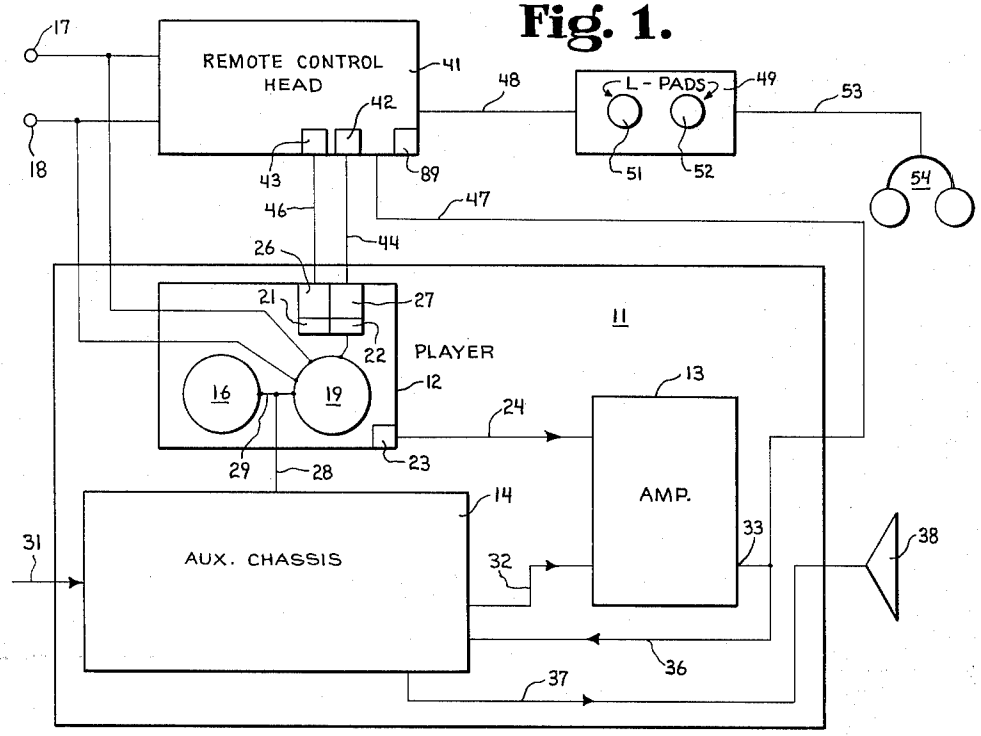
Sept. 21, 1965 B. M. EPSTEIN 3,207,847

REMOTELY CONTROLLED SOUND SYSTEM

Filed Sept. 28, 1961 2 Sheets-Sheet 1

Fig. 1.



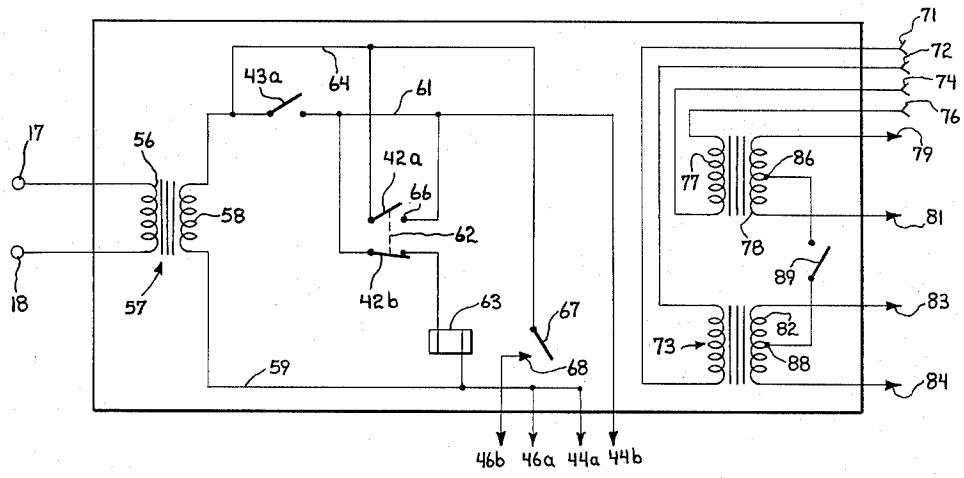


Fig. 2.

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REMOTELY CONTROLLED SOUND SYSTEM

Filed Sept. 28, 1961 2 Sheets-Sheet 2

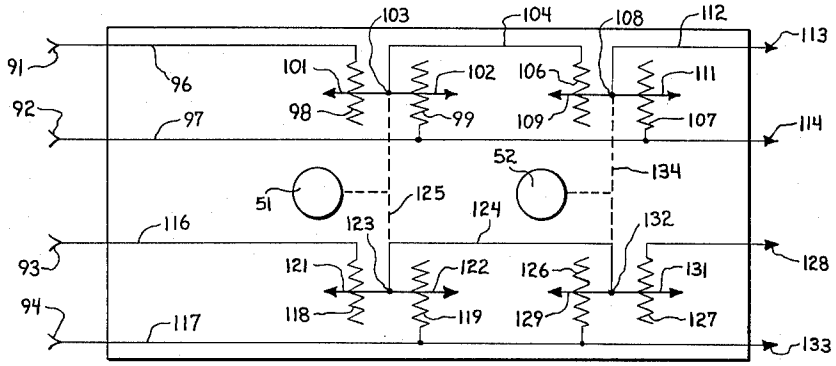


Fig. 3.

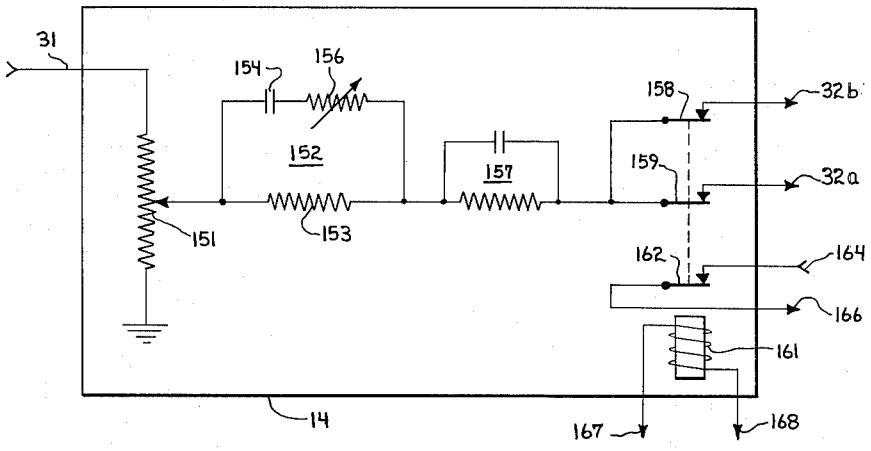


Fig. 5.

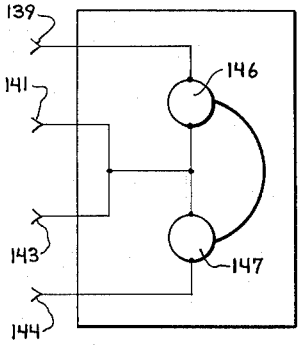


Fig. 4.

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United States Patent Office 3,207,847 Patented Sept. 21, 1965

3,207,847

REMOTELY CONTROLLED SOUND SYSTEM

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Filed Sept. 28, 1961, Ser. No. 141,492
12 Claims. (Cl. 179—1)

This invention relates generally to sound systems and more particularly to systems capable of producing outputs at various locations, obtained by various sound sources, all by remote control.

In conventional sound systems, particularly those in current use by dentists in connection with the technique of audio-analgesia, it is necessary for the operator to personally manipulate the record or tape playing machine to initiate and terminate production of the desired sound. The disadvantages of such arrangements can be particularly well recognized when one considers the problem which can develop in a dental or other office, where a particular type of sound is desired at a particular time. For example, in a dental clinic there may be a number of chairs and dentists, but in the interest of economy, there should be only one sound producting machine and associated amplifier. The recording, containing both white sound and music, is of course of limited duration, whether it be in the form of a tape recording or a phonograph record disc.

Consider the problem of the dentist with such equipment. When the need for the recorded sound begins, such as when the drilling operation is about to begin, the dentist must personally go to the location of the playing machine and start the record. The playing machine may be located a considerable distance from the chair location, such being likely in many instances in the case of a dental clinic. During pauses in the drilling operation, the record continues to play, regardless of how long the pause will be. In the event of a prolonged operation, it is likely that the record will end some time during the drilling operation, resulting in the rather prompt appearance of pain for the patient. Aside from the inherent risk and danger of such an eventuality, there is the inconvenience of the necessity of renewing the record, the actual dental operation being temporarily suspended in the meantime. The disadvantages of sound systems currently in use, are therefore apparent, not only from the standpoint of waste of time for the dentist and inconvenience to him, but also inconvenience, time loss, and comfort of the patient.

It is a general object of this invention to provide an improved sound system.

It is a further object of this invention to provide a remotely controlled sound system.

It is a still further object of this invention to provide a remotely controlled sound system which lends itself to a plurality of locations of the control means, and to a plurality of sound output stations, and wherein a variation of volume and balance controls on the part of the patient at one station, does not affect the signal at other stations.

It is a still further object of this invention to provide a remotely controlled sound system wherein control at any one of a variety of locations is available to provide sound from one source to an individual station at the location, or sound from another source at any one or all of several locations.

It is a still further object of this invention to provide a sound system having the foregoing characteristics and particularly well adapted to incorporation of many components readily available in the market.

In brief, a typical embodiment of this invention includes the conventional stereophonic record player-changer having the usual "stop" and "start-reject" buttons

performing their usual and well known functions. Stereophonic records are used which have one channel containing music and the other containing white sound whereby the records are well adapted to audio-analgesia.

The output of the changer is fed through an amplifier to remote control head containing matching transformers with switching means whereby the music and white sound signals can be mixed for an output to earphones. The remote control head also contains stop and start buttons controlling solenoids in the changer coupled to the "start-reject" and the "stop" buttons. The buttons are thereby effective to control the operation of the record player-changer.

An auxiliary chassis is coupled to the changer, the chassis being also provided with a music signal input from an external source and with an output through the amplifier to a speaker. The coupling to the changer is for the purpose of operating relays in the chassis whereby the external music source is decoupled from the amplifier and the amplifier decoupled from the speaker, during reproduction of a record by the player-changer.

Control by the patient of the mixture of music and white sound is provided by means of L-pads located in the coupling between the amplifier output and the earphones, the pad being physically constructed for resting in the lap of the user. Both volume controls and balance controls are provided in the L-pads whereby the volume and the proportion of white sound to music may be varied at the option of the patient.

The full nature of the invention will be understood from the accompanying drawings and the following description and the claims.

FIG. 1 is a block diagram of the system according to this invention in a typical embodiment thereof.

FIG. 2 is a schematic diagram of the remote control head of FIG. 1.

FIG. 3 is a schematic diagram of the L-pad of FIG. 1.

FIG. 4 is a schematic diagram of the earphone connections.

FIG. 5 is a schematic diagram of the auxiliary chassis.

Referring particularly to FIG. 1, a main unit **11** includes as the principal components, a record player-changer **12**, an amplifier **13**, and the auxiliary chassis **14**. Any one of a variety of commercially available record player-changers may be used in this application. An example of one well suited is the Norelco automatic four-speed stereo record player-changer, model AG1024, Serial No. 63,018. Similarly, the amplifier may be any one of a variety of commercially available stereo amplifiers, one example being the H. H. Scott model 222B 30 watt stereo amplifier. The auxiliary chassis will be described subsequently.

The record player-changer, hereinafter referred to as changer, includes the usual motor **16** electrically connectable to the 110 volt A.C. power supply across terminals **17** and **18**, by means of the motor switch **19**. The motor switch **19** is conventionally controlled by a pair of actuators **21** and **22**. These actuators are normally in the form of buttons and actuator **21** is labeled "stop" and actuator **22** is labeled "start-reject." The changer has a tone arm, designated schematically by reference numeral **23**. A signal output line **24** from the tone arm is connected to the "mag-hi" input terminals of the amplifier **13**. For purposes of this invention, the bar linking the "stop" and the "record size" (not shown) buttons of the Norelco changer is removed. Therefore, the "record size" button can be left set on the proper record size (usually 12″) so that if a single record is played remotely, the phonograph needle will engage the record properly.

According to this invention, a solenoid **26** is coupled

to the stop actuator 21, this solenoid being referred to hereinafter as the stop solenoid. A second solenoid 27 is coupled to the start-reject actuator 22, and will be referred to hereinafter as the start solenoid. While it is apparent that any number of commercially available solenoids may be used in this application, a suitable example is that manufactured by the Guardian Electric Company, Model No. 11, 24 volt 1 inch stroke. Thus, while the start, stop, and reject operations may still be effected manually, they may also be performed electrically by energization of the respective solenoids.

Further according to this invention, an electrical connection 28 is made to the circuit path 29 between the motor and motor switch, whereby electrical energy may be obtained from the changer whenever the changer motor is energized. This connection 28 is coupled to the auxiliary chassis 14 to operate a relay therein which will be described hereinafter. An additional input to the auxiliary chassis is indicated by the conduit 31 which would be connected to an external source of signals such as music signals from an F-M tuner, or a telephone line carrying music which is available as a service provided under the trade name Muzak or other suitable source. A signal output from the auxiliary chassis is available to the amplifier by way of the conduit 32. The amplifier itself has audio output means 33 to provide a signal source for both the speaker and headphones. The speaker output on conduit 36 is returned to the auxiliary chassis 14 for control by a relay therein, the output from the relay contacts being by way of conduit 37 to the speaker 38.

The main unit described above, may be located at any suitable place in the building. In addition to the main unit, according to the present invention, there is a remote control head 41 which is usually located close to the actual work station where the audio-analgesia is to be used. Typically the remote control head may be mounted to the dental chair. Though the remote control head will be described in detail subsequently, it is pertinent here to indicate that an input is provided thereto from the terminals 17 and 18. Start and stop buttons 42 and 43 respectively control electrical outputs on the conduits 44 and 46 coupled to the start and stop solenoids respectively of the changer. An input signal from the audio output 33 of the amplifier is received by way of conduit 47. An output conductor is one of a number of electrical couplings carried in conduit 48 between the remote control head and an additional unit intended for use of the patient. This additional unit is an L-pad 49.

L-pad box 49 includes volume and pain control knobs 51 and 52, respectively. An output conduit from the L-pad box 49, designated by reference numeral 53, provides a coupling to the earphone set 54.

FIG. 2, being a schematic of the remote control head 41 shows the 110 volt A.C. input from terminals 17 and 18 connected across a primary winding 56 of a control transformer 57. An example of a suitable transformer would be a Triad, Model F–40X. The secondary winding 58 is coupled across the circuits for controlling the solenoids in the changer of FIG. 1. The output terminals 44*a* and 44*b* are provided for an output to the solenoid 27 of FIG. 1, and the output terminals 46*a* and 46*b* are provided for an output to the stop solenoid of FIG. 1. Terminals 44*a* and 46*a* are connected in common to one side of secondary winding 58 through the conductor 59. The other terminal 44*b* for the start solenoid, is connected by way of conductor 61 through the normally open contacts 43*a* of the stop switch operated by button 43, to the opposite side of the secondary winding 58. The reason for this connection will become apparent as the description proceeds.

A pair of movable contactors 42*a* and 42*b*, which are interlocked as designated by the dotted line 62, are operable by the start switch button 42 of FIG. 1. The contactor 42*b* is normally closed, and 42*a* is normally open. A circuit branch is coupled between the conductor 61 and 59 and includes in series, the normally closed switch contactor 42*b* and a time delay relay 63. The normally open contactor 42*a* is connected through the conductor 64 to the secondary winding 58 of the control transformer. The fixed contact 66, corresponding to the movable contactor 42*a* is connected to conductor 61. The normally open contacts 67 and 68, operable by time delay relay 63, are connected to the conductors 64 and to the output terminal 46*b*, respectively.

Examples of the switches and relay used are the following. For the stop button, an Arrow, Hart and Hegeman, Type No. 3391, SPST normally-open switch may be used. For the start push button, an AH&H, Model SP2, Type No. 3392 switch may be used. For the relay, an Amperite 24 volt delay relay, normally open, having a three second delay, may be used. Of course, equivalents may also be used.

The remote control head also includes audio step-up transformers for the headphones. The primary windings of the transformers actually receive input signals from the L-pads, to be described hereinafter. Suffice it to say at this point, that input signals from one channel are available at terminals 71 and 72 and coupled therefrom to the primary winding 73. Input signals from a second channel are available at terminals 74 and 76 and coupled therefrom to the primary winding 77. Output signals from secondary winding 78 are available across terminals 79 and 81, and output terminals from secondary winding 82 are available across the output terminals 83 and 84. Each of the secondary windings 78 and 82 is tapped at points 86 and 88 respectively, these points being connectable through the switch 89. Switch 89 is provided to perform a mixing function, whereby the sound signals from each of the channels may be mixed with those from the other of the channels in both earphones during the use of the phones for audio-analgesia purposes, whereas opening of the switch permits separation of the signals so that those from one channel are provided to one earphone and those from the other channel to the other earphone, for stereophonic listening when desired.

Referring to FIG. 3, which is a schematic of the L-pad box 49, input terminals 91 and 92 are provided for connection to the output signals from one channel of the amplifier 13 of FIG. 1. Input terminals 93 and 94 are provided for output signals from the second channel of the amplifier 13 of FIG. 1. It should be understood, of course, that the inputs to these terminals are obtained from the audio terminals of the different channels in the amplifier, these being designated generally at FIG. 1 by the reference numeral 33. It should be understood further that the actual wiring is through the conduits 47 and 48 with the remote control head between the conduits, only for convenience of mechanical arrangement. No operation is performed on the signals from the amplifier to the L-pads, though the wires pass through the remote control head, and therefore, the actual showing of the wires in FIG. 2 was omitted, for simplicity of illustration. An example of a suitable L-pad for use in this invention is the Fedtro Stereo L-pad #STLP–8.

Referring to the first channel, a conductor 96 is connected to the input terminal 91 and a second conductor 97 is connected to the input terminal 92. A resistance element 98 is disposed with one end thereof connected to the first conductor 96. A movable resistance element contactor 101 is provided and may be moved to various positions along the element 98. This, of course, may be conveniently accomplished in the form of a potentiometer.

A second resistance element 99 is connected to the second conductor 97 and has a movable contactor 102 associated therewith. Contactors 101 and 102 are joined at the junction 103 electrically and are also mechanically joined so as to be operable in unison. Therefore, when

contactor 101 is moved to decrease the resistance between said contactor and the conductor 96, contactor 102 is moved to decrease the resistance between itself and the second conductor 97. In other words, the mechanical interconnection of the two contactors is such that the resistance between each and the input conductor with which it is associated through the corresponding resistance element, is changed in the same sense. This pair of potentiometers is for the purpose of providing a volume control in the channel.

A balance control element is also provided in each channel, that in the first channel being composed of a pair of potentiometers similar to that already described for the volume control. Resistance element 106 thereof is connected through conductor 104 to the junction 103 of the volume control. The resistance element 107 is connected to the second conductor 97 of the channel. Movable wipers 109 and 111 having a common connection 108 are provided and operate together in the same manner as described for the volume control. Outputs from the channel are available by means conductor 112 connected to the common connection 108 and terminated in the output terminal 113. The other output terminal 114 is directly connected to conductor 97.

Channel number two, includes a first conductor 116, and a second conductor 117. A volume control is also provided in this channel in the same manner as in channel one, and includes resistance elements 118 and 119, and wipers 121 and 122 having a common junction 123. A conductor 124 is provided to connect the signal from junction 123 to the balance control element of channel two. The volume control elements of the first and second channel are mechanically interconnected as by the link 125 for operation in unison by the volume control knob 51 mentioned in the description of FIG. 1.

The relation of the balance control element in channel number two to the other circuit elements is slightly changed from that of the balance control element of channel number one. In this instance, resistance element 126 is connected to the second conductor 117, and resistance element 127 is connected directly to an output terminal 128. Movable contactors 129 and 131 have their common point 132 connected to the conductor 124. A second output terminal 133 is connected directly to the second conductor 117.

To establish a connection between the output terminals of the L-pads back to the output transformer input terminals located at the remote control head, it will be most easily appreciated by referring to FIGS. 2 and 3 together. Output terminal 113 would be connected to the input terminal 71. Output terminal 114 would be connected to input terminal 72, terminal 128 connected to input terminal 74, and output terminal 133 connected to input terminal 76.

Referring again to FIG. 3 specifically, it should be observed that the contactors of the balance control elements are operated in unison by virtue of their interconnecting link 134, by the balance control knob 52 of FIG. 1. In referring to FIG. 1, this knob was termed pain control knob. The reason for this is that, when one channel carries white sound for the deadening of pain, and the other channel carries music, by adjusting the knob 52, the proportion of music and white sound can be varied so that to increase the pain deadening effect of the white sound, the knob is moved to increase the output of the channel carrying the white sound and decrease the output of the channel carrying the music. In this manner, if a plurality of chairs are using the audio-analgesia at the same time, adjustment of the pain control at one chair will not affect the adjustment at another chair. Similarly, by virtue of the arrangement of the elements in the volume control, it can be adjusted also without affecting the other chairs.

Referring to FIG. 4, the headphone set-up is shown schematically. The terminals 139 and 141 provided for coupling to the signal output terminals 81 and 79 at the remote control head of FIG. 2. Terminals 143 and 144 are provided for connection or coupling to the output terminals 83 and 84 of the remote control head. Again, it should be understood, that these couplings are through the L-pad box itself and conduits 48 and 53 of FIG. 1, for the purpose of simplicity of mechanical construction, there being no actual operation upon signals between the secondaries of the audio transformer and headphones, in the L-pad box. Because there is no operation in this coupling, these wires are omitted from the schematic of the L-pad in FIG. 3.

Referring further to FIG. 4, earphone 146 is connected across the input terminals 139 and 141. Phone 147 is connected across the input terminals 143 and 144. There is a common connection between terminals 141 and 143, for purposes of mixing the sound from the two channels in each of the phones upon closure of switch 89 of FIG. 2, as alluded to previously in this description.

Referring to FIG. 5, a schematic of the auxiliary chassis 14 of FIG. 1 is illustrated. It includes an input from the conduit 31 through the level control potentiometer 151 to the tone control mesh 152 including a resistance 153, and the series connection of capacitance 154 and variable resistance 156 in parallel with resistance 153. The variable resistance 156 provides a tone control. Because the input from the conduit 31 is intended for coupling to the "mag-low" phonograph input of the Scott amplifier 13, compensation to approximate the R.I.A.A. curve is provided by the RC mesh 157 in addition to mesh 152. It should be understood, that if the phonograph output is such as to require coupling to the "mag-low" input of the amplifier, conduit 31 could be coupled to the "mag-hi" input of the amplifier, compensation being provided by potentiometer 151.

Normally closed contacts 158 and 159 operable by relay coil 161, are connected to receive the signal output from the mesh 157. Contact 159 is connected to an output terminal 32*a* and contact 158 is connected to output terminal 32*b*. These terminals are coupled through the conduit 32 of FIG. 1 to the separate "mag-low" stereo input channels of the amplifier 13. It should be understood at this point, that if the input to the auxiliary chassis through conduit 31 is in the form of a two channel input, a level control, a tone control and a compensating mesh as shown in FIG. 5 for a single channel, would be provided for each channel. In this event, there would be only one output from each channel to a separate one of the relay contact 158 or 159 to provide a stereo input to the amplifier. The showing in FIG. 5, presupposes that the input on conduit 31 is a monophonic or one channel input.

The relay operating coil 161 also operates in unison with the normally closed contacts 158 and 159, the normally closed contact 162. The input to contacts 162 is from the speaker output terminal 33 of the amplifier 13 in FIG. 1, applied to terminal 164 of the auxiliary chassis. The output from contacts 162 is available at terminal 166 whereby it may be connected through the conduit 37 of FIG. 1 to the speaker 38. The relay operating coil is electrically energized through the terminals 167 and 168 which are coupled through the conduit 28 of FIG. 1 to the electrical connection from the motor switch 19 to the motor 16 of the changer 12 in FIG. 1. Thus, this relay is energized whenever the phonograph motor 16 is energized.

Operation

In the operation of the invention, a multiplicity of the functions are performed and it may be well to begin the description thereof with a description of the principal aspects of operation of the changer itself. Pressing of the "start-reject" button of the changer moves actuator 22 of FIG. 1 to operate the motor switch 19 initiating

operation of the motor 16. This raises the tone arm from the record, moves it aside, allows a new record to drop in place, and returns the tone arm to the record surface to begin play of the new record. Of course, if no new record was available, the tone arm would return to play the previous record. If only one record is used, it will be played over and over. Pressing of the stop button moves the stop actuator 21 of FIG. 1 to place the changer mechanism in condition to return arm to rest at end of the record being played and deenergize the changer motor. These functions will be recognized as standard typical functions of a wide variety of commercially available record changers.

Assume that prior to initiation of the dental operation, input signals are fed through conduit 31 from an F-M tuner to the auxiliary chassis 14. Because the relay contacts 158, 159 and 162 are normally closed, and the record changer is not operating at this time, thus permitting the normal closure of the relay contacts, the F-M input signals are applied to the "mag-low" input of the amplifier 13. The amplified output is fed to the speaker 38, or may be fed to a plurality of speakers in parallel to provide background music.

When a dental operation is about to begin, a phonograph record is located on the changer which provides two types of signal outputs upon play thereof. One is a white sound which is for the purpose of eliminating pair during the dental operation. The other is music for purposes of masking the white sound to some extent and entertaining and relaxing the patient.

The patient dons the headphones and places the L-pad box in his lap. The dentist pushes the start button 42 at the remote control head, at the same time being certain that the mixing switch 89 is closed. The immediate sequence of operations will be most readily appreciated by referring to FIGS. 2 and 1. Pushing of button 42 opens the contacts 42*b* and closes contacts 42*a*. Thus energy from the secondary winding 58 of the transformer 57 is fed by way of conductors 64 and switch contacts 42*a* to the start solenoid output terminal 44*b*. Thus the start solenoid 27 is energized whereupon it moves actuator 22 to initiate the operations above described in the changer.

As play of the record begins the dual channel output from the tone arm is fed by way of conductor 24 to the amplifier 13 where it is amplified to produce a dual channel output over conduit 47 through the control head and conduit 48 to the L-pad input terminals 91, 92, 93 and 94 shown in FIG. 3. Of course, at the same time that the record changer motor begins to operate, the relay operating coil 161 of FIG. 5 is energized to open the contacts of the relay whereby the input to the amplifier from the external music source is terminated and whereby the coupling from the speaker output of the amplifier to the speakers is also interrupted. The background music is therefore terminated.

According to the intensity of the pain present, the patient may adjust the volume of sound at the head phones by means of the knob 51 and may adjust the proportion of music to white sound by means of the knob 52.

When the dental operation is completed, the dentist may press the stop button 43 in the remote control head. The immediate sequence of operation may be again most readily appreciated by referring to FIGS. 1 and 2 together. The start switch sections 42*a* and 42*b* will have again returned to their initial positions as shown in FIG. 2, inasmuch as the start button returns to the original position as soon as the dentist releases pressure therefrom. Upon pushing the stop button 43 in FIG. 1, the contacts 43*a* of FIG. 2 are closed. It will be seen that this applies energy from the source 58 to the start solenoid output terminal 44*b*. Energization of the start solenoid thus achieved, moves the actuator 22 of FIG. 1 whereby the effect is the same as pushing the "start-reject" button whereupon though the motor was already operating, the sequence of operations including raising and moving aside of the tone arm would begin.

At the same time that closure of the contacts 43*a* by pushing the button 43 initiated a rejecting operation on the record changer, energy was supplied through the normally closed start switch contacts 42*b* of FIG. 2 to the time delay relay 63. After a delay of approximately three seconds, which is the time required for the record changer to move the tone arm aside after a rejecting operation is initiated, the relay 63 will close the contacts 67 and 68 thereof to energize by way of terminal 46*b* the stop solenoid 26 of FIG. 1. This solenoid moves the actuator 21 to immediately move stop control mechanism of the changer to deenergize motor 16 whereupon the reject operation is stopped and the playing of the record is stopped. Thus, the tone arm is out of the way whereby a record may be readily removed if desired. Deenergization of the motor 16, will of course simultaneously deenergize the operating coil of relay 161 in the auxiliary chassis, whereupon background music will again become present in the speakers.

If it should be desired to provide a patient with stereophonic music, after the necessity for audio-analgesia has terminated, a stereophonic record may be placed on the changer and the start button 42 of the remote control head pressed. By opening switch 89 at the remote control head, the signals from the separate channels are again available at the separate earphones without mixing, whereby normal stereophonic listening may be obtained. At this time, the pain control knob 52 is useful to obtain a desirable balance of sound between the left and right headphones.

While the many advantages of this invention to the dental profession should be readily apparent, it should also be recognized that this invention offers many heretofore unattained benefits to other professions, businesses, and even to residential applications. Therefore, while the invention has been disclosed and described in some detail in the drawings and foregoing description, as applied to the dental techniques of audio-analgesia, it should be considered applicable to a wide variety of other employments. Therefore, the disclosure and foregoing description and drawings, are to be considered as illustrative and not restrictive to character, as modifications may readily suggest themselves to persons skilled in the art and within the broad scope of the invention, reference being had to the appended claims.

I claim:

1. A remotely controlled sound system comprising:
- a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines;
- a first electromechanical device coupled to said start actuator;
- a second electromechaincal device coupled to said stop actuator;
- a source of electrical energy;
- a switching network coupled between said source and said devices and comprising a start switch in first circuit with the first device and said energy source to energize said device upon closure of said switch to operate said start actuator, a time delay relay having an operator and having normally open contacts in a second circuit with said second device and said energy source, a stop switch in a third circuit with said first device to operate said start actuator and in a fourth circuit with the operator of said time delay relay to energize said operator and thereupon close said second circuit to operate said stop actuator at a predetermined delay time after operation of the stop switch has operated the start actuator;
- an amplifier having a pair of signal amplifying channels, each coupled to one of said signal output lines and said amplifier having output means for each channel;

a sound control unit having a pair of signal transmitting channels coupled to said amplifier output means, each of said channels having a volume control means and a balance control means, the balance control means of the two channels being mechanically interlocked for operation thereof in unison to increase signal translation through one of said channels of said unit and simultaneously decrease signal translation through the other of said channels of said unit;
a transformer primary winding coupled to each of said channels of said sound control unit;
a transformer secondary winding coupled to each of said primary windings;
an earphone connected across each secondary winding to receive a signal from its respective channel;
and conducting means coupled between tap points in said secondary windings, to produce a mixture of signals from both channels in each earphone.

2. A remotely controlled sound system comprising:
A recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines a first electromechanical device coupled to said start actuator;
a second electromechanical device coupled to said stop actuator;
a source of electrical energy;
a switching network coupled between said source and said devices and comprising a start switch in a first circuit with the first said device and said energy source to energize said device upon closure of said switch to operate said start actuator, a time delay relay having an operator and having normally open contacts in a second circuit with said second device and said energy source, a stop switch in a third circuit with said first device to operate said start actuator and in a fourth circuit with the operator of said time delay relay to energize said operator and thereupon close said second circuit to operate said stop actuator at a predetermined delay time after operation of the stop switch has operated the start actuator;
an amplifier having a pair of amplifying channels with output means for each of said channels, each of said channels, having input means coupled to one of said signal output lines;
a sound control unit having a pair of signal transmitting channels coupled to said amplifier output means, each of said channels having a volume control means and a balance control means, the balance control means of the two channels being mechanically connected for operation in unison whereby a change thereof increases the signal translation through one of said channels of said unit and simultaneously decreases signal translation through the other of said channels of said unit;
a transformer primary winding coupled to each of said channels of said sound control unit;
a transformer secondary winding coupled to each of said primary windings;
an earphone connected across each secondary winding to receive a signal from its respective channel;
conducting means coupled between tap points in said secondary windings to produce a mixture of signals from both channels in each earphone;
an external signal source coupled through a first relay operated switch to one of said amplifier channels;
a speaker coupled through a second relay operated switch to said amplifier channel;
and a relay operator for said first and second switches and coupled to said stop and start actuator whereby said first and second relay operated switches are closed upon operation of said stop actuator to produce signals at said speaker from said external source.

3. A remotely controlled sound system comprising:
a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, a motor controlled by said actuator, and a pair of signal output lines;
a first solenoid coupled to said start actuator;
a second solenoid coupled to said stop actuator;
a source of electrical energy;
a switching network coupled between said source and said solenoids and comprising a start switch in a first circuit with said start solenoid and said energy source to energize said first solenoid upon closure of said switch to operate said start actuator, a time delay relay having an operator and having normally open contacts in a second circuit with said second solenoid and said energy source, a stop switch in a third circuit with said first solenoid to operate said start actuator and in a fourth circuit with the operator of said time delay relay to energize said operator and thereupon close said second circuit to operate said stop actuator at a predetermined delay time after operation of the stop switch has operated the start actuator;
an amplifier having a pair of signal amplifying channels, each coupled to one of said signal output lines and said amplifier having output means for each channel;
a sound control unit having a pair of signal transmitting channels coupled to said amplifier output means, each of said channels having a volume control means and a balance control means, the balance control means of the two channels being mechanically interlocked for operation thereof in unison to increase signal translation through one of said channels of said units and simultaneously decrease signal translation through the other of said channels of said unit;
a transformer having primary and secondary winding, a primary winding coupled to each of said channels of said sound control unit;
an earphone connected across each secondary winding of said output transformer to receive a signal from its respective channel;
conducting means coupled between tap points in said secondary windings and having a switch therein whereby closure of said switch produces a mixture of signals from both channels in each earphone;
an external signal source coupled through a first relay operated switch to one of said amplifier channels;
a speaker coupled through a second relay operated switch to said amplifier channel;
and a relay operator for said first and second switches and coupled to said stop and start actuators whereby said first and second relay operated switches are closed upon operation of said stop actuator to produce signals at said speaker from said external source.

4. In a remotely controlled sound system for audio-analgesia having a dual channel source of music and white sound, with music signals in one channel and white sound signals in the other channel, and having means coupling an earphone to one channel and means coupling an earphone to the other channel;
a pain control in the coupling means of each channel, said pain controls being interlocked for simultaneous change thereof, to simultaneously increase the signal flow through a portion of one of said coupling means, and decrease the signal flow through a portion of the other of said coupling means;
and mixing means for electrically interconnecting said coupling means to provide signals from both of said channels in each of said earphones.

5. In a remotely controlled sound system having a dual channel source of music and white sound, with music signals in one channel and white sound signals in the other channel, and having means coupling an earphone to one channel and means coupling an earphone to the other channel;
a balance control in the coupling means of each chan-

nel, said balance controls being mechanically interlocked for simultaneous change thereof, to simultaneously increase the signal flow through a portion of one of said coupling means and decrease the signal flow through a portion of the other of said coupling means;

and a switchable mixing means for electrically interconnecting said coupling means to selectively provide signals from both of said channels in each of said earphones.

6. The system of claim 5 wherein each of said coupling means includes a volume control, said volume controls being mechanically interconnected for simultaneous change thereof to simultaneously change, in the same sense, the strength of signals flowing to each of said earphones.

7. In a remotely controlled sound system having a dual channel record player-changer with a combined record playing start and record reject actuator and a record playing stop actuator, electromechanical operators coupled to each of said actuators, and a control head located remotely with respect to said player-changer and having circuits coupled to said operators and switches coupled in controlling relation to said circuits for remotely effecting operation of said actuators to selectively initiate and terminate play of a record by said player-changer.

8. A remotely controlled sound system comprising:

a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines;

a first electromechanical device coupled to said start actuator;

a second electromechanical device coupled to said stop actuator;

a source of electrical energy;

and a switching network coupled between said source and said devices and remotely located from said devices and comprising, a start switch in a first circuit with said first device to energize said first device and thereby operate said start actuator to initiate production of signals on said signal output lines, and a stop switch in a second circuit with said second device to energize said second device and thereby operate said stop actuator to terminate production of signals on said output lines;

earphone means;

means coupling said earphone means to said output lines;

an external music signal source;

a loudspeaker located for producing background sound;

a relay having normally closed contacts coupling said external source to said loudspeaker, said relay having an operator coupled to said reproducing machine and energized thereby when said start actuator is operated to open said normally closed contacts for deactivating said loudspeaker, said operator again becoming de-energized when said stop actuator is operated, to return said contacts to normally closed condition and again couple said external source to said loudspeaker for providing background music.

9. A remotely controlled sound system comprising:

a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines;

a first electromechanical device coupled to said start actuator;

a second electromechanical device coupled to said stop actuator;

a source of electrical energy;

a switching network coupled between said source and said devices and comprising a start switch in a first circuit with said first device and said energy source to energize said first device upon closure of said switch to operate said start actuartor, a time delay relay having an operator and having normally open contacts in a second circuit with said second device and said energy source, a stop switch in a third circuit with said first device to operate said start actuator and in a fourth circuit with the operator of said time delay relay to energize said operator and thereupon close said second circuit to operate said start actuator at a predetermined delay time after operation of the stop switch has operated the start actuator;

earphone means;

means coupling said earphone means to said output lines, said coupling means including manual control means for controlling the signals produced at said earphone means;

an external signal source;

a loudspeaker;

and a sceond relay having normally closed contacts coupling said external source to said loudspeaker, said second relay having an operator coupled to said reproducing machine and energized thereby when said start actuator is operated to open said normally closed contacts for deactivating said loudspeaker, said operator again becoming de-energized when said stop actuator is operated, to return said contacts to normally close condition and again couple said external source to said loudspeaker for providing background sound.

10. A remotely controlled sound system comprising:

a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines;

a first electromechanical device coupled to said start actuator;

a second electromechanical device coupled to said stop actuator;

a source of electrical energy;

a switching network coupled between said source and said devices and comprising a start switch in a first circuit with said first device and said energy source to energize said first device upon closure of said switch to operate said start actuator, a time delay relay having an operator and having normally open contacts in a second circuit with said second device and said energy source, a stop switch in a third circuit with said first device to operate said start actuator and in a fourth circuit with the operator of said time delay relay to energize said operator and thereupon close said second circuit to operate said start actuator at a predetermined delay time after operation of the stop switch has operated the start actuator;

earphone means;

means coupling said earphone means to said output lines, said coupling means including manual control means for controlling the signals produced at said earphone means;

an external music signal source;

a loudspeaker;

a second relay having normally closed contacts coupling said external source to said loudspeaker, said second relay having an operator coupled to said reproducing machine and energized thereby when said start actuator is operated to open said normally closed contacts for deactivating said loudspeaker, said operator again becoming de-energized when said stop actuator is operated, to return said contacts to normally closed condition and again couple said external source to said loudspeaker for providing background music;

said reproducing machine and said second relay being at a first location, said switching network being in a second location remote from said first location, and said manual control means and said earphones means being at a third location proximate said second location and remote from said first location and said

loudspeaker being at a fourth location proximate said second and third locations and remote from said first location.

11. A remotely controlled sound system comprising:

a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines;

a first electromechanical device coupled to said start actuator;

a second electromechanical device coupled to said stop actuator;

a source of electrical energy;

a switching network coupled between said source and said devices and comprising a start switch in a first circuit with said first device and said energy source to energize said first device upon closure of said switch to operate said start actuator, a time delay relay having an operator and having normally open contacts in a second circuit with said second device and said energy source, a stop switch in a third circuit with said first device to operate said start actuator and in a fourth circuit with the operator of said time delay relay to energize said operator and thereupon close said second circuit to operate said start actuator at a predetermined delay time after operation of the stop switch has operated the start actuator;

earphone means;

and means coupling said earphone means to said output lines.

12. A remotely controlled sound system for audio-analgesia comprising:

a recorded sound reproducing machine having a reproduction start actuator, a reproduction stop actuator, and a pair of signal output lines;

a first electromechanical device coupled to said start actuator;

a second electromechanical device coupled to said stop actuator;

a source of electrical energy;

a switching network coupled between said source and said devices and comprising, a start switch in a first circuit with said first device to energize said first device and thereby operate said start actuator to initiate production of signals on said signal output lines, and a stop switch in a second circuit with said second device to energize said second device and thereby operate said stop actuator to terminate production of signals on said output lines;

earphone means;

and means coupling said earphone means to said output lines, said coupling means including manual control means for controlling the signals produced at said earphone means;

said reproducing machine being in a first unit at a first location, said switching network being in a second unit in an operating location remote from said first location, and said switching network being thereby operable by a doctor in the operating location, and said manual control means being in a third unit in said operating location and operable by a patient in the operating location.

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