Sept. 19, 1944. C. S. RHOADS 2,358,594

TELEPHONE BROADCAST SYSTEM

Filed July 28, 1943 2 Sheets-Sheet 1

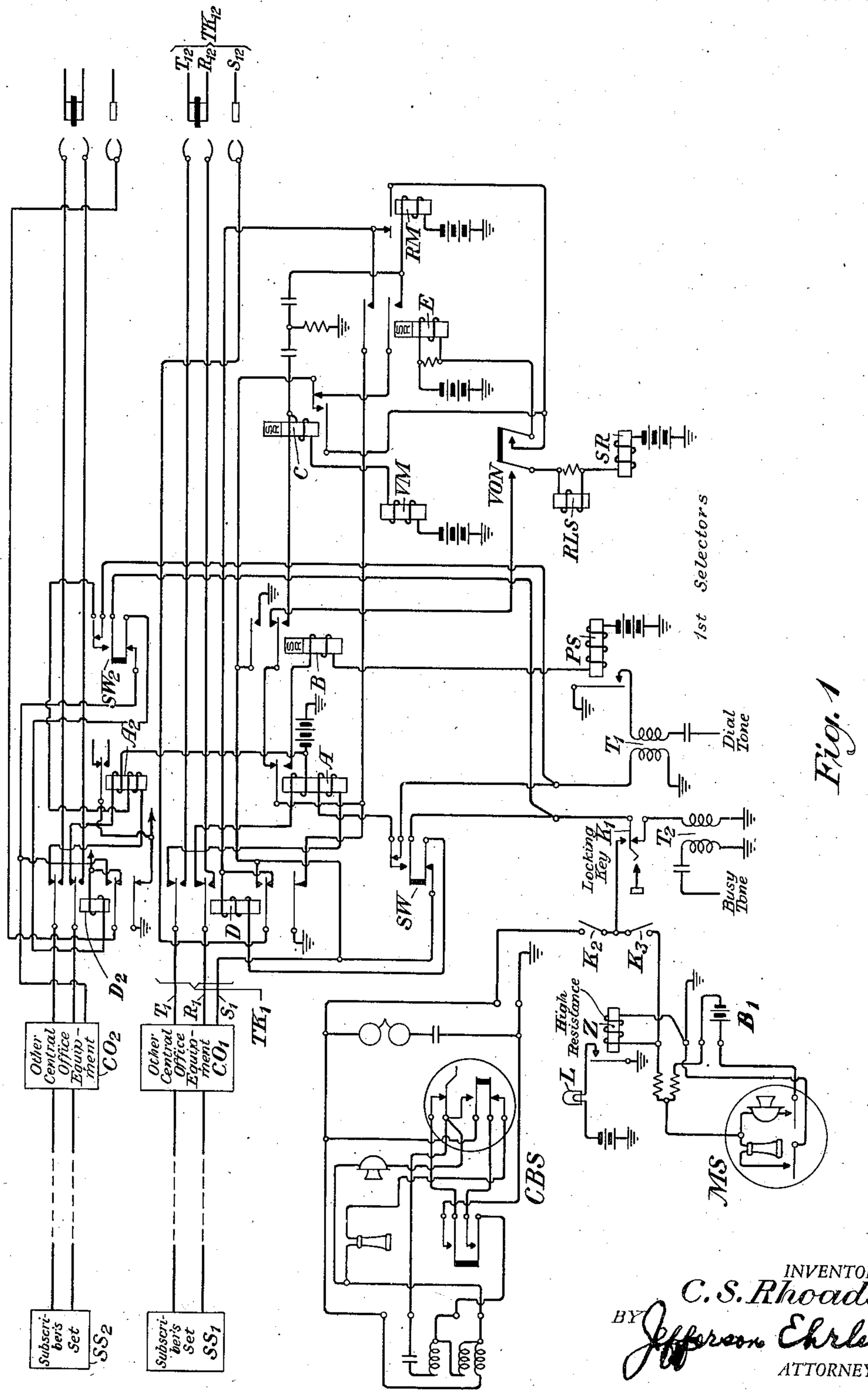

Fig. 1

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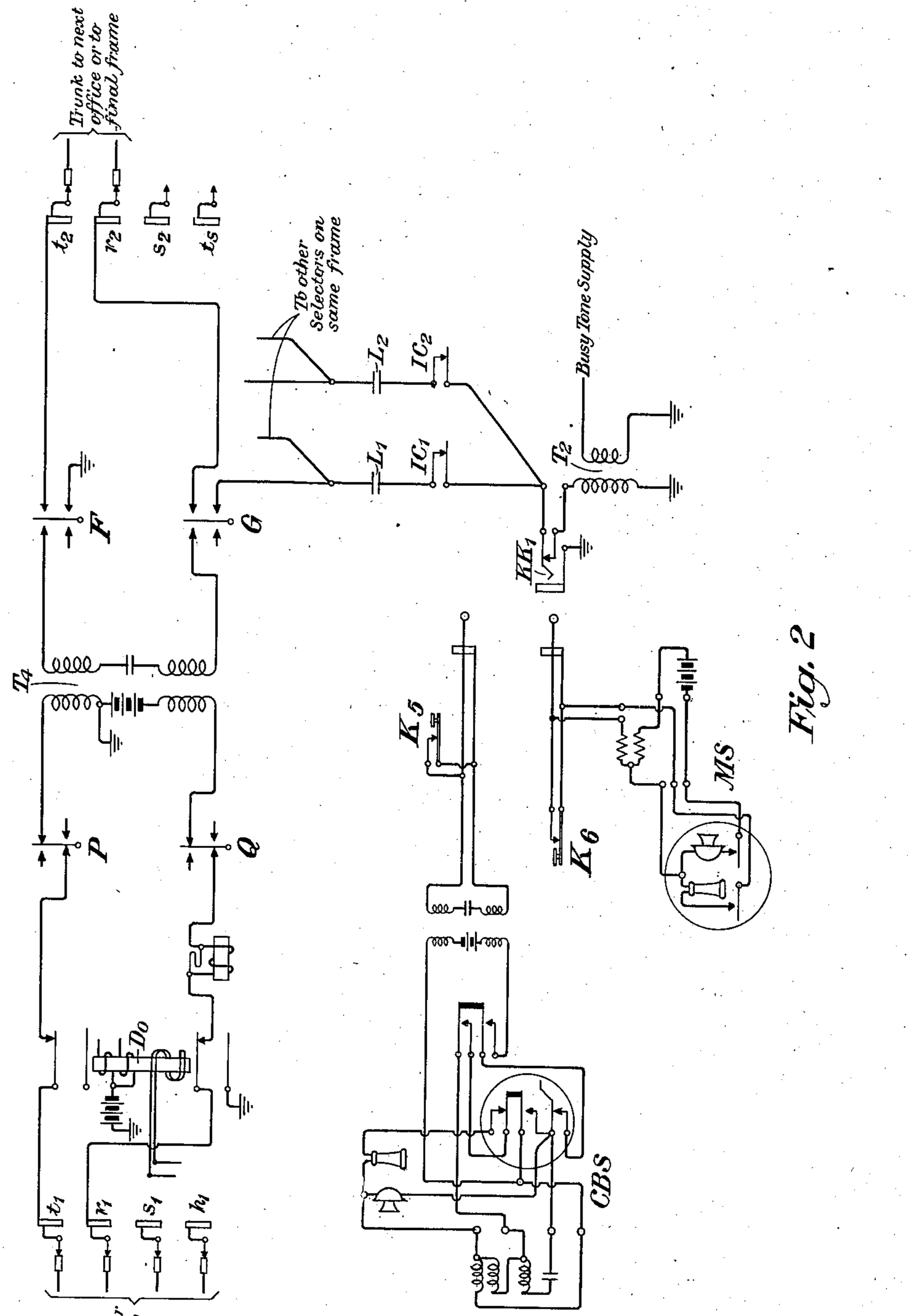

Fig. 2

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TELEPHONE BROADCAST SYSTEM

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5 Claims. (Cl. 179—27)

This invention relates to telephone systems and more particularly to telephone systems of the machine switching type.

In step-by-step telephone systems, or panel telephone systems, for example, it may happen that one or more central offices or one or more groups of trunks have been disabled because of an accident or a condition due to war. Numerous parties may seek to establish connections over the group or groups of trunks or to the disabled office or offices but may find that their connections cannot be completed. Under such conditions the calling parties may continually dial the desired parties and seek to establish connections through the disabled central offices or groups of trunks and this will result in considerable traffic overload and block calls that could be completed. It is proposed, therefore, to provide at a central office or central offices not disabled but connected to the disabled central office or offices, or to the group or groups of trunks, an arrangement whereby the parties endeavoring to reach the disabled office may be notified that their connections cannot be completed.

Accordingly, it is an object of this invention to provide an arrangement for connecting a telephone transmitter at a central office to broadcast to all of the parties calling a particular office or seeking connection with a particular group of trunks to enable an attendant either to notify all of these calling parties that their connections cannot be completed, or to give them other information.

Another object of this invention is to enable an attendant at a central office to be apprized of the fact that one or more parties are calling a particular office or seeking connection of any one of a group of trunks and to enable the attendant to talk to the various calling parties at one time.

The object of this invention may be accomplished by substituting a telephone set for the busy tone generator at the eleventh step switch of a step-by-step telephone system. When this conversion is made the telephone set may be used for supplying information to all of the parties connected to all of the first selectors advanced to the eleventh step at the central office. In that case the busy tone will not be furnished to the calling parties when they dial a particular office or a particular group of trunks, but instead the calling parties will be connected to the telephone set and the attendant may then talk to the calling parties at the same time and apprize them of the conditions of transmission or give them other information. A similar arrangement may be applied to panel and other types of telephone systems.

This invention will be better understood from the more detailed description hereinafter following, when read in connection with the accompanying drawings in which Figure 1 illustrates the invention applied to a step-by-step telephone system and Fig. 2 illustrates the invention applied to a panel type of telephone system.

Referring to Fig. 1 of the drawings, two of a plurality of first selectors of a step-by-step telephone system are shown, each of which may be used for connecting a subscriber's set such as SS_1 to a succeeding selector. One of these first selectors is shown in detail and it is connected by three conductors T_1, R_1 and S_1 of a trunk TK_1 to other central office equipment CO_1. This selector will be used to establish a connection between the trunk TK_1 and any one of a number of other trunks such as TK_{12} which comprises conductors T_{12}, R_{12} and S_{12}. This first selector may include a Strowger switch, which, as is well known, has a vertical magnet VM, a release magnet RLS and off normal contacts VON. This switch may be employed to connect the trunk conductors T_1, R_1 and S_1 associated with trunk TK_1 to any one of ten other trunks such as TK_{12} in a group of trunks, as is well known. The eleventh step switch SW may be employed to apply dial tone to the calling subscriber's set such as SS_1 through the normal upper contacts of the switch SW. The lower normal contacts of the switch SW may be employed for applying busy tone to the calling subscriber's set SS_1 after all of the ten trunks at a particular level have been tested by the Strowger switch mechanism and found busy.

When the calling party having the telephone set SS_1, for example, removes his receiver from its hook, the relay A will become operated over a circuit which includes battery, the upper winding of relay A, the inner upper armature and back contact of relay D, the conductor R_1 of trunk TK_1, the subscriber's set SS_1, the conductor T_1 of the trunk TK_1, the upper outer armature and back contact of relay D, the lower winding of relay A, the upper normal contacts of switch SW, the primary winding of dial tone transformer T_1 and ground. The closure of this circuit serves to supply dial tone to the calling subscriber and upon hearing the dial tone he may then proceed to dial the digits of any desired number. The operation of relay A will result in the operation of relay B over a circuit which includes battery, the winding of the relay PS, the winding of relay B, the

armature and make contact of relay A, the lower outer armature and back contact of relay D and ground. The operation of both relays A and B prepares a circuit for operating the vertical magnet VM of the Strowger switch, as will be explained. Relay B also connects ground at its upper armature to the sleeve conductor S_1 to hold the preceding circuits and to partially close the path for operating relay C and the vertical magnet VM.

The first digit dialed by the calling party will result in a series of interruptions in the flow of current over the circuit to the windings of relay A. The first such interruption in releasing relay A will cause the winding of relay C and the winding of the vertical magnet VM to become energized, the operating circuit including battery, the windings of the vertical magnet VM and relay C, the lower armature and make contact of relay B, the armature and back contact of relay A, the lower outer armature and back contact of relay D and ground. The operation of the vertical magnet VM raises the wiper shaft of the Strowger switch by one level, as is well understood. Each subsequent interruption of the circuit between the windings of relay A and the subscriber's dial set in response to the digit dialed by the calling party will result in raising the wiper shaft of the Strowger switch one additional level.

Immediately after the first movement of the wiper shaft of the Strowger switch, the off normal switch VON will close its contacts and cause relay E to operate. The operating circuit for relay E includes battery, the winding of relay E, the right contacts of the switch VON, the armature and make contact of relay C, the upper armature and make contact of relay B and ground. Relay E will then be locked in its operative position, the locking circuit including battery, the winding of relay E, the right contacts of the switch VON, the armature and back contact of the release magnet RM, the outer armature and make contact of relay E, the lower outer armature and back contact of relay D and ground. Relay C will release soon after the last interruption of the pulses of the first digit dialed by the calling subscriber. The release of relay C will complete a circuit for the operation of the rotary magnet RM, the circuit now completed including battery, the winding of the magnet RM, the inner armature and make contact of relay E, the make-before-break contacts of relay C, the upper armature and make contact of relay B and ground. The operation of the rotary magnet RM will rotate the wipers of the Strowger switch to the first set of bank contacts, as is well understood. At the same time the operation of the rotary magnet RM will break the locking circuit of relay E at the back contact of the armature of the magnet RM.

The relay E will operate if the sleeve conductor of the first set of bank contacts is grounded as it would be if the associated trunk were busy, and on the other hand relay E will release if the sleeve conductor of that trunk is ungrounded as it would be if that trunk were idle. The relay D will likewise operate or remain unoperated, depending upon whether the sleeve conductor of the trunk of the first set of bank contacts is found grounded or ungrounded. If one of the trunks such as TK_{12} of the group is idle and its sleeve conductor S_{12} therefore ungrounded, the sleeve conductor S_{12} of that trunk will be connected to the grounded sleeve conductor S_1 through the lower inner armature and make contact of relay D upon the operation of relay D. The circuit for operating relay D includes battery, the winding of relay E, the right contacts of the switch VON, the armature and back contact of release magnet RM, the winding of relay D, the lower normal contacts of switch SW, and upper outer armature and make contact of relay B and ground. Although the windings of relays D and E are connected in series with each other in this circuit the resistance of the winding of relay D is so high that it will prevent relay E from operating at the same time.

When relay D operates, the tip conductor T_1 of trunk TK_1 will be connected through its upper outer armature and make contact to the tip conductor T_{12} of the trunk TK_{12}, the ring conductor R_1 of trunk TK_1 will be connected through the upper inner armature and make contact of relay D to the ring conductor R_{12} of the trunk RK_{12}, and the sleeve S_1 will be connected with the sleeve S_{12} as already noted so that both will be grounded. If the trunk, such as TK_{12}, has been found busy by the Strowger switch, ground at its sleeve conductor S_{12} would have been connected to the upper terminal of the winding of relay D through the lower inner armature and back contact of relay D. In that case both terminals of the winding of relay D would be grounded and hence relay D would remain unoperated. Nevertheless, relay E would be operated to cause the rotary magnet RM to step the wipers to the next set of trunk contacts. This rotary movement will be continued until a sleeve conductor of one of the various trunks on the same level is found ungrounded.

When all of the ten trunks on the level corresponding to the digit dialed by the subscriber's set SS_1 are busy, the eleventh step switch SW becomes operated in a well known manner and a trunk signal will be transmitted to the calling subscriber. The trunk busy signal current will flow over a circuit which includes the secondary winding of transformer T_2, the normal contacts of key K_1, the upper make contacts of switch SW, the lower winding of relay A, the upper outer armature and back contact of relay D, the telephone subscriber's set SS_1, the upper inner armature and back contact of relay D, the upper winding of relay A, battery and ground. This is the normal circuit for trunk busy tone but as will be explained hereinafter, a telephone set may be substituted for the source of busy tone to enable an attendant to broadcast to the calling subscriber having the set SS_1 and to other calling subscribers connected to the various selectors at the office that have advanced to the eleventh step of the switch.

The release magnet RLS will be operated after the call has been completed and the subscriber has returned his receiver to its switch-hook and relay D has restored to normal. The operation of the release magnet RLS is brought about by the completion of a circuit from battery, the winding of supervisory relay SR, the release magnet RLS, the left contacts of the switch VON, the lower armature and back contact of relay B, the armature and back contact of relay A, the lower outer armature and back contact of relay D and ground. It is noted that relays A and B become released immediately after relay D is operated and remain released thereafter to enable the release magnet RLS to operate.

Whenever all of the trunks on the level of trunk TK_{12} are disabled and the sleeve conductors of these trunks of that level have been grounded so that they will appear to be busy, all parties calling

that group of trunks will of course find them busy. But in accordance with this invention, the attendant may operate the key K_1 so that she may connect a telephone set in place of the busy tone source, for the purposes already referred to hereinabove. If the telephone system is of the common battery type, the attendant may also close her key K_2 and thereby connect a common battery set CBS through keys K_2 and K_1 to the upper contacts of switches SW, SW_1, SW_2, etc. and the windings of relays A, A_1, A_2, etc. The circuits will be substantially the same as already described hereinabove for the return of busy tone to the calling subscribers. However, other telephone sets such as SS_2 connected to first selectors similar to the one already described will also be connected to the same common battery set CBS. In that case the telephone set CBS may be used by the attendant for notifying all of these calling subscribers simultaneously that all of the trunks of the desired level are busy, or that the office called by these parties is disabled, or the attendant may furnish them other information of importance to them. This is one of the features of the invention. The battery connected to the upper winding of relay A may in that case supply current to the windings of all of the various A relays of the other first selectors in parallel. With this arrangement a substantial increase in the number of subscribers' sets connected in parallel with the common battery set CBS will increase the current flow through the transmitter of the common battery set which will compensate for the added load of the listeners and permit the attendant to speak to the various calling parties at the same time, the transmission level remaining high under these conditions. This feature has already been tried out in the plant and all of the parties were found capable of receiving the attendant's message at a good transmission level, and it is not possible for one calling subscriber to talk to another when connected to this circuit.

A magneto set such as MS may be connected to the switches SW, SW_1, SW_2, etc., and to the windings of relays A, A_1, A_2, etc. by operating the keys K_3 and K_1, instead of a common battery set. This is a matter of availability of sets. This will insert the magneto set MS in place of the busy tone source in substantially the same manner as already discussed with respect to the common battery set CBS. In this case the local battery B_1 of the magneto set will supply the current for the operator's set MS and this set will not depend upon the supply of current from the battery connected to the A relay.

It will be noted that the closure of keys K_1 and K_3 will connect the winding of relay Z in series with the upper contacts of switch SW and the windings of relay A which extend to the calling subscriber's set. Relay Z will be operated immediately after any one of the various eleventh step switches such as SW becomes operated. The relay Z will then illuminate the lamp L and provide an indication to the attendant that she has been connected to a party dialing one of the trunks of the level which may be in trouble. The attendant in observing the signal will then notify the calling party or the several calling parties connected to the telephone set of the conditions of transmission. This is another feature of the invention. The magneto set arrangement MS permits the attendant to wait until her lamp L has been illuminated before she begins to broadcast to the various calling parties.

It will be understood that although the circuit of Fig. 1 has been shown connected either to a common battery set CBS or to a magneto set MS, both of these sets will not be connected simultaneously in any particular installation. One or the other will be used depending on the availability of the sets, as already noted. Both are shown in Fig. 1 merely to illustrate the possible alternatives available for practicing the invention.

Although the arrangement of Fig. 1 illustrates that the broadcasting system of this invention may be operated when the switch has been advanced to the eleventh step, the invention is equally applicable to second selectors, for example, that have been advanced to a corresponding position. Furthermore, the common battery set CBS may include indicating means, such as relay Z and lamp L, or any other means, to apprize the attendant that a calling party has been connected to the eleventh step.

Fig. 2 shows the arrangement of this invention applied to a panel type of telephone system. The tip, ring, sleeve and hunt conductors T_1, R_1, S_1 and H_1, respectively, at the left connect to the selector on the district frame shown in the drawings. The tip and ring conductors T_1 and R_1 are connected through elements P and Q respectively of a sequence switch, then through a repeating coil or transformer T_4 and through elements F and G on the sequence switch to the tip and ring conductors T_2 and R_2 which are part of a trunk extending to the next office or to the final frame. The contact G is connected to one of the windings of a busy tone transformer T_2 over a circuit which includes condenser L_1, interrupter contacts IC_1, jack contacts KK_1, and the grounded secondary winding of transformer T_2. The upper terminal of the jack contacts KK_1 may lead to other interrupters such as IC_2 on other frames in the office. These interrupters should be blocked in the operated position when it is desired to broadcast to the calling parties.

It will be apparent from the drawings that the various calling parties' sets will be connected in common to the overflow circuit of the selector. The common battery set CBS or the magneto set MS may be plugged into the jack KK_1 to permit the operator to broadcast to the calling parties simultaneously, only one telephone set being used for this purpose, as already pointed out in regard to Fig. 1. The key K_5 connected to the set CBS will prevent the calling parties from talking with each other when they are simultaneously connected to the overflow circuit. The operator, however, will push key K_5 to broadcast to the connected parties. Key K_6 associated with magneto set MS will serve a similar purpose.

While this invention has been shown in certain particular arrangements merely for illustrative purposes, it will be understood that the general principles of 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. In a telephone system, the combination of a plurality of selectors, each selector having a switch which becomes operated when the selector is connected to a busy or grounded trunk, a plurality of subscribers' dial sets, means for individually connecting each of said subscribers' sets to each of said selectors, and means including a telephone transmitter for broadcasting over par-

allel paths extending through the operated switches of said selectors to all of the subscribers' sets simultaneously.

2. In a telephone system, the combination of a plurality of selectors, a plurality of subscribers' dial sets each of which may be connected to one of said selectors, a plurality of switches each of which is associated with one of said selectors, means responsive to the dialing by said subscribers' sets of predetermined numbers for operating said switches at said selectors, a telephone set associated with and common to all of said selectors, means for connecting said telephone set to said subscribers' sets over parallel paths extending through the operated switches of said selectors, and means for broadcasting from said telephone set to all subscribers' sets that have dialed said predetermined numbers.

3. A claim according to claim 2 including, in addition, means for indicating the operation of any of the switches associated with said selectors.

4. In a telephone system, the combination of a plurality of selectors each having an eleventh step switch which becomes operated when the selector is connected to a busy or grounded trunk, a plurality of subscribers' dial sets each of which may be connected to one of said selectors, a telephone set, and means for connecting said telephone set through all of the operated switches to enable an attendant to broadcast simultaneously to all subscribers' sets.

5. In a telephone system, the combination of a plurality of selectors, each selector having a switch which becomes operated when the selector is connected to a busy or grounded trunk, a plurality of telephone dial sets each of which may be connected to one of said selectors, a telephone transmitter, means for indicating the operation of one or more of said switches, and means to broadcast from said telephone transmitter through the operated switches to all subscribers connected to selectors having operated switches.

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