

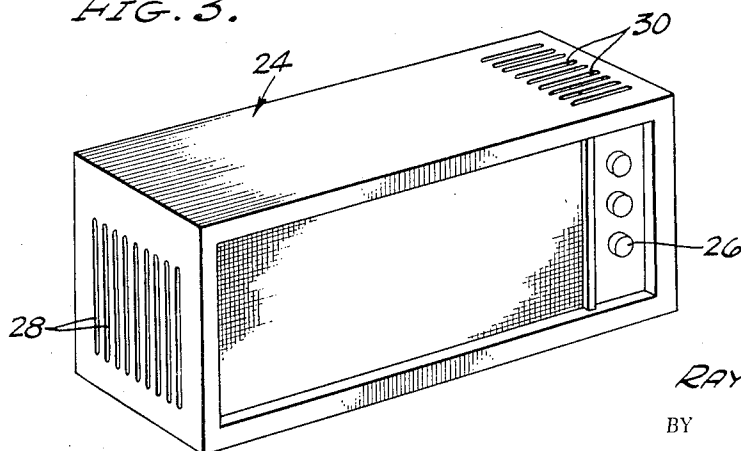
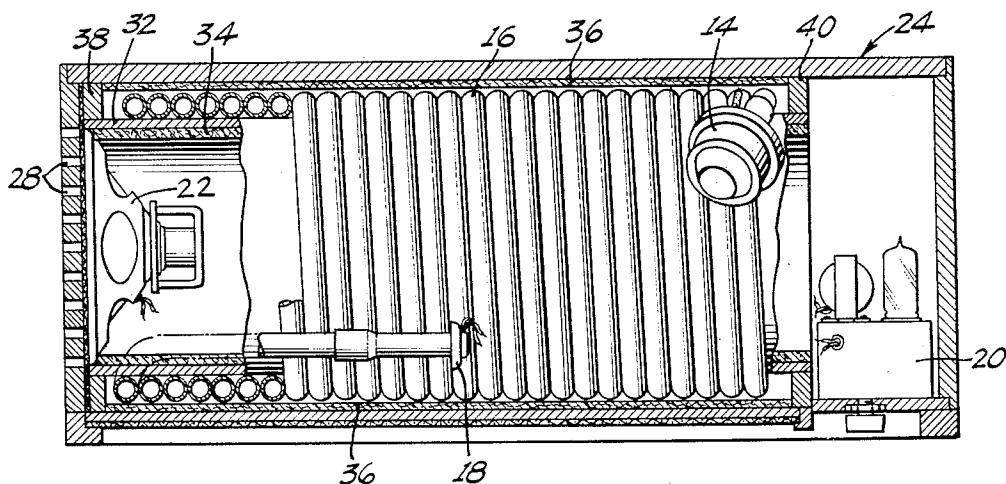
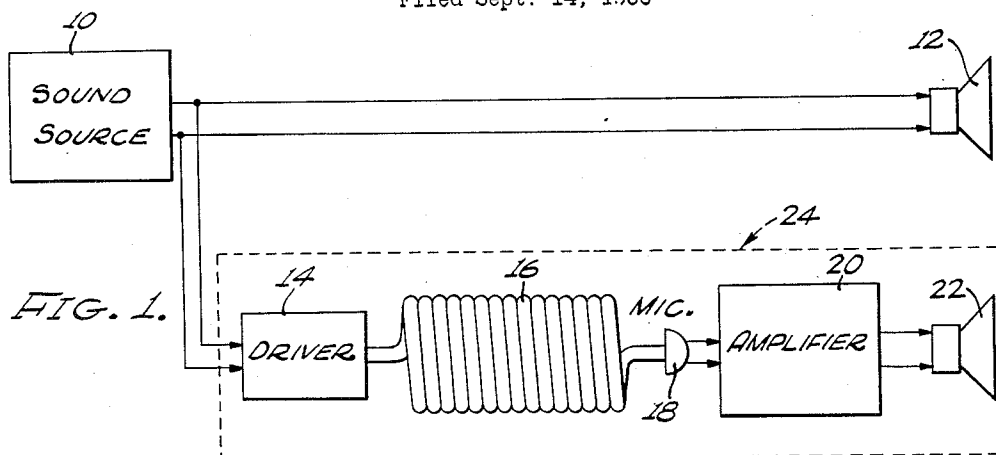
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AUDIO REPRODUCTION APPARATUS

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AUDIO REPRODUCTION APPARATUS

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5 Claims. (Cl. 179—1)

This invention relates to audio reproduction apparatus and, more particularly, to improvements therein.

In an application for Sound Producing System, by this inventor, which was filed July 20, 1956, and bears Serial No. 599,083, there is described an arrangement whereby the enjoyment of an audio reproduction may be considerably increased by providing an artificial reverberation effect for the existing audio system. As shown in that disclosure, this effect may be achieved in a receiver or reproducer of audio signals by driving an auxiliary speaker through delay apparatus from the existing audio system, which thereby reproduces the same signals as the main speaker but slightly delayed with respect thereto. This application is directed to improved apparatus for producing the result described in the application for the Sound Producing System.

When tubing is used as the delay means, the length thereof required to obtain a proper delay makes the apparatus required to effectuate the improved sound system unwieldy and bulky. Even when the tubing is coiled, as shown in Figure 2 of the above-noted application not too much space is conserved. The apparatus required to properly mount and baffle the speaker, in addition to the requirement for acoustically isolating a microphone required in the embodiment of the invention, makes for a difficult packaging problem.

An object of the present invention is to provide a novel arrangement for a reverberation producing system.

Another object of the present invention is to provide a compact arrangement for a reverberation producing system.

Yet another object of the present invention is to provide an arrangement for a reverberation system that makes required acoustic isolation of components simple to obtain.

These and other objects of the present invention are achieved by providing an arrangement whereby the tubing, which is used to provide an acoustical delay, is coiled to establish the walls of an air column which can serve as the backload for a loudspeaker and, in addition, assist in acoustic isolation of the speaker backward radiation from a microphone. These walls are lined with acoustic-absorbing material. A loudspeaker driver unit is coupled to drive one end of the tubing with acoustic vibrations, and a microphone is coupled to receive these vibrations from the other end of the tubing. The loudspeaker, which uses the air column defined by the tubing as a backload, is driven by the output of the microphone. An enclosure for all this apparatus is provided which includes means to acoustically isolate the output of the loudspeaker from the microphone.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood

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from the following description when read in connection with the accompanying drawings, in which:

Figure 1 is a schematic diagram of the apparatus embodied in the invention;

5 Figure 2 is an isometric view of the enclosure which houses the apparatus incorporated in the invention; and

Figure 3 is a cross section taken through the housing shown in Figure 2, which shows the displacement of the parts embodying the apparatus of this invention.

10 Reference is now made to Figure 1, which shows in schematic form the apparatus included in this invention. The conventional reproducing system includes a sound source 10 and a main speaker 12. In order to obtain the pleasing effects of reverberation, or echo, which can add materially to the enjoyment of the subject matter being reproduced, in the application for a Sound Producing System noted previously, it was proposed that connections be made to the output of the sound source driving the loudspeaker. These connections are coupled to a

20 loudspeaker driver unit 14. The output of this loudspeaker driver unit drives a delay line. This delay line comprises an air column defined by tubing 16. In order to conserve space, this tubing is coiled. The output of the tubing is coupled to a microphone 18, which is driven by the acoustical vibrations of the air column. The output of the microphone drives the amplifier 20, and the output from the microphone drives an auxiliary loudspeaker 22.

25 In order to secure a sufficient delay for the purposes of adding an echo, or reverberation, it was found necessary to employ at least 50 feet of tubing. Even when coiled, the tubing, the amplifier, and the loudspeaker and the necessary packaging presented a rather bulky and cumbersome addition to the present-day receiving systems. Of course, the length of the tubing required could be reduced by using a medium other than air therein. This, however, requires sealing to prevent this medium from leaking out, as well as precautions in coupling to the microphone and driver unit. With the increase in cost and complexity of the arrangement required, it was felt that this

30 savings in the length of tubing required was not justified. By employing the teachings of this invention, it was found that all the apparatus required for practicing the invention could be fitted into an enclosure 24, as shown by the isometric view in Figure 2. The amplifier controls 26 extend from one side of the enclosure. Holes 28, or slots, are provided at one end of the enclosure, from which the sound from the loudspeaker 22 emanates. The slots 30 on the upper surface of the enclosure are aeration openings to provide ventilation for the amplifier 20.

35 The cross section of the embodiment of the invention is shown in Figure 3, and from this may be seen the compact disposition and unique utilization of space afforded by the invention. The tubing 16 is coiled to define a cylindrical cavity, or column of air. This may be used for the purpose of backloading the loudspeaker 22. Thus, a cylindrical form 32, on which the tubing may be coiled, has its inside lined with an acoustic-absorbing material 34. The speaker is fitted at one end of this cylindrical form. The loudspeaker front portion abuts upon the openings 28. The driver unit 14 is coupled to one end of the tubing and the microphone 18 is coupled to the other end of the tubing. The portion of the enclosure 24, within which the microphone is positioned, is acoustically insulated from the sound emanating from the loudspeaker 22. This is achieved by providing an acoustic lining 36 for the inner walls of the enclosure 24, and by sealing that portion of the enclosure within which the microphone is positioned. This is effectuated as by means of a first end wall 38 at the loudspeaker end of the

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enclosure and a second end wall 40 at the amplifier end of the enclosure.

It may therefore be seen that with the unique arrangement shown in Figure 3 all the apparatus required is compactly and uniquely assembled and advantage is taken of the air column defined by the coils of tubing. Accordingly, there has been shown and described herein a novel, unique, and simple arrangement for a sound reverberation producing system.

I claim:

1. Acoustic delay and reproducing apparatus comprising a first air column defined by a length of tubing, walls defining a second air column, said tubing being wound around said walls, means to apply acoustical vibrations to one end of said tubing, a loudspeaker, means to backload said loudspeaker with said second air column, and means to drive said loudspeaker from acoustical vibrations emanating from the other end of said air tubing.

2. Acoustic delay and reproducing apparatus comprising walls defining a loudspeaker loading enclosure, tubing wound upon said walls, means to apply acoustic vibrations to one end of said tubing, means to receive acoustic vibrations at the other end of said tubing, means to drive said loudspeaker from said means to receive acoustic vibrations, and means to acoustically isolate said means to receive acoustic vibrations from the output of said loudspeaker.

3. Acoustic delay and reproducing apparatus comprising an air column defined by tubing wound to define the periphery of a hollow cylinder, a loudspeaker driver unit

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acoustically coupled to one end of said tubing, a microphone acoustically coupled to the other end of said tubing, a loudspeaker, means to drive said loudspeaker from said microphone, and means to mount said loudspeaker to be backloaded by the air column defined by said hollow cylinder.

4. Acoustic delay and reproducing apparatus comprising walls defining a hollow cylinder, a loudspeaker fitted at one end of said cylinder, tubing wound around the outside of said cylinder walls, a loudspeaker driver unit mounted at one end of said tubing, a microphone mounted at the other end of said tubing, means to drive said loudspeaker from said microphone output, and means to acoustically isolate said loudspeaker from said microphone.

5. Acoustic delay and reproducing apparatus comprising an enclosure within which are walls defining a hollow cylinder, a loudspeaker fitted at one end of said cylinder, acoustic damping material lining the inner walls of said cylinder, tubing wound around the outside of said cylinder walls, a loudspeaker driver unit mounted at one end of said tubing, a microphone mounted at the other end of said tubing, and an amplifier coupled to drive said loudspeaker from said microphone, said enclosure having openings at one end, means to support said loudspeaker against said openings, and means to acoustically insulate from said speaker the portion of said enclosure within which said microphone is positioned.

No references cited.