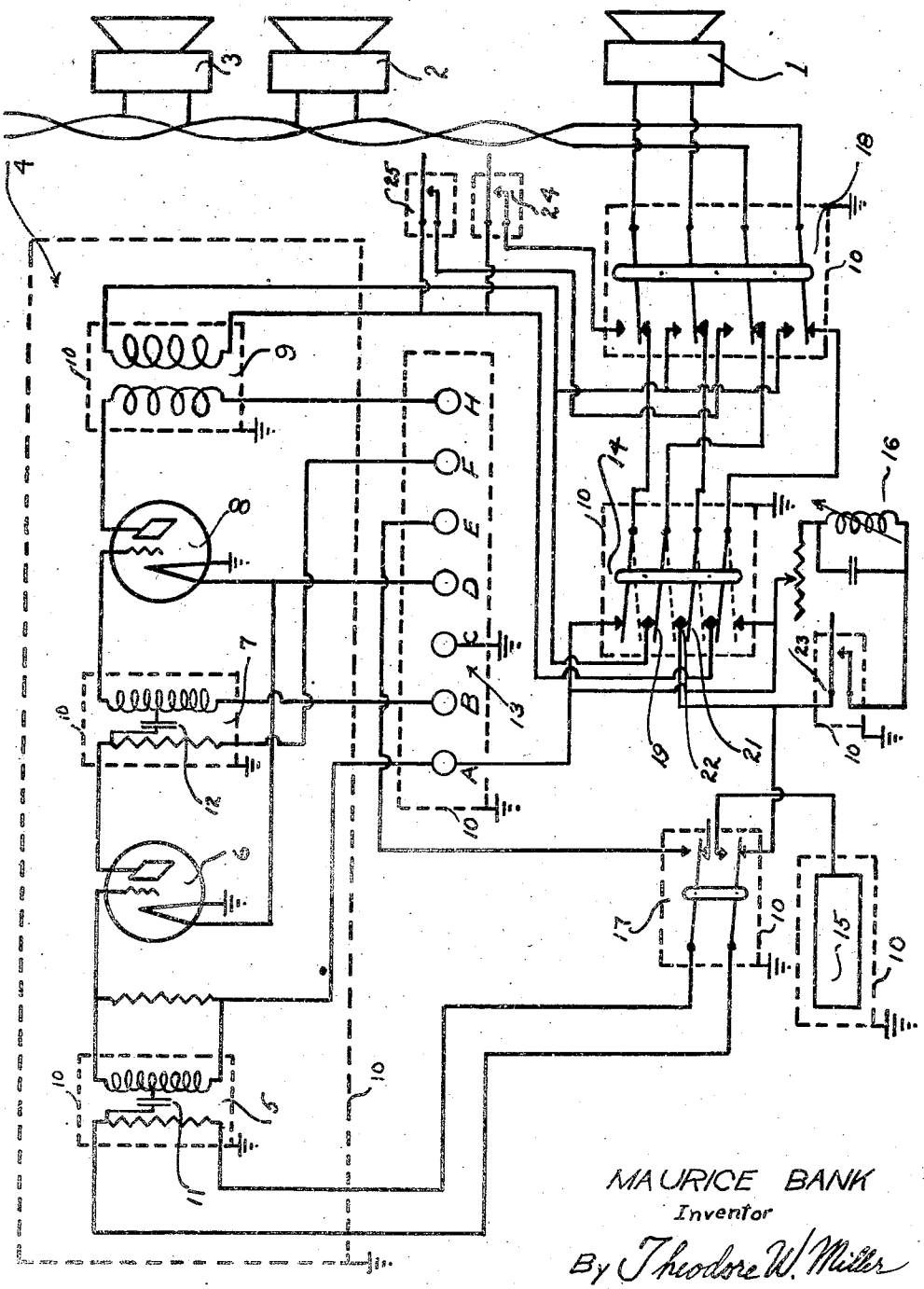
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ELECTRICAL—INCLUDING RADIO—APPARATUS

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ELECTRICAL—INCLUDING RADIO—APPARATUS

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3 Claims. (Cl. 179—1)

This invention relates to electrical apparatus—including radio—in general.

It is highly desirable in many institutions to have a system of loud-speaking communication involving a central station and remote stations and in which the central station may communicate with the remote stations and vice-versa, and the various stations may receive communications, jointly or severally, eminating from an outside source. It is furthermore highly desirable that such a system involve a minimum of apparatus and be as simple as possible.

Heretofore such a system has not been practicable because of the difficulty in rendering sufficiently effective the slight fluctuations of current in a reproducer circuit resulting from sound waves acting upon the reproducer whereby these fluctuations may cause the reproduction of the sound in another reproducer in the circuit. By properly avoiding unnecessary capacities I am enabled to provide such a system utilizing a minimum of amplification and simple switching apparatus.

It is accordingly the primary object of this invention to provide such a system in which a plurality of loud speaking reproducers are used at respective stations and are so united that either one may be selectively used as either a transmitter or a reproducer to transmit to or receive from another.

Another object of this invention is to provide a system of the above type which includes means whereby a plurality of stations may either jointly or severally be controlled to selectively receive communications from a radio receiving set or a phonograph record.

A further object of this invention is to provide a system of communication involving a plurality of stations, each provided with a loud speaking reproducer capable of being used as a transmitter for transmitting communications to a loud speaking reproducer at another station thru the intermediary of a minimum of stages of amplification.

A still further object in this invention is to provide a system of communication involving a plurality of stations, each provided with a loud speaking reproducer and connections between these reproducers having a minimum of capacity permitting the selective use of one reproducer as a transmitter for transmitting communications to another reproducer.

Other and further objects of this invention will be apparent as the same becomes better understood from an examination of the specification and claims in connection with the accompanying drawing, wherein is shown a diagrammatic view of a system embodying this invention.

Referring to the drawing; more particularly, reference character 1 indicates a loud speaking reproducer of the magnetic type situated in a central station of a communication system. Numerals 2 and 3 indicate similar loud speaking reproducers respectively, of remote stations, these reproducers being preferably arranged in parallel.

At the central station wherein is located the reproducer 1 there is also located an amplification apparatus generally designated by the reference character 4 including an audio-frequency transformer 5 adapted to receive the input to the amplification apparatus and a vacuum tube 6 preferably a power amplifier tube, which with said transformer forms the first stage of amplification. A second audio-frequency transformer 7 and a second vacuum tube 8 form the second stage of amplification. The second stage of amplification of apparatus 4 is connected to the input of a 1:1 ratio output coupling 9. In order that there may be a minimum of capacity in the amplification apparatus and ultimately in the connections of the system between the reproducer 1 and the reproducers 2 and 3 at the remote stations, it is highly essential to provide known negligible capacities 11 and 12 in the transformers 5 and 7 respectively and to use reproducers which do not require an external source of current. In other words the input circuit to the amplification apparatus including the reproducers when the latter are used as transmitters should not include an external source of current as would be the case were dynamic type loud speakers used as this would result in indeterminate and inconstant inductances. By so eliminating indeterminate reactance in the connections between the reproducers they are enabled to be used efficiently and selectively as transmitters.

A power supply terminal block 13 adapted to be energized by a suitable connection (not shown) to an electric light socket (not shown) or other source of power is provided with the terminals A, B, C, D, E, F and H. The terminal A has the customary negative grid potential and is connected to the secondary of the transformer 5. The terminal B is the usual negative power potential. The terminal C is the common negative for the plate and filament circuits and the positive for the grid potential. This terminal C is grounded. The terminal D is the positive for the

filament circuits. The terminal E has no connection with the amplifier circuit, but provides the potential for a detector circuit of a radio receiver which may be used as will be explained hereinafter in conjunction with the amplifier apparatus 4 for permitting the reproduction of external communications by the reproducers 1, 2 and 3. The terminal F provides the potential for the plate circuit of the 1st stage of amplification, and the terminal H provides a power potential for the plate circuit of the output stage.

The specific voltage of the various terminals is dependent upon the requirements of the power amplifier tubes 6 and 8.

When it is desired to use the loud speaking reproducer 1 as a transmitter for transmitting communications to the reproducers 2 and 3 the input of the amplifier apparatus 4 is connected to said reproducer 1 and the output of said apparatus is connected with the said reproducers 2 and 3. When it is desired to use either of the reproducers 2 and 3 as transmitters for transmitting communications to the reproducer 1 for reproduction thereby at the central station the input of the amplifier apparatus 4 is connected to said reproducers 2 and 3 as the case may be and the output of said apparatus is connected to said reproducer 1. The switching of the input of the amplifier apparatus 4 from the reproducer 1 to the reproducers 2 and 3 or vice versa and the switching of the output of said apparatus from the reproducers 2 and 3 to the reproducer 1 or vice versa is accomplished by means of a non-capacity pole changer switch 14 in circuit with said apparatus and reproducers as shown in the drawing.

There is also employed in the circuit with the reproducers and the switch 14 a radio receiving apparatus 15 and a phonograph record pick-up 16, and it is therefore necessary to employ in addition to the switch 14 a non-capacity double pole double throw switch 17 and a four pole double throw jack switch 18 as shown in the drawing for permitting communications from said receiver or pickup to be reproduced by the reproducers when it is not desired to use the latter for intercommunication. The switches 14 and 17 include input connections to the amplifier apparatus 4 and consequently it is essential that they be non-capacity switches in order that the fluctuations of the input circuit to the amplifier apparatus caused by the respective reproducers when they are used as transmitters, may have a maximum of effectiveness. To further enhance the effectiveness of the fluctuations caused by the reproducers in the remote stations when used as transmitters the leads thereto are twisted as shown, thereby eliminating inductance. The various parts of the circuit are shielded as indicated by the dotted lines 10 to further prevent interference with the fluctuations caused by the reproducers when the same are used as transmitters. These shields 10 are grounded to a common ground.

The non-capacity switch 18 is so connected that it may be selectively actuated to connect the input of the amplifier apparatus 4 with either the output of radio receiving apparatus 15 or the reproducers 1, 2 and 3 thru the intermediary of the switches 14 and 18.

The switches 14 and 18 are so connected that the latter when in one position may connect the reproducers thru the intermediary of the former and the switch 17 with the input of the amplifier apparatus 4. The switches 14 and 18 are so connected that the latter when in downwardly (viewing the drawing) closed position may connect the reproducers to the former switch which as previously mentioned controls the alternate use of the opposed reproducers as transmitters. Thus the switch 18 when in one position connects the reproducers to the switch 14 the later being between this switch 18 and the input to the amplifier apparatus 4.

The circuits from the reproducers which pass from the switch 18 to the switch 14 are so arranged with respect to the latter that the same is enabled to render any capacity negligible which may have been built up in the circuit between said switch 14 and reproducers.

In this regard the outer contacts on the switch 14 are connected to the common terminal A and thus grounded thru the grid potential of the amplifier apparatus, so as to reduce any capacity which might otherwise be built up in the switch. Such a capacity is further reduced in the switch 14 by the arrangement whereby the two center blades 19 and 21 are connected respectively to one leg of the opposing reproducer circuits and these blades are adapted to selectively contact a center contact 22 on the switch which is connected to the input of the amplifier circuit thru the intermediary of switch 17. By this arrangement opposite circuits are at all times disposed adjacent to each other in the switch 14 and in addition a comparatively short lead from the switch to the input of the amplifier apparatus results whereby capacity other than that specifically provided for is practically eliminated in the circuit.

The record pick-up 16 which in this instance is of the variable magnetic type is adapted to be connected to the input of the amplifier apparatus 4 thru the intermediary of a single pole switch 23 and the previously mentioned switch 17. The switch 23 should be opened when the pick-up 16 is not being used so as to prevent heavy currents being fed back to the pick-up when the reproducers are being used in inter-communication to prevent capacity losses being built up when the reproducers are being so used and also saturating the magnet in the pick-up.

A pair of single pole switches 24 and 25 and connections as shown between the switch 18 and the output of the amplifier apparatus 4 are provided whereby when said switch 18 is in upwardly closed position the reproducers are connected to the output of the amplifier apparatus for the reception of radio or record communications and the central station reproducer 1 or the remote station reproducers 2 and 3 may be cut out as desired.

In the operation of the afore-described apparatus when it is desired to use the reproducers for inter-communication the switch 17 is actuated to the down position shown; the switch 18 is actuated to the down position shown and the switch 14 is selectively actuated to the up position shown assuming it is desired to talk from the central station to the remote stations or the latter switch may be actuated to its down position shown in dotted lines if it is desired to talk from any of the remote stations to central station. It is important, however, when so using the reproducers to first open the switch 23 to prevent the capacity losses being built up by the feeding back of currents to the pick-up 16 as previously described. All of these switches being located at the central station preferably in panel form, the entire control is at the will of the operator at said station.

When it is desired that phonograph record communications be received at the various stations, switch 18 is actuated to its upper position to connect the reproducers to the output of the amplifier apparatus and switch 23 is closed. This movement of switch 18 entirely disconnects switch 14 from the circuit. Should it be desired to eliminate either the reproducer 1 at central station or the reproducers 2 and 3 at the remote station from the reception, switch 24 or 25 respectively may be opened. (It will be noted that when the switch 18 is in the down position shown, the switches 24 and 25 are out of the circuit.)

When it is desired that radio communications be received at the various stations, the switch 17 is actuated to its upwardly closed position to connect the output of the radio receiver 15 to the input of the amplifier apparatus 4 whereby, when the switch 18 is in its downwardly closed position, the output of the amplifier apparatus 4 will deliver the amplified communications to either the central station reproducer 1 or the outlying reproducers, depending upon the position of the switch 14. If the switch 18 is in its upwardly closed position, and the switches 24 and 25 are both closed, the radio-communication will be received at the reproducers in both the central station and the remote stations.

The efficiency of the afore-described apparatus is dependent upon the elimination of indeterminate inductance and more particularly capacities in the input circuit to the amplifier apparatus and the stages of amplification therein. This elimination of indeterminate inductances and capacities is accomplished as previously described by the use of the particular form of reproducers, switches and circuits described, and the use of predetermined capacities in the circuits in general and more particularly between the primary and secondary of the transformers in the amplifier apparatus. The elimination of indeterminate inductances is further provided for by the use of the twisted wire leads to the remote station reproducers. A condenser 20 of predetermined negligible capacity is provided across the record pick-up to further prevent the building up of undesired capacities.

It will be apparent that the system will be very useful in institutions both for interior communication and for the reception of external communications as from a radio receiver or a phonograph record.

I am aware that many changes may be made without departing from the principles of my invention, and I, therefore, do not wish to be limited to the details shown or described.

I claim:

1. In an apparatus of the character described, the combination of a plurality of loud speaking reproducers in circuit and an amplification apparatus in said circuit adapted to receive input fluctuations from one reproducer and deliver amplified fluctuations to another, said amplification apparatus including a transformer in an amplification stage provided with a predetermined capacity for preventing the building up of a capacity between the primary and secondary of said transformer and for permitting the efficient operation of said reproducer as a transmitter.

2. In an apparatus of the character described, the combination of a plurality of loud speaking reproducers in circuit and means associated with said circuit including a multi-pole switch whereby one reproducer may be selectively used to transmit to as well as receive from another reproducer and vice versa, said switch being so connected that its adjacent blades are connected to separate reproducers whereby the capacity that would otherwise be built up in said switch is reduced.

3. In an apparatus of the character described, the combination of a plurality of loud speaking reproducers in circuit, amplifier means in said circuit, and a multi-pole switch so connected with respect to said reproducers and means that it may be actuated to selectively connect one reproducer to the input of said means and another reproducer to the output thereof and vice versa, said switch being so connected that its adjacent blades are connected to separate reproducers and provided with a contact intermediate said blades adapted to be selectively contacted thereby and connected to said input whereby the capacity in the circuit is reduced.

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