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Nilsson et al.

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[54] **LOUDSPEAKER**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **181/31 B**

[51] **Int. Cl.** **G10k 13/00**, H04r 1/28

[58] **Field of Search** ..... 181/31 B

[56] **References Cited**

UNITED STATES PATENTS

2,775,309	12/1956	Villchur	181/31 B
3,393,766	7/1968	Mitchell	181/31 B

FOREIGN PATENTS OR APPLICATIONS

1,084,764	7/1960	Germany	181/31 B
653,263	5/1951	Great Britain	181/31 B
628,901	11/1961	Italy	181/31 B

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[57] **ABSTRACT**

Loudspeaker with a cabinet in the form of a bent tube having a loudspeaker element at one end and a closure plate at the other end, whereby sound reproduction will be of very high quality although the tube is relatively small in size compared with conventional loudspeaker cabinets.

10 Claims, 4 Drawing Figures

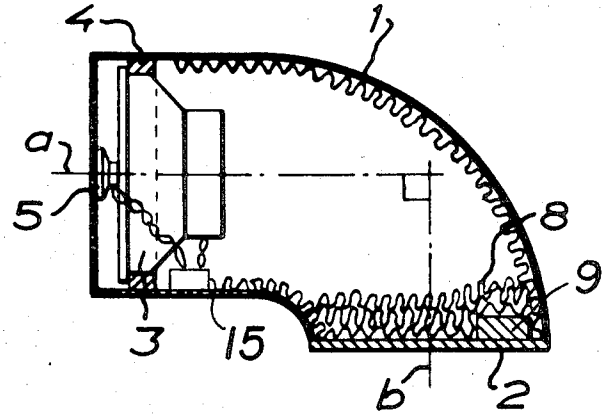


FIG.1

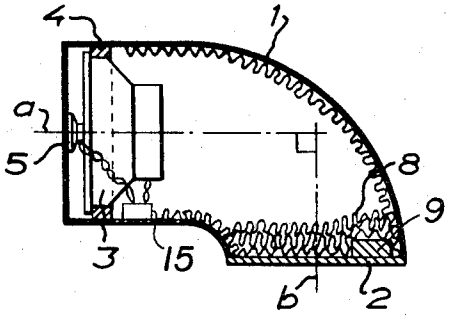


FIG.2

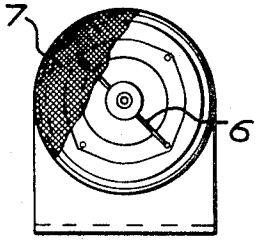
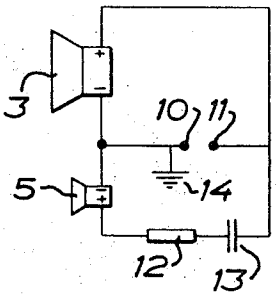


FIG.3



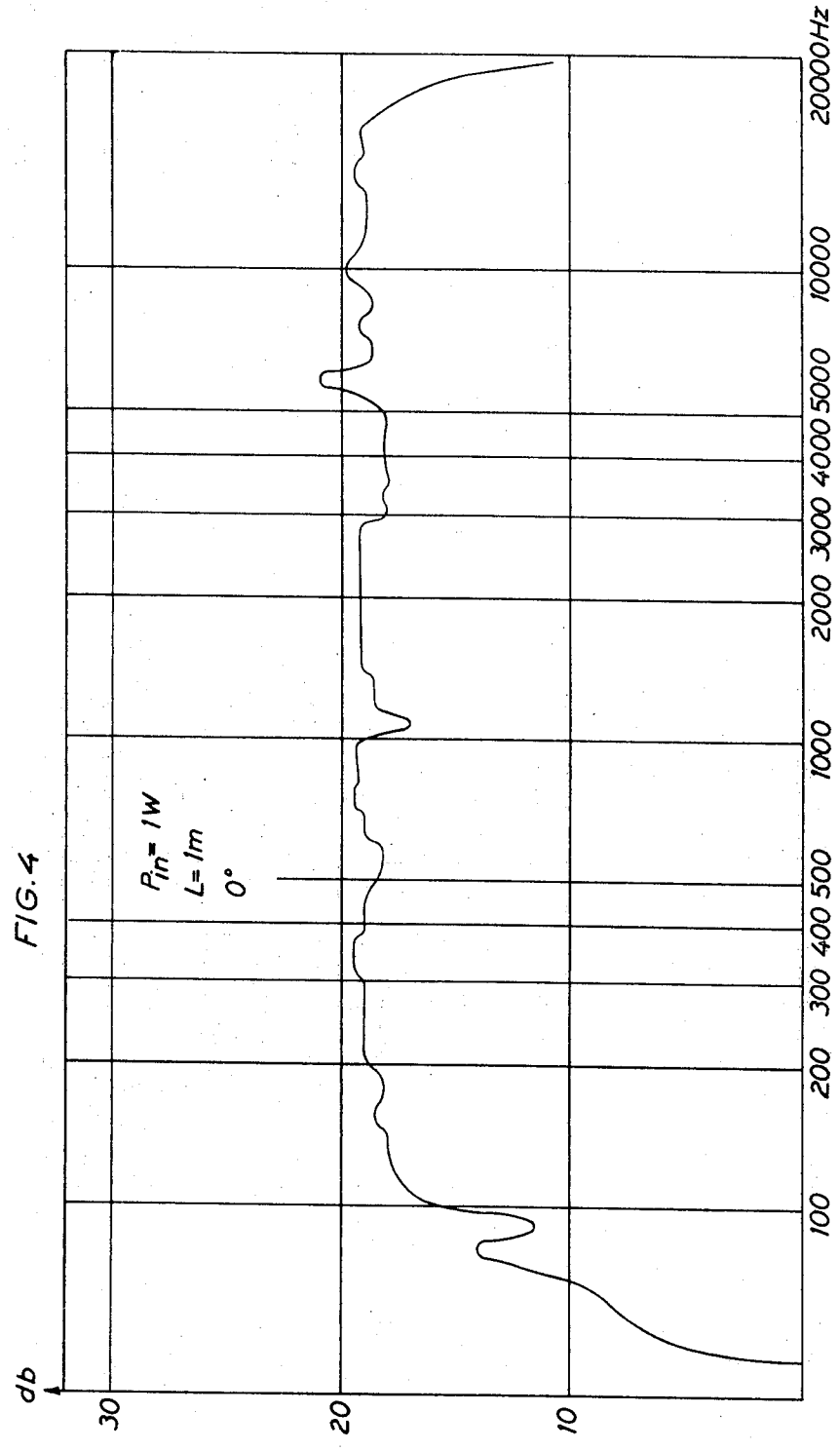

db
30
20
10
100
200
300
400
500
1000
2000
3000
4000
5000
10000
20000Hz
P_{in}= 1W
L= 1m
0°

FIG. 4

LOUDSPEAKER

This invention relates to a loudspeaker having a cabinet which contains at least one loudspeaker element, damping material and possibly a dividing filter.

Conventional loudspeakers for high-quality sound reproduction generally require a very large space as well as a plurality of loudspeaker elements of various types, which are very costly. One of the drawbacks of prior art loudspeakers the cabinets of which as a rule have planar and acute angles, is that the rearwardly directed sound wave from the loudspeaker element reaches the rear wall of the cabinet (the shortest distance) and then along with other sound waves of different intensity the bottom of the cabinet. While travelling this distance a major portion of the acoustical energy will be consumed as it is converted into frictional heat in the damping material of the cabinet, which considerably reduces the efficiency.

The object of the invention is to provide a loudspeaker of very high sound reproduction quality though of relatively compact size compared with prior art loudspeakers, and also at relatively low costs.

To this end, the cabinet of the loudspeaker of the type outlined in the foregoing is in the form of a bent tube which has one end closed by means of a plate while the loudspeaker element is positioned at the other end of the tube.

One embodiment of the present invention will be more fully described hereinbelow with reference to the accompanying drawings in which:

FIG. 1 is a section of a loudspeaker according to the invention;

FIG. 2 is a side view of the loudspeaker in FIG. 1, certain parts having been removed for greater clarity;

FIG. 3 is a wiring diagram of connecting elements and a dividing filter comprised in the loudspeaker shown in FIG. 1;

FIG. 4 shows a frequency response recorded with the loudspeaker shown in FIG. 1.

The loudspeaker illustrated in FIG. 1 has a cabinet 1 which consists of a tube of circular cross section. The tube is bent at an angle of 90°, as is shown by means of the crossing axes *a* and *b*. The axis *b* is approximately half as long as the axis *c*. One end of the tube is closed by means of a plate 2 of lead or other soft, dense metal which is secured in the tube in some suitable conventional manner. For additional stability, a lead weight 9 can be positioned, as shown. A loudspeaker element 3 is mounted in a baffle plate 4. The loudspeaker element 3 preferably is of the bass type and the baffle plate 4 is fastened in the tube in some suitable manner. Ahead of the loudspeaker element 3 is mounted a further loudspeaker element 5 which is of the treble type and held in position by means of some suitable fastening member 6. Some suitable material, such as loudspeaker cloth or a metal grid 7 of some suitable kind, is applied over the loudspeaker end of the tube 1. A damping material 8 is disposed in the interior of the cabinet rearwardly of the loudspeaker element 3. This damping material is a synthetic long-filament sound absorbing material which is previously known in the loudspeaker technique and has proved to prevent partial vibrations.

The two loudspeaker elements 3 and 5 are connected in the manner illustrated in FIG. 3, the bass loudspeaker element 3 being connected over two input terminals 10 and 11; the input terminal 10 is connected to earth at 14. The treble loudspeaker element 5 is connected in series with a resistor 12 and a capacitor 13. This series circuit is connected over the input terminals 10 and 11 and thus lies in parallel with the loudspeaker element 6. This dividing filter shown at 15 in FIG. 1 thus is an RC-filter.

FIG. 4 illustrates a frequency response which has been recorded with a loudspeaker having the following data

frequency response: 55–20,000 Hz
power: 15 W sin (1 kHz 10 min)
impedance: 8 ohm, 1 kHz
self-resonance (fO_2): about 80 Hz
loudspeaker elements: one 5-inch bass loudspeaker with rubber-mounted cone one 1-inch treble loudspeaker with large distributing angle
sensitivity: 5 W (1 m, 1 kHz, 0°, 96 dB)
volume: about 4 litres
weight: about 7 kg
dividing frequency: 5125 Hz

The great advantage of the loudspeaker according to the present invention is that as large a part as possible of the rearwardly directed sound wave is led down into the base (floor, furniture or the like) without any greater losses. This is permitted by the round cross sectional area of the loudspeaker cabinet and the gently rounded bend or curvature of the tube whereby the rearwardly directed sound wave is uniformly damped so that all critical frequencies are uniformly damped. The distance between the loudspeaker element 3 and the wall of the tube 1 is such that the rearwardly directed sound wave is not influenced in its critical point in which the energy of the sound wave is at its maximum.

The length of the tube is adapted to the self-resonance of the bass loudspeaker in the system or 1/16 fO_2 converted into meters 330/16 fO_2 in order that the cabinet shall be as small as possible ($fO_2 = 80$ Hz). As will appear from FIG. 1, the treble loudspeaker element 5 is placed as far in front as possible at one end of the tube in order to obtain a maximum distribution of the treble and the bass loudspeaker element 3 is placed as close as possible to the treble loudspeaker element 5 in order that the distribution of the intermediate register and the inner volume in the tube 1 shall be as large as possible and arising interference as small as possible. As already mentioned, the dividing filter is of the RC type and this filter gives a well defined dividing frequency, a small intermodulation distorsion and insignificant influence on the damping factor of the amplifier. The tube is preferably made from synthetic plastics in some suitable manner.

What we claim and desire to secure by Letters Patent is:

1. A loudspeaker system comprising a cabinet in the form of a rigid tube bent at an angle so as to form a first tube section and a second tube section, the cross-section of said tube being in the form of a closed curve, the end of said tube at said first tube section being closed by a plate means including a soft, dense metal and a loudspeaker means being positioned at the end of said second tube section at the other end of said tube; and damping means covering substantially all of the inner walls of said cabinet.

2. A loudspeaker system as claimed in claim 1 wherein said tube is bent at substantially right angles so as to form said first and second tube sections.

3. A loudspeaker system as claimed in claim 1 wherein the length of said second tube section is greater than the length of said first tube section.

4. A loudspeaker system as claimed in claim 1 wherein the ratio of the lengths of said first and second tube sections is 1:2.

5. A loudspeaker system as claimed in claim 1 wherein said tube is cylindrical.

6. A loudspeaker system as claimed in claim 1 wherein said loudspeaker means comprises two loudspeaker elements and said system further includes a dividing filter connecting said two loudspeaker elements together.

7. A loudspeaker system as claimed in claim 6 wherein one of said two loudspeaker elements is of the bass type and the other of said two loudspeaker elements is of the treble type; said bass type loudspeaker element being positioned centrally at the end of said second tube section and said treble type loudspeaker element being positioned in front of and coaxially with said bass type loudspeaker element.

8. A loudspeaker system as claimed in claim 7 wherein the length of said second tube section is greater than the length of said first tube section.

9. A loudspeaker system as claimed in claim 7 wherein the ratio of the lengths of said first and second tube sections is 1:2.

10. A loudspeaker system as claimed in claim 7 wherein said tube is cylindrical.

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