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Try the Potted J

— a 2m antenna impervious to the elements

Structural integrity and simple construction.

Some antenna is better than no antenna at all. In many circumstances where adverse weather conditions are encountered, a primary consideration should be to have an antenna that will function dependably even though it might not provide the last dB of gain. This article describes such an antenna designed primarily for 2 meter repeater usage. The antenna has only a modest amount of gain over a simple ground-plane antenna. But, it has far better structural integrity. The materials used to construct the antenna might vary a bit depending on what is available locally, but the design permits construction by anyone using only simple hand tools.

The antenna form is a commonly used variation of the old-fashioned J antenna shown in Fig. 1(a). The variation, as shown in Fig. 1(b), simply uses a closed metal cylinder for the lower ¼λ section instead of the open-style construction of the original J antenna. This type of construction has a number of advantages, such as easy mounting on any type of mast, relatively inconspicuous appearance, and an all-metal, dc grounded structure. Since the antenna's central element and the metal cylinder are electrically shorted at the base of the antenna, that point will be a low impedance point. At the other end of the ¼λ cylinder, there will be a high impedance point. The latter is the only point where consideration has to be given to proper insulation between the metal elements of the antenna.

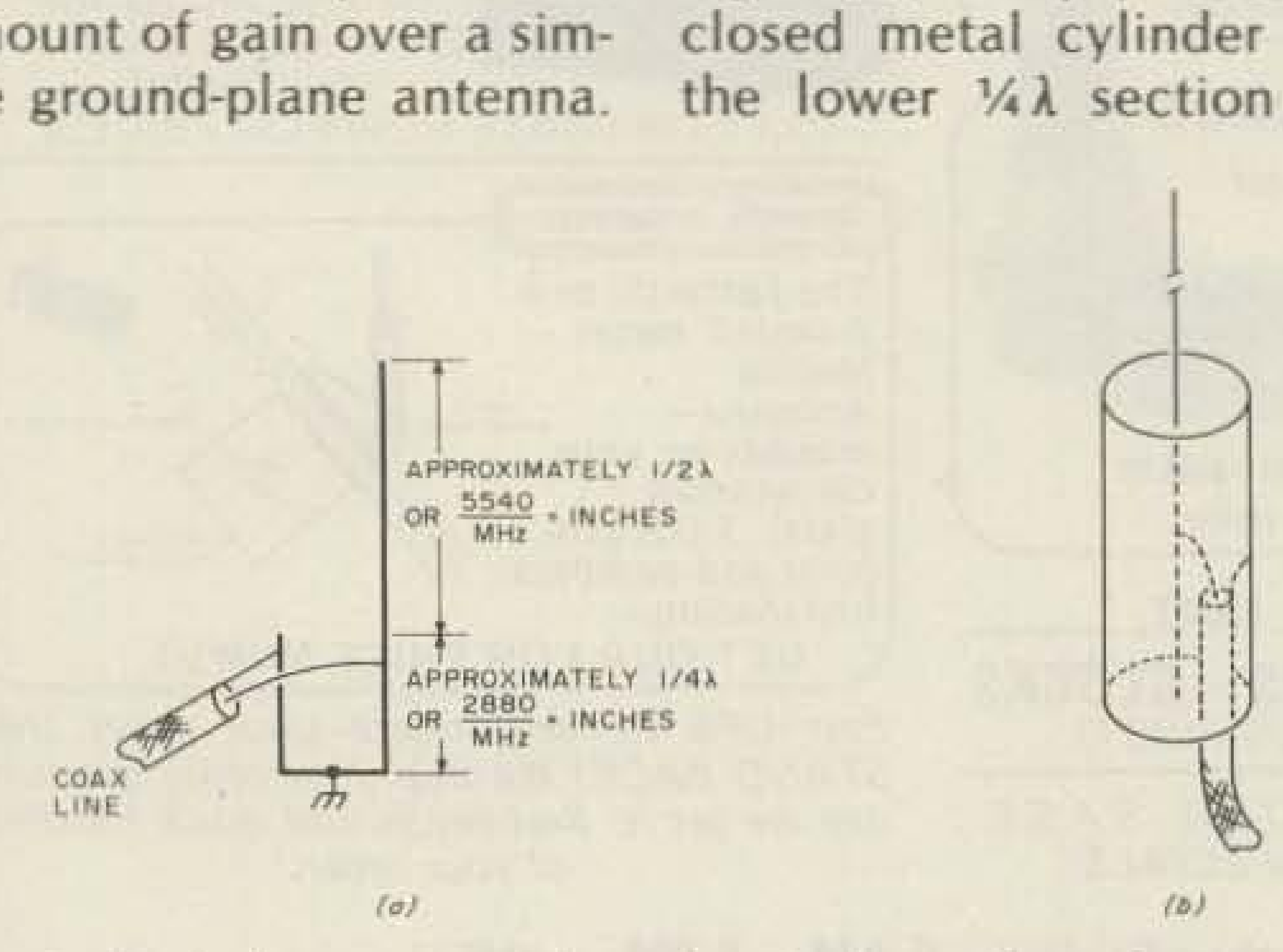

Fig. 1. Basic J antenna (a) and variation where lower ¼λ section is in the form of a cylinder (b).

The mechanical dimensions of the antenna are given in Fig. 2(a). Depending on the materials available locally, the *diameters* of the cylinder and the radiating element can vary a bit from those shown. But, the *lengths* should be closely maintained and dimensioned using the formulas shown in Fig. 1(a) for the particular segment of the 2 meter band of interest. The mechanical construction can vary a bit from that shown as long as the dimensions are maintained, the central element is securely grounded to the bottom of the ¼λ cylinder, and the coaxial feedline is connected properly.

In the method of construction shown, the end of the central element is flattened out at the bottom and bent and bolted to the bottom side of the ¼λ cylinder. Additionally, a small piece of the same material as the central element is flattened out and used as a brace to the other bottom side of the cylinder. The coaxial cable shield is connected via a ground lug to the inside of the cylinder and the inner conductor is either soldered or connected to the central element at the point indicated via a ground lug. The connection to the central element can be made before that element is inserted in the cylinder. The connection of the cable shield must be made after insertion. This requires a bit of dexterity working in the narrow cylinder, but with good lighting and patience it can be done. One handy way to help things along is to temporarily glue the nut for the bolt holding the ground lug on a thin piece of wood. Once the nut is started on the bolt, the wood piece can be broken away.

Before the final assembly step, check the electrical performance of the antenna for swr. It should check out with a very low swr if proper dimensions have been maintained. If one wants to optimize the swr, the feedpoint on the central element can be varied slightly up or down. Usually this can be done without having to change the connection point for the ground shield of the coaxial feedline. This does mean going through the procedure of having to take out and reinsert the central element, but it is not at all that tedious after one does it once or twice. During this test, the central element can be held centered in the upper end of the cylinder by a PVC reducer fitting as shown in Fig. 2(b). These reducer fittings can be found wherever PVC piping fittings are available and one can be found which will fit exactly over a pipe having a 1¼" outside diameter.

The final and most important step in assembly is to fill the cylinder in completely with an insulating compound. This will give the antenna its final mechanical rigidity and, more importantly, completely exclude moisture leakage or condensation in the cylinder. Many potting or sealing compounds can be used as long as they contain no form of metal filler. The plastic resin body fillers sold in automotive stores, with or without fiberglass reinforcement, are readily available. However, to make the filler flow readily in the cylinder, the filler should be heated so that it is fairly liquid. Don't use an open flame to make the filler liquid, but rather insert the container (a tin can will do) containing the filler into a bath of very hot water. Temporarily plug the top end of the PVC fitting where the central element protrudes and, with the cylinder initially held at an angle, pour in the filler from the coaxial cable end.

The use of a coaxial connector on the antenna was deliberately avoided. Simple coaxial connectors, when used in a harsh outdoor environment, will almost always eventually become the source of a problem. This is the same reason why screw-in elements, etc., are avoided. Of course, this all means that the antenna becomes a throw-away unit in case something should really damage it. But, the cost of materials involved to build another antenna is relatively low. As long as it does last, one can use the antenna with the confidence that none of the electrical or mechanical connections inside the antenna are likely to become corroded.

The ¼λ cylinder need not be insulated from a metal mast as long as it is fastened to the mast at the *bottom* of the cylinder with the usual metal U-type mast clamps.

One can add parasitic or phased elements around the basic antenna if it is desired to obtain some directivity. Parasitic elements, of course, require no cable connection to the main element, but then one has to go through a careful process of seeing that the feedpoint of the main element is altered to compensate for the presence of the parasitic element. In spite of the increased cable cost, etc., if one really wants to keep the weather-ruggedness for a directive antenna installation paramount, it would be better to have two spaced antennas of the type described with separate feedlines. Then, the necessary phasing, matching, and switching can be done from the protected environment inside the shack. ■

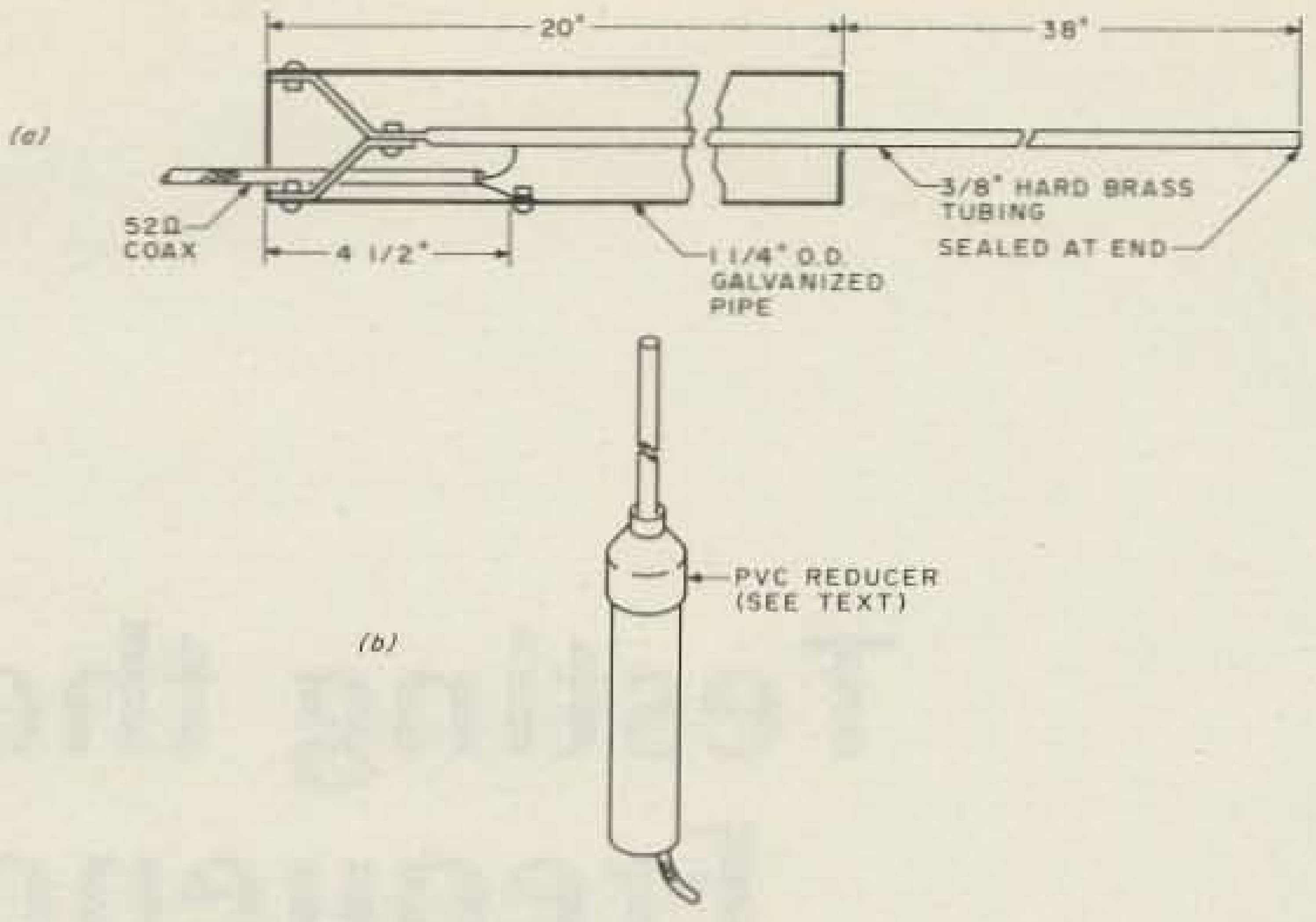

Fig. 2. (a) A cross-sectional view of the antenna giving dimensions centered in the 2 meter band. (b) A PVC pipe reducer used to insulate and center the vertical radiator at the top of the ¼λ cylinder.