

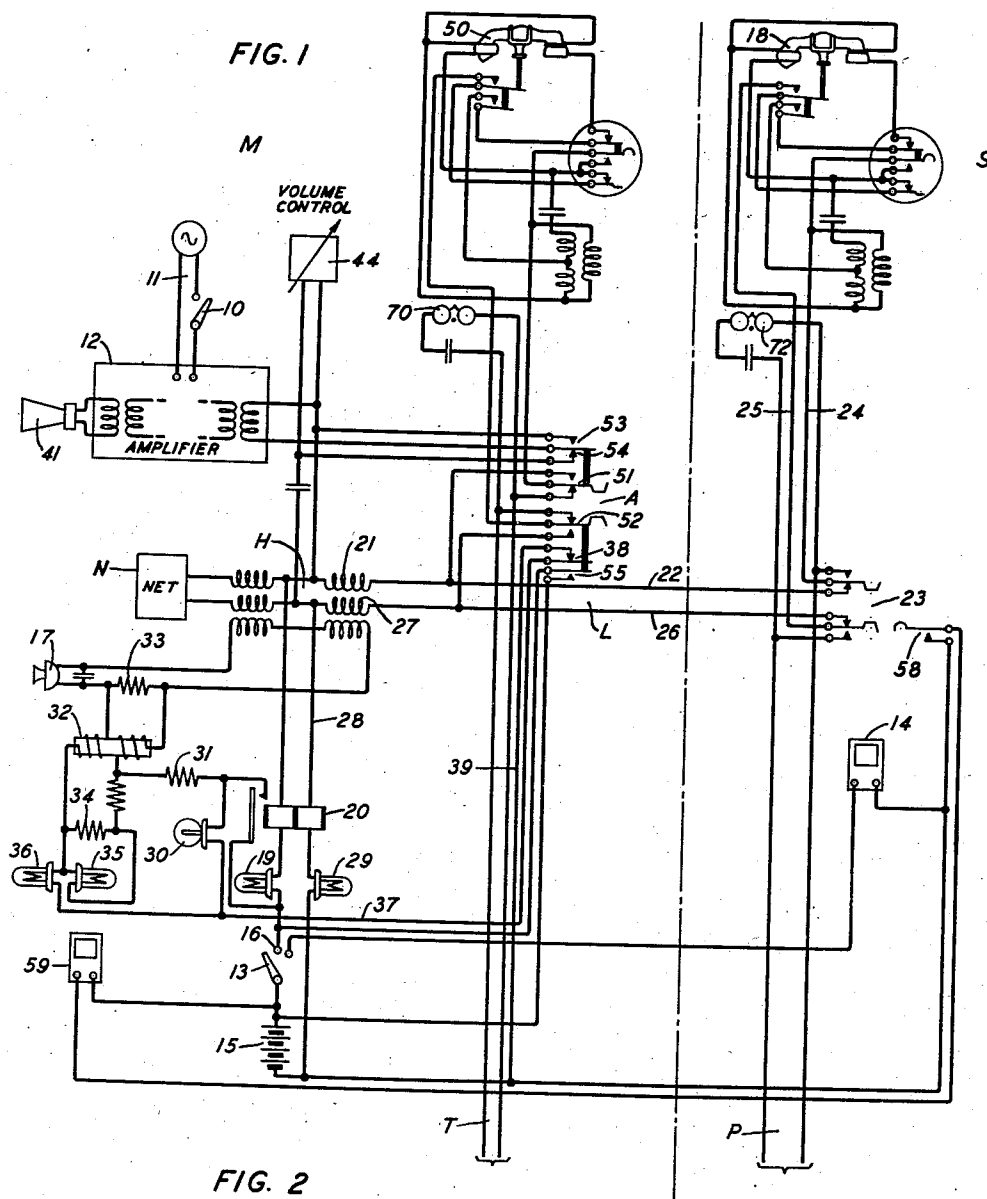
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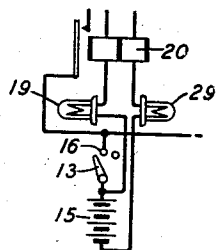
2,206,385

TELEPHONE SYSTEM

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**FIG. 2**



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## UNITED STATES PATENT OFFICE

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## TELEPHONE SYSTEM

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11 Claims. (Cl. 179—1)

This invention relates to telephone systems and particularly to intercommunicating telephone and signal systems of the type in which loud-speakers and distant talking transmitters are employed at one or more of the substations.

It is the object of this invention to provide an improved system of intercommunication between a master station equipped with a loud-speaker and a distant talking transmitter and a subordinate station equipped with a standard hand telephone set.

This object is attained in accordance with a feature of the invention by the provision of switching means at a master station which functions to disconnect a regular telephone set from a central office line and connect it to an intercommunicating line and simultaneously disconnect a loud-speaker set from the intercommunicating line whereby the regular telephone equipment at the master station may be employed for intercommunication with a subordinate station independent of the loud-speaker equipment usually employed for such purpose.

Another feature of the invention resides in the use of a pilot signal at the master station which functions upon the conjoint operation of a switch at the master station and the receiver switch-hook contacts at a subordinate station to indicate to the subscriber at the master station that the subordinate subscriber is connected to the intercommunicating line. This feature precludes the possibility of a subordinate listening in on a conversation being carried on at the master station when the subscriber thereat has inadvertently failed to restore his "talk" switch at the termination of a previous telephone conversation.

These and other features of the invention will be readily understood from the following detailed description made with reference to the accompanying drawing in which;

Fig. 1 illustrates, to the left of the broken line, the loud-speaking telephone equipment, signaling device and regular telephone equipment located at a master station, and to the right of the broken line, the subordinate station telephone equipment; and

Fig. 2 shows an optional wiring arrangement by virtue of which a subscriber at the subordinate station may signal the master station by way of the loud-speaker thereat.

The first descriptive portion will be directed to the origination of a call at the master station M employing the loud-speaking equipment.

The subscriber at the master station M having operated the switch 10 in the amplifier extension

cord 11 to energize the amplifier schematically shown at 12, operates switch 13 which, in practice, is located on the face of the loud-speaker cabinet, to the signaling position, which is the extreme right position on the drawing. The buzzer 14 located at the subordinate station S thereupon operates in an obvious circuit which includes the battery 15. The master station subscriber then actuates the switch 13 to contact 16 which is the talking position of the switch. With the switch 13 in the talking position, a circuit is prepared for supplying battery to the distant talking transmitter 17 located at the master station M and battery 15 is connected to the master station end of the intercommunicating line L.

In answer to the operation of the buzzer 14, the subscriber at subordinate station S removes the handset 18 from its mounting, causing current to traverse a path extending from the upper terminal of battery 15, switch 13 and contact 16, ballast lamp 19, left winding of relay 20, line winding 21 of hybrid coil H, conductor 22 of intercommunicating line L, upper normal contacts of key 23, conductor 24, through the closed subscriber's station loop, conductor 25, lower normal contacts of key 23, conductor 26 of intercommunicating line L, winding 27 of hybrid coil H, conductor 28, right winding of relay 20, ballast lamp 29 to the other terminal of battery 15. Relay 20 operates in this circuit and in attracting its armature completes the circuit to supply transmitter current to the distant talking transmitter 17 and causes lamp 30 to be lighted. The transmitter supply circuit extends from the upper terminal of battery 15, armature and front contact of relay 20, resistance 31, right winding of impedance coil 32, resistance 33, left winding of impedance coil 32, through the network including resistance 34 and ballast lamps 35 and 36, conductor 37, contact 38 of key A, conductor 39 to the other terminal of battery 15. The potential across resistance 33 supplies transmitter 17 which, with the lower windings of hybrid coil H, are connected across resistance 33. The circuit for lamp 30 extends from the upper terminal of battery 15, switch 13 and contact 16, armature and front contact of relay 20, filament of lamp 30 to conductor 37 and thence over the circuit previously traced to the other terminal of battery 15. With relay 20 operated and the distant talking transmitter 17 therefore supplied with talking battery, two-way conversation may be carried on between the subscribers at stations M and S by way of the intercommunicating line L, it being understood that the loud-speaker 41 and the distant

talking transmitter 17 are connected to the line L by way of the hybrid coil H, as illustrated.

Upon completion of conversation, the subscriber at the master station restores the switch 13 to the "off" position, which it occupies in the drawing, and the subordinate subscriber replaces the handset 18 to its mounting. When this occurs, relay 20 releases its armature, opening the battery supply lead to the distant talking transmitter 17 and to the lamp 30, which becomes extinguished.

It will be observed that, if after the termination of conversation on the connection just described, the subscriber at station M should inadvertently fail to restore the switch 13 to "off" position, the battery 15 would remain connected to the armature of relay 20 and to the master station end of intercommunicating line L so that, should the subordinate subscriber remove the handset 18 from its mounting, relay 20 would operate to complete the battery connection to the distant talking transmitter 17 with the result that any conversation being carried on at station M would be picked up by the transmitter 17 and transmitted over line L to be overheard by the subscriber at station S. The operation of relay 20, however, also completes the circuit to lamp 30 so that the subscriber at station M would be immediately advised by the lighting of the lamp 30 that the switch 13 was left in the talking position and that the subscriber at station S, who may be the secretary of the subscriber at station M, could hear the conversation being carried on at station M. The master subscriber could then restore the key 13 to the "off" position to disconnect the battery supply from the transmitter 17 and from lamp 30.

At 44 is diagrammatically represented a volume control which would be mounted on the face of the loud-speaker cabinet and which provides loud-speaker volume control. This control may take any desirable form, for example, the control switch may be designated as having three positions, high, medium and low. In the high position there would be no shunt resistance connected across the input of the amplifier 41, in the medium position a suitable resistance, 300 ohms, for example, would be connected across the amplifier input and in the low position a lower resistance, such as 100 ohms, would be connected across the amplifier input. By means of this volume control, the output of loud-speaker 41 may be adjusted to desired levels.

The balancing network indicated by the block N and associated with the hybrid coil H balances the intercommunicating line L and the telephone set at the subordinate end of the line. As long as the subordinate set is bridged across the line, adequate side-tone balance is provided and howling or singing in the loud-speaking equipment is prevented. However, when the subordinate station replaces the handset on its mounting and the bridge is thus removed from the intercommunicating line, the condition of balance is upset and singing would occur except for the fact the battery feed relay 20 releases when the subordinate handset is replaced on its mounting and immediately opens the circuit to the distant talking transmitter. In this manner, singing or howling is prevented.

The next descriptive portion is directed to the origination of a call at the master station M employing the handset 50.

When the subscriber at the master station de-

sires to employ the hand telephone on the intercommunicating line, the key A is operated, thereby removing the handset from the telephone line T which terminates at a central office or private branch exchange and connecting it to the intercommunicating line L. This transfer is effected by the springs 51 and 52 of switch A. With the handset 50 removed from its mounting, relay 20 operates from battery 15 by way of contacts 55 of key A but performs no useful function. The operation of key A short-circuits the input to the amplifier 12 by the closure of contacts 53, and by opening the contacts 54 the key A opens the input circuit to the amplifier. At contact 38 of switch A the battery supply circuit to the distant talking transmitter 17 and to lamp 30 is opened. At contact 55 a path is closed to supply talking battery to the intercommunicating line L irrespective of the position of key 13.

The subscriber at station M then actuates the key 13 to the signaling position, causing the buzzer 14 at station S to operate in a circuit previously traced.

When the subordinate subscriber at station S hears the buzzer 14, the handset 18 is removed from its mounting and conversation is carried on between the stations M and S by way of the intercommunicating line L, with both parties employing their respective telephone handsets. When conversation has been completed, the handsets at both stations are restored to their respective mountings.

The next descriptive portion is directed to the origination of a call at the subordinate station S and intended for the subscriber at the master station M.

When the subscriber at station S desires to signal the master station M, the key 58 is operated, completing an obvious circuit for the buzzer 59 at station M. The key 58, in practice, would constitute an integral part of the key 23 and would operate to a non-locking position thereof. The subscriber at station M responds to the buzzer signal by operating the key 13 to the talking position, contact 16. With the handset 18 at station S removed from its mounting and with key 13 at station M operated to contact 16, relay 20 is operated and the distant talking transmitter 17 is supplied with talking battery from the source 15 and lamp 30 is lighted in a manner previously described. Conversation takes place with the subscriber at station S employing the handset 18 and the subscriber at station M using the distant talking transmitter 17, speech currents incoming to station M being transmitted over the intercommunicating line L, amplified by the amplifier 12 and received by the loud-speaker 41. Upon completion of the conversation, the subscriber at station M restores the key 13 to the "off" position and the subordinate subscriber at station S replaces the handset 18 on its mounting, thereby releasing relay 20 which, in turn, opens the battery supply to the distant talking transmitter and to the lamp 30.

If desirable, the subscriber at station M, upon receipt of a buzzer signal, may employ the handset 50 in answering the call originated at the station S merely by actuating key A.

As illustrated in the drawing, the handset at the station M is normally connected to the central office or private branch exchange line T by way of the normal contacts of key A associated with the springs 51 and 52 thereof. With key A in nor-

mal position, as illustrated, the hand telephone functions in the well-known manner in initiating a call to the central office or private branch exchange over line T. When the key A is operated to transfer the handset 50 from the line T to the intercommunicating line L, as previously described, the line ringer 70 remains bridged across the line T so that even though the handset 50 is being used on the intercommunicating line L, signals identifying calls originated at the central office or private branch exchange and intended for station M may be received.

The handset 18 at the subordinate station S is normally connected to the intercommunicating line. In order to associate it with the central office or private branch exchange line P, the key 23 must be operated and when this occurs, the telephone functions in the usual manner. The ringer 72 at the subordinate station is always associated with the line P for the receipt of call signals incoming from the central office or private branch exchange.

With reference to Fig. 2, it will be noted that the lead extending from the lower terminal of ballast lamp 19 is carried directly to the upper terminal of battery 15 rather than to the switch contact 16, as in Fig. 1. With this wiring arrangement, the subscriber at the subordinate station S need only remove the telephone from its mounting and talk into the transmitter to signal the subscriber at station M by means of a voice signal. This obviates the necessity for the subscriber at the subordinate station actuating a signaling key 58 in signaling the master station.

Though but one subordinate station is illustrated in the drawing, it is apparent that multiple connections for more than one such station may be provided to effect a conference service. When the system embraces a plurality of subordinate stations, the various stations will be signaled from the master station by means of code signaling.

What is claimed is:

1. In a combined telephone and loud-speaking intercommunicating system, a master station having a handset telephone normally connected to a central office line, a subordinate station, an intercommunicating line interconnecting said master station and said subordinate station, a loud-speaker at said master station normally connected to said intercommunicating line and switching means at said master station for disconnecting the handset thereat from the central office line and connecting it to said intercommunicating line and for simultaneously opening the connection of said loud-speaker to said intercommunicating line and short-circuiting the input to the loud-speaker.

2. In a combined telephone and loud-speaking intercommunicating system, a master station having a handset telephone normally connected to a central office line, a subordinate station, an intercommunicating line interconnecting said stations, a loud-speaker at said master station normally connected to said intercommunicating line and switching means at said master station for disconnecting the handset thereat from the central office line and connecting it to said intercommunicating line and for simultaneously disabling said loud-speaker.

3. In a combined telephone and loud-speaking intercommunicating system, a master station, a subordinate station, an intercommunicating line interconnecting said stations, a signal at said master station, a switch at said master station

and means responsive to the conjoint operation of said switch at said master station and the receiver switchhook contacts at said subordinate station for operating said signal.

4. In a combined telephone and loud-speaking intercommunicating system, a master station, a subordinate station, an intercommunicating line interconnecting said stations, a signal at said master station and means controlled over said intercommunicating line jointly from said master station and said subordinate station for operating said signal.

5. In a combined telephone and loud-speaking intercommunicating system, a master station, a subordinate station having a telephone handset, a distant talking transmitter at said master station, a course of current, means at said master station for preparing a supply circuit from said source of current to said distant talking transmitter, and means controlled by the receiver of the telephone handset at said subordinate station for completing the supply circuit to said transmitter.

6. In a combined telephone exchange and loud-speaking intercommunicating system, a master station, a subordinate station, an intercommunicating line interconnecting said stations, a distant talking transmitter and a signal at said master station, means controlled at said master station for preparing energizing circuits for said transmitter and said signal, a call signal at said subordinate station, switching means at said master station for operating the signal at said subordinate station, and means at said master station and controlled over said intercommunicating line when the subscriber at said subordinate station responds to the call signal for completing the energizing circuits for said transmitter and said signal.

7. In a combined telephone and loud-speaking intercommunicating system, a first station, a second station, an intercommunicating line circuit interconnecting said stations and terminating at one station in the line windings by a hybrid coil, a distant talking transmitter at said first station inductively associated with one of the line windings of the hybrid coil, a telephone handset at said second station, a relay having windings included in circuit with the line windings of said hybrid coil and whose energizing circuit is normally open at both said stations, switching means at said first station for partially completing the energizing circuit for said relay, means responsive to the removal of said handset at said second station for completing the energizing circuit to said relay whereupon said relay operates, and means controlled by said relay for energizing said distant talking transmitter.

8. In a combined telephone and loud-speaking intercommunicating system, a first station, a second station, an intercommunicating line interconnecting said stations, a signal at one of said stations, and means controlled over said intercommunicating line jointly from both said stations for operating said signal.

9. In a combined telephone and loud-speaking intercommunicating system, a calling station having a distant talking transmitter, a called station, a source of supply current for said transmitter, an intercommunicating line interconnecting said stations, a switch at said calling station for connecting said source of current to said intercommunicating line, and means under the control of said called station when said switch

is operated for connecting said source of supply current to the transmitter at said calling station, said means being controlled over said intercommunicating line.

- 8 10. In a combined telephone and loud-speaking intercommunicating system, a master station equipped with a loud-speaker telephone set comprising a loud-speaker and a distant talking transmitter, a subordinate station equipped with  
10 a telephone handset, a battery, a switch at said master station, an intercommunicating line interconnecting said stations, means responsive to the joint operation of said switch at said master station and the removal of the handset at said  
15 subordinate station for effectively connecting said battery to said distant talking transmitter and to said intercommunicating line to permit two-way conversation to be carried on over said intercommunicating line by means of the loud-  
20 speaking telephone set at said master station and the handset at said subordinate station, a telephone handset at said master station and a key thereat for disabling the loud-speaker and distant talking transmitter at said master station  
25 and for connecting said battery to said intercommunicating line irrespective of whether or not said switch at said master station is operated whereby the handset at said master station may be employed to the exclusion of said loud-speaking  
30 set for conversation purposes on said intercommunicating line.

11. In a combined telephone and loud-speaking intercommunicating system, a master station, a subordinate station, an intercommunicating line interconnecting said stations, said intercommunicating line including the line windings of  
5 a hybrid coil, a loud-speaker bridged across the coil side terminals of the line windings of said hybrid coil, a distant talking transmitter inductively coupled to one of the line windings of said hybrid coil, a battery for supplying current to  
10 said transmitter, switching means at both said stations which, when operated jointly, effectively connect said battery to said distant talking transmitter whereupon two-way conversation  
15 may be carried on over said intercommunicating line between said stations, a telephone handset at said master station and a manually operated key at said master station for connecting said handset to said intercommunicating line, for  
20 opening the battery supply to said distant talking transmitter, for short-circuiting the input circuit of said loud-speaker and for connecting said battery to the terminals of the line windings of said hybrid coil whereby two-way conversation may  
25 be carried on over said intercommunicating line by means of the telephone handset at said master station independently of the loud-speaker and distant talking transmitter thereat.

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## DISCLAIMER

2,206,385.—*Lawrence H. Allen*, Summit, N. J. TELEPHONE SYSTEM. Patent dated July 2, 1940. Disclaimer filed January 15, 1944, by the assignee, *Bell Telephone Laboratories, Incorporated*.  
Hereby enters this disclaimer to claims 3, 4, and 8 of said patent.  
[Official Gazette February 8, 1944.]

## DISCLAIMER

2,206,385.—*Lawrence H. Allen*, Summit, N. J. TELEPHONE SYSTEM. Patent dated July 2, 1940. Disclaimer filed July 22, 1942, by the assignee, *Bell Telephone Laboratories, Incorporated*.

Hereby enters this disclaimer to claims 5 and 9 of said patent.

[*Official Gazette August 25, 1942.*]