lower frequencies where several reflector and director elements should be determined in isolation, before attaching to the boom. The same design rules apply to parasitic helical elements as pertain to full sized versions: the helical dipole should be constructed for resonance at the operating frequency; the director(s) for a frequency some five per cent higher and the reflector around five per cent lower.

Low Resistance

As a general point, the radiation resistance of an helical element is substantially lower than its full size equivalent. To keep losses within acceptable limits, the aerial should be wound with the heaviest gauge wire possible. Heavy gauge copper wire on a glass fibre pole is ideal. Resistive losses for elements resonating above 30MHz are negligible in most cases. At 7MHz this is not the case.

Element spacings are a bit of a problem. There is nothing which can be done to reduce these without sacrificing both gain and bandwidth. An helical element has markedly sharper tuning than a linear element and the characteristic is accentuated by very close element spacings. Furthermore, close spacing reduces the radiation resistance still further thus increasing resistive losses.

In spite of these shortcomings, very compact, worthwhile designs can be produced with superior characteristics to other aerial types for the same size. It is possible to build a 40m three element beam with excellent directional characteristics into the same size as a three element full size monoband array for 10m. Furthermore the practical gain in the forward direction is considerably higher than most of the standard designs for 40m. I've shown a design for such an aerial which uses varnished wooden poles for the supporting structure. From bitter experience I have found it is not a good idea to put more than about 100W up the spout because local heating causes the varnish to flake. Damp then gets into the wood and the aerial becomes useless! A 144MHz helically-wound antenna is easily made, and can be formed on a 12in length of plastic tubing ½in in diameter, as shown in the diagram, although fibre glass or PTFE tubing would be better and less lossy. A small hole is drilled near to one end of the tube, leaving a couple of inches to spare, eventually to be soldered to the centre pin of the coaxial plug. A second small hole is drilled 10in from the first hole and a self-tapping screw inserted.

Then 34 turns of the wire (18SWG or thereabouts) are close wound at the lower end of the tube, leaving an extra couple of inches before cutting the wire. The turns will spring open a little but they are then slid along the former, which will tighten them up again, and the 30th turn anchored under the ST screw, the remaining turns being left for adjustment purposes.

Plug In And Tune Up

The coaxial plug can now be fitted by threading the wire through the centre pin, forcing the plug into the tube and then soldering the wire into the pin. If the wire is enamelled the end should be scraped clean, of course, before fitting the plug. It is a good idea to make sure the plug fits the tube before starting construction.

The top turns are adjusted by plugging the antenna into a rig via and SWR meter and adjusting them by pulling them along the tube or compressing them until the SWR is correct. This is best done at around 145MHz for general use unless there is a preference for a particular frequency.

If the tubing is slightly larger in diameter then fewer turns will be needed, and vice versa, and a matter of experiment. Finally, after adjustment, the top turns can be held fast by a spot or two of plastic cement or another ST screw.

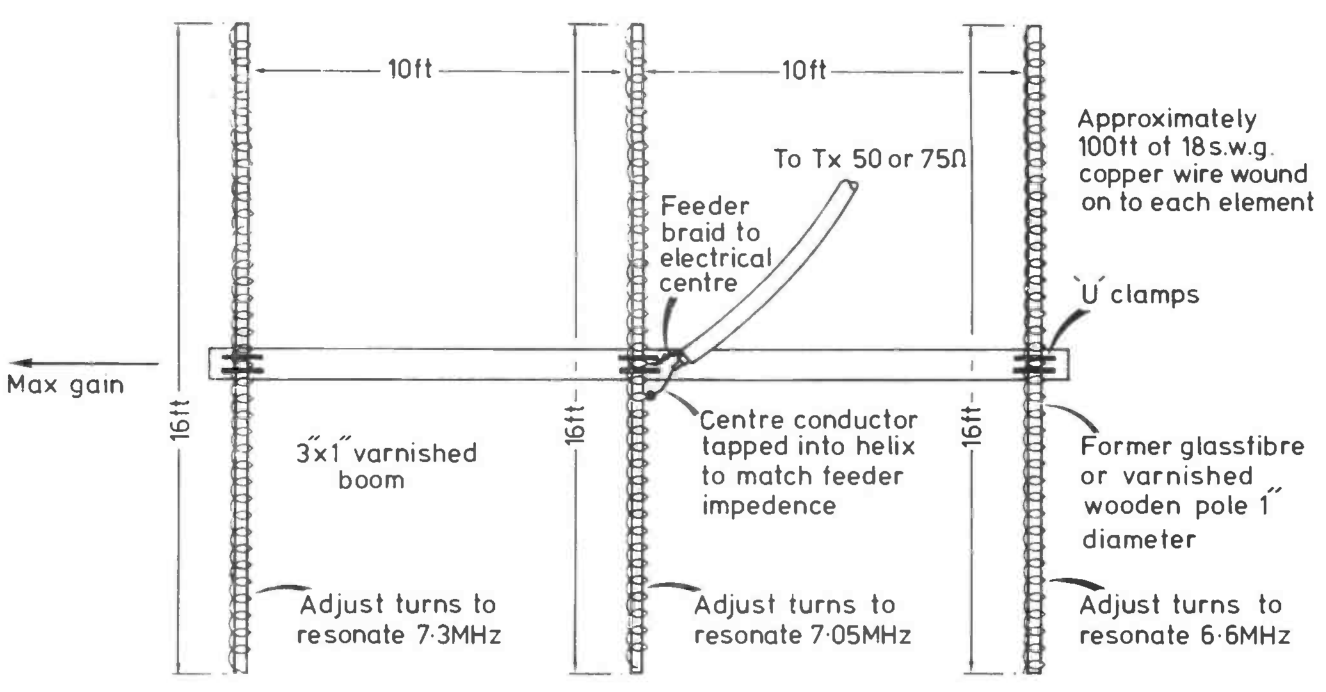

Fig.2. A Multi-element Yagi. Note that all dimensions are for 40m operation.