Harry Bourne comes through again with another simple antenna design that will add to your enjoyment of amateur radio.

A MINIATURE QUAD LOOP ANTENNA FOR 15/20 METERS

BY HARRY K. BOURNE*, ZL1OI

Amateurs living in suburban areas with a small space around the house, often obstructed by trees or by an overhead power line, with insufficient space for the erection of a full size Yagi or quad antenna, may obtain quite good DX results with a single element quad of reduced size. This antenna is very light in weight, has little wind resistance, is inexpensive to build and uses easily available materials. It may be erected by one person without assistance, is much less obtrusive than a normal quad and is suitable for use when height and space are limited.

The quad loop is an efficient radiator and has useful directional properties. The theoretical gain over a dipole is about 2 dB, but in practice, especially on reception, the effective gain often exceeds this. With its low angle of radiation, even at a low mounting height, the loop can give good DX performance. At ZL1OI, good results have been

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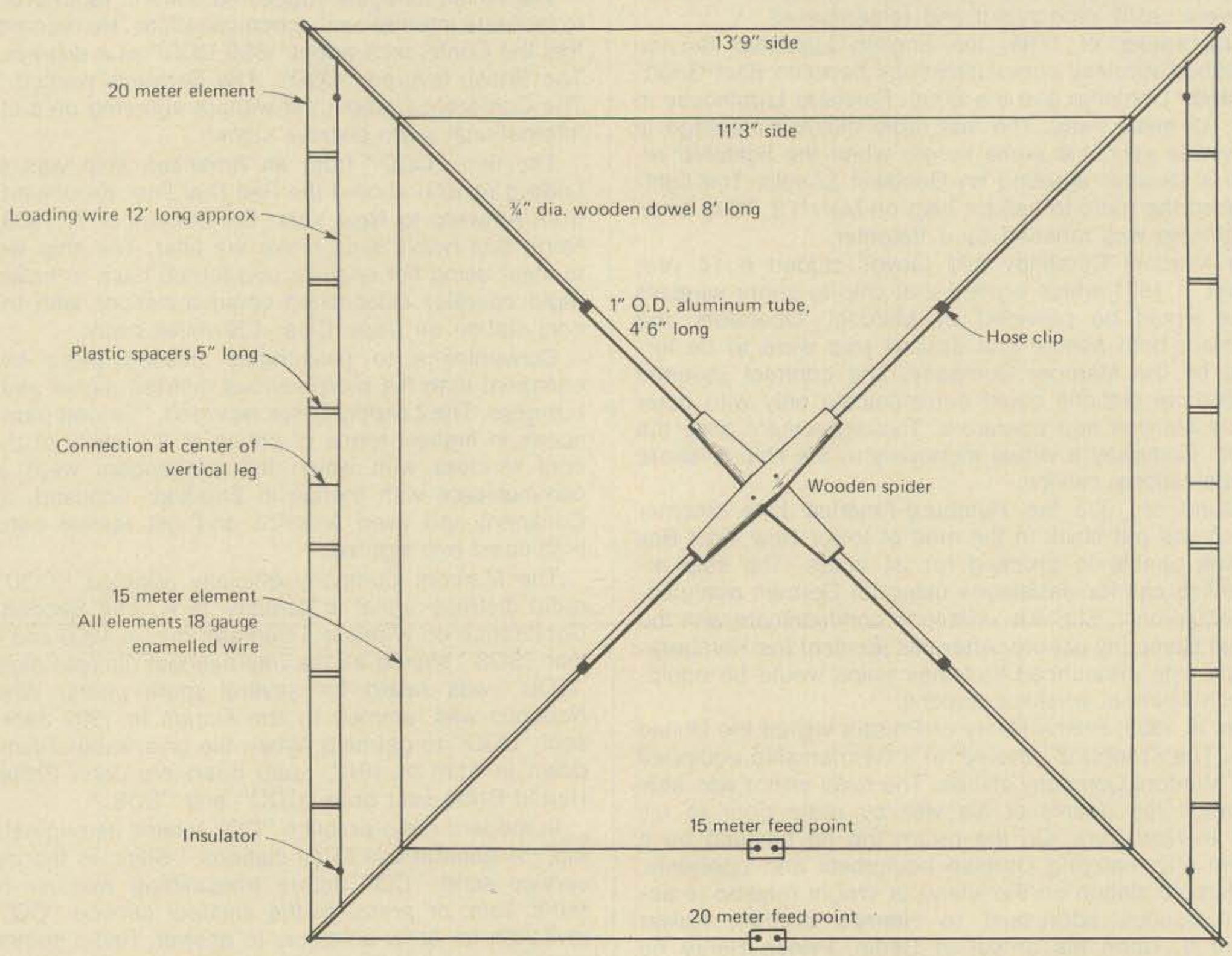

Fig. 1—The miniature 15/20 meter quad loop antenna.

obtained with the center of the quad loop 30 feet above the ground, a height insufficient for the best operation of a dipole or Yagi antenna on 20 meters.

The quad loop is bidirectional, with two broad lobes of radiation in directions perpendicular to the plane of the antenna, towards the front and the back, with strong nuls of over 20 dB on each side. The antenna is a relatively quiet performer and often provides good reception in locations subject to line noise and other man-made interference. As the directional pattern is broad, aiming of the antenna is not critical, and with rotation through only 90 degrees providing complete coverage in all directions, no elaborate turning mechanism is required. At ZL1OI the antenna is mounted on a tubular aluminum mast which may be rotated by hand, generally into one of two set positions, one facing Northeast for working into North America and the other at right angles to this for Europe.

The arrangement and dimensions for a quad loop for 20 and 15 meters are shown in fig. 1. The 20 meter element is less than the normal size with capacity loading by two loading wires with their mid points connected to the centers of the vertical legs and spaced from them by about 5 ins. This method of linear loading is well known and was described some years ago by G3FPQ in *QST* magazine and more recently by G3MWV and G6XN in *Radio Communication*. This method of loading enables the sides of the 20 meter element to be shortened with very little loss of efficiency.

The 15 meter element is full size and is mounted inside the 20 meter loop. Each loop is fed through a quarter wave matching section of 70 ohm coaxial cable to improve the match to a 50 ohm feeder. The length of the matching section is trimmed to give resonance at the lower end of each band with a grid dip oscillator coupled to one end of the matching section which is shortcircuited by a small loop. Connections are shown in fig. 2.

A quad loop has a fairly low Q and will cover the whole 20 or 15 meter band but for maximum efficiency the elements may be trimmed to resonate at the desired frequency of operation with a grid dip oscillator coupled to a one or two turn coil connected across the feed point with the feeder removed. The antenna may be trimmed in a position about 10 feet above the ground but an allowance must be made for a small increase in resonant frequency when it is raised into the operating position. This may be done by measuring the s.w.r. in the two positions of the antenna. The final length of the loading wires will depend on their spacing from the vertical legs of the loop and the amount of metal in the support arms. The 15 meter element is trimmed in the normal way. Balanced operation may be obtained by feeding the antenna through a balun between the matching section and the 50 ohm coaxial feeder. No noticeable improvement by using the balun has been observed at ZL1OI so in this case no balun is used.

Constructional details of the antenna are shown in figs. 1 and 2. A wooden spider supports the arms carrying the elements. The arms are varnished wooden dowels which fit into aluminum tubes bolted to the spider as shown. The loops are of 18 gauge enamelled wire threaded through screw eyes in the wooden dowels.

This antenna has been in use at ZL1OI for a considerable time and has been compared by switch-over tests with a trapped vertical antenna with radials mounted on a 20 foot high pole. On the average, the quad loop gives signals about one S point stronger on transmission, and often more than this on reception. Reception is markedly better than on the vertical antenna as the directional properties of the quad minimize QRM from the sides, and the antenna is much less susceptible to noise pickup. Signals which are unreadable in a background of noise with the vertical antenna may often be copied easily with the quad loop.

The antenna will operate on 28 MHz but in this case the angle of radiation is higher and DX results are not as good. Better results could be obtained by adding a 10 meter loop inside the 15 meter loop for tri-band operation.

It is hoped that this article may be of assistance to those who are unable or unwilling to erect a full size quad or Yagi with reflector, and yet wish to obtain results noticeably better than those from a vertical or dipole antenna. ■

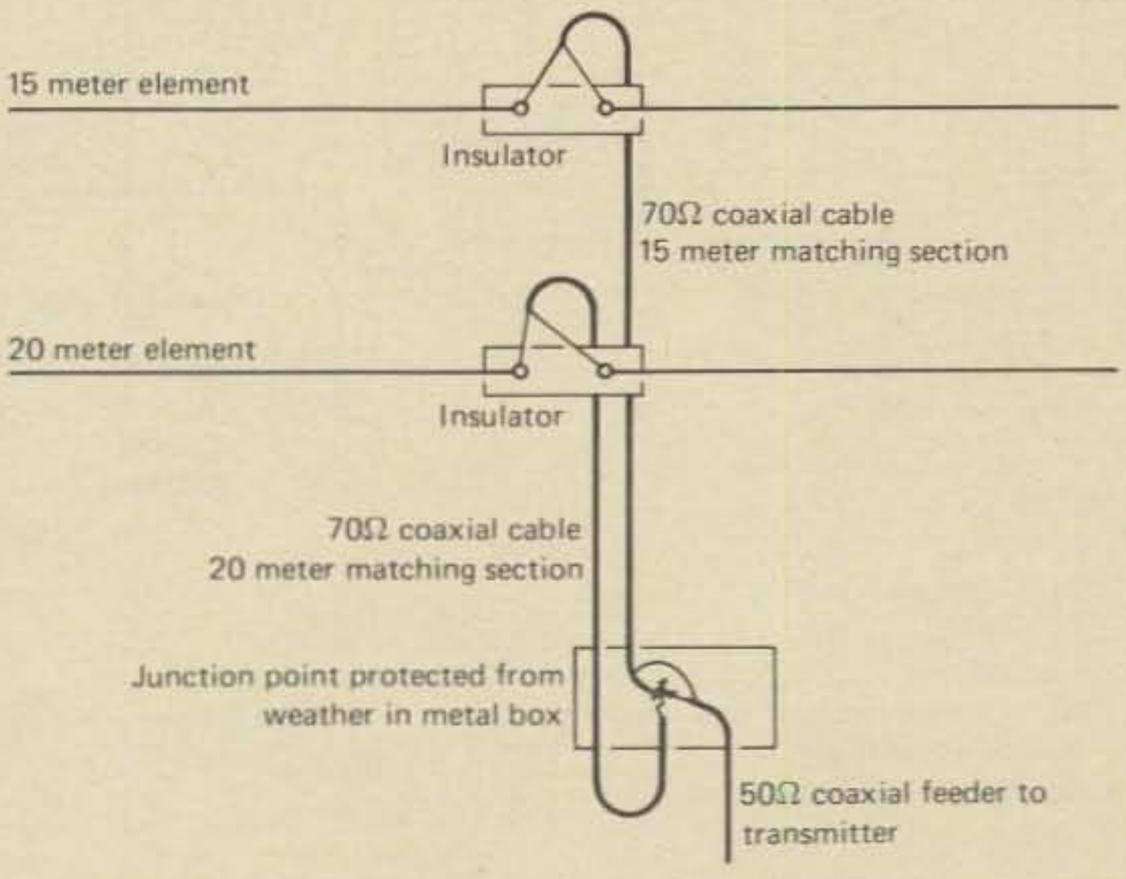

Fig. 2—Arrangement of connections to the loops.