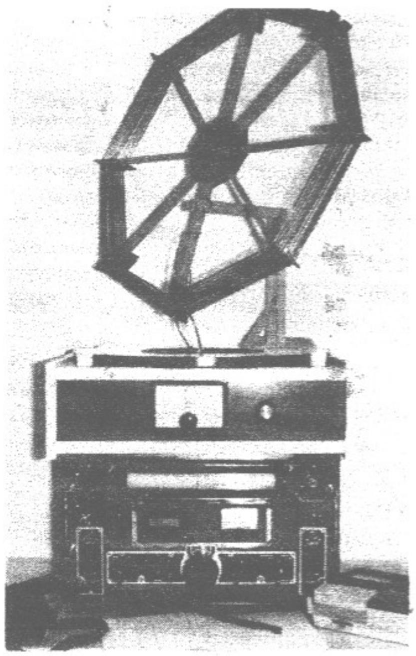
The W-Q MW Loop

In this article G. S. Maynard focuses on a medium wave DXing antenna developed during five years of spare time activity. He outlines the design and construction of an efficient 635mm octagonal loop, which features dial-drive tuning, switch-selectable bandwidth and an integral, variable output amplifier.



Design Pointers

Two important advantages of high *Q* loop windings are narrowed bandwidth reception and reduced winding noise. Where DXing passbands less than 6kHz are acceptable, an increase in *Q* allows slightly smaller wound area without degradation of signal to noise ratio. The "W" form described here was developed as a method of decreasing losses by allowing more, closely coupled, paralleled turns to form a low capacitance, low resistance winding—20pF, 0·4Ω and 1·9MHz series resonant frequency.

Loop construction was determined by a listed set of requirements. These were that:

a) it should be no larger than is necessary for DX-bandwidth reception of distant background noise,
b) it must be free to rotate about both horizontal and vertical axes for nulling either ground or skywave signals,
c) with a sturdy insulating frame it should approximate to a circular shape to reduce peripheral losses and create an even flux distribution,
d) it must possess a high inductance to capacitance ratio for maximum *Q* performance,
e) if wound with Litz wire or many paralleled strands of enamelled copper wire then the effective resistance should be reduced,
f) to minimise dielectric losses it should be tuned with an air-spaced variable capacitor keeping connections short and physically isolated,
g) by avoiding asymmetrical (spiral) construction and side-by-side (solenoid) windings a more uniform energy coupling between all turns should be achieved,
h) grounding the loop winding via a centre tap reduces electrostatic pick-up and generates a differential output,
i) to ensure balanced tuning use a dual-gang variable capacitor with the fixed vanes connected one set to each winding end, and the moving vanes to the ground; this obviates hand capacity problems,
j) to avoid introducing unnecessary losses by using a receiver coupling winding, a very high impedance loop matching amplifier with short, fine interconnecting wires should be used
k) for local reception series resistance should be added at the winding centre to broaden bandwidth and reduce gain; switch wiring here does not upset the high *Q* response.

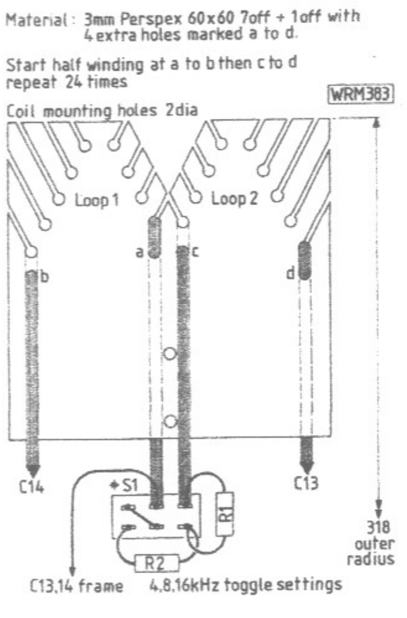


Fig. 1: Details of the Perspex formers on which the two halves of the loop are wound. Note that the unusual switch S1 is mounted as close as possible to the loop

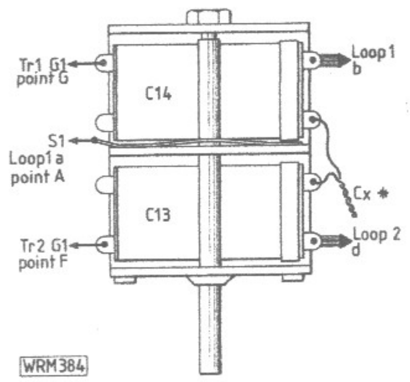


Fig. 2: Connections to the two-gang tuning capacitor C13,14. Cx is a "fiddle" capacitor made by twisting together two lengths of insulated flex

The Loop

This comprises two halves each of 9 turns, wound over eight "W" shaped Perspex supports (cut and drilled as shown in Fig. 1) and mounted on wooden limbs at 318mm outer radius. Twenty five separate overwinds of 32 s.w.g. enamelled copper wire (455g) are alternately wound on from central anchor points to simultaneously build up each half of the winding. Loose wire ends are taped to the central hub until they fill anchor holes and become firmly held. The bandwidth switch is mounted close to the anchoring support (Fig. 1), with resistors R1, R2 and mid-winding ends soldered directly to it.

The outer winding ends are swept down to the tuning capacitor, C13,14, in their multi-strand form without running close to supports or any other wires. They allow for vertical loop rotation with respect to tuning components, dial etc. and up to 45 degree tilting each way about a pivot 100mm below the loop centre. When used with its matching amplifier this loop tunes from 510 to 1630kHz, and offers choice of three bandwidth settings —approximately 4, 8 and 16kHz.