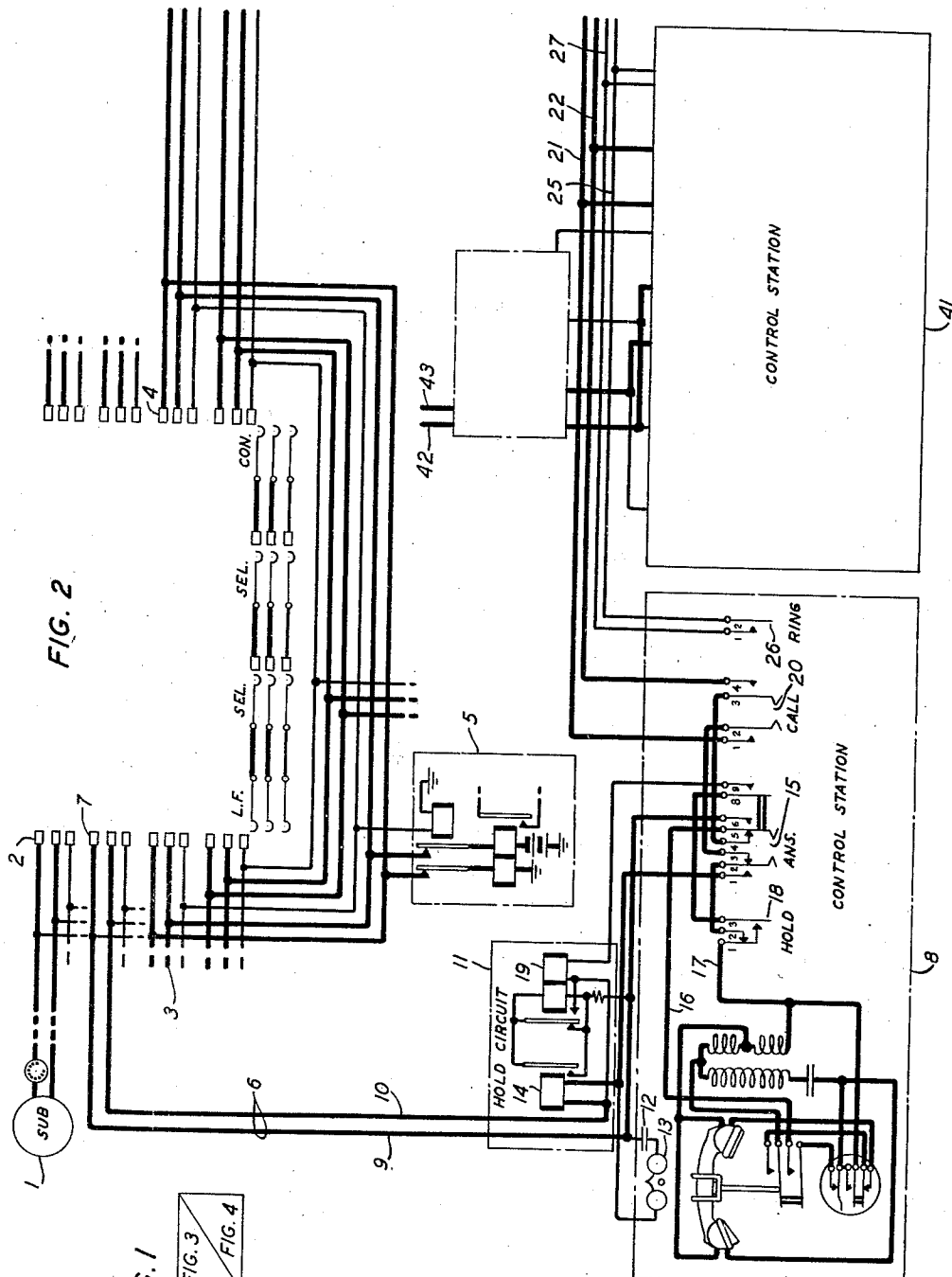
H. H. ABBOTT ET AL

2,270,915

SPECIAL SERVICE COMMUNICATION SYSTEM

Filed Oct. 16, 1940

3 Sheets-Sheet 1



INVENTORS: H. H. ABBOTT
L. J. BOWNE
A. TRADUP

BY *Shumaker*
ATTORNEY

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H. H. ABBOTT ET AL

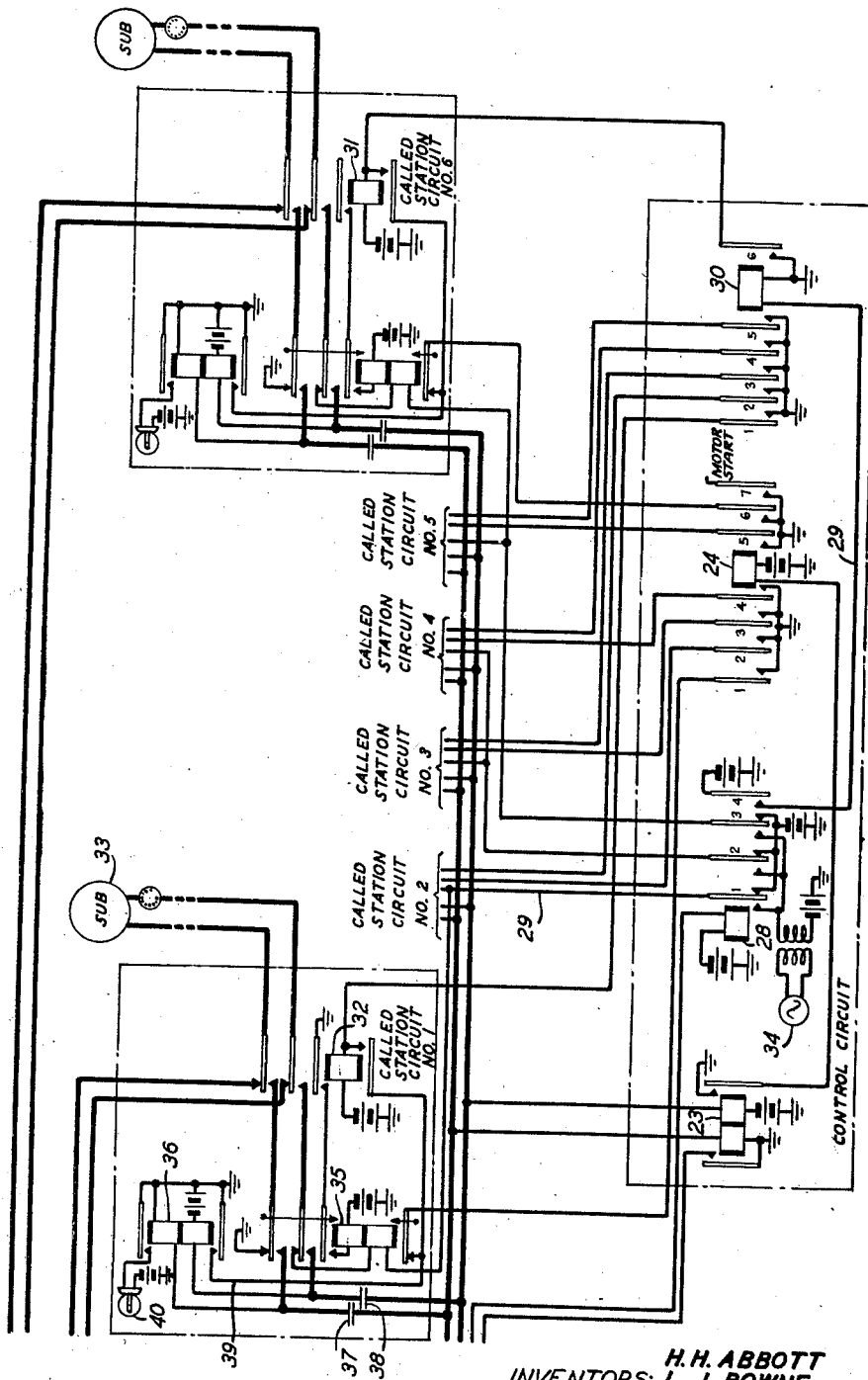
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FIG. 3



H. H. ABBOTT
INVENTORS: L. J. BOWNE
A. TRADUP

BY

John A. Hall

ATTORNEY

Jan. 27, 1942.

H. H. ABBOTT ET AL

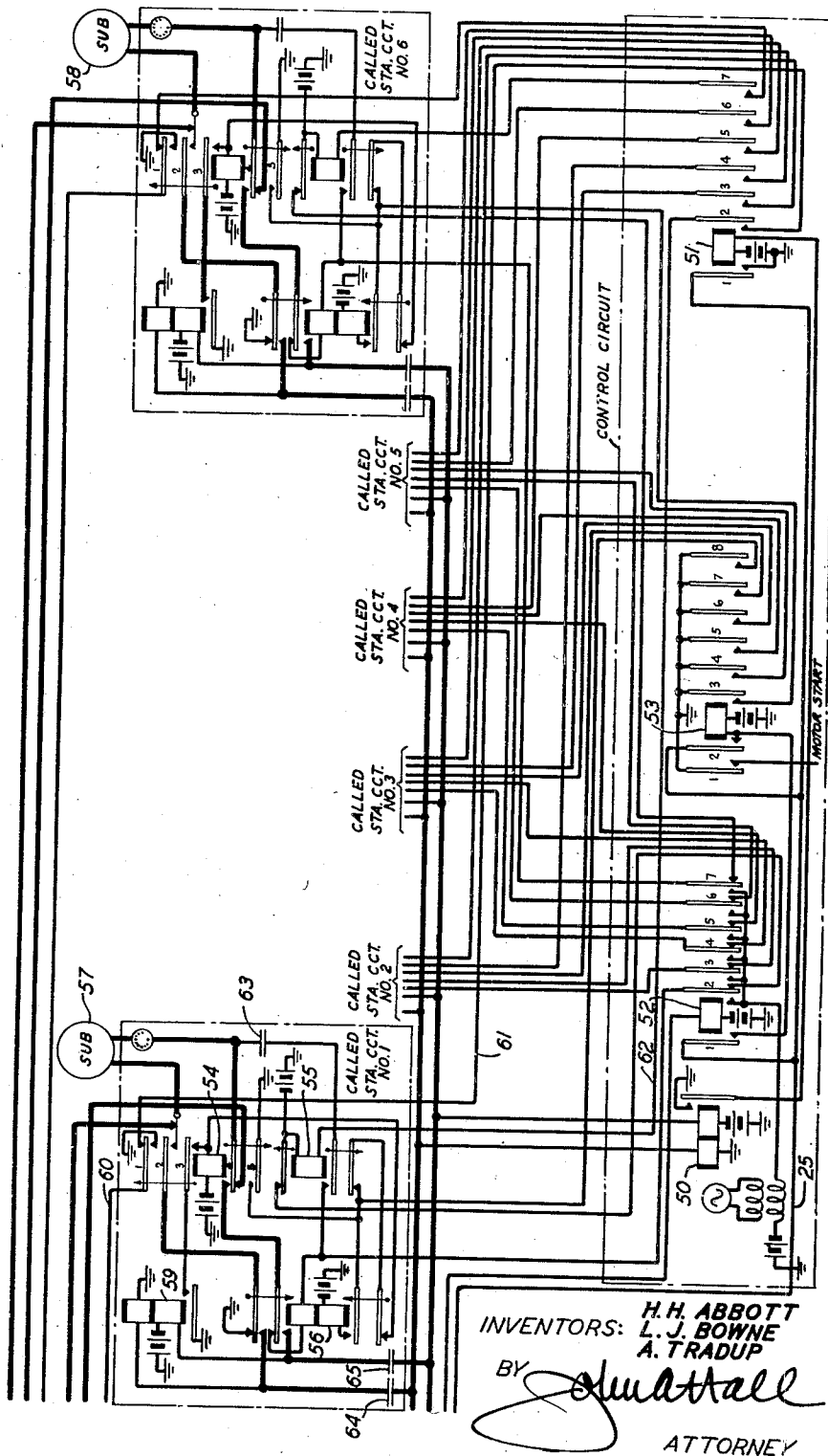
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FIG. 4



INVENTORS: H. H. ABBOTT
L. J. BOWNE
A. TRADUP

BY

John Hall
ATTORNEY

UNITED STATES PATENT OFFICE

2,270,915

SPECIAL SERVICE COMMUNICATION
SYSTEM

Henry H. Abbott, Yonkers, and Langford J. Bowne, Howard Beach, N. Y., and Albert Tradup, West Englewood, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application October 16, 1940, Serial No. 361,376

6 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 1,780,617 to Thomas F. Crocker, issued November 4, 1930. Generally speaking, 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. According to one form of the present invention 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 idle, they will be immediately called and if they are busy their line will be opened and added to the conference connection.

A feature of the present invention is a supervisory signal which indicates to the operator that the associated substation is effectively added to the conference connection. In case a particular substation disconnects from the conference connection this supervisory signal will indicate that fact.

Another feature is a recall means. If one or more of the subordinate substations excludes itself or themselves from the conference circuit, it is only necessary to operate a ringing key to summon them back and this is done without disturbance to the conference circuit.

In accordance with another form of the invention those subordinate substations which are busy are not forcibly added to the conference circuit as in the first form, but are rather given a warning signal whereupon they may break down the local connection in which they are engaged and thereupon add themselves to the common connection. In this form of the invention the recall means are such that if one or more subordinate substations which have been in on the conference connection disconnect, they can be brought back by the control station disconnecting momentarily and then operating the ringing key.

In accordance with another feature of the invention the conference circuit having been once established is held under control of each subordinate substation as well as the controlling substation so that a conference being held over such circuit by a number of subordinates cannot be disturbed by the controlling substation. Thus until every party to a conference has disconnected, a new conference connection cannot be established except that stations may be added to an existing conference connection by the recall means described above.

Another feature is the inclusion in the conference circuit of a battery feeding bridge for the controlling station as well as an individual battery feeding bridge for each of the subordinate stations.

The drawings comprise three sheets of circuit diagrams. Fig. 1 indicates the manner in which these sheets are placed together. When Fig. 2 and Fig. 3 are used, one example of the invention is disclosed and when Figs. 2 and 4 are used together another example of the invention is disclosed.

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, a 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 to the telephone substation circuit connected to conductors 16 and 17.

If the subscriber at this substation wishes to hold the 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. Relay 14 is released at this time since the subscriber has taken his telephone set off the line. When the holding key 18 is restored to its normal position and the telephone set again bridged across the line, relay 14 operates and this causes the left-hand winding of relay 19 to

be short-circuited so that the holding circuit is now restored to the 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. 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 operator now operates the ringing key 26, ground will be extended back over conductor 27 to cause the operation of relay 28. Through its outermost armature and front contact, relay 28 connects battery to conductor 29 causing the operation of relay 30. Relay 30 places ground on a number of conductors each going to the winding of a relay such as 31 in each of the circuits individual to the selected telephone stations which are to be 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 the superposition of a ringing current from the source 34, on to the lower winding of relay 35 and 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 the control substation 8 is allowed to release.

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

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 substations involved will be restored to their normal circuits when they open their substation loops and allow their associated talking current feed relay 36 to release. The control substation

may release by replacing the handset on the cradle or by releasing the call key 20. Thereupon relay 23 will be released 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 noted that the conference circuit may be maintained by 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 41 coming from a line denoted by its tip and ring conductors 42 and 43 may have control over the conductors 21, 22, 27 and 25 in the same manner as control station 8.

When the arrangement shown in Fig. 4 is used, practically the same operation takes place. The operation of the call key 20 will cause the operation of talking battery supply relay 50 whereupon ground is extended to the winding of off-normal relay 51 and this relay supplies ground to the conductor 25. When the ringing key 26 is operated, ground is extended over conductor 27 to cause the operation of relay 52. Relay 52 through its left-hand contacts extends the ground on conductor 25 to the winding of relay 53 whereupon ground is extended through the armatures of this relay to windings of such relay as 54. This circuit may be traced from ground, armature 8 and front contact of relay 53, the back contact and outer lower armature of relay 55, the lower outer armature and back contact of relay 56, the winding of relay 54 to battery and ground. At all substations such as 57 which are idle, the relay 54 will be operated and the substation 57 will be disconnected from its connector and line-finder multiples and connected instead to the upper armatures of relay 56. When relay 52 is operated by the ringing key 26, a ringing current connection will be extended through the upper winding of relay 56 over the line to subscriber substation 57 and back to ground. The bell at this subscriber substation will ring as long as the control station attendant presses the key 26. When the subscriber answers, relay 56 will respond and lock through its lower winding to the ground supplied by the relay 53 and talking battery for the substation 57 will be supplied over the windings of relay 59.

If the substation 57 is busy, ground will appear on the sleeve lead 60 and this will be extended over the upper outer armature and back contact of relay 54, conductor 61, the front contact and innermost right-hand contact of relay 51, conductor 62, winding of relay 55 to battery. Relay 55 will hold the circuit of relay 54 open so that the substation 57 will not be disturbed in its normal use. The connection of ringing current to the upper winding of relay 56 will be bypassed through the front contact and inner lower armature of relay 55 and thence over condenser 63 to act as a warning tone to the subscriber on this substation that he is wanted on a con-

ference connection. This warning tone will last as long as the ringing key 26 is operated and relay 53 is consequently operated. If the subscriber at substation 57 deems his present connection to be more important, he may not respond to the warning signal but of course will be warned each time the ringing key 26 is depressed. If, however, the subscriber at this substation deems it necessary to answer this warning signal, he will excuse himself to the subscriber with whom he is in conversation and break down the connection in which he is involved by merely hanging up. Thereupon ground will be removed from sleeve conductor 60 and the relay 55 will be allowed to release. The substation circuit will, therefore, revert to the condition of an idle circuit and the subscriber at substation 57 may attach himself to the conference circuit by responding in the normal manner whereupon relay 54 will operate followed by the operation of relay 56 and lastly by the operation of relay 59. With relay 59 operated, relay 54 is locked to its operative position and ground is supplied over the sleeve lead 60 to mark this line as busy. Talking current between the substation 57 and other substations on the conference circuit will traverse condensers 64 and 65.

In this case, the conference circuit may be held by any one or more of the subscribers who have come in on the circuit so that even though the main topic of conversation has been exhausted between the attendant at the control substation and those he has summoned, two or more of the summoned parties may still maintain the connection for their own benefit. Should the attendant at the control station abandon the conference by restoring his call key 20, the relay 53 would be returned to normal and the holding grounds for the ringing trip relay such as 56 would be opened. The individual subscriber, however, has control of this relay through a circuit from ground, the armature 5 and front contact of relay 54, to the lead to the lower locking winding of relay 56.

Any of the substations in Fig. 4 which have abandoned the conference may be recalled by having the attendant at the control station restore his call key 20 for an instant so as to restore the control relays to normal leaving the conference connection in the state of being held by the one or more remaining stations. Thereupon the call key 20 is reoperated and the ringing key 26 is used to call in those stations whose relays corresponding to 54 and 56 have returned to normal.

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 under control of all said stations for holding said conference circuit until every one of said stations has released.

2. In a communication system, a conference circuit arrangement comprising a conference circuit, a controlling station and a plurality of subordinate stations, means under control of said controlling station for simultaneously calling all of said subordinate stations, a supervisory signal for each said subordinate station responsive to

the effective connection of said station to said conference circuit and means under control of all of said stations for holding said conference circuit until every one of said stations has released.

3. In a communication system, a conference circuit arrangement comprising a conference circuit, a controlling station and a plurality of subordinate stations, means under control of said controlling station for immediately connecting the lines of all busy subordinate stations to said conference circuit and for calling all idle subordinate stations, a supervisory signal for each said subordinate station responsive to the busy condition of said station while connected to said conference circuit and means under control of all of said stations for holding said conference circuit until every one of said stations has released.

4. In a communication system, a conference circuit arrangement comprising a conference circuit, a controlling station and a plurality of subordinate stations, means under control of said controlling station for simultaneously calling all of said subordinate stations, a supervisory signal for each of said subordinate stations responsive to the busy condition of its associated station when connected to said conference circuit, means under control of all of said stations for holding said conference circuit until every one of said stations has released, means under control of each of said subordinate stations for disconnecting from said conference circuit and for setting up independent connections and means under control of said controlling station for recalling all disconnected subordinate stations.

5. In a communication system, a conference circuit arrangement comprising a conference circuit, a controlling station and a plurality of subordinate stations, means under control of said controlling station for simultaneously calling all of said subordinate stations, a supervisory signal for each of said subordinate stations responsive to the busy condition of its associated station when connected to said conference circuit, means under control of all of said stations for holding said conference circuit until every one of said stations has released, means under control of each of said subordinate stations for disconnecting from said conference circuit and for setting up independent connections and means under control of said controlling station for recalling all disconnected subordinate stations regardless of whether independent connections have been established.

6. In a communication system, a conference circuit arrangement comprising a conference circuit, a controlling station and a plurality of subordinate stations, means under control of said controlling station for simultaneously signaling all said subordinate stations, means responsive to the answer of an idle subordinate station for connecting such answering station to said conference circuit, and means responsive to the release of an already established connection and the subsequent answer of a busy subordinate station for connecting such station to said conference circuit.

HENRY H. ABBOTT.
LANGFORD J. BOWNE.
ALBERT TRADUP.