

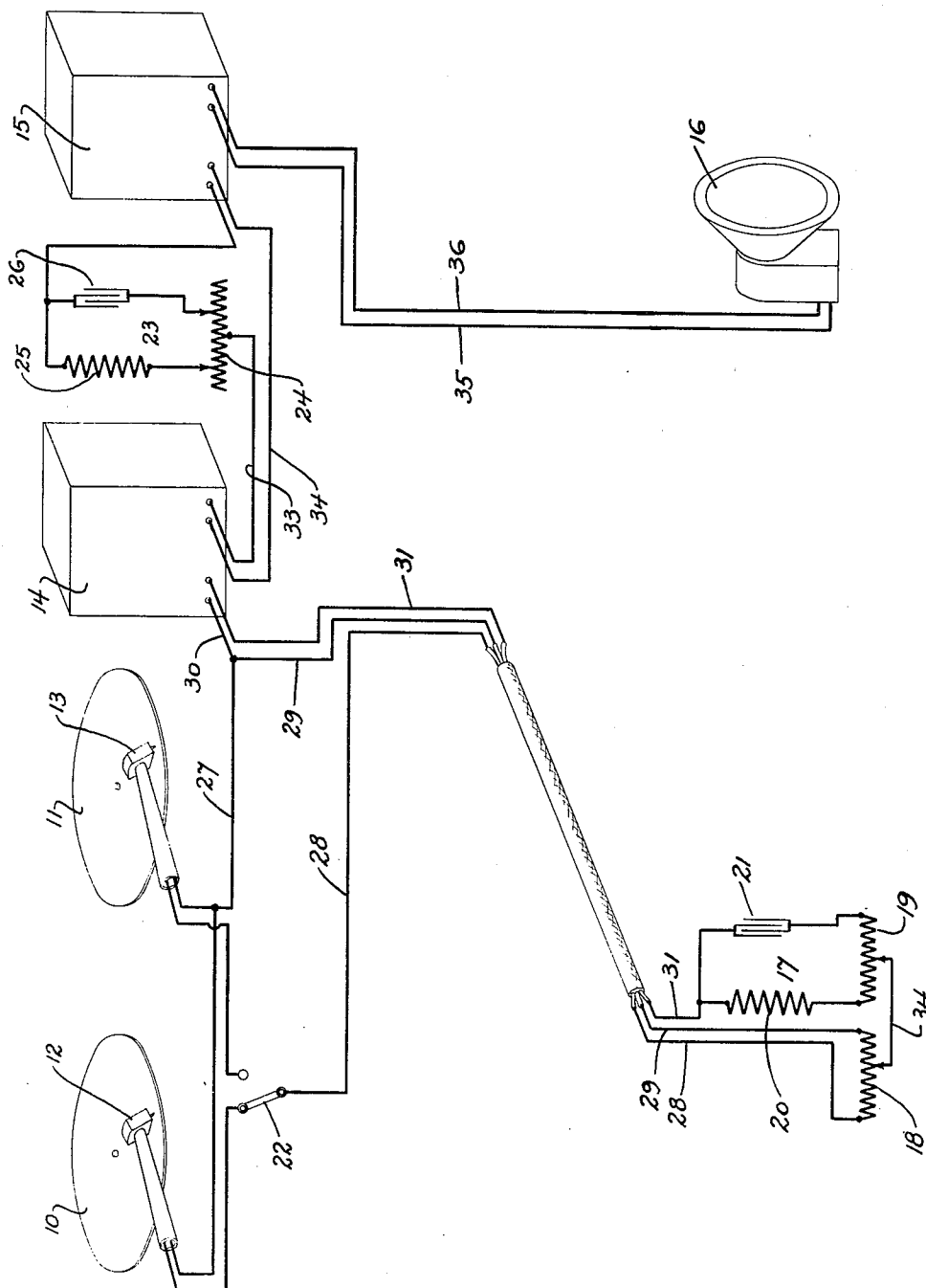
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SOUND CONTROL APPARATUS

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SOUND CONTROL APPARATUS

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My present invention relates to new and useful improvements in sound control apparatus and more particularly a method and apparatus for controlling sound reproduced in talking pictures, public address systems, radio receivers, and for other applications where sound is amplified by electrical means and reproduced by an electrically operated loud speaker.

10 The principal object of my invention is to provide a new and useful arrangement and apparatus by means of which electrically operated loud speakers may be controlled to vary their tonal qualities.

15 A further object of my invention is to provide a system and apparatus by means of which the reproduction of sound may be controlled from a point remote from the reproducing apparatus.

20 Other objects and advantages of my invention will be in part evident and in part pointed out in the following specification.

For a better understanding of my invention reference should be had to the accompanying drawings wherein I have shown by way of illustration and not of limitation a preferred embodiment thereof.

25 In the drawing the single figure is a diagrammatic illustration showing the preferred arrangement of apparatus and scheme of electrical connections.

30 In the drawing the numerals 10 and 11 designate phonograph records of the usual design. Associated with the records 10 and 11 there is provided respectively electrical pick-up devices 12 and 13. These pick-ups are connected through suitable amplifiers 14 and 15, to be hereinafter described, to an electrically operated loudspeaker 16. Interposed between the pick-ups 12 and 13 and the amplifier 14 I show one embodiment of apparatus constructed in accordance with my invention. This apparatus is designated by the numeral 17 and embodies two resistances 18 and 19, and inductance 20 and a condenser 21. At a point between the pick-ups and the regulating apparatus 17 I provide a suitable switch by means of which either of the pick-ups 12 and 13 may be used as desired.

This switch designated by the numeral 22 is a single pole double throw type.

In addition to the regulating controller 17 I also provide a similar regulator 23. This latter regulator comprises a resistance 24, an inductance 25 and a condenser 26. These regulators 17 and 23 are so designed and proportioned that the currents flowing there-through may be divided and caused to pass in different proportions through the inductance of capacity condensers. With this arrangement it will be understood by those skilled in the art that the strength of the high or low frequency impulses can be either strengthened or weakened as desired and as a result the loudspeaker can in this manner be rendered responsive to either the high pitched or the low pitched notes of the musical scale or any variation between the two extremes may be obtained.

Before proceeding with a description of the operation of my invention it is thought that a word about the amplifiers will be pertinent. The amplifier 14 is of the type commonly referred to as an audio frequency amplifier. It can, however when used in a radio circuit also have radio frequency stages. This amplifier as is well known is generally provided with a relatively high step-up ratio of transformation and operates more to step up the voltage of the system. The amplifier 15 on the other hand is a so-called power amplifier which is usually designed with a small step-up ratio and operates to amplify the current sent to the loud speaker. This latter amplifier while illustrated is not necessary under all circumstances. Where this power amplifier is used I have found that better results can be obtained if I provide the second regulator apparatus 23.

In order that a complete understanding of my invention may be had I shall now describe its operation in connection with the apparatus shown in the drawing. If we assume that the record 10 is in movement and the pick-up 12 is generating current impulses it will be apparent that these impulses will travel over the wires 27 and 28 to the regulator 17, the current in wire 27 dividing and flowing to both

the regulator 17 and the amplifier 14 respectively over conductors 29 and 30. A third conductor 31 forms the other connection between the regulator 17 and the amplifier 14.

5 With this arrangement it will be seen that the currents flowing in the conductors 28 and 29 will be impressed upon the resistance 18 and that by an adjustment of a suitable jumper 32 any desired amount of this current can in

10 turn be caused to flow to the second resistance 19. The resistance 18 provides what might be termed the volume controlling element of the regulator 17. This resistance is in the order of 7000 ohms and the resistance 19

15 which might be termed the quality controlling element is in the neighborhood of 1000 ohms resistance. The current which flows over the jumper 32 will divide in the resistance 19 and flow in any desired proportions

20 through the inductance 20 and the condenser 21. If the major portion of the current is shunted through the inductance 20 as by moving the jumper to the left of the resistance 19 the lower tones of the musical scale will pre-

25 dominate in the speaker reproduction and if the major portion of the current is shunted through the condenser 21 the higher notes of the scale will predominate. This is as is well known because of the fact that inductance

30 permits the flow of low frequency currents and prevents the free flow of high frequency currents and the fact that the action of a condenser in a circuit operates in an opposite manner, namely permits the flow of high frequency

35 currents and prevents the flow of low frequency currents. The inductance of the coil 20 is approximately 30 Henrys and the capacity of the condenser 21 is approximately 1 micro-farad.

40 From the above it will be readily seen that both the volume and tone quality of the music picked up from the records can be simply controlled by a proper adjustment of the ends of the jumper 32. The currents thus produced

45 by the pick-up 12 and regulated by the controller 17 are next imposed upon the amplifier 14 to be amplified. These amplified currents are then as shown in the drawing conducted to the second regulator 23 and the power amplifier 15 through the conductors 33 and 34

50 and then to the loud speaker 16 over the conductors 35 and 36. At this point I desire to point out that where no power amplifier is used I might dispense with the second regu-

55 lator 23. In this event the loud speaker would be connected directly with the audio amplifier 14. The regulator 23 differs from the regulator 17 in only one respect. This is in the resistance 24 which in the present instance is in a single unit divided in two halves

60 by the conductor 33. The resistance of this unit over all is approximately 500,000 ohms and the value of the inductance 25 and condenser 26 is substantially the same as in the

65 regulator 17.

After a proper choice of amplifiers 14 and 15 has been made and the regulator 23 is once adjusted I have found that the regulator 17 is all that is necessary to take care of the variations in tone quality occurring or produced

70 at the source.

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 devices and arrangements,

75 I desire to have it understood that this invention is not limited to the specific means disclosed but may be embodied in other ways that will suggest themselves, in view of this broad disclosure, to persons skilled in the art. For

80 instance I may substitute for the pick-ups described, a microphone, a photo-electric cell, or in fact any other device in which voice or musical vibrations are converted into electrical impulses. It is also conceivable that the

85 regulator might be placed between the amplifiers and the loud speaker.

It is believed that this invention is broadly new and it is desired to claim it as such so that all such changes as come within the scope

90 of the appended claims are to be considered as part of this invention.

What I claim and desire to secure by Letters Patent is:—

1. A regulator for controlling the tonal response of electrically operated sound reproducing apparatus comprising a source of operating current, an adjustable resistance connected in shunt relation with the source of operating current, an adjustable filter circuit

95 having inductance and capacity connected intermediate the ends of said resistance through a second adjustable resistance, a loud speaker, and connections whereby the magnitude of the high and low frequency

100 current impulses impressed on the loud speaker may be independently controlled by an adjustment of either of said resistances.

2. In a system for the reproduction of sound by electrical means, the combination

110 of a device for generating modulated currents, an amplifier for amplifying said currents, a sound reproducing loud speaker, and means for controlling the tonal response of said loud speaker comprising a resistance

115 connected directly across said modulated current generating source, and an adjustable filter circuit connected between a point intermediate the ends of said resistance and

120 said amplifier.

3. A control device for regulating the tonal response of electrically operated sound reproducing apparatus, comprising a source of controlling current, a loud speaker, a relatively high resistance unit connected across

125 the controlling current source, a second resistance having an inductance coil and a condenser connected in parallel between its respective ends and the loud speaker, and an adjustable connector extending between said

130

resistances and connecting them together intermediate their ends.

4. In a sound reproducing system of the character described, the combination of a
5 phonographic sound current generating device, an amplifier for the currents generated by said device, a loud speaker connected to the output of said amplifier, a resistance unit connected across the output circuit of said
10 sound current generating device, a filter circuit in one of the input connections of said amplifier comprising an inductance, a condenser and a resistance connected to form a closed circuit, and an adjustable connection
15 between said first resistance and the resistance of said filter adapted to be moved simultaneously over said resistances, whereby the value of the high and/or low frequency currents produced by said generating device
20 may be varied to control the tone of the reproduced sound.

5. In a sound reproducing system of the character described, the combination of a
25 phonographic sound current generating device, an amplifier for the currents generated by said device, a loud speaker connected to the output of said amplifier, a connection between one side of said generator and said
30 amplifier, a resistance unit between said connection and the other side of said sound current generating device, a filter circuit in the other input connection of said amplifier comprising an inductance, a condenser and a
35 resistance connected to form a closed circuit, and an adjustable connection between said first resistance and the resistance of said filter adapted to be moved simultaneously over
40 said resistances, whereby the value of the high and/or low frequency currents produced by said generating device may be varied.

6. In sound reproducing apparatus of the character described, the combination of an
45 electro-magnetic phonograph pickup, a loud speaker, an amplifier connected to said speaker, a connection between said pickup and one side of the input circuit of said
50 amplifier, a filter circuit connected to the other side of said amplifier, said filter circuit comprising an inductance, a capacitance and a resistance connected in series to form a
closed circuit, a connection between the other side of the amplifier and a point between
the inductance and capacitance of said filter,
55 an adjustable connector engaging the resistance of said filter, and a second resistance connected across the output circuit of the pickup adapted to be also engaged by said
adjustable connector, whereby the tonal response of the loud speaker may be varied
60 by changing the position of said connector upon said two resistances.

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