yesterday's radio

Transformers

by N.C. Batch

Last of a series

For unknown reasons, we seldom blame transformers for distorted radio reception, or no reception whatever the case. We have a tendency to blame the vacuum tubes for all shortcomings.

Transformers in a vintage receiver perform a very important task indeed. Unlike vacuum tubes, radio transformers have a solid if not rugged appearance. However they too have their weak spots.

Let us look briefly into the construction and function of such transformers, commonly used in vintage radio equipment. There are two types of transformers in the average receiver: 1) The air-core transformer used mainly in RF stages. 2) The laminated iron core transformer, used in AF stages, power supplies. This second variety, because of their construction, small coil wire, cross section and high turns ratio, are naturally more prone to breakdown than the 'air core transformers' (which are used in the RF stages).

This article will point out the most common trouble spots in audio interstage transformers and suggest some remedies. These transformers are used in the majority of vintage receivers, for the interstage vacuum tube coupling in audio frequency circuits, such as the Detector to 1st Audio Amp., 1st Audio Amp. to 2nd Audio Amp., and naturally in many sets, the output from the last audio stage to the speaker.

Technically speaking, such transformers are electro magnetic audio frequency signal transfer links' between one vacuum tube's plate (output) and the next tube's grid (input). It is understood, of course, that the impedance matching characteristics and frequency response of the transformer are of the utmost importance for a distortion free signal transfer between the two vacuum tube stages.

A very common turns ratio for interstage coupling is 1 to 3, in other words, the secondary winding (grid circuit) has 3 times the amount of the primary (plate circuit) turns. A good example of such a turns ratio would be — Primary 4000 turns, Secondary 12000 turns. A frequently used magnet wire cross section was: size .0028 which is #41 B & S gauge. The major trouble spot in such transformers is the solder joint between the magnet wire at the start and finish of the winding, where it is usually soldered to a pigtail wire, which in turn leads to the transformer's primary and secondary terminals. The reason for an open circuit is a simple combination of solder flux that contained acid which reacted with the copper to form an oxide.

After you have located an open winding by means of a high impedance tester, do the following. First check if connections to the terminals on the transformer are o.k. Sometimes the pigtail wires are corroded or broken at the terminal connections. Now mark the connections of the wiring to the transformer, and remove the transformer from the chassis. Disassemble the transformer by removing the core laminations one by one until the coils are completely exposed. If you are lucky, the break will be on the secondary coil finish, this is on the outside face of the coil assembly. Carefully remove the outside wrapper until you see the joint between the magnet wire and the terminal lead (pigtail wire). Examine the joint, any green spots indicate trouble. Such spots are caused by the previously mentioned reactions between the copper and acid used in soldering flux. When the break is located the remedy is obviously to clean the wires and re-solder the joint. However, if you are not so lucky, the interruption could be either on the start of the secondary or the finish of the primary, between the coils. In this case you will have to separate the coils in order to make the necessary repairs. As a rule the transformer coils were impregnated in beeswax. To separate the primary and secondary coils, you have two choices: 1) suspend the coils in a can of white gasoline overnight (do with extreme caution, preferably outside). This will dissolve the wax and the coils can be separated by pushing the primary coil out of the secondary. 2) The other method, and the one I prefer, is to subject the coils to a 50° C temperature and soften the wax, for coil separation. After the coils are separated, follow the above procedure for locating the open or break in the winding.

After you have repaired the coils, you may treat them in wax of paraffin and reassemble the transformer. Be careful placing the last lamination in order not to cut into the coil foundation with the edge of the lamination. Transformers which are filled with compound (asphalt) as used in early Atwater-Kent receivers for instance, should first be suspended in a solvent such as mentioned before, in order to remove the core and coil assembly. (Again be careful — have a bucket of sand ready or the fire dept. telephone number handy, just in case.)

If you are not successful in repairing the transformer there may still be a substitute unit. Try your local radio store or write to Hammond Transformer Co. in Guelph, Ont.

This concludes the series *Yesterday's Radio.* Any inquiries regarding vintage radio and schematics can be addressed to 278 Sutherland, Toronto 17, Ont.

With a sigh to the past, I salute the men who gave us the miracle called radio.