The Bamboo Birdcage

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The G4ZU Birdcage is a distant relative to the familiar Cubical Quad. One of the original design approaches of the Birdcage was to use tubular elements, thus not requiring the use of bamboo arms. However, this results in an array that requires considerable mechanical rigidity if it is to survive a good wind, in turn adding to the weight. The can become a detrimental factor in erecting a 14 mc antenna atop a mast of reasonable height. The Quad on the other hand is of sufficiently light weight so that under most conditions a 14 mc model can easily be erected by two persons. However, the basic Quad design suffers from a lack of rigidity unless an exceptionally strong boom is used. The boom length in turn makes the array somewhat hard to handle.

The use of a "Boomless Quad" has therefore become quite popular, with the added advantage of providing proper spacing between elements on dual and tri-band versions to permit a good match to be obtained to a single coaxial line. This configuration, however, requires longer bamboo arms than the basic Quad, and a rather complex "spider" at the center.

By combining the electrical design of the "Birdcage", with the mechanical design of the "Boomless Quad", we can obtain an antenna which contains the best features of both configurations, as shown in Fig. 1.

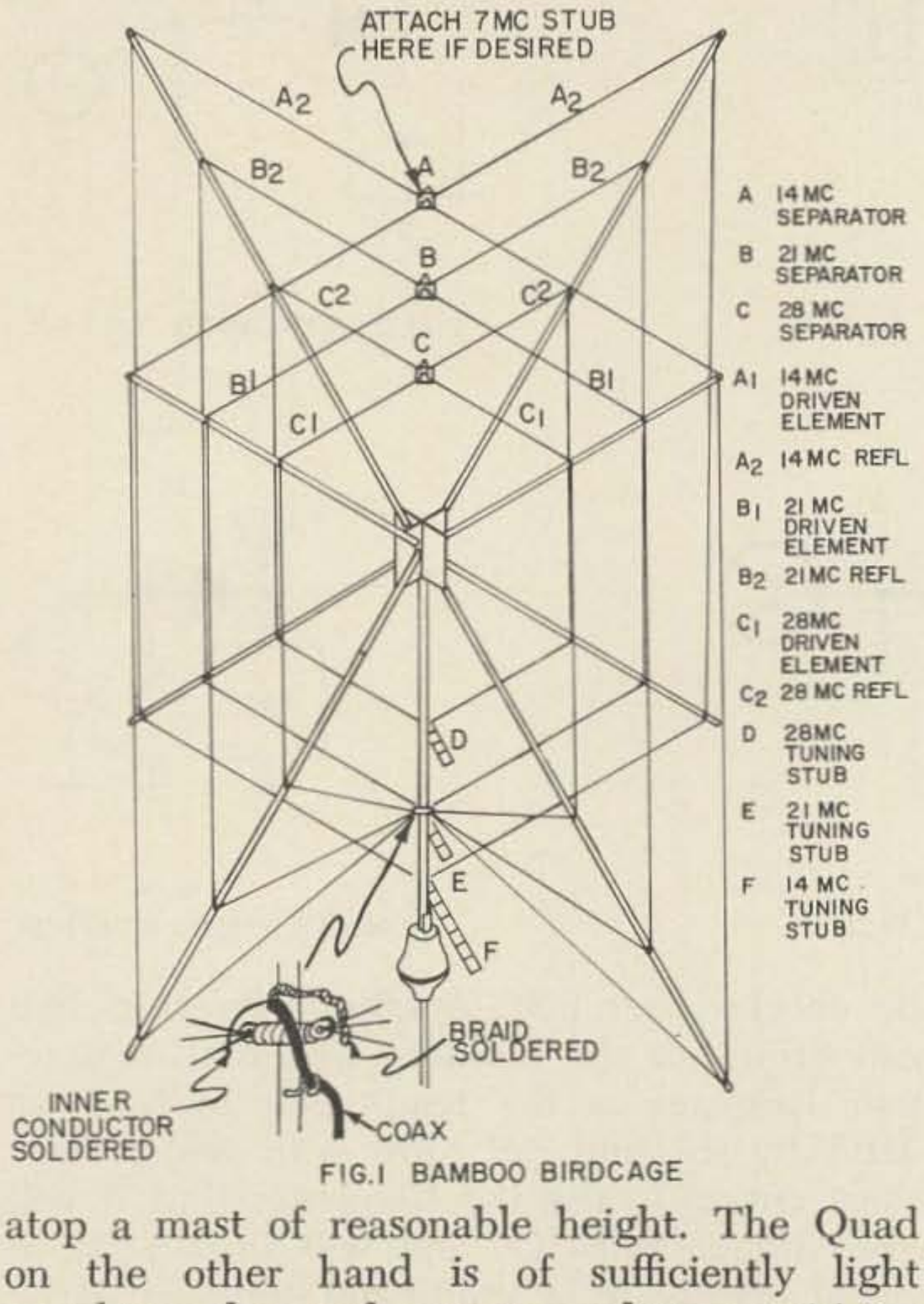

FIG. 1 BAMBOO BIRDCAGE

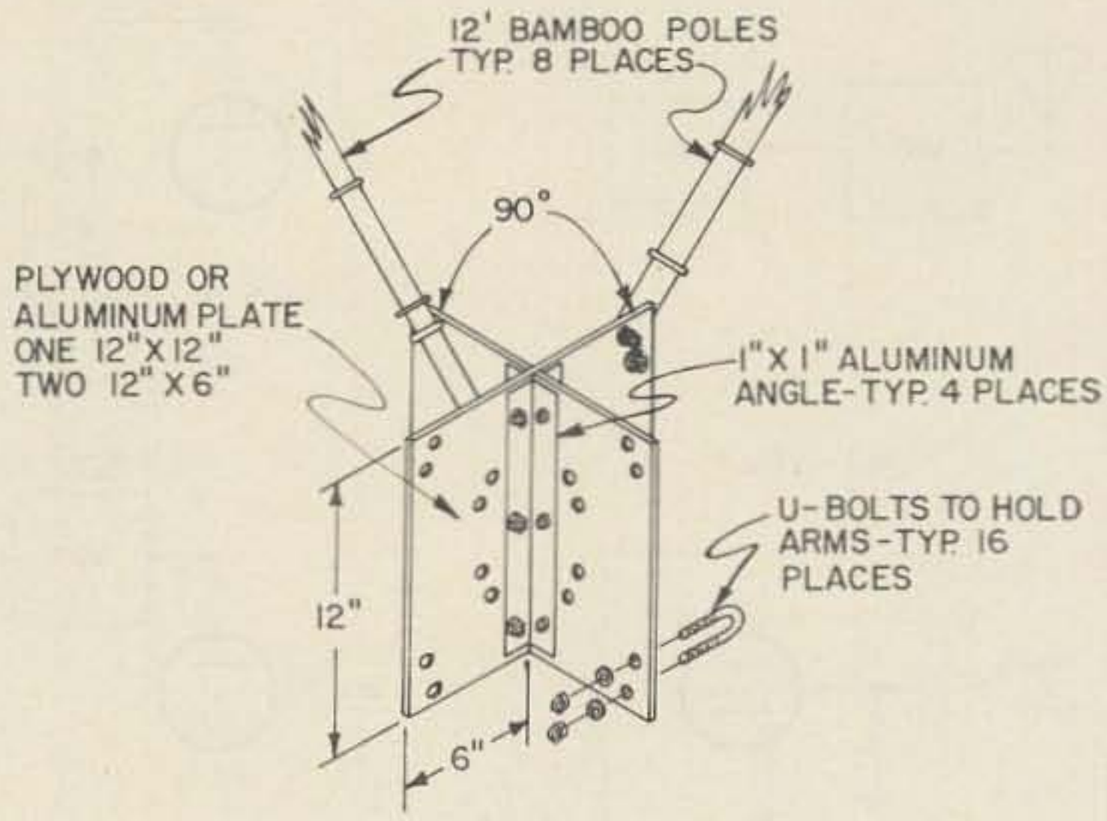

FIG. 2 SPIDER CONSTRUCTION DETAIL

The basic "spider" is detailed in Fig. 2. This may be constructed from either sheet aluminum or plywood, depending upon which is more readily available. The eight arms are then mounted at a 45° angle from the horizontal and the "spider" mounted to a ten foot length of 1¼ inch TV mast by means of "U-bolts". A separator plate, as shown in Fig. 3, should then be made up for each band. This can be cut from Micarta, Lucite, or even wood if it is well varnished.

BAND MC.	ELEMENT LENGTH	TWISTED LOOP	TUNING STUB LENGTH*
14	36'	9'	48"
21	23'	6'	36"
28	18'	4' 6"	24"

* Two #14 wires spaced 3 inches apart. (not shorted)

The elements are cut from #14 wire, to the lengths given in Table 1. Cut four elements for each band (two for the driven element and two for the reflector) and solder a lug to both ends of each element. Twist a single loop about ¼ inch in diameter and solder well, at the distance given in Table 1 from each end of the elements. Also make up two jumpers and a reflector tuning stub for each band. The jumpers are used as shown in Fig. 3, while the tuning stubs are attached as shown in Fig. 1.

Connect the element ends for each band to the separator plates and install the jumpers.

Using two of the 28 mc elements, center the separator plate over the top of the mast section, so that the twisted loops are the same distance from the ends of the bamboo arms. Using several turns of #14 wire, secure the loops to the bamboo arm and solder well. Now secure the other two elements the same way.

Attach the 21 and 14 mc elements in the same manner, making sure that the jumpers for all three bands are in the same plane. If 7 mc operation is also desired, do not use a jumper on the 14 mc driven element. Instead, connect a 28′ length of 300 ohm twin lead between the driven elements at the separator plate. Short the other end of the stub and tape for insulation.

Connect the ends of the drive elements to a length of 50 ohm coaxial line as shown in Fig. 1, and attach the tuning stubs to their respective reflector elements. The antenna is now ready to be mounted on the rotator and tuned.

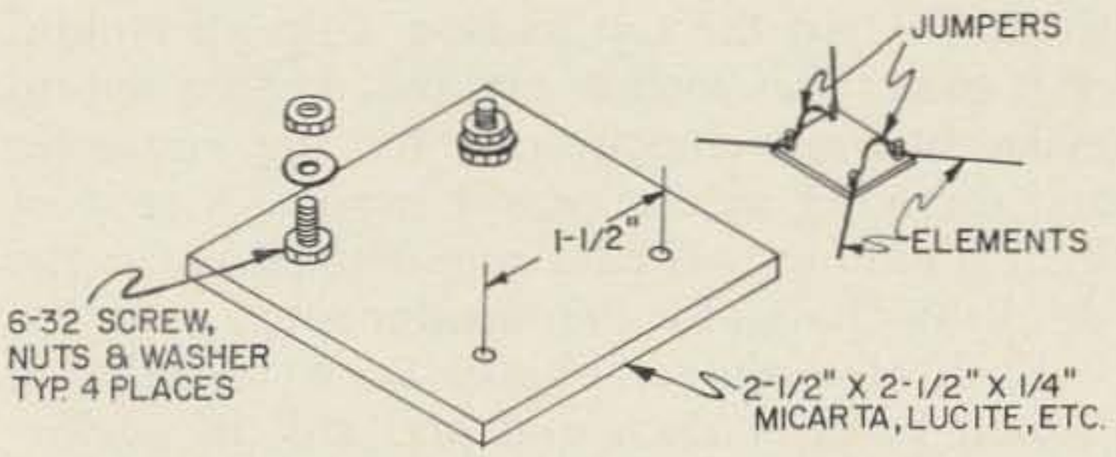

FIG. 3 SEPARATOR PLATE DETAIL

Tuning can be accomplished using a station a mile or so away as the signal source, and adjusting the shorting jumpers on the stubs until best foreward gain is obtained on each band. Then rotate the antenna 180° and repeat the process to obtain the best front-to-back ratio. Usually these two adjustments will coincide; however, the forward gain is fairly broad, while the front-to-back adjustment is somewhat more critical.

The coaxial line can be passed thru an eye-bolt to bring the center of the elements in at the mast, while the tuning stubs can be folded back up the mast if desired. The 7 mc stub can be dropped inside the mast, or taped to the outside, whichever is more convenient.

The completed antenna should provide about 7 db of forward gain, which is approximately 2 db better than the average two element Quad, while the front-to-back ratio should be at least 25 db. The turning radius for the "Bamboo Birdcage" is also slightly less than the Quad, while the whole assembly weighs less than 20 pounds.

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