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## Metal Radio Tubes

A new line of metal radio tubes, which tests indicate to be of greater continued efficiency of operation than the glass type now in use, was announced recently. These new metal tubes are not only much smaller and more sturdy, but offer many improved electrical characteristics over the conventional tubes of today. They provide their own shielding and this metal shell is a better heat conductor and radiator than glass. They are particularly advantageous in the field of short wave reception, which in the last year or two has become an important part of all radio receivers. The short leads of the tubes permit greater amplification at the higher frequencies and the more effective shielding insures greater stability.

These new tubes are not interchangeable with glass tubes in the present type radio receivers and will make their first appearance in the new line of sets.

The metal tubes are cylindrical in form, some in reduced diameter at the top. Others, such as a radio frequency amplifier, have a terminal at the top extremity. Each lead-in wire passes through a tiny bead of special glass that is fused securely within an alloy eyelet, which in turn is welded to the metal container, thus assuring a long life vacuum. This alloy, having substantially the same coefficient of expansion as glass, is known as Fernico and is a combination of iron, nickel and cobalt. It was developed expressly for this purpose of a perfect seal on the new tubes.

The inner parts of the tube are first assembled on the steel and plate or header, the shell is placed over the assembly and welded to the header at its circumference. In the main, the new tubes are less than half the size of the familiar glass tubes of corresponding rating. The metal shells are, of course, much stronger than glass bulbs, and not subject to breakage, while the use of short,

stiff supports in the new tubes results in less mechanical vibration of the internal elements.

Elimination of the glass "pinch seal," in which all leads and supports are concentrated in the glass tubes, allows the leads to enter the header of the new tube at the proper points for short, direct paths. Also, the new design permits a logical arrangement of connections and supports between base pins and electrode structure.

The familiar metal shield which is necessary with the glass tube in radio-frequency portions of a circuit is no longer required with the new tube. The metal envelope itself serves as a shield. And, since closer proximity of shield to elements can be realized, the shielding is more effective. Whereas, in certain types of glass enclosed screen-grid tubes the anode is shielded first by an internal structure, next by a coating on the inside of the glass bulb, and finally, when in use, by an external "can," in the new metal tube all these functions are performed by the shell.

The new tubes have one more base pin than comparable glass tubes, since the metal envelope has become the shield, and provision must therefore be made to ground this envelope. Designers of the tube have even taken into consideration greater ease of inserting it in the socket. In the present conventional glass tube, two of the base pins are of larger diameter than the others, necessitating alignment of these larger pins with corresponding socket holes. In the base of the new tube, all the pins are of the same diameter, and in the center is a longer insulated keyed pin. By placing this insulated pin in a hole centrally located in the socket, and rotating the tube until the key slips into its groove, the tube is quickly and easily inserted.

The metal construction has been applied both to existing types of glass tubes having indirectly heated cathodes, and to other newly developed tubes. Included in these is a duo-diode, which is only about five-eighths of an inch high above the base, and a hexode, which is an improved pentagrid convertor.

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