THE HALF-WAVE DDRR ANTENNA

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The half-wave "directional discontinuity ring radiator" presents a number of advantages—both electrical and as far as construction is concerned—over the conventional quarter-wave ring antenna. The design is particularly suitable for v.h.f. operation. Constructional and adjustment details are presented in this article.

THE DDRR ring antenna or hula-hoop antenna—however you prefer to call it—has proved to be a very controversial antenna development. In its original quarter-wave form (fig. 1), it was developed to replace large quarter-wave vertical radiators on medium frequencies. Adapted to use on the high-frequency and v.h.f. bands, it can be made to perform well but proper adjustment of the antenna becomes very critical as the frequency of operation is increased and the useful bandwidth becomes very narrow. The situation is somewhat similar to a very thin wire dipole being used on v.h.f.—very small changes in physical dimensions produces very pronounced changes in operation.

Also, the physical configuration of the antenna makes it somewhat unhandy to construct and support when it is made from tubing. The ungrounded end has to be supported by some insulating material. Both the electrical and physical shortcoming of the DDRR antenna on v.h.f. are overcome nicely by a newly developed commercial design.

Basic Half-Wave DDRR

The basic half-wave DDRR can be simply visualized, as shown in fig. 2· as two conventional quarter-wave DDRR's connected back-to-back. Only one of the sections of the antenna is connected to the transmission line and a small capacitor at the mid-point of the ring—the equivalent of the capacitor at the open end of the conventional DDRR—may be necessary to tune out stray reactance for exact resonance. Since both ends of the ring are at ground potential, they may simply be combined and grounded together. Thus, a single grounded support point is all that is necessary for the antenna structure. This single support point may be connected by a metal rod to the ground plane surface or if an independent ground plane is desired, a similar ring may be connected the proper distance below the first ring—both being directly grounded to the support mast, as shown in fig. 3. The directivity pattern of the antenna is the same as that of the conven-

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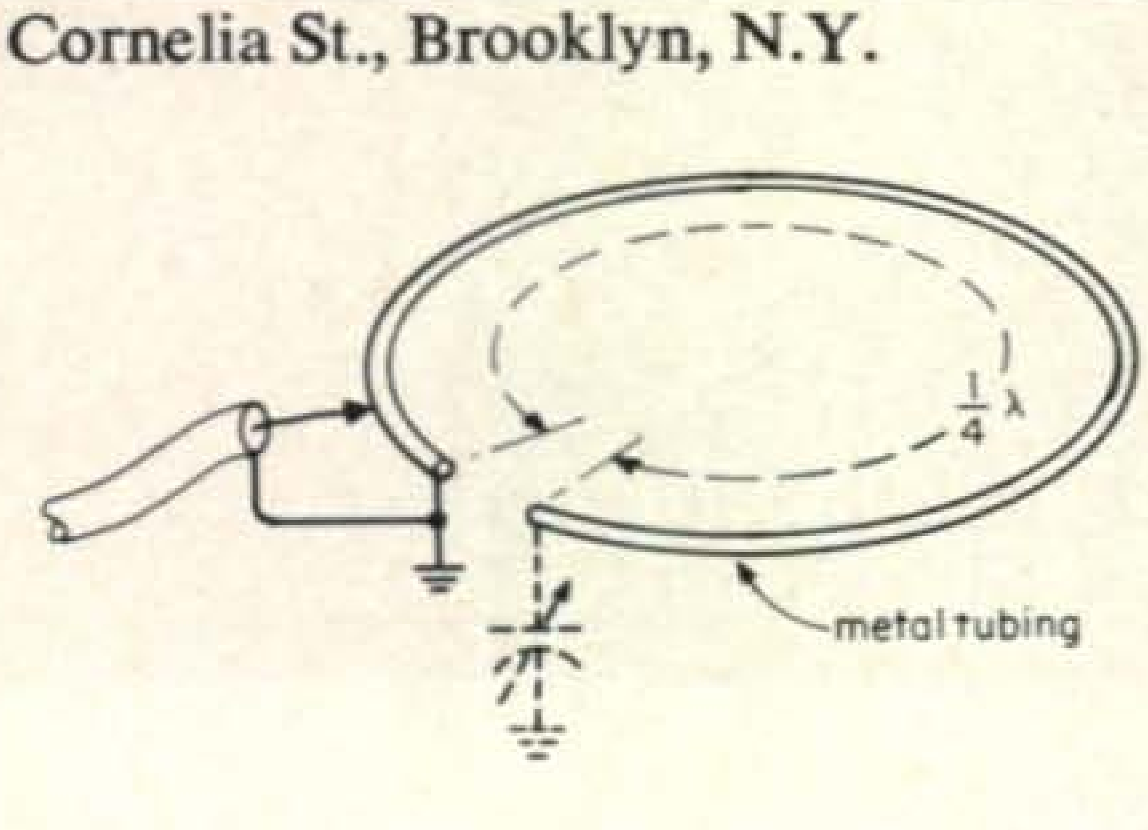

Fig. 1—Conventional quarter-wave ring antenna.

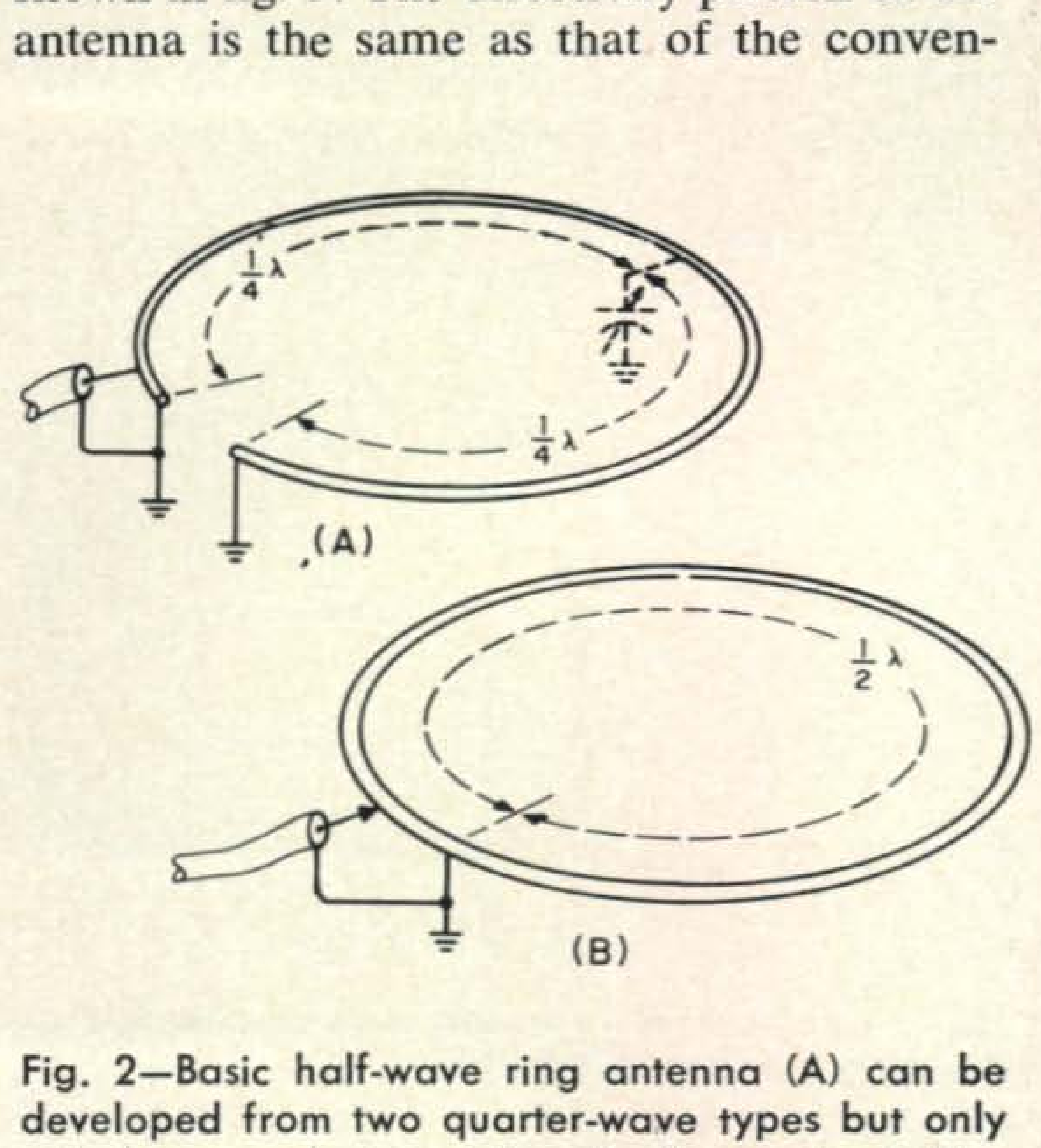

Fig. 2—Basic half-wave ring antenna (A) can be developed from two quarter-wave types but only single ground-support is actually required (B).

tional DDRR—that is, omnidirectional in the horizontal plane. A very minor gain of 1-2 db over a conventional quarter-wave DDRR is also present but this is just an added bonus and not a design objective for the antenna. Another slight bonus of the design is that its completely grounded structure provides a direct path to ground for the buildup of precipitation static charges. With proper adjustment, a half-wave DDRR will exhibit a low s.w.r. over the complete range of almost any v.h.f. band.

A 2 Meter Version

Figure 4 shows a half-wave DDRR dimensioned for operation on the 2-meter band. Because of the effect of the tubing diameter, the total circumference is not exactly a half-wavelength but somewhat reduced, the same as for a conventional dipole used on v.h.f. which is made from tubing. The tubing itself can be thin wall type of either aluminum or copper as long as the outside diameter is correct. With care and using a form, the tubing can be bent into shape. During the process, packing the tubing with fine sand will insure that it doesn't develop any unusual kinks. The ends of the tubing can either be soldered together or joined mechanically. Usually, it is better as far as mechanical stability is concerned to place this "joined" point in the ring at the side opposite the midpoint of the ring which is supported from the ground plane or mounting mast. A solid 1/2" diameter rod should be used for the vertical support to hold the ring above the ground plane. The height of the ring above the ground plane (or similar ring used as a ground plane) is important and cannot be arbitrarily chosen.

Adjustment of the antenna for proper operation with a coaxial feedline of 50 to 72 ohm impedance is fairly simple. With the antenna mounted in place, the tap point of the inner conductor of the coaxial feedline is varied to produce the lowest s.w.r. For the 2-meter model, this distance should be about 1/2" to 3/4" from the ground point. If the lowest s.w.r. which can be achieved is around 1.5:1 or less across the band of frequencies desired, no further adjustments are necessary and the antenna is ready to operate. Otherwise, if the lowest s.w.r. which can be achieved is not acceptable, either one of two adjustments can be made. A small disc plate type capacitor can be connected to the midpoint of the ring opposite the ground point. A disc of about 2" diameter is usually satisfactory. For each setting of the disc capacitor, the feedline tap point is varied to produce the lowest s.w.r. After this is done, the disc setting is changed to reduce the s.w.r. This process is carried back and forth until the lowest possible s.w.r. close to 1:1 is obtained.

Another method that can be used is to tilt the plane of the loop either away from or closer to the ground plane. The effect produced is somewhat similar to the use of the disc capacitor and the adjustments are carried out in the same manner. The only restriction is that the ring plane should not be set much more than 10 to 15 degrees above or below its horizontal axis or else the radiation pattern will be affected.

The half-wave DDRR antenna is a very much improved version of the conventional

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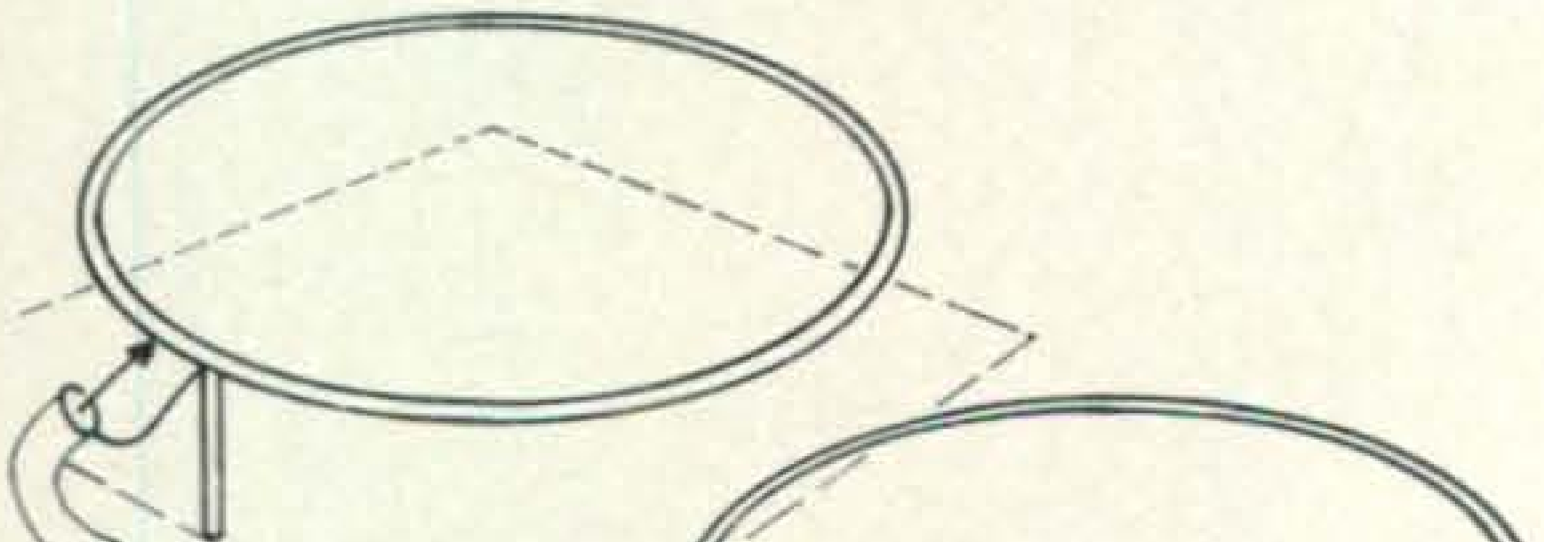

Fig. 3—Single half-wave ring may be mounted at the proper height above a metal ground plane (A) or two rings used (B), one to simulate ground plane.

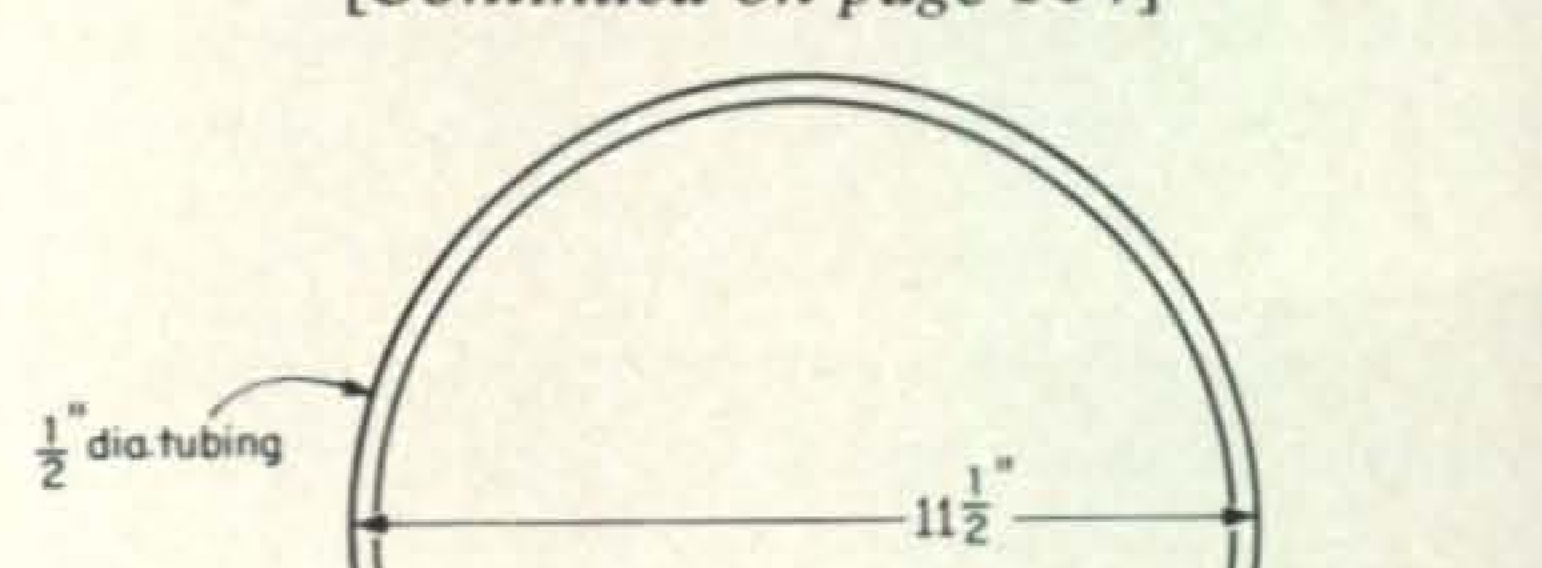

Fig. 4—Top and side view of half-wave ring antenna dimensioned for 2 meters.

strongest reaching the East Coast from west of the Mississippi. In short, this old stand-by "8JK" has performed very well and made what once seemed a dead-end city lot a very rewarding experience. If you're in my predicament, this antenna could well be the answer to your problems. Give it a try. It costs little and requires little effort! ■

Half-Wave DDRR [*from page 22*]

DDRR antenna for v.h.f. use. Its dimensions for 6-meters probably make it somewhat impractical for most applications. However, for two meters on down it is particularly easy to construct for either fixed or mobile station use. The dimensions for bands other than two meters can be frequency scaled, as a first approximation, from the dimensions given for the 2-meter model. A model should be constructed for test purposes to determine the final dimensions. ■

75 M. WAS Antenna [*from page 28*]

The cost of the whole system including all the wire necessary to make both folded dipoles, is nominal. Refinements may be added, and these will certainly elevate the cost, but the basic antennas, lead-ins, and switches with a balun, should not cost in excess of $15-$20.

Nor is this system a particularly space consuming proposition. All of us know that a 75 meter antenna of any useful kind is not ideally suited to apartment dwelling—neither is this antenna. But if two such wires are put up at 70° angles to each other, (see fig. 2), the whole affair will go on a 100 × 65 foot lot, which is hardly in the estate category.

Result-wise, we completed our WAS in just over the month we had set as our goal. One or two of the "less difficult" states proved more of a problem than we had expected. We seldom had more than an hour of operating time per day, which didn't always come at the optimum propagation period, and this proved troublesome too. Depending upon whether you want to check into nets to get new states, on whether you want to make schedules on other bands for 75 meter contacts etc., you may expect to do better or worse than this. In any case, having two antennas oriented so that they cover all quadrants with major radiation lobes, will greatly help. Good luck. ■