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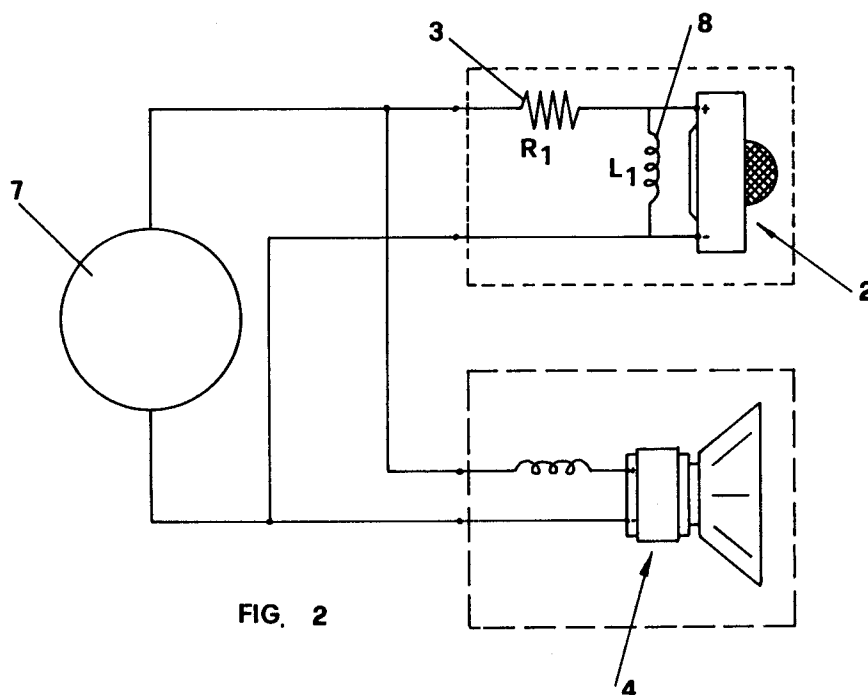
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I-36100 Vicenza(IT)(54) **A filtering device for high frequency loudspeakers.**

(57) A filtering device for a high frequency loudspeaker comprises a resistor (3) interposed in series on the feeding line of the loudspeaker, and downstream of the resistor there is provided an inductor (8) located directly in parallel with respect to the

loudspeaker (2). The device permits to linearize the impedance seen by the amplifier (7) at the output terminals when the frequency varies, a fact which permits the attainment of a substantial improvement in the operating conditions of the amplifier.

**FIG. 2****EP 0 485 010 A1**

The present invention relates to a filtering device for high frequency loudspeakers.

It is well known that acoustical boxes for high fidelity installations require a minimum of a two-way system comprising one or more loudspeakers specifically suitable to reproduce the intermediate and high sound frequencies, as well as one or more loudspeakers capable of reproducing the low sound frequencies. This is due to the fact that each loudspeaker is capable of reproducing with high fidelity only the sound frequencies contained in a specified range. In general, the rule is that the loudspeakers of small dimensions are capable of acting as diffusers for the high frequency sounds while the loudspeakers of large dimensions are capable of acting as diffuser elements for the low frequencies.

On the feeding line of each loudspeaker there is placed a filtering device to ensure that the same loudspeaker be fed only by signals having frequencies corresponding to the frequency which the loudspeaker is capable of effectively reproducing. These devices, usually called "cross-over" devices comprise a high-path portion which feeds the loudspeaker and the loudspeakers which are intended to reproduce the high acoustical frequencies. This filter essentially consists of a capacitor placed in series with the feeding line of the high frequency loudspeaker. In actual practice, it is also necessary to insert in series with the capacitor a resistor, a fact which necessarily causes damping of the signal. In addition, the impedance of the filtering device on the loudspeaker in the rejection or shadow zone has a tendency to increase with the decrease of the frequency of the signal, preventing the passage of the lower frequencies. For this reason, the dumping factor of the loudspeaker becomes worse with the increase of the impedance discussed hereinabove.

In addition, the reactive component used in this filtering device of a known type is placed in series with the loudspeaker and therefore it crosses over with the signal to an extent which increases the more the signal is within a pass-band.

The object of the present invention is to provide a device capable of eliminating the drawbacks described hereinabove.

The crux of the present invention resides in providing a filtering device which comprises a resistor placed in series with the feeding line of the loudspeaker and downstream of the resistor there is an inductor placed directly parallel with respect to the loudspeaker.

The dependent claims of this application are essentially drawn to preferable dimensional values of the components described hereinabove.

The invention is illustrated in detail with reference to the accompanying drawings of which:

Fig. 1 is a schematic view of a conventional filtering device;

Fig. 2 is a schematic view of the filtering device of this invention;

Fig. 3 is a diagram which shows the comparison between the value of the impedance at the terminals of the loudspeaker as a function of different frequencies with and without the filtering device of the invention, respectively.

Fig. 1 illustrates the conventional "cross-over" high-pass device which comprises a capacitor (1), placed in series with the feeding line of the high frequency loudspeaker (2). In practice, it is necessary to also insert in series with the capacitor a resistor (3), a fact which causes the drawbacks mentioned hereinabove.

According to the invention, in Fig. 2, inductor (8) is placed in parallel with the loudspeaker (2). The inductor (8) has preferably an inductance value in the order of hundreds of μH . Directly on the feeding line of the loudspeaker there is inserted resistor (3) which preferably has a value of resistance greater or equal to 6-7 Ω .

It should be noted that, while in the conventional filtering device the resistor could have been omitted, in the present case the resistor constitutes an essential element of the filtering device. A difference between the conventional device and the device according to the present invention is that in the latter, the reactive component, which consists of the inductor, is placed parallel with the loudspeaker. This means that this component performs, with respect to the signal, a shunt or derivative function to an extent which decreases with the increase of the frequency and which therefore is close to zero when the signal is within the pass-band. Therefore, in the conventional case, the signal must cross the reactive component in order to feed the loudspeaker. On the contrary, in the device according to the present invention, this does not occur and the effect of the reactive component is to tend to cancel itself as the frequency of the signal tends to increase. In particular, this difference operates in favor of the quality of reproduction which is not limited by the quality of the reactive component being used.

Another surprising and advantageous effect of the invention is due to the fact that, as shown in Fig. 3, the value of the impedance as a variation of frequency directly present at the terminals of the amplifier (which feeds in addition to loudspeaker (2) also one or more loudspeakers (4) for the average and low frequencies); without the device of the invention, shows values (5) which vary and have substantial lows and peaks, particularly in the interior of the resonance frequencies of the component (loudspeaker of low frequency) and the entire system (loudspeaker with low frequency and

acoustical box). In fact, in view of the fact that the inductor acts in practice as a short circuit at the low frequencies, the filtering device according to the invention performs as a resistor which acts as a derivative shunt element on the resonance peaks. 5
This results in a linearization as shown by curve (6) of the irregular values of the modulus of the impedance and this, in turn, permits the amplifier (7) to operate in a much better manner, since the load is then much more linear as a function of the frequency. 10

Claims

1. A filtering device for a high frequency loudspeaker which comprises a resistor (3) placed in series with the feeding line of the loudspeaker and an inductor (8) downstream of said resistor, said inductor being placed directly parallel with the loudspeaker. 15
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2. The device according to claim 1 wherein the resistor has a resistance value greater or equal to 6-7 Ω . 25
3. The device according to claim 1 or 2 wherein the inductor (8) has an inductance value in the range of hundreds of μH . 30

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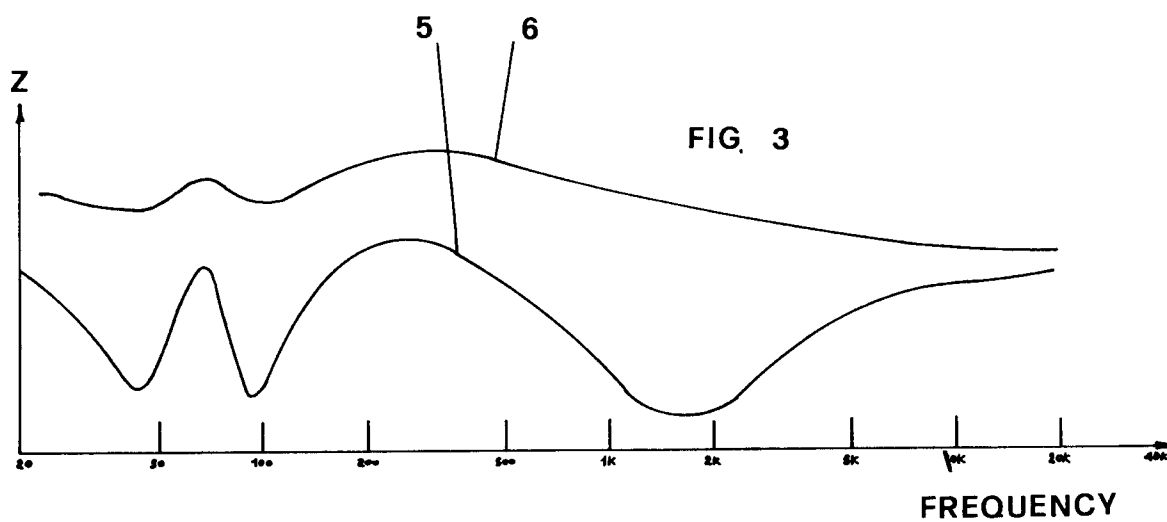
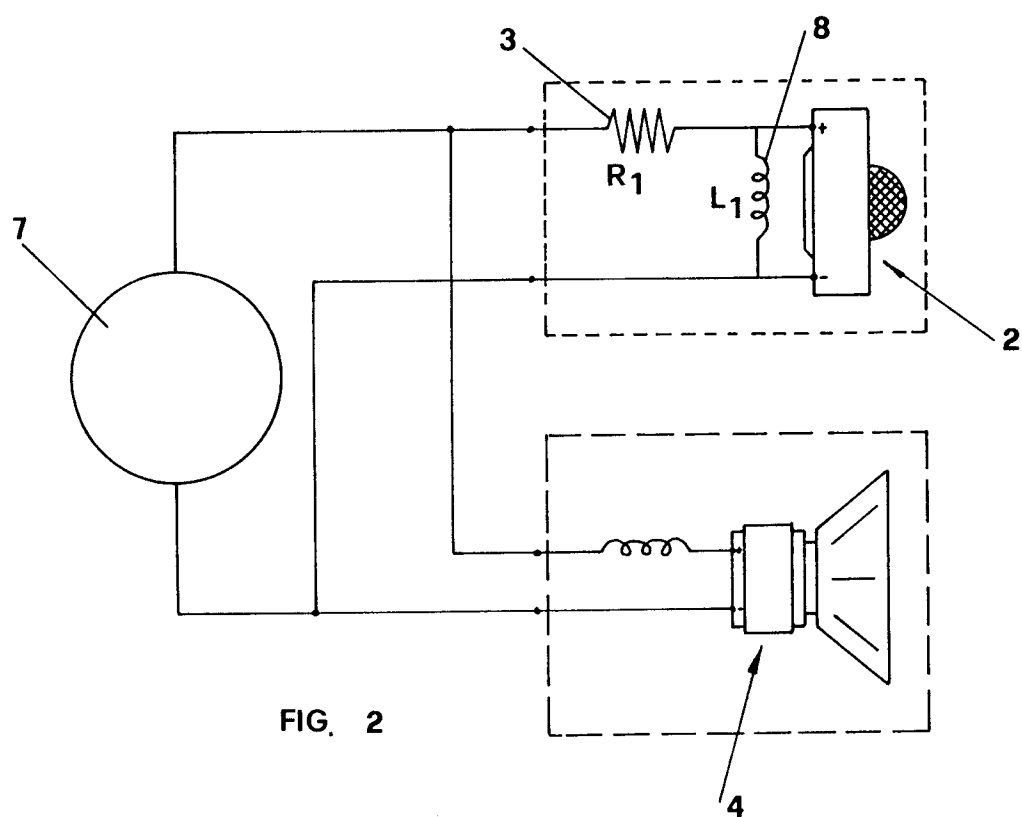
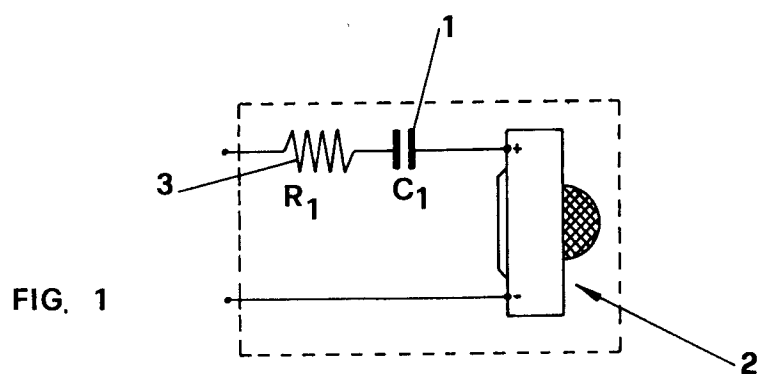
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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 2795

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 067 390 (WOLCOTT) * column 3, line 6 - line 31; figure 1 * ---	1	H04R3/14
A	EP-A-0 241 994 (GELUK) * page 3, line 9 - line 33; figure 1 * ---	1	
A	JOURNAL OF THE AUDIO ENGINEERING SOCIETY. vol. 26, no. 11, November 1978, NEW YORK US pages 850 - 855; J. K. HILLIARD AND H. R. KIMBALL: 'Dividing Networks for Loud Speaker Systems' * pages 851-853, paragraphs 1 and 2 * * figures 1,3,4 * ---	1	
A	FUNKSCHAU vol. 54, no. 25, December 1982, MUNCHEN DE pages 52 - 55; R. SCHUTZ: 'Frequenzweichen für Lautsprecher' * page 53; figures 2,3 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H04R
Place of search THE HAGUE		Date of completion of the search 14 FEBRUARY 1992	Examiner GASTALDI G. L.
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