Notes on "B" Eliminator Construction

Bias, Resistances, Chokes and Filament Heating

By "MEGOHM"

WITHOUT a doubt, "B" battery eliminators have came to stay. In striving for quality, the key-note of modern radio, the adoption of mains-produced plate supply is a good first step. Even with a crystal and two-valve amplifier, the adoption of a simple half-wave "B" eliminator will often effect a remarkable improvement in quality of reproduction compared with that produced from dry batteries, especially when the temptation is present to run the latter after the inevitable drop in voltage that should cause them to be discarded.

Radio dealers now stock many of the components required for "B" eliminators and when all these are purchased ready-made, the connecting up is a comparatively simple matter.

The new "Listeners' Guide" deals fairly exhaustively with eliminator construction, but a few hints regarding details will be of interest to constructors.

Dissipation of Resistances.

IT is usual to take the full voltage of the eliminator to feed the plate of the power-valve. This voltage may be between 100 and 400, 150 to 200 being the usual, and suiting the average receiver with a smaller power-valve in the last stage. This maximum voltage of the eliminator then has to be reduced to suit each of the other separate stages, early audio, detector, and radio-frequency. In general use there are two methods of effecting this reduction.

The first is to provide each of the three outputs with a separate resistance, variable or fixed, and the second method is to connect "B" positive and "B" negative by means of a continuous high resistance ranging of between 12,000 and 30,000 ohms, the various voltages being tapped off at different points calculated to give the required voltage, which decreases gradually until "B" negative is reached, where the voltage is zero.

If it is proposed to obtain grid bias by the latter system, a suitable amount of resistance is continued past the B negative point, and the grid-bias values are tapped from suitable positions. These points are usually variable along this portion of resistance. It is not always an easy matter for the amateur constructor to obtain entire grid-bias in this way without the slightest trace of hum, and many prefer to obtain the power-valve bias only, providing lower voltages from the dry "C" battery.

One of the objects of this paragraph is to point out that when a bias resistance is used in this way, it is to be remembered that the whole of the plate current of the power-valve returns to "B" negative through the bias resistance, so that the latter must be of higher current rating than might be considered necessary. Where the last valve is a small power-valve, taking only four or five milliamperes on the plate, the ordinary composition variable resistance turned for the purpose into potentiometers, may be used. Where the plate of the power-valve draws 15 to 20 mils. or more, resistance that will not soon disintegrate must be provided, with the comparatively heavy current flowing. For this purpose a pair of 400ohm. potentiometers, with their resistances placed in series, and the arms each providing a separate bias voltage, will be found admirably suited. Wire-wound resistances, in series, may be added to make up the required total, but these should be of high rating, 30 to 50 watts dissipation, otherwise they will heat and soon burn out.

Breaking Down the Voltage.

SIMILAR high rating is required in the resistances used to reduce the maximum voltage to 90 volts, when 100 to 250 volts are to be dropped. The best type of resistance to use in this position is the Ward-Leonard type of fixed resistance, consisting of a wire winding embedded in vitreous clay and capable of heating to a high temperature without damage. These resistances dissipate 44 watts, and are obtainable in the following values in ohms: 1500, 2000, 2500, 3000, 3500, 4000, 5000, 10,000, 15,000 and higher values to 100,000.

handy method of mounting these resistances is shown in a diagram, short lengths of 14's copper wire being inserted in a strip of wood, the resistances standing upright, thus occupying minimum space. The wire connections are cut short, leaving about one inch to connect in series.

The actual potentiometer or voltage divider may be purchased ready-made with a system of tappings provided, and where the maximum voltage for the power valve is greater than that which the potentiometer is constructed to deal with, extra resistance may be added between it and "B" positive power in accordance with the table on page 69 of the "Guide."

Between 90 volts and "B" negative a resistance of low dissipation, as low as 5 watts, may be used, as the current carried by this portion is only a few mils at the higher end, and less still at "B" negative. In this portion variable composition resistances may be employed, high values for separate outputs, or lower values if connected in series to form a voltage divider.

Variable Resistances as Potentiometers.

BUILDERS of eliminators who wish to make up their voltage divider will find it an easy matter to alter a variable resistance so that it will connect up as a potentiometer—that is, with a connection to each end of the resistance and a third connection to the rotating arm.

Some variable resistances now on the market are made with a view to being so altered, and each end of the resistance strip is connected to a terminal bolt. The arm is also connected to one end of the resistance by a strip of metal which is to be liberated from contact with the resistance and secured by a bolt passed through a hole already provided in the bakelite body between the two resistance terminals.

Transformer Construction.

THE one-inch core transformer is in every way quite suitable for an eliminator, and has the advantage of being compact, standing 5in. high in a floor space 4½in. x 2½in. This transformer is as large as is usually provided in commercial eliminators to supply as much as 350 volts full-wave. The only consideration is that thin gauges of wire must be used in order to economise space.

The length of the spool is to be 2½in. inside, and the size of "window" will be about 2 13-16 x 13-16in. The primary winding of 1850 turns may be of 30's or 32's s.w.g. enamelled, occupy ing 13 or 11 layers respectively, 150 or 180 turns per layer. Next follows the filament winding, which should be put on whether required or not, to act as an electrostatic shield between primary and secondary. If not required for filament heating, one end is connected to earth and the other coiled up and insulated. Double cotton-covered 22's will carry one ampere, and the necessary 53 turns for 6 volts will occupy nearly a layer. A centre-tap is provided at the twenty-seventh turn in case a potentiometer is provided outside across leads. A secondary winding giving 200 volts in each half is well suited to the average receiver, as when rectified and smoothed, will give a maximum of 150 to 160 volts. The secondary winding of 3700 turns is made continuous, occupying 15 layers, about 250 turns of 36's wire on each layer. The centre-tap is taken out half way at the 1850th turn. Half a pound of 36's enamelled wire will be required, and the same weight of primary wire.

For an eliminator it is very important that the stalloy laminations are tightly held, so that there may be no mechanical hum. They must be packed as tightly as possible inside the spool without cutting the interior of it with sharp edges or corners. The last two or three strips pushed in should have the entering corners rounded off, and should be placed under the top strip, so that there will be no chance of cutting the spool. As a final tightener, two 4½in. strips slightly narrower than the rest, should be hammered in separately near the centre of the core after the clamps have been lightly screwed up.

In sizes above the one-inch core there may be a considerable amount of "spring," depending to some extent upon the flatness or otherwise of the stalloy, and it is a good plan to make a small allowance for this by building the core a little over size, increasing the size of the former accordingly in one direction, say, 1-8in. for the 1½in. core, and up to ¼in. in the larger sizes.

It will be found that when the clamps are tightly screwed up, the size will be very near that required, and there will be full compensation for shellacing that may be thicker than necessary, and for uneven cutting and consequent gaps at the joins of laminations. Any core is better built slightly over size than under. The small iron belts used by coachbuilders may be used to secure clamps.

The total cost of this transformer, including wire, 2 dozen 3ft. lengths of