March 8, 1938. R. H. DREISBACH 2,110,358

SYSTEM FOR SOUND REPRODUCING APPARATUS

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Fig. 1.

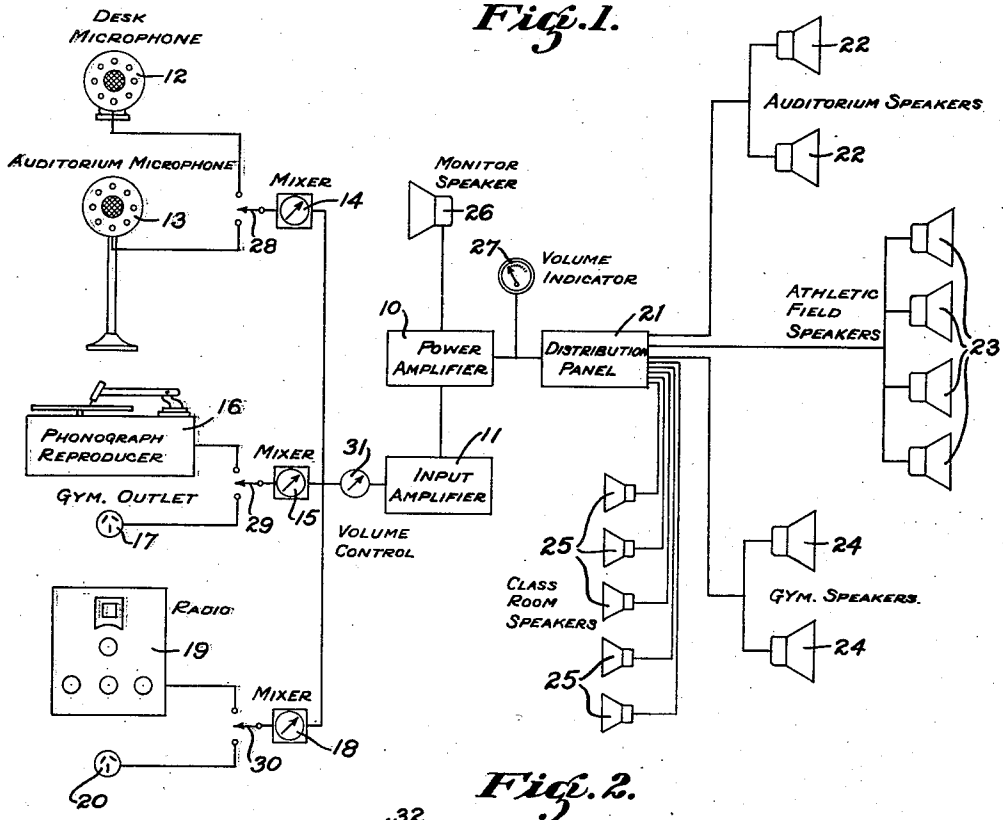
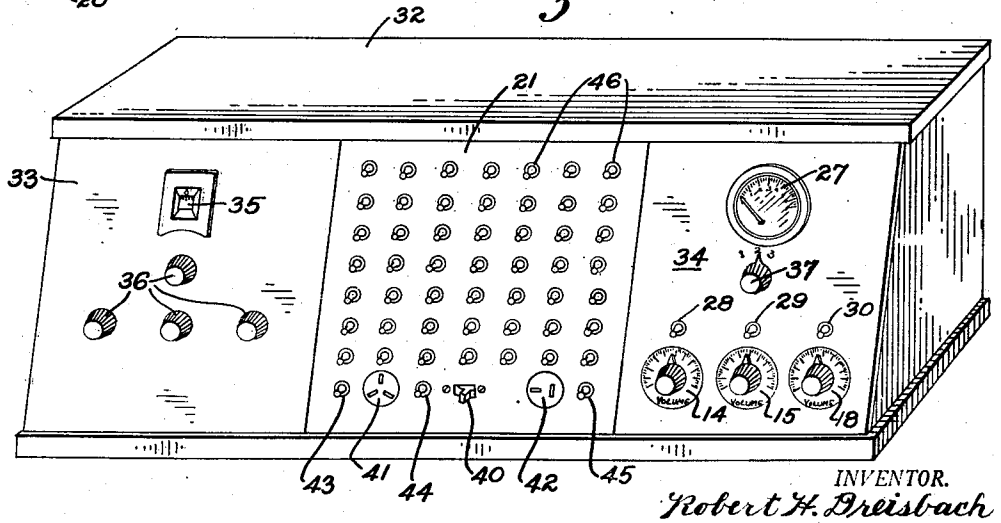


Fig. 2.



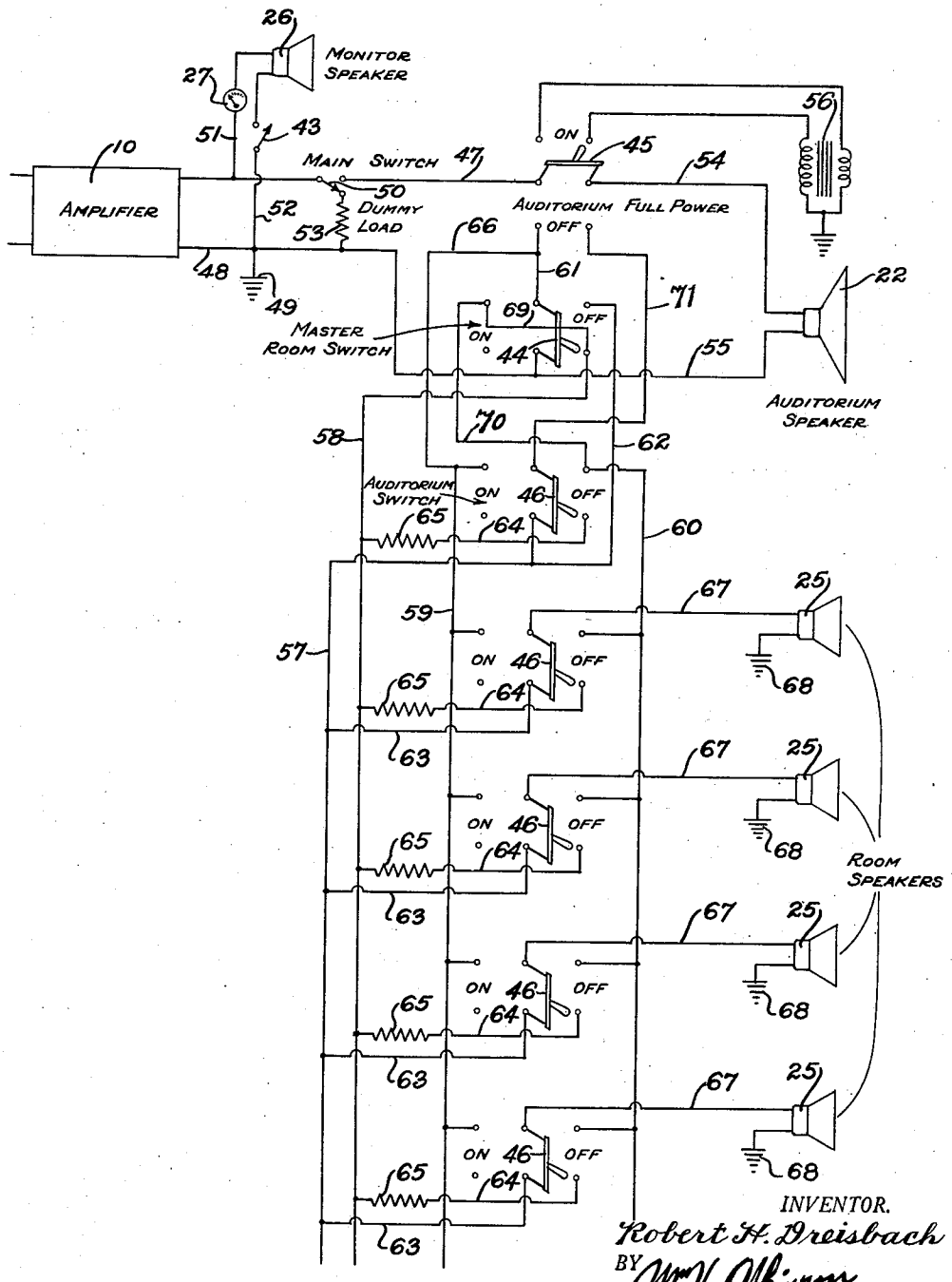
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Fig. 3.



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SYSTEM FOR SOUND REPRODUCING APPARATUS

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6 Claims. (Cl. 179—1)

The present invention relates to a system for sound reproducing apparatus, and more particularly to an address and program reproducing system for schools and like institutions.

An object of the invention is to provide in a sound reproducing system having a plurality of sound reproducing devices, switching means whereby any number or all of said sound reproducing devices may be selectively switched into and out of the system without affecting the volume of sound reproduced by the operating devices.

Another object of the invention is to provide a novel form of switching means in a system of the above character whereby the full power available may be directed to a particular group of sound reproducing devices independently of the remaining sound reproducing devices of the system.

A further object of the invention is to provide in a system of the above character, a switching means whereby any preselected number of sound reproducing devices may be independently connected to the system, and wherein all of the sound reproducing devices may be connected to the system at any time irrespective of the positions of the independent speaker controlling switches and without disturbing the volume of sound reproduced by said sound reproducing devices.

Other objects and advantages of the invention will be in part pointed out and in part evident to those skilled in the art, from the following description taken in connection with the accompanying drawings, wherein there is shown, by way of illustration and not of limitation, a preferred embodiment of a system designed primarily for school purposes.

In the drawings—

Figure 1 is a schematic one line diagram showing a complete distribution system,

Figure 2 is a perspective view of a preferred form of desk type distribution panel, and

Figure 3 is a partial wiring diagram showing a switching system embodying the present invention, which is suitable for a high school or a college.

For the purpose of illustrating the invention, the applicant has shown, by way of illustration, a sound transmission system for schools in which each classroom is provided with one or more speakers and auxiliary sound reproducing devices are located at various other locations, as in an auditorium, at the athletic field and in the gymnasium or other meeting halls.

As illustrated in Figure 1 of the drawings, the complete system provides for spoken programs, phonographic reproductions and radio programs. These programs are adapted to be connected through suitable mixers and amplifiers to a distribution panel where the selected program may be distributed throughout the system as desired.

More specifically, the system, as illustrated in Figure 1, will comprise suitable input and power amplifiers 10 and 11, into which the pickup of a desk microphone 12, or a pedestal microphone 13, may be selectively introduced through a mixer 14. A second mixer 15 will also be provided through which the output of a phonograph reproducer 16 or a pedestal microphone, connected to a receptacle 17, may be introduced into the amplifiers 10 and 11. A third mixer 18 provides for the introduction of the output of a radio receiver 19, into the amplifiers 10 and 11. Connected to the mixer 18 there is also an auxiliary inlet receptacle 20, to which a pedestal mircrophone or other source of modulated current may be connected. The output circuit of the amplifiers 10 and 11 is connected with a distribution panel 21, which will be described in detail hereinafter. Connected to the distribution panel 21, as will hereinafter appear, are a plurality of groups of speakers 22, 23, 24 and 25, which are respectively located in the auditorium, at the athletic field, in the gymnasium and in the individual room of the school building. Associated with the power amplifier, there is also provided a suitable monitor speaker 26 and a volume indicating instrument 27. Suitable switches 28, 29 and 30, for connecting the various mixers to their associated source of modulated current may also be provided, together with means 31 for controlling the output volume therefrom.

As illustrated in Figure 2 of the drawings, the preferred form of control cabinet incloses all of the necessary apparatus for the complete switching operations necessary between the microphone, phonograph or radio and the various sound reproducing devices. In its preferred form, the distribution panel 21 is mounted centrally upon a cabinet 32 with a radio receiver 33 at one side and a mixer and volume control panel 34 at the other side. In this figure of the drawings, the distribution panel 21 is shown as having a plurality of independent room switches and the various other switches of the circuit disposed therebelow. The radio receiver 33 is preferably of the all-wave type, having a tuning dial 35 and various control knobs 36. The mixer con-

trol panel 34 at the right of the distribution panel 21 carries the volume indicator 27, the switches 28, 29 and 30 and the mixer controls 14, 15 and 18, shown in Figure 1 of the drawings. A suitable switch 37 is also shown for connecting the volume indicator 27 in the circuit of the particular source of modulated current selected by the mixer controls 14, 15 or 18.

The distribution panel 21 carries a suitable power switch, designated by the numeral 40, for connecting the complete system to the service lines of the school building. This switch 40 is preferably disposed upon the lower part of the panel 21, and adjacent thereto, upon opposite sides, is a microphone plug receptacle 41 and a phonograph plug receptacle 42, for the attachment respectively of a desk microphone and a local phonograph unit. In connection with the latter plug receptacle, it should be stated that in some instances the phonographic reproducer may be built into the cabinet 32. The desk microphone may also be permanently connected to the apparatus if desired. The panel 21 also carries a monitor speaker switch 43, a master room switch 44, a full power switch 45 and a plurality of individual speaker switches 46.

In the drawings, the panel 21 is equipped with forty-two (42) switches 46, which are adapted to individually control as many sound reproducing devices. If the apparatus is to be used with a fewer number of sound reproducing devices, the switches 46, not in use, may be omitted altogether, or merely disregarded insofar as connections are concerned, as desired.

One of the novel features of the present invention is the provision of a system wherein any number less than all of the reproducing devices, or all of the sound reproducing devices, may be connected and/or disconnected from the source of modulated current without requiring any adjustment of the volume controls or effecting the sound reproduced by the operating devices. This feature, and the other features of the invention, will be best understood by reference to Figure 3 of the drawings, wherein the various switches and their controlled circuits are shown in detail.

As shown in Figure 3 of the drawings, the output of amplifier 10 is connected to the various control switches upon the panel 21 through conductors 47 and 48. The conductor 48 is grounded as at 49, and the conductor 47 is provided with a main switch 50, by means of which the amplifier 10 is connected and disconnected from the switching system. The main switch 50 is of the single pole double throw type. Connected across the conductors 47 and 48, between the amplifier 10 and the main switch 50, by means of conductors 51 and 52, is the monitor speaker 26 and the volume indicator 27. Arranged adjacent and connected between one of the poles of the main switch 50 and the conductor 48, there is a dummy load or impedance 53. With this arrangement it will be seen that when the main switch 50 is moved into its panel disconnecting position it will connect the dummy load or impedance 53 across the output circuit of the amplifier 10 and permit an adjustment at the panel of the tonal volume of the amplifier output with the monitor speaker before any of the other speakers are put in operation. Under these conditions the impedance 53 will serve to load the amplifier with an impedance corresponding to the total impedance of the circuit when all of the speakers are operating, and as a result, when the proper volume has been obtained by the use of the monitor speaker, it will then be possible to connect the system to the amplifier output and operate such speakers as are connected with the system at a proper volume.

In order to permit the full power of the amplifier to be directed to any special location, as for example, to a large auditorium, the athletic field or other location, the conductor 47 is connected to one blade of the full power switch 45, and the other blade of this switch is connected to a conductor 54 which furnishes power to the sound reproducing devices at the location selected. The other side of the sound reproducing devices, designated by the numeral 22, are then connected to the other side of the amplifier 10 through the conductors 55 and 48. The full power switch 45, when in its "on" or up position, will serve to connect a suitable power converting transformer 56 into the circuit formed by the conductors 47 and 54, which connects the selected group of speakers with the amplifier 10.

In the example chosen for illustration in this figure of the drawings, there is shown only one full power switch 45 for controlling the power of the auditorium speaker or speakers 22. Where additional locations are desired, as for example in a cafeteria, at the athletic field, or other meeting hall, and full power is desired, additional switches similar to and connected as is the switch 45, will be provided. In connection with such additional switches there may also be provided additional impedance converting transformers 56, having the required impedance converting capacities.

In order not to complicate the switching diagram now under consideration, the sound reproducing devices or loud speakers 22, 25 and 26 are shown as of the permanent magnet type, and consequently only the conductors which form the modulated voice or other sound currents are shown. Where loud speakers of the electro-dynamic type, involving an energized field, are used, it is to be understood the fields thereof will be excited in the usual manner by separate conductors.

In the drawings, the master room switch 44 is shown as located at the top of a vertical row of horizontally disposed switches 46. The adjacent one of these switches is connected to control the auditorium speaker 22 in a manner similar to that contemplated for the control of the individual room switches. Extending downwardly adjacent the vertical row of horizontally disposed switches 46, there is provided four (4) bus bars or conductors 57, 58, 59 and 60. As here shown, the switches 46 are all of the double pole double throw type, and as connected they will be, as indicated, in their "on" or speaker circuit closing position when thrown to the left, and in their "off" or speaker circuit opening position when thrown to the right. With this arrangement it will be seen that when the master room switch 44 is in its "off" position and the full power auditorium switch 45 is in its down or "off" position, a circuit will be established through a conductor 61, the upper blade of the master room switch 44, through a conductor 62, to the bus bar 57. Now, if the auditorium, or any of the room switches 46 are in their "off" position, a circuit will be established from the bus bar 57, through conductors 63 leading therefrom to the corresponding speaker switch 46, through the lower blade of said speaker switch, and by way of conductors 64 to associated dummy load impedances 65, and back through the bus bar 58 to the lower blade of the master room

switch 44, and back to the conductor 48 at the other side of the amplifier output. If any one of the speaker switches 46 is now thrown to the left or into its "on" or speaker energizing position, the dummy load impedance 65 associated therewith will be cut out of the circuit and a new connection will be established to the particular speaker from the amplifier output conductor 47 through the left-hand blade of the full power auditorium switch 45, a portion of the conductor 61, and through the conductor 66 to the bus bar 59, from whence the current will flow through the upper blade of the particular "on" room switch, via an associated conductor 67, to the particular speaker 25, and to ground, as indicated at the points 68, and by virtue of the ground 49 at the source, complete a circuit back to the conductor 48 at the other side of the amplifier 10.

At this point it should be stated that the dummy load impedances 65, associated with the several room switches 46, of which there will be a number corresponding to the number of rooms and/or locations provided for by the system, each have an impedance value corresponding to the impedance of the particular speaker which it is to be substituted for when the particular speaker is disconnected from the system.

Now, if the master room switch 44 is thrown to the left or to its "on" position, the current flowing from the conductor 47 will pass through conductor 61, as described above, and by virtue of the jumper conductor 69 connected in the master room switch 44, and the conductor 70, be distributed between the buses 58 and 60, so that those room switches which are in their "on" position will complete the speaker circuits, as indicated above, and those speakers having their associated switches in the "off" position will be completed from the bus bar 60 through the upper blades of the switches 46 and back to the amplifier 10, through the conductors 67 and the ground connection, as previously suggested. Under these conditions, with less than all of the room speaker control switches 46 in their "on" position, should the master room switch be then thrown back to its "off" position, circuits will then again be reestablished through the dummy load impedances 65, and thus the total impedance of the system will be maintained constant, and as a result, the sound reproduced by the remaining connected speakers will remain at the same volume without requiring any adjustment of the volume control means.

As shown in the diagram of Figure 3, the auditorium speaker 22 also has a switch 46 upon the panel 21, by means of which it may be thrown into the circuit or cut out of the circuit, as desired, when the room speakers 25 are in operation. In connection with this use it is possible that a plurality of speakers 22 may be used where the size of the auditorium warrants, and in such an event the dummy load or impedance 65 associated therewith will be of a different impedance value than the impedance units associated with the individual loud speakers 25. In this diagram only four (4) room speakers 25 have been illustrated. However, it is understood that this number may be multiplied to any extent depending upon the capacity of the amplifier 10 to supply current therefor. The additional room speakers will, of course, be connected in a manner similar to that illustrated with the four (4) room speakers shown in the drawings. When the auditorium speaker 22 is operated with less than full power, as when the full power switch 45 is in its "off" or down position, the circuit of this loud speaker will be completed from the conductor 47 through the adjacent pole of the full power switch 45, the conductor 66, through the upper blade of the auditorium switch 46 and back to the right-hand blade of the full power switch 45, through the conductor 69, and then by way of conductor 54 to the speaker 22, and through conductor 55 to the conductor 48, at the other side of the amplifier 10.

Upon further inspection of the above described circuit, it will be seen that the bus bar or conductor 57 will be energized only when the master room switch 44 is in its "off" or normal position, and that the bus bars 58 and 60 will be energized only when the master room switch 44 is in its "on" position. This, therefore, means that the bus bar 59, which as described above is connected with the amplifier output conductor 47, provides a circuit from the amplifier 10, through the ground connections 68, for each of the individual speakers 25, whenever a corresponding room switch is thrown into its "on" position, irrespective of the position of the master room switch 44.

From the above, it will be seen that there is provided by the system of connections described, an arrangement wherein any one or a number less than all of the loud speakers of the system may be connected thereto, and disconnected therefrom, without effecting the volume of sound produced by the operating speakers, and without requiring any adjustment of the volume controlling means at the source of the speaker operating modulated current. The arrangement also provides for a segregation of the total output of the source of modulated current to any particular group of speakers independently of the remaining speakers of the system, and by the provision of the dummy load impedance 53, in connection with the main switch 50, the described system also provides a means whereby the sound reproducing volume of the speakers in the system may be properly adjusted by reference to a monitor speaker and/or indicating meter, independently of the sound reproducing devices or speakers which may be later connected to the system.

While I have, for the sake of clearness and in order to disclose my invention so that the same can be readily understood, described and illustrated specific arrangements, I desire to have it understood that this invention is not limited to the specific arrangements disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In an address system for public buildings, the combination of a source of modulated current, a plurality of loud speakers adapted to be operated by said modulated current, switching means associated with each of said loud speakers having open and closed circuit positions for independently connecting and disconnecting same with respect to said source of modulated current, and a master switch for connecting all of said loud speakers to said source of modulated current irrespective of the positions of the switching means associated with each of said loud speakers.

2. In an address system for public buildings, the combination of a source of modulated current,

a plurality of loud speakers adapted to be operated by said modulated current, switching means associated with each of said loud speakers for connecting and disconnecting same to said source of modulated current, a load resistance associated with each of said loud speakers having an impedance corresponding to that of the loud speaker, switching means for alternately connecting a speaker or a load resistance to said source of modulated current, and a master switch for disconnecting said load resistances and connecting all of said loud speakers to said source of modulated current independently of their respective switching means.

3. In an address system for public buildings, the combination of a source of modulated current, a plurality of loud speakers adapted to be operated by said modulated current, switching means associated with each of said loud speakers for connecting and disconnecting same to said source of modulated current, a plurality of load resistance units having an impedance corresponding to that of each speaker and adapted to be substituted one at a time in the modulated current circuit when a speaker is disconnected therefrom, and a master switch for disconnecting all of said resistance units and connecting all of said loud speakers to said source of modulated current independently of their respective switching means.

4. In a constant impedance sound reproducing system of the character described, the combination of a source of modulated current, a plurality of sound reproducing devices arranged in groups of different total impedance values at various locations, switching means for connecting said source of modulated current to any one or more of said groups of sound reproducing devices, an impedance changing transformer means associated with each of said groups of sound reproducing devices for maintaining the load impedance upon said modulated current source constant irrespective of how many of said groups of sound reproducing devices are connected to said source of modulated current, and a second switching means for connecting and disconnecting said impedance changing transformers without affecting the control established by said first switching means.

5. In an address system for public buildings, the combination of a source of modulated current, an amplifier for controlling the value of said modulated current, a plurality of loud speakers and impedances adapted to be optionally connected to said amplifier, switch means for controlling the optional operation of said loud speakers and/or impedances, a monitoring loud speaker adjacent said source of modulated current for observing the tonal volume produced by said amplifier, a resistance unit having an impedance corresponding to the total impedance of the optionally chosen loud speakers and impedances connected to said amplifier, and a second switching means for disconnecting all of said loud speakers and impedances from said amplifier and connecting said resistance unit into said circuit, whereby said modulated current source and said amplifier will operate under an artificial load condition corresponding to the total load impedance thereupon when said chosen loud speakers and/or impedances are connected to said source of modulated current.

6. In a system of the character described, the combination of a source of modulated current, an amplifier connected to said source of modulated current having a plurality of sound reproducing devices connected thereto, means for controlling the output volume of said amplifier, a monitor speaker for observing the volume control effected by said volume control means, a microphone adapted to be connected into said amplifier circuit for transmitting announcements through said sound reproducing devices, and switching means for simultaneously disconnecting said monitor speaker when said microphone is connected into said amplifier circuit to prevent a feed-back from the monitor speaker into said microphone.

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