Oct. 18, 1932. L. O. DORAN 1,883,624

CONSTANT LINE AND SPEAKER IMPEDANCE VOLUME CONTROL

Filed May 24, 1929

Fig. 1

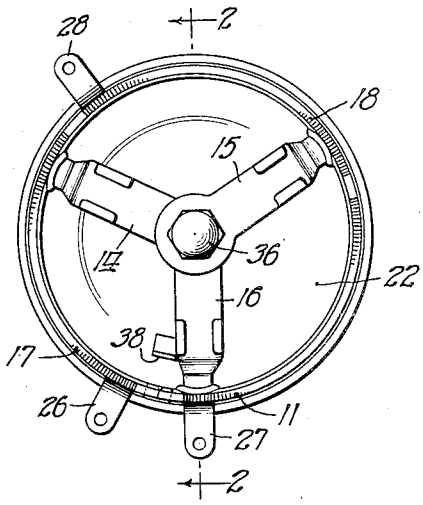


Fig. 2

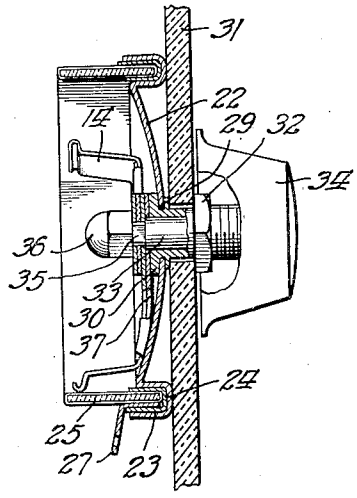
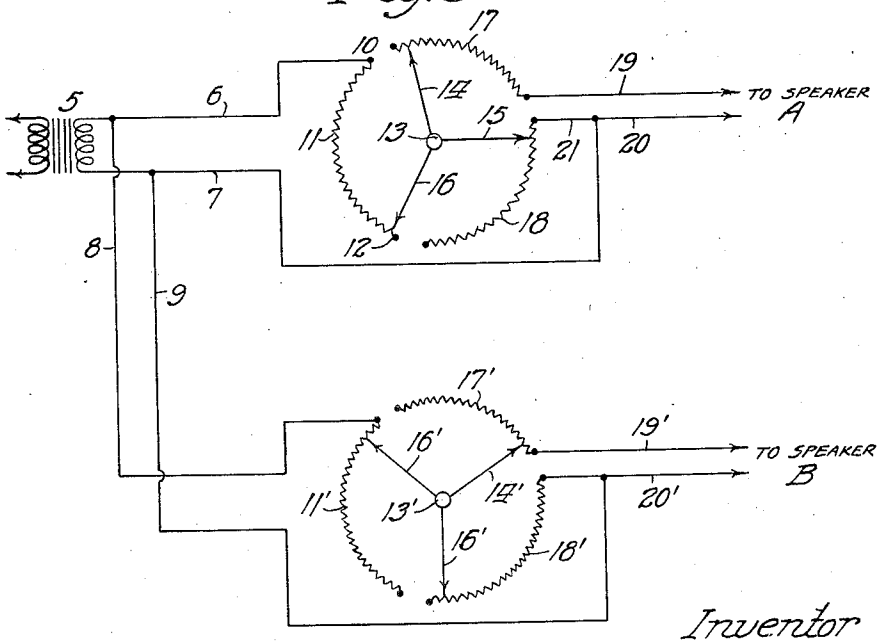


Fig. 3



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UNITED STATES PATENT OFFICE

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CONSTANT LINE AND SPEAKER IMPEDANCE VOLUME CONTROL

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My invention relates to volume control for speaker devices of radio sets, and more particularly to means for maintaining constant impedance between the terminals of a speaker that is one of a number on the same receiving or amplifying circuit.

At the present time there is a tendency, particularly in hotels and apartment houses, to equip the establishment with one or more receiving sets of high grade, and supplying to each one of the residents in the building, or to each suite of rooms, a loud speaker which may be connected into the receiving set, and thus supply the particular individual with music from the receiving set.

One of the difficulties encountered in this type of installation lies in the fact that, unless some means is provided for maintaining the impedance across the line the same at all times, irrespective of whether or not the speakers are taking full volume, the tuning of one speaker to a louder or lower volume causes a corresponding effect upon the other speakers in parallel therewith, and thus makes it impossible to get reception of a constant volume.

One of the purposes of this invention is to provide a system whereby the tuning of the various speakers in parallel upon the circuit of a receiving or amplifying device has little or no effect upon the impedance across the terminals of the receiving or amplifying device.

A further purpose is to provide, in such a system as has been described, means for also maintaining the impedance across the terminals of any particular speaker substantially the same irrespective of the volume for which that speaker is tuned.

I will describe one form which my invention may take by reference to the accompanying drawing, wherein—

Fig. 1 is a plan view of a resistor element that is utilized in conjunction with each speaker to accomplish the result desired;

Fig. 2 is a section on the line 2—2 of Fig. 1; and

Fig. 3 is a wiring diagram showing the connections for a plurality of speakers in parallel to the output of an amplifying device.

Referring now in detail to the drawing, I show at 5 the secondary winding of the last stage of a radio receiving device, from which the conductors 6, 7, 8 and 9, extend, as, for example, to different suites of rooms in a building, these conductors being arranged in parallel.

Conductor 6 connects at 10 to one terminal of a resistance 11, the other terminal of which is shown at 12 as having no direct connection to any other part of the circuit. A bridging member, indicated generally by the numeral 13, and having three arms 14, 15 and 16, is adapted to connect the resitance 11 with two other resistances 17 and 18, as shown clearly in Fig. 3.

The circuit may then be traced from conductor 6 through resistor 11, arm 16, arm 14, resistor 17, to conductor 19, which leads to one side of a loud speaker (not shown). The other terminal of the loud speaker is connected directly by means of the conductor 20 to the conductor 7, and is also connected by means of conductor 21 to the resistor 18. Conductors 8 and 9 are similarly connected, as shown, to resistors 11′, 17′ and 18′, which resistors are adapted to be connected by a device 13′ similar in all respects to that shown at 13. Conductors 19′ and 20′ lead to a second loud speaker in parallel with the first mentioned speaker.

Now, in the utilization of this device, let us assume that in one case the person listening to the first described speaker, which we will call for convenience sake speaker A, wants to turn the speaker down very low, while the person listening to the second speaker, or speaker B, desires to have the program brought in rather loudly. The connecting device 13 is turned by the operator of speaker A to the position shown, so as to complete a circuit from conductor 6 through resistor 11, arm 16, arm 14, resistor 17, conductor 19, speaker A and conductor 20, back through conductor 7 to the opposite side of the transformer coil 5. At the same time, a parallel circuit which governs the amount of voltage that will be impressed across speaker A is completed from conductor 6 through resistor 11, arm 16, arm 15, a small

portion of resistor 18, conductor 21 and conductor 7. Thus it will be seen that the resulting voltage drop between the arm 16 at its contact point with resistor 11 and the conductor 7 will be only a small portion of the total drop across the transformer 5, and as the total drop across the speaker must be the drop between the arm 16, which is direct-connected to arm 14, and the conductor 7, this drop must necessarily be the same small value across the speaker. In the position shown, of course, this is greatly exaggerated, as it is unlikely that, with the member 13 in the position shown, any one would be able to hear speaker A.

It will be noted, however, that the impedance across the line between the conductors 6 and 7 is substantially equal to the value of one of the resistances 11, 17 or 18, which are made equal. This is due to the fact that arm 16 cuts off just as much resistance from resistor 11 in this circuit as arm 15 adds from resistor 18.

At the same time, it will be noted that the total impedance between the conductors 19 and 20 leading to the loud speaker consists of substantially the same amount, namely, the greater portion of resistor 17 plus the small portion of resistor 18 which is encompassed by the circuit extending from conductor 19 through resistor 17, arm 14, arm 15, a small portion of resistor 18 and conductor 21, to conductor 20.

In speaker B the member 13′ has been turned so as to bring its arms in such position as to impress substantially the entire voltage between the terminals of the winding 5 across the terminals 19′ and 20′ of the loud speaker B. This is done, however, as is clearly apparent, without changing the value of the impedance connected across conductors 8 and 9, or the value of the impedance connected across conductors 19′ and 20′.

Thus it will be seen that the volume of the speakers may be regulated or adjusted in any manner that the user thereof desires without in any way interfering with other speakers on the circuit or the tone of the individual speaker, which is rather seriously affected by variations of impedance in its circuit.

The structure of resistors 11, 17 and 18 and the member 13 with its corresponding arms 14, 15 and 16 is shown more clearly in Figs. 1 and 2, wherein, as shown, a disk 22 has an annular flange formed at the rim thereof to provide a U-shaped recess at 23, into which an insulation strip 24 of similar shape is mounted, and the resistance strip 25 of insulating material, having wound thereon the several resistances 11, 17 and 18, is clamped within these U-shaped members 23 and 24. Suitable terminals 26, 27 and 28 serve for connections, and are also clamped within the U-shaped members 23 and 24, with the strip 25. The disk 22 has a central aperture at 29, in which a bearing sleeve 30 is secured, and this sleeve may be mounted on a panel 31 by a suitable nut 32 being screw-threaded thereon to clamp the panel between the disk 22 and the nut. A shaft 33 carrying a handle 34 extends through the bearing sleeve 30 and has mounted thereon the three arms 14, 15 and 16, which contact with the resistors 11, 17 and 18, these three sleeves being connected together by being clamped upon the stub 35 projecting from the shaft 33 by means of a nut 36. The stub shaft 35 is, of course, flattened on the sides or otherwise made non-circular so as to hold the arms 14, 15 and 16 in proper position 120° apart. A spring bearing plate 37 is carried by the lowermost arm, so that these arms may be held against coming loose without tightening them to such an extent as to make it difficult to turn the handle 34. Also a suitable stop, as shown at 38, is struck up from the disk 22 to limit the movement of the arms in both directions, contacting when the member 13 is moved in one direction with arm 16, and when it is moved in the other direction with arm 14.

While I have described one specific form which the invention may take, it is obvious that various modifications may be made therein without departing from the scope of the invention, and it is to be understood that all such modifications are to be considered as part of this invention so long as they fall within the scope of the claim.

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

In a system of the character described including a reproducing device connected across the output circuit of radio receiving apparatus, means for varying the volume of said reproducing device without varying the impedance across the output circuit or reproducing device comprising resistance units, and means for varying the amount of said units in series with said reproducing device while maintaining a substantially constant amount thereof across the terminals of said device and a substantially constant amount thereof across the output circuit, said last named means comprising an adjustable contactor element having three contact making arms electrically connected to each other and each engaging one resistance unit only.

In witness whereof, I hereunto subscribe my name this 6 day of May, A. D. 1929.

LEROY O. DORAN.