Practicalities

Hints and tips for home constructors

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One type of component which is often avoided throughout the whole field of electronics if possible is the inductor or coil. They are not available off the shelf as easily as capacitors and resistors and therefore they usually have to be wound for each individual use, which adds to the cost of a unit if it is being manufactured commercially. However, amateur radio, being what it is, lends itself very well to the use of coils, chokes and the like. So this month I thought I would concentrate on inductors and give a few tips on how to overcome some of the problems encountered when making them.

Inductance of a Single Layer coil.

I can remember seeing some excellent circuits published in various magazines which were spoilt by the fact that the winding details for the coils were omitted and only the inductance or the part number of the commercially made component given. Of course matters were usually made worse by the fact that the item in question was either no longer available or it was not available in this country. This meant starting from scratch with the coil. This can be very time consuming, just guessing at the winding details, as I discovered some years back. In addition to this it is always very helpful to have a good starting point for a coil when you are developing a circuit. As the inductance depends on many factors it is possible to generate very complex formulae. I have seen formulae as long as one's arm to determine the exact inductance of a coil. However, whether one will have access to all the figures for all the variables is another matter. In addition, I wonder how accurate the end result will be in any case? There are three formulae which I have come across which do give a very good starting point when designing a coil, and they are accurate to the degree one really needs, because the inductance can easily be trimmed by using either ferrite or brass cores to adjust the inductance. In any case some method of trimming the inductance would probably be needed even if the exact inductance was known, because the other circuit components and leads will alter the overall effective inductance. The formulae here have been given in a form which should be the most useful for the constructor:

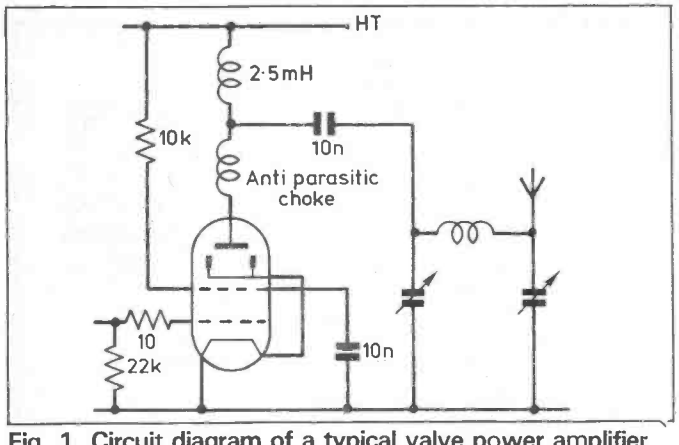

Fig. 1. Circuit diagram of a typical valve power amplifier showing use of anti parasitic choke

$N = 10\sqrt{\frac{L}{D}}$ if winding length is twice diameter

$N = 7.6\sqrt{\frac{L}{D}}$ if winding length equals diameter

$N = 6.2\sqrt{\frac{L}{D}}$ if winding length is half diameter

where N is the number of turns; L is the inductance in microhenries; and D is the diameter of the coil in inches.

As mentioned earlier these formulae will give a good starting point from which to work and the value of the inductance can be changed using cores. If a ferrite core is used this will give an increase in inductance to about twice its original value, while a brass core will reduce the value to about three quarters of its original value.

RF chokes

Very often one requires a small RF choke for suppressing oscillations in a power amplifier, or for protecting the input of an audio amplifier from RF pick-up or for some other use where a small amount of inductance is required. There are two easy ways of constructing small chokes, both of which I have seen used in commercially made equiment. I have found the first of these used mainly in power amplifiers where a very small amount of inductance is required, as shown in **Fig. 1**. to reduce the susceptibility of the amplifier to parasitic oscillations. The choke is easily made by taking a fairly high value resistor, preferably above 100k but less will suffice, and winding five or six turns of enamelled copper wire using the resistor as a coil former. Normally a small wattage resistor (say ½ watt) is perfectly satisfactory as it will be large enough to accommodate the winding without taking up too much space. For some of the higher power amplifiers, a larger resistor will be more suitable. If the turns are fairly wide spaced then tinned copper wire can be used. The other advantage of using the resistor as a former is that it provides a readily available method of providing the choke with mechanical strength whilst not detracting from its performance. Using the formula given above for a winding length of twice the diameter, the inductance turns out to be 0.06uH, which would not normally be enough to alter the