Loudspeaker feedback circuit

Power dissipated in a loudspeaker is proportional to V^2/R where V is the voltage across the coil and R is the resistive impedance. Modern voltage amplifiers driving into moving coil loudspeakers work successfully on the assumption that the impedance is roughly constant over the entire frequency range. This, however, is not the case and, although damping factors can minimize the effect, this is one of the causes of colouration.

It is possible to obtain a loudspeaker output which is more accurately proportional to the square of the amplifier input voltage by including the speaker in the feedback path of an amplifier. In circuit (a) the resistance in series with the loudspeaker monitors the current, and a potentiometer is used to monitor the output voltage. If the feedback is now made proportional to the geometrical mean of v_1 and v_2, i.e. $(v_1 \times v_2)^{1/2}$, then the output from the speaker will be proportional to the amplifier input and independent of variations in the speaker impedance. Very complicated circuitry would be needed to obtain such a mean, but for medium differences between v_1 and v_2 the arithmetical mean approximates closely to the geometrical mean. The simplest way of obtaining an arithmetical mean is shown in circuit (b) where the output and feedback paths of a typical amplifier are shown. Circuit (c) shows a modified arrangement but other configurations are possible and may be more suitable in different amplifier designs. The results, especially in the medium quality loudspeaker range, can be quite impressive.

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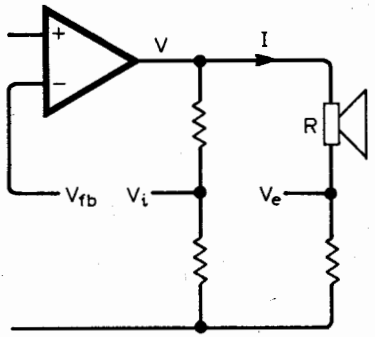
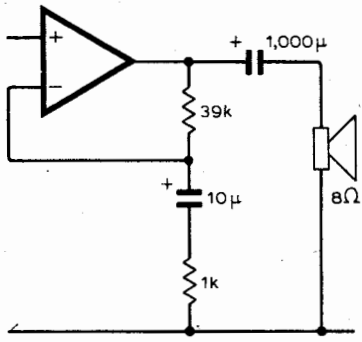
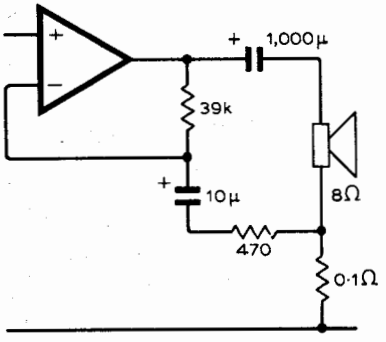


(a)



(b)



(c)