PHILCO SERVICE

PHILCO Factory-Supervised Service

New Product News

MARCH 1951

RADIO

Philco Tube Saver Resistor

The advent of AC-DC sets with high voltage filaments making unnecessary the line dropping resistor was quite a step forward in this type of set. However, it was not without its problems also because where the set was operated on fluctuating line voltages, such as experienced on R.E.A. lines, tube burn outs were experienced that were attributed to this type of high-voltage filament tube.

Philco Engineers working on this problem discovered some very interesting facts which enabled them to prove exactly what went on in the circuit and take steps to protect the tubes.

By properly wiring an oscilloscope to the filament string it was possible to see that it was not necessarily the high voltage that caused tube burn outs, but the resultant current surge. Because the higher voltage filament in a tube the more hair pin turns there were to a filament, this presented that many more "hot" spots that were susceptible to burn out and consequent tube failure in this type of tube with high current.

Figure 1 shows the pattern on the oscilloscope presented by the "current" flow during the warm up period of the tubes. Note that for the first few seconds the current is very high and gradually tapers off to the normal operating current when the tubes have warmed up.

With this information, it was seen that what was needed was a current limiting device that would enable the tubes to warm up with the normal amount of current applied and thus prevent the shock of high current during this warm up period.

The answer to this is the "Philco Tube Saver". This is a negative co-efficient resistor that has high cold resistance and while the tubes are warming up the resistor also warms up so when the tubes reach operating temperatures, the resistor has decreased in value so that normal current will flow.

The oscilloscope pattern, Figure 2, shows that slightly less than normal current is applied at the initial "turn on" and at final warm up the normal amount.

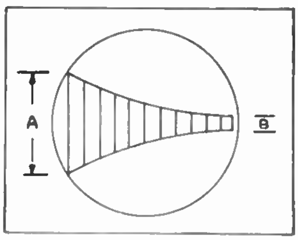


FIGURE 1

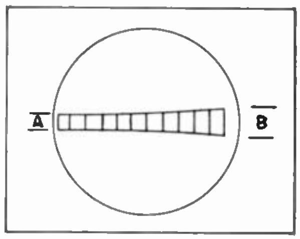
A
CURRENT AT START OF WARM-UP.

B
CURRENT AT END OF WARM-UP PERIOD.

FIGURE 2

A
CURRENT AT START OF WARM-UP.

B
CURRENT AT END OF WARM-UP TIME.



A typical example of the change is resistor value is shown where the cold resistance to start is 800 ohms @ 25° C and changes in a few seconds to 100 ohms @ 80° C.

We are using this resistor in our 1951 sets and it is doing an admirable job in restricting current surges and preventing tube burn outs.

Magnecor Antenna

Recently a new development in broadcast reception came about with the introduction of the Magnecor Antenna, used in the new model 51-631 personal portable radio set. With this new type of antenna the performance of this particular personal or small size radio receiver has equaled and even out-performed many larger sets. Here are some of the features of the Magnecor Antenna.

Physical Size

From the physical appearance of this new type of antenna it can readily be called a "space saver", for it is only 7" in length and about 5/8" in diameter. While its bulk or volume is greater than the average loop, its compactness requires far less mounting area and thus allows large antenna performance with considerable savings in cabinet volume.

Physical Construction

The Magnecor Antenna is made up of a special core upon which two coils, an external aerial input primary and a tuned secondary, are wound. The core itself is composed of metallic oxides that are mixed, shaped, and then fired like a ceramic material. The finished core has the appearance of ceramic but has definite magnetic properties including the ability to conduct magnetic lines of force with extremely low losses. This property is called high permeability.

Performance

This new type of antenna has several distinct advantages over the old familiar type of loop because of its high permeability. It has a high "Q" factor. This means it has a high ratio of inductive reactance to capacitive reactance and actual resistance. This important feature of high "Q" allows for good selectivity which would be difficult to obtain with an antenna system such as a loop aerial, which has a characteristically large amount of distributed capacity. This distributed capacity actually loads down the input r-f stage of the receiver giving lower selectivity and therefore limits the station-selecting ability of the receiver. This feature of "Q" affecting selectivity can be easily seen in figure 3. The external antenna is connected capacitively to the r-f input stage through the loop antenna: Thus this gives the

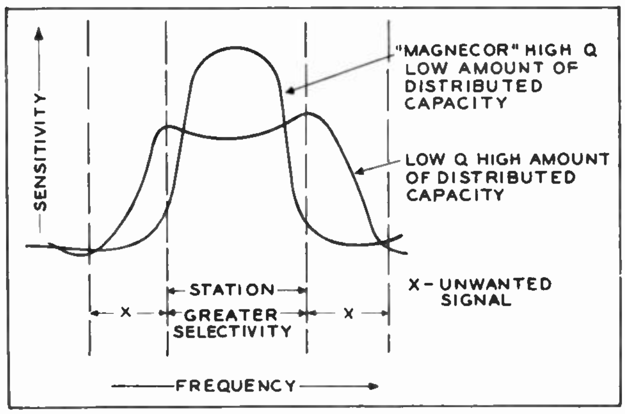


FIGURE 3

effect of adding physical length to the loop but nevertheless results in a loading effect, in the form of distributed capacity, on the r-f input stage! Thus using an external antenna connected to a loop type of aerial will decrease the average selectivity. On the other hand the Magnecor Antenna uses two separate windings. When an external antenna is used with the Magnecor the antenna is connected to the primary winding and therefore there is no capacitive coupling to the grid of the input stage. Instead any coupling that does exist is purely inductive. Some loading does take place by use of the external antenna due to mutual inductance effects from primary to secondary; however, the amount of loading is infinitesimal as compared to that experienced with a loop type of antenna. The simplified diagram showing the

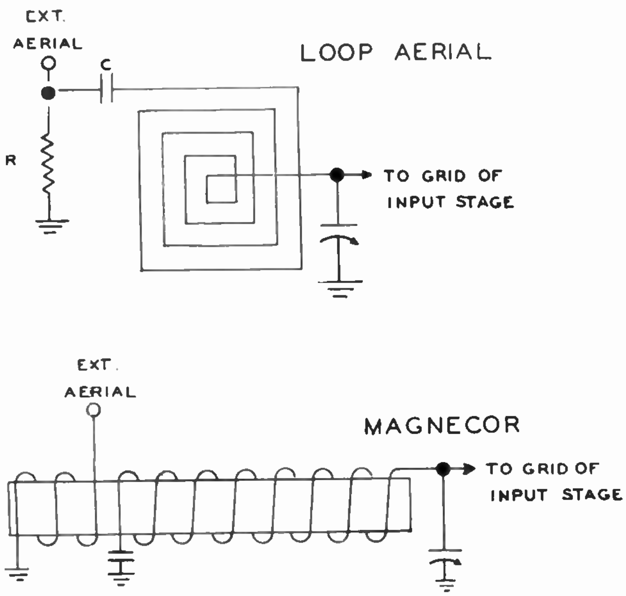


FIGURE 4

electrical wiring comparison of a loop antenna to a Magnecor Antenna is shown in figure 4. Another advantage of the Magnecor Antenna is the fact that it exhibits less directive qualities than the loop antenna. This is shown in figures 5A and 5B. This is a distinct advantage in some signal areas. For example, in areas where local broadcast signals are rather weak, as in some mountainous locales, a noticeable increase in the ease of tuning is noticed due to the lack of a pronounced null as experienced with the conventional loop.

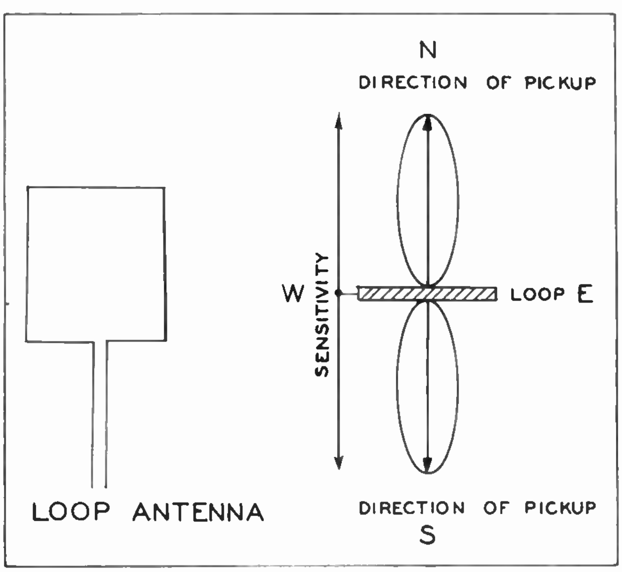


FIGURE 5A

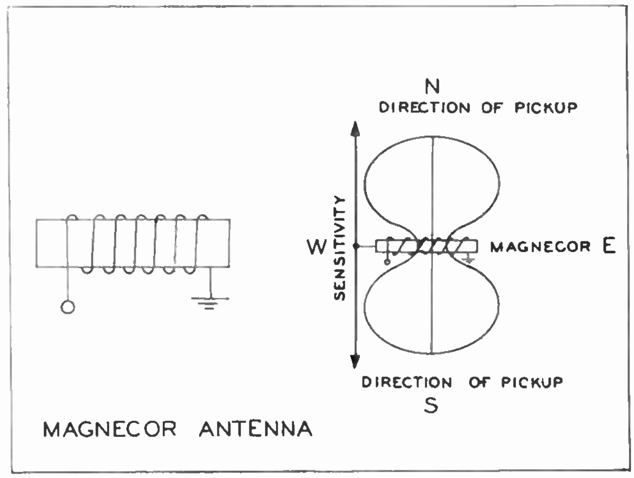


FIGURE 5B

Power-Supply Circuits

The history of power supplies, which replaced batteries in home radios, is an interesting story which combines engineering development and manufacturing-cost considerations.

Half-Wave Rectifier

The simplest method of obtaining direct current from the a-c power supply is the insertion of a rectifier in series with the a-c line. This type of circuit is still used in many of the less-expensive types of radio receivers.

Full-Wave Rectifier

In order to obtain a smoother output, the idea of using full-wave rectification was proposed and is now extensively used. By full-wave rectification, the ripple frequency is twice that of the half-wave rectifier, therefore, by using the same filter, a better than two-to-one improvement is obtained in the reduction of hum. The first type of full-wave circuit utilized four rectifiers, arranged in a bridge circuit, but it was soon shown that the same results could be obtained by using a transformer with a center-tapped secondary and only two rectifiers. For many years this has been by far the most widely used rectifier circuit for a-c receivers.

Sometimes special circuits, such as a-c/d-c systems with selenium rectifiers, are used. Philco engineers have tested these systems, and use them only where they prove as effective and dependable as conventional a-c supplies.

Just as cost is a constant consideration in every manufacturing operation, now, in our present National emergency, the availability of materials is of prime importance. Philco has years of solid reputation and experience in effective cost control and conservation of critical materials with ever increasing quality.

For instance, there is a normal fluctuation in the cost of the basic materials, and in recent years we have seen the cost of such materials as copper, lead, zinc, etc. increase out of proportion to the cost of other materials. For many years it was the practice of radio-receiver manufacturers to utilize either electrodynamic speakers or permanent-magnet speakers, depending upon the relative cost of copper wire and permanent-magnet material (cobalt steel, alnico, etc.). As far as the receiver is concerned, it cannot tell whether the required magnetic flux is obtained from an electromagnet or a permanent magnet; therefore, in normal times it became a matter of economics as to which type of field to use. Now during the present emergency, cobalt is in extremely short supply so that another economic factor (supply) dictates that we be prepared to use electrodynamic speakers and carbon resistors for the filter.

Voltage-Doubling Rectifier

The same economic force has caused a recent trend in power supplies. Since it is very desirable in the better-class radio receivers to have a full-wave rectifier, it becomes a matter of economics as to how this can best be obtained — whether by the use of a transformer or by means of a voltage-doubler circuit.

Voltage-doubler circuits were first developed with the idea of obtaining more voltage from a given source. This is only one of their good points. In effect, they give you a higher ripple frequency, which is easier to filter. This type of circuit has become increasingly popular, and it has been the fundamental laws of economics that have governed the whole matter. It is just another change similar to those that can be seen repeatedly in the radio industry. We started out by using paper-dielectric condensers in the "B" filter; due to cost, the capacity of these condensers had to be small; therefore, expensive chokes had to be used to obtain proper filtering. With the increasing cost of copper, the development of the electrolytic condenser was accelerated, and modern filters often use capacities ten times as great as those used formerly.