July 11, 1961 G. C. VAN CAMP 2,991,840

SOUND REPRODUCER

Filed Sept. 12, 1957

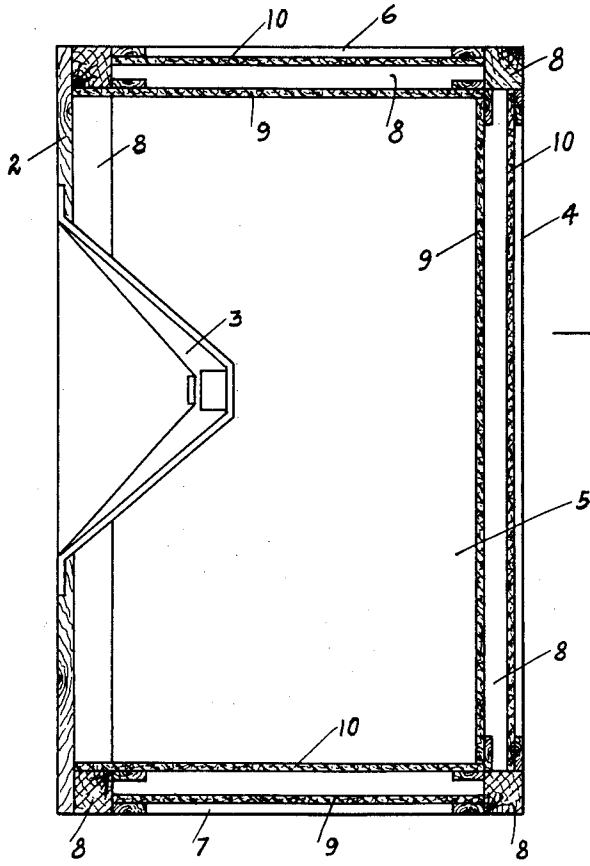


Fig. 1.

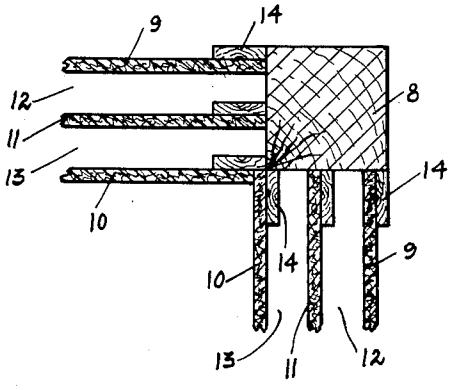


Fig. 2.

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SOUND REPRODUCER

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This invention relates to sound reproduction and is for a so-called loud-speaker for reproducing a more realistic rendition of the recorded sounds, with particular reference to vibration in the bass end of the audible scale, that is vibrations below 250 c.p.s.

Loud-speaker cabinets generally, but not necessarily, comprise an enclosure having a front panel on which the cone speaker is mounted, with the interior of the cone facing outwardly. The other walls of the cabinet are variously formed of different materials in an attempt to secure fidelity of reproduction. Most commonly plywood panels are used with heavy wood strips secured thereto to reduce the resonance of the panels. The enclosure is usually lined with hair felt or like material to improve the tone qualities in the intermediate audible spectrum.

The difficulty of realistic reproduction occurs largely with vibrations in the bass or lower frequency range and may be said to generally increase with the decrease in pitch or frequency. This is largely attributed to the fact that the negative wave phase generated at the rear of the cone has time to pass around the cone to the front and cancel the positive wave phase at the front. Ideally therefore, the best situation from this standpoint would be one in which the space at the rear of the cone would be a room of comparable or greater volume than the room into which the cone faced. This is obviously impractical, but attempts are made to provide very large cabinets, these often being of a size impractical for many environments where recorded music is enjoyed, and even with such enclosures the bass notes are likely to have an unnatural boom or timbre. On the theory that the resonance of wood is a factor, some authorities have suggested concrete or brick as the best enclosure, but this alone is not satisfactory and is highly impractical. It is also common practice to provide some baffled channel arrangement to delay the back wave and bring it into isocronysm with the front wave, but this heavily accents the bass notes and requires expert design.

The present invention is based on dissipating the energy of the wave form within the cabinet by constructing the walls of the cabinet of material having substantially no resonance, and through which the air pulses generated by the speaker cone may pass, but with a great loss of energy. A condition approximating that of a room of large or infinite volume is thereby approached. As a result, a cabinet of moderate size may be employed while securing a higher fidelity and much more realistic reproduction.

My invention may be more fully understood by reference to the accompanying drawing, in which:

FIG. 1 is a vertical transverse sectional view through a speaker embodying my invention with the reproducing units schematically shown; and

FIG. 2 is a fragmentary detail sectional view on a large scale showing a modified wall construction.

In the drawing, **2** designates the front panel of a cabinet with a hole therein in which is set a cone speaker schematically illustrated and designated **3**. Such speakers, as are well known, are formed with a shallow cone of a special moderately stiff paper, and of a diameter most usually of about fifteen inches, although this varies widely. The periphery of the cone is secured in a frame and there is an armature at the center which is operated by a coil through which the sound modulated electric current passes. This cone, upon being vibrated, alternately moves the air to create sound waves. It may be regarded

in a sense like a pump that pushes the air over its surface in one direction and then pulls it back, making it alternately dense and rare, and when it is pushing at the front, it is drawing back at the rear face so that the waves at the front and back are of equal, but opposite, phase.

In addition to the front panel, the cabinet here shown has a back wall **4**, side walls **5**, and top and bottom walls **6** and **7** respectively, it being generally cubical or rectangular, but it may be some other shape. There may be a skeleton framing of wood, plastic or other rigid material, the framing members being designated **8**.

According to the present invention, each of the enclosure walls other than the front panel is formed of two or more spaced sheets **9** and **10** of air-pervious felted or felt-like fabric, preferably one made from vegetable fibers, such, for example, as ozite or similar floor padding used under carpets. Other felted fibrous materials may be used, but the material should be soft and flexible. The alternate dense and rare air conditions generated in the enclosure by the speaker can pass through this material, but the energy is greatly spent and the wave form is disrupted. Since the material has little inherent resonance and absorbs the energy, it does not vibrate as a diaphragm to any appreciable extent, nor reflect low frequency waves to a noticeably detrimental extent.

The felted material of course does not completely deaden the sound, but by providing a second panel of like material with an intervening air space, the deadening effect on the pulsations at the back of the cone is entirely adequate to produce good tone quality and volume. It can be improved by using additional felted layer of fibers separated from the others by air spaces. This is indicated in FIG. 2 where three such curtains are provided in each enclosure wall other than the front panel, these being **9**, **10**, and **11**, while **12** and **13** are the air spaces between. The material may be secured to the wooden frames **14** by any type of conventional fastening and the frames are firmly fitted into the cabinet framing, and the fabric should be applied without stretching.

It is well recognized that intermediate and higher frequencies are well taken care of in a cabinet of moderate size formed of plywood and covered interiorly with hair felt, so my improved cabinet has no adverse effects in the higher ranges.

Experimental cabinets utilizing my invention have been made with substantially less cubical volume than that recommended by the builder of the cone speaker, so that my invention not only achieves a truer fidelity, but effects a saving of space. It is unnecessary to provide vents as is often done, and the size and location of which is critical.

It will be understood that I have disclosed one type of cabinet construction, but that it may be variously shaped, proportioned and framed within the contemplation of my invention.

I claim:

1. A loud speaker for sound reproduction comprising an enclosure having a rigid front panel with a cone speaker mounted thereon, all of the remaining walls of the enclosure being each comprised of at least two spaced sheets of flexible, fibrous, sound-absorbing, substantially non-resonant material pervious to the restricted passage of air therethrough and an open rigid framework for the enclosure to which the edges only of said sheets are attached.

2. A loud speaker for sound reproduction comprising an open frame structure defining a cabinet, a single rigid panel enclosing one side only of the cabinet having a cone speaker mounted therein, the top and remaining side walls of the cabinet being each closed by a plurality of curtains with an air space between the curtains, the curtain being of flexible, fibrous, sound-absorbing, non-resonating ma-

terial attached to the open framework only around the edges of the sheets.

3. A loud speaker for sound reproduction comprising a cabinet having a front panel in which is mounted a cone type loud speaker, the remaining walls of the cabinet being enclosed by matted fibers in sheet form pervious to restricted air flow therethrough but substantially non-resonant and sound-absorbtive, and capable of substantially damping the amplitude of low frequency pulsations generated in the cabinet by the vibration of the cone, and a rigid open framework defining the boundaries of the cabinet walls to which the edges only of the sheets of fiber are attached.

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