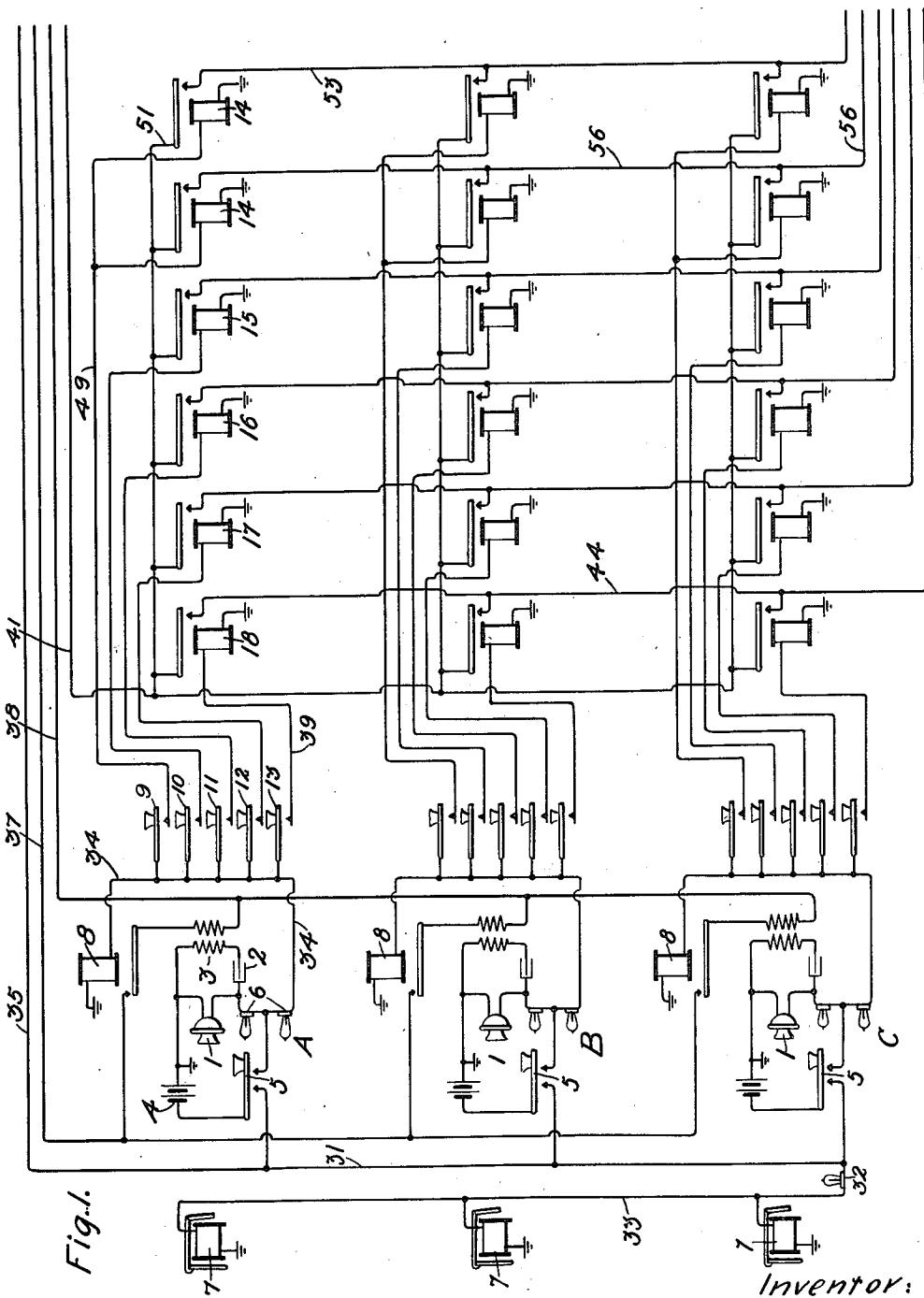


1,272,641.

H. C. EGERTON.
TELEPHONE SYSTEM.
APPLICATION FILED JULY 24, 1916.

Patented July 16, 1918.

2 SHEETS—SHEET 1.



Inventor:
Henry C. Egerton.

by A. C. Munn, Atty.

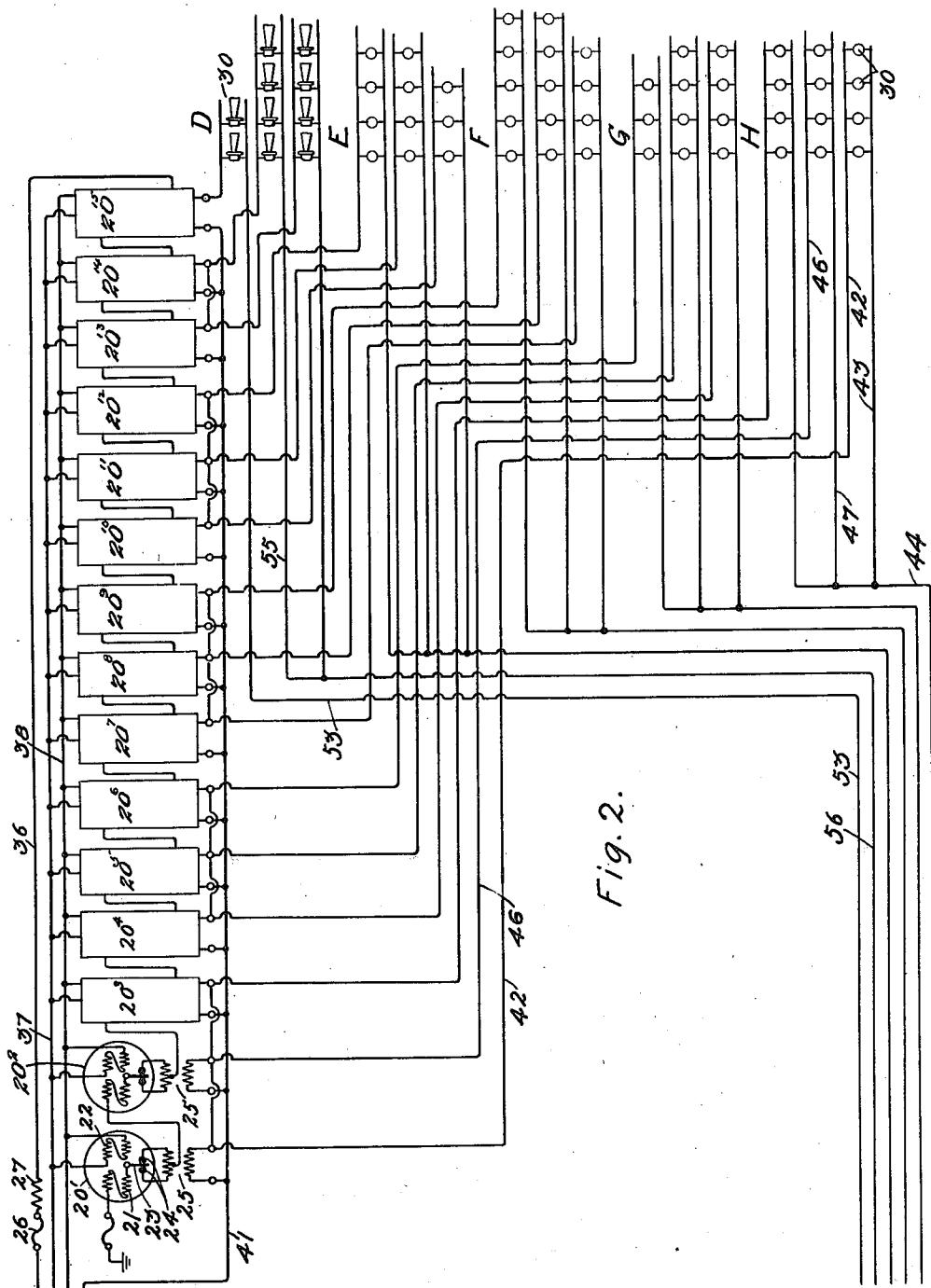
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UNITED STATES PATENT OFFICE.

HENRY C. EGERTON, OF PASSAIC, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

1,272,641.

Specification of Letters Patent.

Patented July 16, 1918.

Application filed July 24, 1916. Serial No. 110,970.

To all whom it may concern:

Be it known that I, HENRY C. EGERTON, a citizen of the United States, residing at Passaic, in the county of Passaic and State 5 of New Jersey, have invented certain new and useful Improvements in Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone systems, and more particularly to that class of such systems generally known as paging or announcing systems.

Generally stated, one of the objects of the invention is the provision of a telephone system which is very flexible from the standpoint of the number of annunciators that may be operated, and the ability to severally and collectively regulate the volume of sound produced thereby.

Another object is the provision of a system in which the operating current therefor is disconnected automatically when the system is not in use.

A further object is the provision of a system in which the ability to easily make selections from a large number of annunciators is accomplished with a minimum of operations upon the part of the operator.

A still further object is the provision of a system in which announcing may be made from any one of a plurality of transmitting stations irrespective of the conditions of the selecting devices located at the stations not in use.

In accordance with the general features of this invention, there is provided a plurality of transmitting stations from each of which it is possible, through the agency of selecting keys, to selectively operate a group or groups of loud-speaking receivers which are actuated by associate groups of amplifiers. The amplifiers are normally included in the transmission circuit, and switching means responsive to the station selecting keys automatically effect the inclusion of desired groups of loud-speaking receivers into the announcing circuit. This arrangement maintains the resistance of the transmission circuit substantially constant, thus eliminating any irregularity in the volume of sound produced by a given receiver, which would occur if the resistance of the transmission circuit was varied. The system, normally inactive, is rendered effective

by the actuation of a single switching element. Other features will be apparent from the description hereinafter given.

In the accompanying drawings, Figures 1 and 2 taken together disclose an entire paging system incorporating the invention, Fig. 1 being a circuit diagram showing a plurality of transmitting stations contemplated by this invention, and Fig. 2 illustrating diagrammatically the organization of the apparatus designed to be controlled by such transmitting stations.

The transmitter circuit of each of the transmitting stations A, B and C includes a transmitter 1, condenser 2, primary winding of induction coil 3, a source of operating current 4, a non-locking key 5, and an impedance element such as a lamp 6, these elements being arranged in the circuit in any approved manner. The key 5, besides controlling this transmitter circuit, also controls an energizing circuit for signals 7, one signal being located at each transmitting station, which are adapted to give a busy indication at all stations when any of the keys 5 is operated. Another circuit under 80 the control of each key 5 includes a relay 8 adapted to close the secondary circuit of the corresponding induction coil 3. Branching from the circuit including the winding of relay 8, at each station, are a plurality 85 of circuits including respectively selecting keys 9, 10, 11, 12 and 13, preferably of the well-known locking type, and corresponding relays 14, 15, 16, 17 and 18. Conductors from the transmitting stations A, B and C 90 lead to groups of amplifiers 20', 20²—20¹⁵, which in turn control corresponding groups of loud-speaking receivers 30, the construction and operation of which will now be described.

Referring to Fig. 2, there is illustrated a plurality of amplifiers 20 which may be similar in construction to that forming the subject matter of another patent to H. C. Egerton, No. 1,207,384, issued December 15, 1916. Briefly, the amplifiers 20' 20²—20¹⁵, comprise a transmitter element of the well-known "push and pull" or differential type, wherein two transmitter buttons are customarily used and connected with a vibrating medium in such a way that an increase in the resistance of one button is accompanied by a simultaneous decrease in

the resistance of the other. The magnet system of the amplifiers schematically illustrated in the drawing embodies a magnetizing winding 21 wound about an iron core 5 and arranged to magnetize the ends thereof to the same polarity. An actuating winding 22 which receives the current to be amplified is disposed so as to operate a vibrating armature 23 which effects the operation 10 of the transmitter buttons 24. The transmitter elements or buttons 24 of each amplifier are associated with the output circuit by being connected to the primary winding of an induction coil 25, the secondary winding 15 of which is connected to outgoing line conductors. The amplifiers 20' 20²—20¹⁵, are preferably arranged in groups, the number of such groups corresponding to the number of selecting keys located at the 20 transmitting stations. The number of amplifiers comprising the several groups may be varied as desired. In accordance with approved telephone practice, there is associated with each of the various groups of 25 amplifiers a protective device 26 and a high impedance coil 27, whose functions are well understood in the art.

The circuit organization of the elements just described is schematically represented 30 in the upper part of Fig. 2. Each of the output circuits of the various amplifiers may include one or more loud-speaking receivers 30, which are connected in multiple when a plurality is employed. The actuating windings 22 of all of the amplifiers 20' 20²—20¹⁵, are connected in multiple as shown and are each adapted to be included in the secondary winding of the corresponding induction coil 3 upon the energization of the associated 35 relay 8. This feature of having the actuating windings of the amplifiers normally connected in the transmission circuit when announcing takes place, makes the resistance of this circuit constant, thereby making 40 the volume of sound produced by a given receiver uniform, which would otherwise be irregular if the resistance of the transmission circuit was varied.

The paging system embodying this invention will be fully understood from a description of its operation. A party wishing 50 to transmit a message from any of the stations A, B and C operates key 5. Let it be assumed that the message is to be transmitted from station A. The operation of the key 5 effects the closure of a plurality of circuits, one of which, extending from the negative side of battery 4, through key 5, lamp 6, transmitter 1 and back to the positive 55 side of battery, supplies talking current for the transmitter 1. A second circuit completed by the actuation of the key 5 effects the operation of the busy signals 7, the circuit for which extends from the positive side of battery 4, key 5, conductor 31, lamp

32, conductor 33, through the windings of all of the signals 7 in multiple, to ground. This causes the display of a busy signal at each of the stations A, B and C, which indicates to a person desirous of transmitting 70 a message that the system is already in use. A third circuit completed by the closure of key 5 includes battery 4, conductors 35 and 36 and the induction coil primaries, buttons 24 and magnetizing windings 21 of all of 75 the amplifiers in series, to ground, whereupon all of the amplifiers are prepared to augment the effect of voice currents passing through their actuating windings 22. The fourth circuit established by the operation 80 of the key 5 may be traced from battery 4, key 5, lower lamp 6, conductor 34, coil of relay 8, to ground. The closure of this circuit causes relay 8 to attract its armature, completing a circuit through the secondary 85 winding of induction coil 3 and the actuating windings 22 of all of the amplifiers in parallel. All of the amplifiers are thus conditioned so that voice currents caused by the 90 operation of transmitter 1 will effect corresponding fluctuations in the magnetization of the secondaries of all of the induction coils 25. Operating currents will thus be induced in all of the loud-speaking receiver 95 circuits which may be closed by the selective operation of keys 9 to 13, as will now be explained.

The operation of any combination of the groups of loud-speaking receivers 30 may be effected by first actuating any combination 100 of the selecting keys 9, 10, 11, 12 and 13. It may be noted at this point that by having the secondary circuit of each of the transmitting stations A, B and C normally open, the operation of any one of the stations is 105 entirely independent of the others, and when a station is not in use, its secondary circuit is disconnected. This arrangement avoids the necessity of having to set the keys 9, 10, 11, 12 and 13 in a required position after announcing has been made. Consequently, from the standpoint of operation, it is immaterial what position the keys 9, 10, 11, 12 and 13 of the respective stations A, B and C 110 occupy when not in use.

Let it be assumed that key 13 was placed in an operative position. This will cause the energization of the relay 18 by closing a circuit from battery 4, key 5, lower lamp 6, conductor 34, key 13, conductor 39, relay 18, 115 to ground. The energization of relay 18 effects the closure of its contact, thereby establishing the following energizing circuit for the loud-speaking receivers, forming the group designated H. Starting from the contact of relay 18, it passes through conductor 41, secondary winding of induction coil 25 of amplifier 20', conductor 42, lowermost row of loud-speaking receivers 30, conductors 43 and 44, back to contact of relay 18. 120

The middle row of receivers forming group H is actuated by amplifier 20² over a circuit from contact of relay 18, conductor 41, secondary winding of induction coil 25 of amplifier 20², conductor 46, the middle row of receivers and conductors 47 and 44 back to the contact of relay 18. In a similar manner the upper row of receivers comprising group 8 is actuated by the amplifier 20³.

10 It will be noted that one side of the secondary windings of induction coils 25 of amplifiers 20', 20² and 20³ are connected in common for the purpose of preventing interference by these receivers when, say group 15 G, is being operated and it is desired not to operate group H. This feature of connecting one side of the secondary winding of the induction coils 25 in common also effects a uniformity in the volume of sound produced 20 by each of the receivers comprising group H. In other words, due to this strapping arrangement, it is immaterial how the receivers comprising group H are disposed among the three branches forming said 25 group.

It will be noted that the relay associated with the respective selecting keys, with the exception of relays 14, control the introduction of an entire group of loud-speaking receivers into the annunciating circuit. The volume of the loud-speaking receivers comprising a given group may be varied if desired by adding more relays responsive to the selecting keys so that the amplifiers may 30 be controlled individually instead of collectively as in the case described above. This modification is illustrated in connection with the selecting key 9 which controls a pair of relays 14 connected in parallel with 35 each other. Upon the operation of the key 9, the relays 14 are energized over the circuit from battery 4, key 5, lower lamp 6, conductor 34, key 9, conductor 49, through the parallel circuits including the windings of the 40 two relays 14, to ground. The circuit established through the closure of the contact controlled by the right-hand one of the relays 14 may be traced from the contact of 45 relay 14, conductors 51 and 41, through the secondary winding of induction coil 25 associated with amplifier 20¹⁵, upper row of 50 receivers forming group D, conductor 53, back to the starting point. The circuit established by the closure of the contact of the 55 left-hand relay 14 extends from the contact of relay 14, conductors 51, 41, secondary winding of the induction coil 25 connected with amplifier 20¹⁴ through the windings of the receivers forming the middle row of 60 group D, conductors 55, 56, back to the contact of relay 14. In a similar manner, a corresponding circuit is closed through the amplifier 20¹³ associated with the third set of receivers of group D. One side of the secondary winding of the induction coils 25

associated with the amplifiers 20¹⁴ and 20¹³ is strapped together in a manner previously described. By this circuit arrangement the receivers actuated by the amplifier 20¹⁵ are independent of those actuated by the amplifiers 20¹⁴ and 20¹³, and as the output of each of the amplifiers is substantially equal, the volume of the receivers operated by the amplifier 20¹⁵ will be different from the volume of those operated by the amplifiers 20¹⁴ and 20¹³. That is, since the amplifier 20¹⁵ controls two of the loud-speaking receivers 30, while amplifiers 20¹⁴ and 20¹³ each control four receivers, the volume of the two operated by the amplifier 20¹⁵ will be substantially twice the volume of the receivers actuated by the amplifiers 20¹⁴ and 20¹³.

From the above it will be apparent that the flexibility of the paging system contemplated by this invention renders the system 85 highly efficient and easily modified, or adapted to accommodate the variety of conditions usually existing where paging systems are employed. Many modifications of the circuit organizations herein set forth 90 will suggest themselves to those skilled in the art without departing from the spirit of this invention.

What is claimed is:

1. A telephone system including a transmitting station, a plurality of amplifiers, loud-speaking receivers adapted to be actuated by said amplifiers, and circuit connections between said amplifiers and receivers to permit the volume of sound produced by said receivers to be relatively uniform as between said receivers or capable of relative variation as between different ones of said receivers.

2. A telephone system including a transmitting station, loud speaking receivers arranged in predetermined groups for simultaneous operation of all receivers in any group, means to select any of said groups for association with said station, and electro responsive means controlled by said selecting means to actively associate a selected group with said station.

3. A telephone system including a plurality of transmitting stations, loud speaking receivers arranged in predetermined groups for simultaneous operation of all receivers in any group, means to select any particular group for association with any one of said stations, and electro responsive means controlled by said selecting means for actively associating a selecting group with a selected one of said stations.

4. A telephone system including a plurality of transmitting stations, loud speaking receivers arranged in predetermined groups for simultaneous operation of all receivers in any group, means individual to each of said stations to select any particular group for association with its respective station,

and electro responsive means controlled by said selecting means to actively associate a selected group with the station making such selection.

5. A telephone system including a transmitting station, loud speaking receivers arranged in independent predetermined groups for simultaneous operation of all receivers in any group, means to select one or more of 10 said receiver groups for association with said station, and electro responsive means controlled by said selecting means to actively associate said one or more selected groups with said station.

15. A telephone system including a plurality of transmitting stations, amplifiers, loud speaking receivers connected to said amplifiers, said amplifiers and receivers being arranged in associated predetermined 20 groups, means to select one or more of said groups for association with said transmitting stations, and electro responsive means controlled by said selecting means to actively associate said one or more selected 25 groups with said stations.

7. A telephone system including a transmitting station, amplifiers arranged in predetermined groups, loud speaking receivers arranged in groups adapted to be actuated by said amplifiers, the number of receivers in any group being independent of the number of receivers in other groups, means for associating any desired groups of 30 said amplifiers with said transmitting station, and means for maintaining the energizing current for each of said amplifiers substantially constant, whereby the aggregate relative volume of sound produced on 35 actuation of a receiver group associated with one of said amplifiers is substantially the same as the aggregate volume of sound produced by another of said receiver groups irrespective of any difference in the number 40 of receivers in such receiver groups.

45. In a telephone system, loud-speaking receivers arranged in a subdivided group, and means for predetermining the relative volume of sound produced by each of the receivers comprising one of the subdivisions 50 of said group as compared to the relative volume of sound produced by each of the receivers comprising another subdivision of said group.

9. In a telephone system loud speaking receivers arranged in a subdivided group, 55 and means for predetermining the relative volume of sound produced by each of the receivers comprising any of the subdivisions of said group as compared to the relative volume of sound produced by each of the receivers comprising other subdivisions of 60 said group.

10. A telephone system including a plurality of transmitting stations, amplifiers, loud-speaking receivers, said amplifiers and 65 receivers being arranged in associated groups, means for connecting a given group of said amplifiers with a particular group of said receivers, and a second means for selectively controlling said first-mentioned 70 means.

11. A telephone system including a plurality of transmitting stations, amplifiers, loud-speaking receivers, said amplifiers and receivers being arranged in associated 75 groups, electromagnetic switching means for connecting a given group of said amplifiers with a particular group of said receivers, and switching means for controlling said first-mentioned means. 80

12. A telephone system including a transmitting station, amplifiers adapted to be actuated simultaneously from said station, loud-speaking receivers arranged in independent predetermined groups, and means 85 at said transmitting station for selectively associating said receiver groups with said amplifiers so as to be operable thereby.

13. A telephone system including a plurality of transmitting stations, loud-speaking receivers in groups, selective means for each of said stations adapted to select any of the receiver groups for association with its respective station, and means for each of said stations to actively associate its respective station with the selected one of said receiver groups independent of the condition 95 of the selective means of other stations.

In witness whereof, I hereunto subscribe my name this 20th day of July A. D. 1916. 100

HENRY C. EGERTON.