Mobile Whip Aerial for Top Band

High Efficiency Loading Coil Wound with Litz Wire

By P. J. H. MATTHEWS (G3BPM)*

DURING the building of a portable all dry battery Top Band transmitter/receiver the need for a readily tunable whip aerial became apparent, and as a result of various experiments the aerial described in this article was evolved.

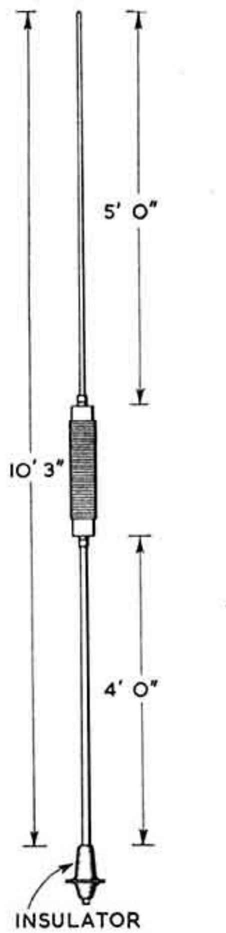

Fig. 1. General details of the centre-loaded mobile whip aerial described in the text.

The basic arrangement is a centre loaded whip with a tapped loading coil (Fig. 1). The various taps are selected by miniature wafer switches mounted within the ends of the loading coil former, the switch spindles forming robust aerial attachments to the loading coil. The switch at the top of the coil selects the coarse adjustments and the lower switch the fine adjustments. To change frequency, the loading coil is merely rotated in relation to the lower section of the whip after the upper switch has been set to suit the particular type of vehicle on which the aerial is mounted. The lower switch alters the resonant frequency of the aerial by approximately 20 kc/s per tap. The aerial will operate effectively over a bandwidth of approximately 10 kc/s. In this way virtually continuous coverage is possible on Top Band.

In view of the low power available in portable and mobile installations, it is most important to reduce the losses inherent when the whip aerial is short in relation to the wavelength used. The radiation resistance of such an arrangement is extremely low, often below one ohm, and a large proportion of the power available can easily be dissipated as heat instead of being usefully radiated. With this in mind it was decided to wind the loading coil with Litz wire to reduce the r.f. resistance. The actual coil consists of 290 turns of Litz wire wound 25 turns per inch on a 1½ in. diameter paxolin tube. The wire was obtained from a variometer from a TU26B tuning unit.† There are 10 taps of 5 turns each at the lower end and 5 taps of 20 turns each at the other. The arrangement of the switches is shown in Fig. 2.

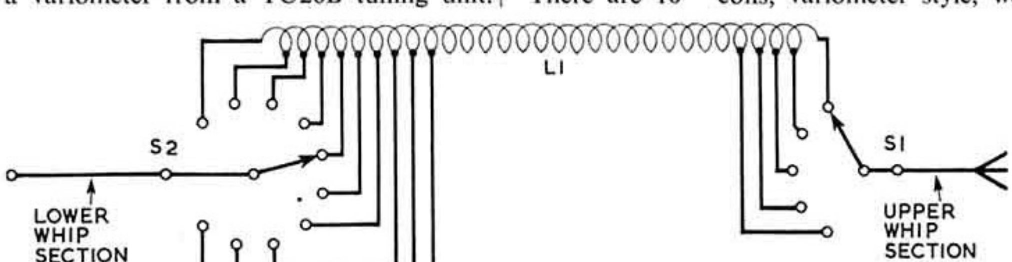

Fig. 2. Arrangement of the switching in the loading coil.

Construction

First, drill the coil former as shown in Fig. 3 and prepare the end plates from ¼ in. thick paxolin. These end plates must be a good fit into the ends of the coil former, as they carry the switches S1 and S2. It is important that use be made of the switch locating spigots as it is easy to break off the coil taps should the securing nuts work loose.

The coil is wound tightly, the taps being fed into the centre of the former and brought right up to the switch tags. They need not be cut. Systoflex sleeving is slipped over each pair of tap leads to prevent them shorting when the switches are fitted into position.

To clean the Litz wire, use a small flame and heat the area to be soldered until it is red hot, then quench in methylated spirit. This cleans the wire completely and enables a perfect joint to be made. It is best to practice this operation a few times with a small piece of wire before tackling the coil itself. Care must be taken as the methylated spirit may possibly burst into flame.

When all the joints have been soldered, carefully slide the switches and end plates into the coil former, ensuring that the leads are not twisted, and secure each end plate with six brass screws and washers. After assembly, dry the coil unit in a warm cupboard or dry room for 24 hours and then carefully cover with several coats of polystyrene varnish or shellac, making certain the end caps are completely sealed.

The whip attachments consist of standard brass ¼-in. spindle couplers soldered on to the ends of the aerial sections and secured to the switch spindles by means of screws. The switch spindles can be either drilled and tapped or they may merely have a small indentation drilled on the flat side in which the securing screws can be set.

For reference purposes a small scale can be engraved on the end plates and the whip securing screw heads used as indices. This simplifies returning to a previous frequency if any large change has been made.

The whip aerial itself can be of many different forms, but the stronger types of ex-government aerials are most satisfactory provided the dimensions are suitable.

Using the Whip

The settings of the coil switches for any particular frequency cannot be given as the amount of inductance required varies with the type of vehicle and the position in which the aerial is fitted. Suffice to say that it is possible to mount it anywhere on almost any car and get it to load in a few seconds by means of the coarse adjustment. The prototype described was in fact fitted to several different vehicles in one day and in each case loaded straight away. This is a useful feature for R.A.E.N. use or where a portable rig is used in a car or boat.

Various arrangements such as sliding coils and rotating coils, variometer style, were tried before the present idea was evolved. It has now been used with a hand carried portable in a dinghy and with mobile gear. It has proved most satisfactory and has enabled frequency changes to be made quickly and easily. The results obtained have been excellent. With a transmitter input of ¼ to ½ watt, ranges of 10 miles have been regularly achieved as a mobile installation using phone and up to 40 miles on c.w. Stations all over the country are easily received. Even with a transmitter power input as low as ½ watt it is possible to light a neon lamp adjacent to the upper section of the whip.

* *18 Kings Avenue, Sunbury-on-Thames, Middlesex.*

† *A suitable Litz wire 3/3/3/0032 is available from the London Electrical Wire Co. and Smiths Ltd., Leyton, London, E.10.*

The efficiency of the aerial is believed to be largely due to the use of Litz wire in reducing the r.f. resistance of the loading coil and the fact that no " lossy " material passes caps instead of end plates to fit over the coil former for about 1 in. However the writer's method of construction can be easily carried out in the average workshop.

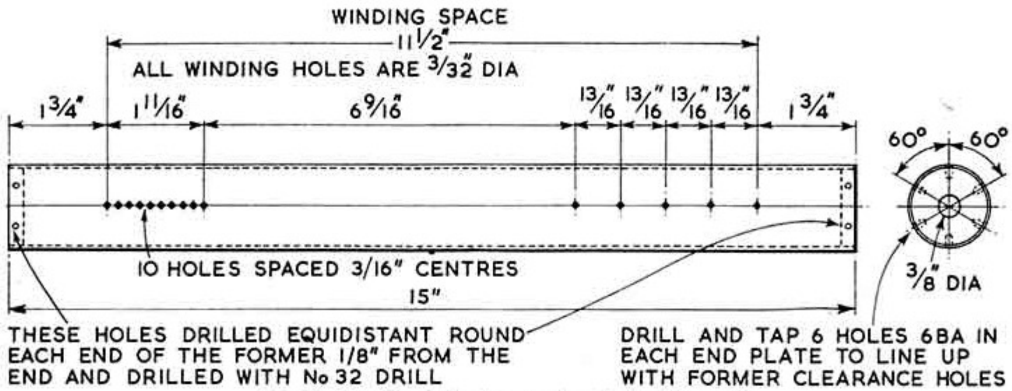

Fig. 3. Details of the former for the loading coil.

through the centre of the coil to give mechanical strength to the whole assembly. Many variations of this basic arrangement are possible and it should be quite easy to build an aerial for several bands using this type of construction. Anyone who has access to a lathe will be able to improve on the end plates and produce a stronger assembly by making end

The aerial will give excellent local coverage if used at home and will out-perform a short length of wire in a small garden.

As this aerial possesses virtually no horizontal component very little fading or interference due to more distant stations is experienced in local contacts.

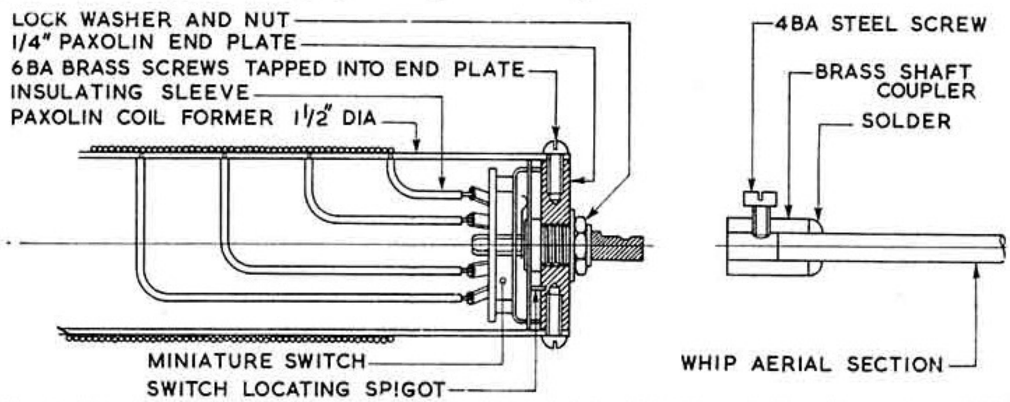

Fig. 4. Mounting of the switches on the end plates and the method of connecting the loading coil to the whip sections with shaft couplers.

Ordinary Administrative Radio Conference

IN accordance with a proposal put forward at a recent meeting of the Administrative Council of the International Telecommunication Union, the next Ordinary Administrative Radio Conference is now expected to open in Geneva on August 17, 1959 and not, as stated earlier, on July 1, 1959. The Plenipotentiary Conference is expected to open on October 14, 1959.

The I.T.U. Conferences will be preceded by the IXth Plenary Assembly of the International Radio Consultative Committee (C.C.I.R.) which will open in Los Angeles on April 1, 1959.

R.S.G.B. News Bulletin Service

THE R.S.G.B. News Bulletin Service is now radiated at the following times on Sundays:

10.00 B.S.T. 3600 kc/s. South of England (Operators: G2MI, G3IIR, G5LC, G6MB and G8TL).

12.00 B.S.T. 3600 kc/s. North of England (Operators: G2ACD, G2YS, G3DQ and G5VO).

11.15, 11.30 and 11.45 B.S.T. 145·55 Mc/s. North of England (Operator: G5YV).

12.00 and 12.15 B.S.T. 145·5 Mc/s. South of England (Operators: G3FZL, G3GHI and G5KW).