as piezo-electric pickup cartridges. Once again, the voltage amplifier and current amplifier see the same phenomena in identical form. The necessary, and inevitable, corrections can be accomplished simply by the tone-control settings.

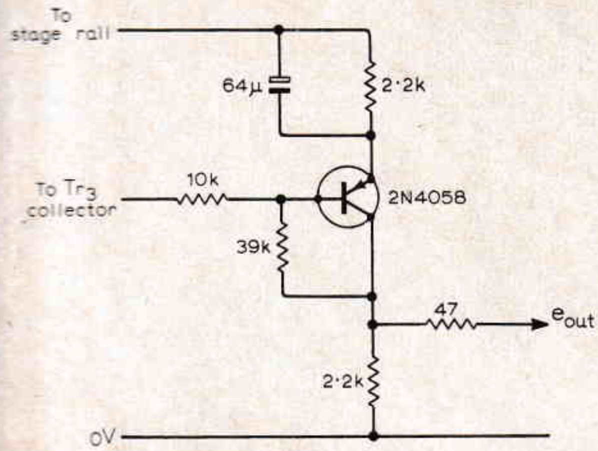


Fig. 11. Floating emitter collector-follower circuit referred to in Appendix II.

Appendix II

Although the R.I.A.A. replay characteristic suggests an approximately flat velocity response from 20 Hz-50 Hz, this would effectively imply recording bass lift in this region, and the author suspects that this is not done, a constant modulation characteristic being used instead. The author has therefore, for his own use, modified the values of the feedback elements as follows: R_5-470 ohms; R_6-1.5 k ohms; C_1-0.47 µF; C_x-6800 pF; and C_y-6800 pF. These changes maintain the velocity response flat down to 25 Hz, with a rapid rumble attenuation below this frequency. Unfortunately the mid point gain of the circuit is reduced to 5 and some additional amplification is therefore needed if it is desired to avoid working with the tone control circuit at the 20 mV level. The simple floating emitter collector-follower circuit of Fig. 11 is therefore interposed, without coupling capacitors, between the output series resistor and the collector of Tr_3. The distortion contributed by this is less than 0.05%.

References

1. Langford-Smith, F., 'Radio Designers Handbook', Vol. 4, ch. 72.
3. Baxandall, P. J., 'Gramophone and Microphone Pre-amplifier', *Wireless World*, October 1952.
3. Baxandall, P. J., 'Gramophone and Microphone Pre-amplifier', *Wireless World*, January 1955.
4. Sallen, R. P. and Key, E. L., *I.R.E. Trans. Circuit Theory*, March 1955, pp. 74-85.

Letters to the Editor

Linsley Hood class A amplifier

Recent measurements on this amplifier have indicated that the gain and power bandwidths of this design, using the component layout shown on page 75 of your issue, are wider than indicated by the Figs. 4 and 5 of the article. The apparent fall-off in gain beyond about 100 kHz was, in fact, due to shortcomings in the measurement apparatus, and measurements made with better equipment suggest that the —3 dB points for voltage gain are above 1.5 MHz although power output falls beyond 200 kHz.

Since the output is in phase with the input, it is necessary to take care that the output leads and output capacitor are not close to the input. (A 2-inch separation will be adequate for normal lead lengths.) However, an additional point must also be noted. If a capacitative load is connected with *short* leads between the output and the earth line near the input connection, the potential developed along the earth line, due to its inductance, can inject an in-phase signal, and thereby cause instability, in the MHz region. To avoid this possibility, it is recommended that the earthy lead to the loudspeaker terminal be returned to the earth line at the same point as the emitter of Tr_1. The inclusion of a small r.f. choke (25 turns of 26-28 s.w.g. wire wound round the outside of a 10-ohm 1-watt resistor is ideal) between the output (point 'X') and C_2 will also prevent this possibility of trouble.

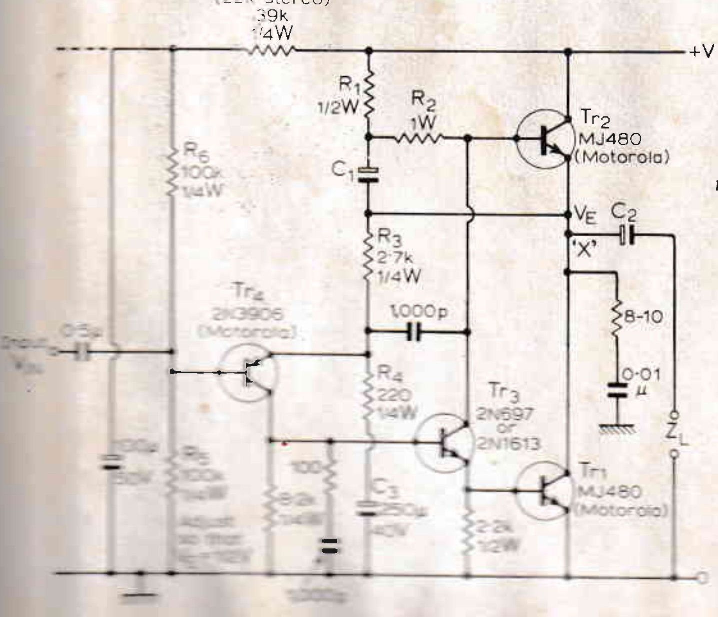
In practice, with the components and layout suggested, the inductance of the normal 12 to 18 inches (or more) of loudspeaker connecting lead prevents instability with capacitative loads, so this should be only of academic interest.

As an alternative, it is possible to reduce the r.f. response of the amplifier to give a smooth, 6 dB/octave, roll-off beyond 50 kHz—which removes much of the need for care in the layout of the components, without detriment to the harmonic distortion in the audible range, and without any audible alteration to the performance—by connecting a 1,000 pF capacitor between the collector of Tr_4 and the emitter of Tr_4; a 1,000 pF in series with 100 ohms between the collector of Tr_4 and earth; and a 0.01 µF in series with a 8 to 10 ohms between the output ('X') and earth. (It should be noted that either all of these components should be added or none at all, they are not alternatives.) If the r.f. response is reduced in this manner, the use of a series r.f. choke would be unnecessary.

A series of measurements has also been made, using the amplifier design exactly as described in the article (without the chokes or other modifications) to determine the voltage waveform produced actually across the loudspeaker, with a square wave input to the amplifier. It was found, in practice, with several different loudspeaker systems, that the output waveform was virtually identical to that obtained with an equivalent resistive load—photographs of which were reproduced in the April issue. It was, in fact, the discovery that a good square wave was reproduced up to the 1 MHz limit of the generator in use which prompted a re-assessment of the r.f. response of the amplifier. The absence of any overshoot or significant ringing also provides confirmation of the stability of the amplifier under practical conditions.

A correspondent has reported that the design has been up-rated successfully to 15 watts into a 15-ohm load, to give a direct power equivalent to the Williamson amplifier, using 2N3055 output transistors with a 43-volt supply (1.1 amp per channel), and rather larger heat sinks. There would seem no good reason why this could not also be done using MJ480s.

J. L. Linsley Hood,



Mr. Linsley Hood's amended circuit of his class A amplifier originally described in the April 1969 issue.