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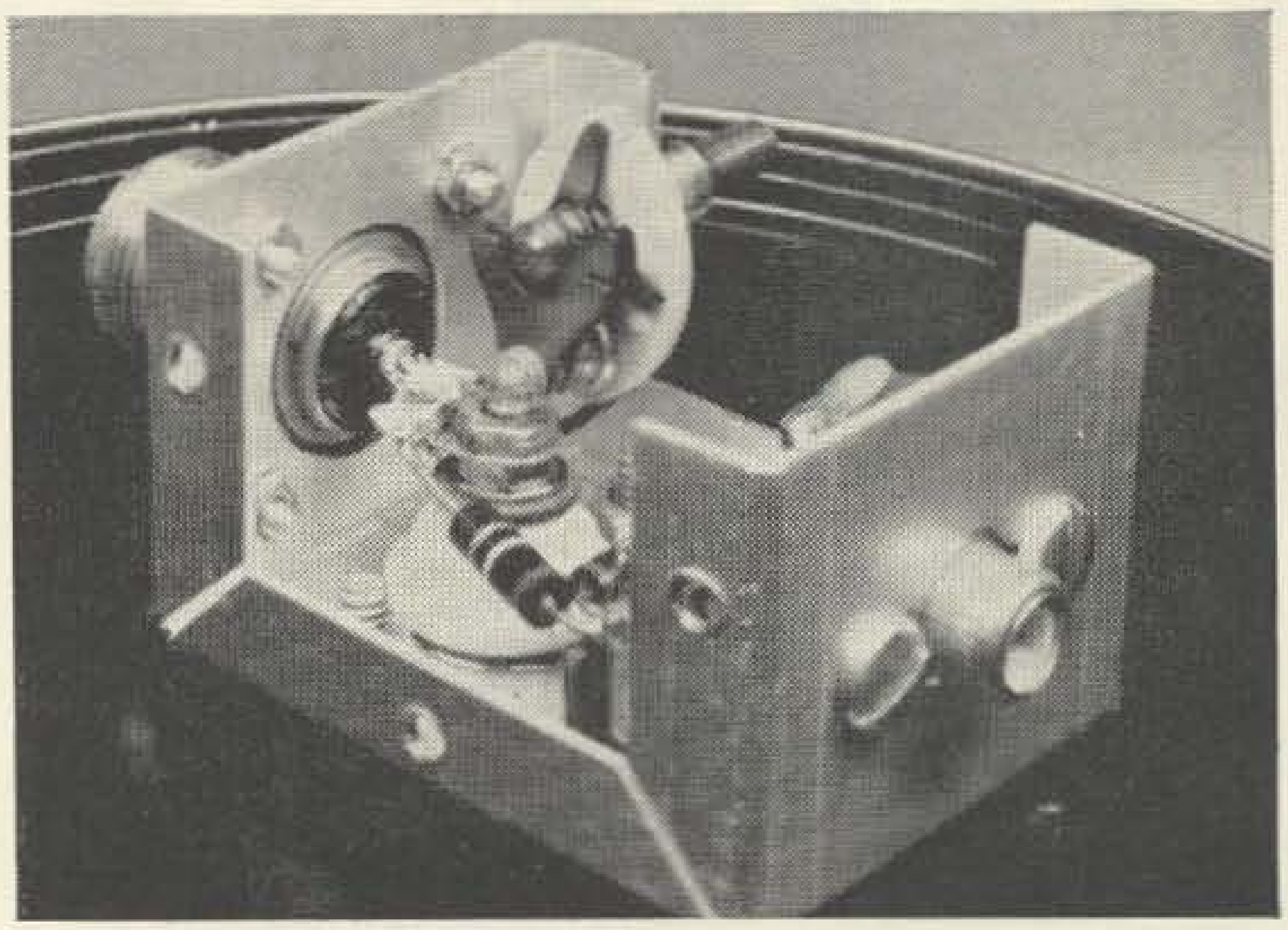

Photo Credit: Joe De Young WA6CQL

The Heath Cantenna is an excellent aid for ham experimenting. This simple modification extends its use to above 432 mc.

Modifying the Heath Cantenna for UHF

The first requirement for accurate rf power measurements is a flat dummy load. Likewise, very low vswr in a dummy load can be an important factor in testing high power transmitters.

Several relatively inexpensive dummy loads are currently available for 50 ohm lines. Of these, at least three are capable of handling up to a kw output.

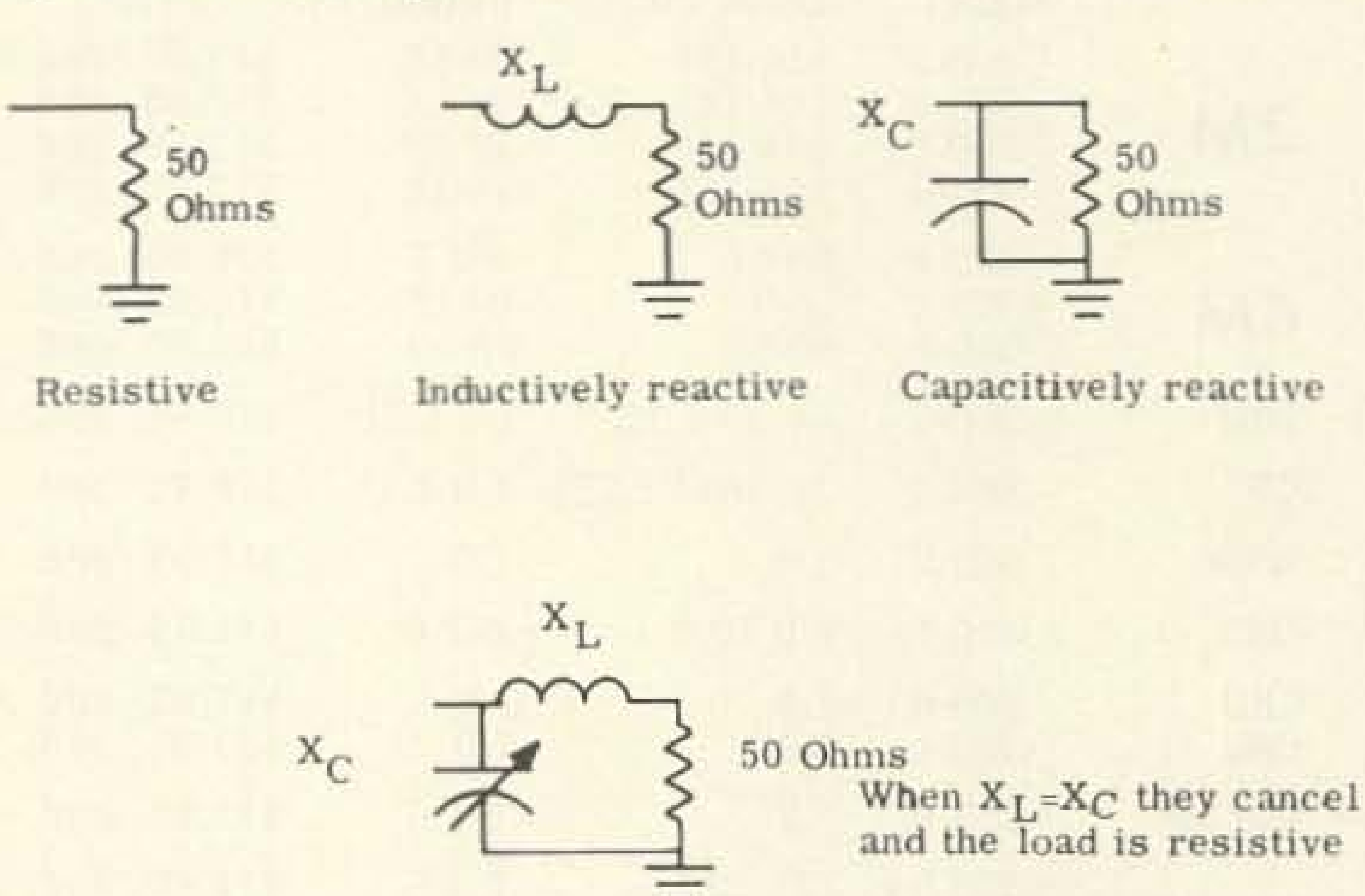

Fig. 1. A dummy load may appear resistive or reactive to rf. The Cantenna acts slightly inductive at UHF but addition of a small capacitor cancels this inductive reactance.

At high frequencies, these loads perform well and exhibit tolerable vswr. However, in the VHF and UHF frequency ranges, performance falls off due to a rising vswr.

The Heathkit Cantenna power rating is 200 watts continuous and 1000 watts for up to ten minutes. The vswr at 50 mc was measured at about 1.15/1. This is a generally acceptable level however; at 220 mc the vswr rises to 1.35/1 and at 432 mc the figure was 1.8/1.

A high power 432 rig operated into such a load might be seriously damaged if the transmission line were being operated near its ratings (an easy thing to do at 420 mc).

Mismatch in dummy loads is the result of either a resistive mismatch or a reactive component in the load.

Since the dc resistance of the load is 50 ohms the source of the standing waves at VHF is probably reactive. This reactance is generally either a shunt capacitance or a series inductance. See Fig. 1.

The source of this reactance is generally either a peculiarity of the load material itself or a lead length or dress problem. In practice, it is generally a combination of a lot of the former and some of the latter.

In theory, then, to return the load to a resistive impedance of 50 ohms, it will be necessary to cancel the reactive component by adding the proper value of either inductance or capacitance.

This generally means that load flatness becomes a frequency sensitive thing, i.e. the load is tuned or rather the reactance is tuned out. This is no more than what you had before, except that now the effect can be controlled.

In applying this theory to the Cantenna, it was found that in the 220-450 mc range, the load exhibited some series inductance. It was further found that, according to theory, a small capcitance shunted across the load could be made to cancel the inductance in the load and produce a resistive 50 ohm situation at 432 mc and hence reduce the vswr to virtually 1/1.

This was done by adding a small variable air capacitor of 5 to 7 mmfd across the input to the load to ground.

The capacitor in the photograph had just enough capacity to null the standing waves at 432 mc.

The lowest vswr at 220 was observed at maximum capacity and, though lower than before, did not produce a null, indicating that more capacity would reduce the vswr even further than the value shown in Fig. 2.

It will be noted that a slight increase in vswr is seen at 50 mc with the capacitor installed at maximum capacity. This indicates that somewhere between 220 mc and 50 mc the natural reactance of the load has changed from inductive to capacitive.

FREQUENCY	VSWR NORMAL	VSWR WITH CAPACITOR
50 Mc	1.25:1	1.35:1
220 Mc	1.43:1	1.35:1
432 Mc	1.8:1	1:1

Fig. 2. VSWR measured at various frequencies with and without added capacitor. All measurements with capacitor are with capacitor fully meshed.

The general conclusions to be drawn from all this are: if operation is desired primarily at 50 mc, and the vswr must be below those given, a small amount of inductance between the connecter and the load terminal should flatten out the load; and, if operation is desired from some undefined point below 220 mc to some equally undefined point above 432 mc, a 10-15 mmfd air variable will allow the load to be tuned to minimum vswr.

If very low vswr operation is required from 50 mc to 450 mc, a small inductance and a 10-20 mmfd air variable might both be installed and allow the load to be tuned across the entire range.

Though these last statements are, for lack of confirming experiments, somewhat conjecture, the fact of a flat load at 432 mc and an improvement at 220 mc was definitely established, and though no figures are shown, tests indicate that these modifications have little, if any, detrimental effect on operation below 30 mc.

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