

A Home-made Dynamic Cone

Constructional Details of Radio's Most Popular Speaker

By "PENTODE"



PROBABLY no other accessory has aroused such universal interest among all the wireless enthusiasts throughout the world as the moving coil speaker.

There is no doubt, that, when properly used, it gives the most faithful reproduction of the original, and although it is not a new invention it is the very latest development offered by science to a critical public. No one can deny that the reproduction of gramophone records by any of the recently introduced electrically controlled gramophones is far short of listening to the original. Each of these instruments uses a moving coil speaker fed by a powerful amplifier, similar, but on a larger scale, to that used in any multi-valve receivers. The amplifier is, of course, partly responsible for the high degree of perfection, but the speaker does its share in reproducing faithfully what is fed into it by the amplifier. This is more than can be said of any other type of speaker. The tendency nowadays among the greater part of the wireless enthusiasts is to improve their amplifiers. Power valves are used, reliable audio transformers are substituted, etc., but improvement in actual reproduction can only be advanced to one point, namely, the efficiency of the loud speaker to handle faithfully all that is delivered to it. After this, further improvement to the amplifier is futile. It is the ambition of many to own a high-class speaker, one which will give true reproduction providing the amplifier approaches perfection. Knowing that the loud speaker is as near perfect as possible, it gives one far more comfort to realise that everything depends on the amplifier. Adjustments

can be made, and their effect noted, knowing that as far as the speaker is concerned it is quite reliable.

Types of Dynamic Cones.

BEFORE dealing with the constructional details of a dynamic speaker, it would be just as well to enumerate the various types existing and describe the working principle of each.

The moving coil speaker was discovered years ago, before the advent of broadcasting, but it is not until recently that it has been taken seriously, and improvements made. The first commercial speaker was known as the Rice Kellogg, and at the time of its release it created world-wide interest. In England it was manufactured by the B.T.H. Company, who had the patent rights in that country. To many the price seemed exorbitant, but the whole unit also contained a power amplifier as well as the speaker, and the speaker could not be obtained without this amplifier.

Previous to this came the Magnovox public address speaker, but this, of course, although operating on the moving coil principle, was a horn type of speaker, and was limited to the reproduction of the frequencies that the design of the horn would allow. The only advantage this speaker possessed was the enormous volume obtainable and was chiefly used for speech.

Since the introduction of the R.K. only improvements in design and assembly have been evolved. The principle in all cases is identical.

If a coil of wire through which an insulating current is passing is suspended in a powerful magnetic field with the lines of magnetic force cutting through the turns of wire at right

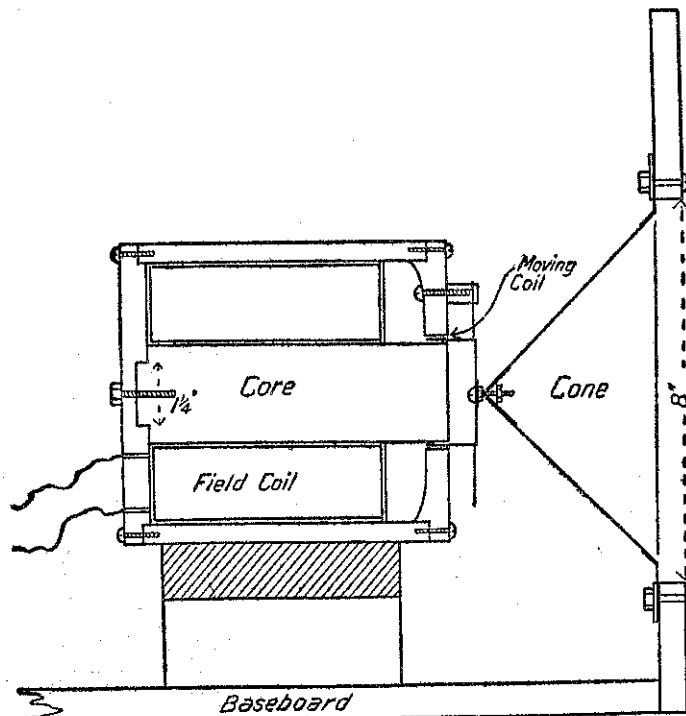
angles, the coil will move backward and forward in a piston movement, in time with the frequency of the alternations of current. Now, if a cone or other rigid surface is attached to the coil, the air will be made to move in the vicinity of the apparatus depending upon the movement of the coil and cone. Again, if the alternations of current were varying at the rate of 256 times a second, the coil and cone would move accordingly, and the note, middle C, would be heard. This is the simple principle upon which the moving coil speaker depends and from which the wave is derived.

In some types of speakers this magnetic field is produced by permanent magnets, while others use electro magnets. Since it is the latter type in which we are interested the writer will briefly show how the principles are embodied in practical methods. The whole speaker can be divided into two sections. In one the question of the strong magnetic field is studied, while

involved will it seem. Let it be said that most of the manufactured ones are built having a high degree of efficiency, but there is no reason why anyone handy with tools and possessed with a fair amount of patience—this latter virtue is important—should not build a good instrument providing they do not aim to have the finished article as neat and compact as the various commercial ones. Here are a few of the most important points upon which the efficiency of a speaker depends:—

1. The magnetic field in which the moving coil, or "voice coil" as it is called in America, is suspended.
2. The method of suspension and centring of the coil and cone.
3. The material of which the cone is made and the shape of the same.
4. The number of turns of wire on the moving coil and their relation to the output of the amplifier.

In each of these cases it will be found that manufacturers have taken



the other deals with the moving coil and cone.

FIGURE I. shows a coil of wire wound around an iron cone. At one end an iron plate is fixed to an iron cover surrounding the whole. At the opposite end is a similar iron plate, except that a small air gap exists between it and the iron cone. Now, it is in the air gap that the magnetic field has to be produced, and it is in this gap that the moving coil has to be suspended.

Attached to the moving coil either direct or indirect, is the cone and various suspending and centring devices that will be mentioned later. Now, to many, the construction of a speaker of this description will seem well-nigh impossible. The more one studies the various factory-built units the more

great precautions. Take point No. 1. This magnetic field in the type of speaker under consideration, is produced by direct current flowing through the larger coil inside the "Pot." This is called the field coil.

The amount of magnetism depends upon two or three factors not in the least being the quality of the iron of which the pot is made. Dynamo steel is best but difficult to obtain and machine. To obtain the same effect with ordinary cast iron, a larger amount has to be used, therefore necessitating a larger pot.

The density of the magnetism in the gap also depends upon the width of the gap. Now to suspend a coil in a gap of 5-64 of an inch is an operation a little too delicate for the amateur, so to get the same magnetic density in

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