RADIO — ELECTRONICS

HUGO GERNSBACK, *Editor*

formerly RADIO CRAFT

ATOMIC ENERGY BEAM RIVALS HEAT OF SUN

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LATEST IN RADIO — ELECTRONICS — TELEVISION connected to the 500-ohm output) the point at which the hum is balanced out. The adjustment is brought all the way up until a loud hum is heard in the phones and then gradually worked down to the position where the hum just fades out.

An ideal feedback loop should go from output to input. In this amplifier the volume control is in the first stage, and feedback introduced here would change with the setting of the volume control. To overcome this difficulty the feedback is applied to the second stage. As the first stage works at a very low level, it contributes negligible distortion. The output transformer and power tubes are the greatest contributors to distortion.

The use of inverse feedback to flatten response calls for a feedback loop with no frequency discrimination. Since no capacitors are used, the feedback loop in our amplifier meets this requirement. The grid resistor of the second 12AU7 triode returns to ground through the secondary of the output transformer.

When the output winding of the transformer is in the feedback loop, there is a frequency at which the phase of feedback is reversed due to the stray inductance of the windings. At this frequency there is oscillation, a.f., ultrasonic, or r.f. While the oscillation may be inaudible, it may overload the amplifier and distort the audible signal. The 1-megohm grid resistor and the 250-μμf capacitor isolate the inductance of the transformer and provide a low-impedance path to ground for r.f. and ultrasonics.

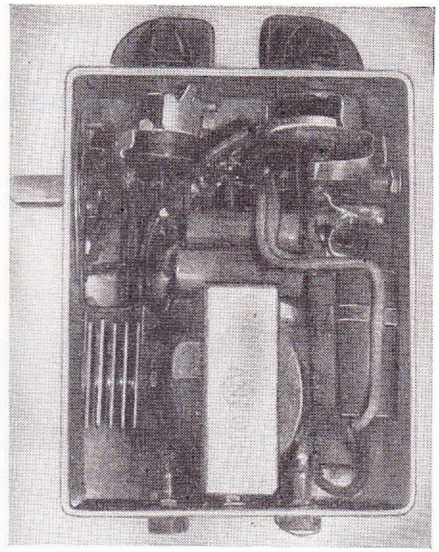
The polarity of the primary and secondary of the output transformer must be correct so that the feedback is negative, not positive. If it is not right on the first try, interchange the connections.

Frequency runs at various levels have been plotted, and there is much improvement in performance when the output transformer is run well under saturation. This is the reason for a 25-watt transformer in a 4-watt amplifier; the larger the transformer, the better the bass response and the lower the distortion.

(*Note this warning carefully: the chassis and the capacitor cans in this amplifier are directly connected to one side of the line—and it may be the hot side!* To make the amplifier safe for use, several methods are possible, though none are entirely safe and precaution is still required.

The entire unit may be enclosed in a nonmetallic cabinet so that no metal part can be touched. If the input is "isolated" from the line with a .05-μf capacitor (not used originally by the author) a phonograph pickup connected to it may be touched with little danger.

The best procedure is probably to bring all points shown connected to chassis to a common negative point, from which the chassis can then be entirely isolated. Two-terminal filter capacitors with insulated cans would, of course, be necessary. This method is used in underwriter-approved receivers, most of which also use an .05-μf capacitor between chassis and negative B.



Getting components into small space is not easy but can be done with planning.

Another method would be to orient the power plug in the wall socket so that the chassis side of the line is the grounded side. The socket and plug can then be so marked that the orientation will be the same in the future. While electrically preferable, this method is psychologically unsound—even a brilliant radioman will forget some day and get burned. If, however, the amplifier is to be connected to a tuner or any other powered device, the polarized-plug trick is the only way to be safe—and it may also be the only way to keep out hum.—*Editor*)

Amplifier Has Unusual Circuits

RATHER unusual tone-control and phase-inverter circuits are used in this amplifier, described originally in *De Radio Revue* (Belgium). The 6SJ7 is a conventional microphone preamplifier. One section of a 6SN7 V1-a is the first voltage amplifier and mixer tube. This section is resistance-capacitance-coupled to V1-b, connected as a low-frequency amplifier. The highs are bypassed around R5 by the .05-μf capacitor. The amplitude of the lows appearing on the grid of V1-b is controlled by the setting of R5.

The output of V1-b is connected to the second 6SN7, which is a "long-tailed" amplifier (see "Phase-Inverter Circuits" in the July, 1948, issue of this magazine). In the original circuit, the grid of V2-b is grounded through a large capacitor C2. In this circuit, the designer has connected one end of C2 to an R-C network consisting of R1, R2, R3, R4, and C1. When the arm of R3 is close to the junction of R1 and R2, the grid of V2-b is effectively grounded. When the arm is at the opposite end of R3, the highs developed across R4 are applied to the grid of V2-b. In this way, the second 6SN7 works as a phase inverter and as a tone-control mixer tube.

Materials for Amplifier

Resistors: 1—470, 2—1,000, 1—4,700, 1—20,000, 1—30,000, 8—47,000, 2—300,000, 4—240,000, 5—470,000 ohms, 1—3.3, 1—6.2 megohms, ½ watt; 1—220, 1—1,500, 1—15,000 ohms, 5 watts, wirewound; 4—500,000 ohms, audio taper potentiometers. **Capacitors:** 3—.001, 1—.005, 4—.01, 2—.05, 1—0.1 μf, 450 volts, paper; 1—.0001 μf, mica; 3—8, 4—16 μf, 450 volts electrolytic; 1—50 μf, 50 volts, electrolytic. **Transformers:** 1—15-watt output, 11,000-ohm primary, multitap secondary; 1—power, 650 volts, c.t., at 60 ma, 6.3 volts at 2 amps, 5 volts at 2 amps. **Miscellaneous:** Chassis, sockets, tubes, switch, speaker, hookup wire, and shielding braid.