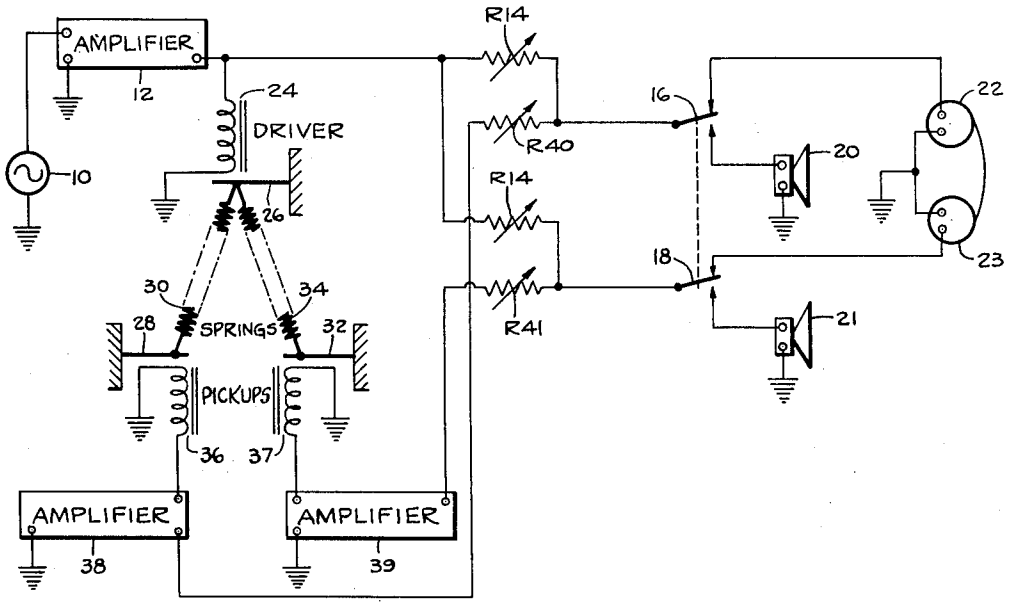
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APPARATUS FOR PRODUCING PSEUDO-STEREOPHONIC EFFECTS

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APPARATUS FOR PRODUCING PSEUDO-STEREOPHONIC EFFECTS

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The invention relates generally to apparatus for introducing pseudo-stereophonic effects in music derived from a single source of electrical signal which does not have any or a sufficient amount of reverberation.

It is an object of the invention to provide a simple apparatus which may be made at relatively low cost and will modify music in the form of electrical signals derived from any source such as radio receiver, photograph, microphone, etc., by changing a portion of the signals from the source into reverberative signals and supplying some of the unmodified signal from the source and some of the reverberated signals to a pair of electroacoustic transducers such as speakers or earphones.

A further object is to accomplish the foregoing result by using a pair of mechanical reverberation devices coupled to a single driver and two separate output pickups.

Other objects will appear from the following description reference being made to the accompanying drawing.

It is now well recognized that the enjoyment of music may be greatly enhanced if it is heard in a reverberative enclosure or if the reverberation effect is added to the music and that this advantage is greatly enhanced if the reverberation effect supplied to the sound reaching one of the listeners ears differs in character from the reverberation applied to the music heard primarily by the other ear. However, the cost of reverberation apparatus in the past has been rather high, but by the use of the present invention, a number of the parts of one of the two reverberation devices are eliminated, with consequent substantial reduction in cost.

The single FIGURE of the drawings is a diagrammatic representation of mechanical elements and electrical circuitry constituting the invention.

In the drawing, a source 10 of musical tone signals which, as previously indicated, may be from any phonograph, radio receiver, or the like, is supplied to the input of an amplifier 12, the output of which is coupled through resistors R14 (which are preferably variable) to switches 16 and 18 which may selectively supply the signals either to speakers 20 and 21 or to earphones 22 and 23 respectively.

In addition, the output of the amplifier 12 is supplied to a driver (electromechanical transducer) illustrated as an electromagnet 24 having an armature 26 associated therewith. The driver armature 26 is mechanically connected to a (mechanico-electric transducer) pickup armature 28 through a coil spring 30 and it is similarly connected to a pickup armature 32 through a coil spring 34. The armatures 28 and 32 have electromagnetic pickup coils 36 and 37 associated in a manner as to have the inductance changed by the vibrations of the pickup armatures 28 and 32.

The outputs of the pickups 36 and 37 are respectively coupled to amplifiers 38 and 39. The output of the amplifier 38 is connected through a variable resistor R40 to the switch 16 and the output of the amplifier 39 is connected through a similar resistor R41 to the switch 18. Each of the four resistors shown is made variable so as to adjust the amplitude of the signal supplied to the speakers and earphones to suit the individual listener and to compensate for any hearing deficiencies he may have.

The driver and pickups may transmit the signal either

in the compressional or torsional mode, and the coil springs are preferably wound in such manner that the signals are transmitted solely as compressional vibrations or solely as torsional vibrations. The drivers and pickups may be of any conventional construction, for example, the pickups may be similar to those used in the pickup heads of phonographs.

Because the portion of the sound reaching one ear is in various phase relations and frequency response, as compared to that reaching the other ear, the listener will perceive the music as he is accustomed to hearing it in an auditorium having good reverberation effects due to its particular size and construction. The frequency spectrum of the music as heard will not appear to contain nulls or peaks because two reverberative signals heard will never be in the same or opposite phase at any frequency, because even though the coil springs are apparently identical, in dimensions and the metal of which they are made, there will inevitably be some variations, even though minute, but sufficient to prevent the reverberated signals of any particular frequency from arriving at the two ears in phase for any perceptible time interval. The phase relationship of the signals will be as random as they are heard in an excellent auditorium, and thus to the listener the music will be sensed as if the listener were hearing the sound as reflected from numberless surfaces in the usual random manner.

While I have shown and described a particular embodiment of my invention, it will be apparent to those skilled in the art that numerous modifications and variations may be made in the form and construction thereof, without departing from the more fundamental principles of the invention. I therefore desire by the following claims to include within the scope of my invention all such similar and modified forms of the apparatus disclosed, by which substantially the results of the invention may be obtained by substantially the same or equivalent means.

I claim:

1. In an apparatus for improving the music as heard by the listener in which the source is a single audio frequency electrical signal, an electroacoustic driver having input terminals connected to the source, the driver having a movable element which moves in response to said audio frequency signal, a pair of solid delay introducing sound transmission springs having input and output ends, means connecting the input ends of said devices to the movable element of the driver, a pair of mechanico-electric pickup devices having movable parts connected separately, one to each of the other ends of said springs, a pair of electroacoustic translating means and means coupling the pickup devices separately, one to each of the electroacoustic translating means.

2. The combination set forth in claim 1 in which means are included for coupling the signal from the source without delay to each of the electroacoustic translating means.

3. The combination set forth in claim 2 in which at least one of the coupling means includes a variable resistor for controlling the intensity of the sound produced by the electroacoustic translating means.

4. The combination set forth in claim 1 in which the means connecting the sound delay transmission devices to the movable element of the driver and to the movable parts of the pickups constitute means for reflecting sound vibrations.

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