A Rugged 28-Mc. Coaxial-Antenna Design

Mechanical Features of a Vertical Antenna

BY STEVE A. HORVATH,* W8PVZ

• Building a 10-meter vertical antenna that will stay put in all kinds of weather involves more attention to mechanical than electrical details. The antenna described by W8PVZ in this article shows careful attention to the mechanical details, and it should be just the thing for good general-coverage operation.

Locally, there is quite a bit of 10-meter fixed and mobile activity and, since skip conditions aren't always the best, many of the QSOs are of a local nature. Mobile coverage with a fixed station using a beam or long wire is difficult at times, which brings us to the subject of types of antennas. Since we're concerned mostly with ground-wave coverage, the vertical antenna is about the best for all-around operation. Ground planes and vertical coaxials are very common, and they are economical to buy or build. Having seen a few types of coaxial vertical antennas, we decided to incorporate the good points we noted along with a few of our own. And we might add that there certainly will be many who will have a few good points to add to the antenna we now describe!

* 203 17th St., N.W., Barberton, Ohio.

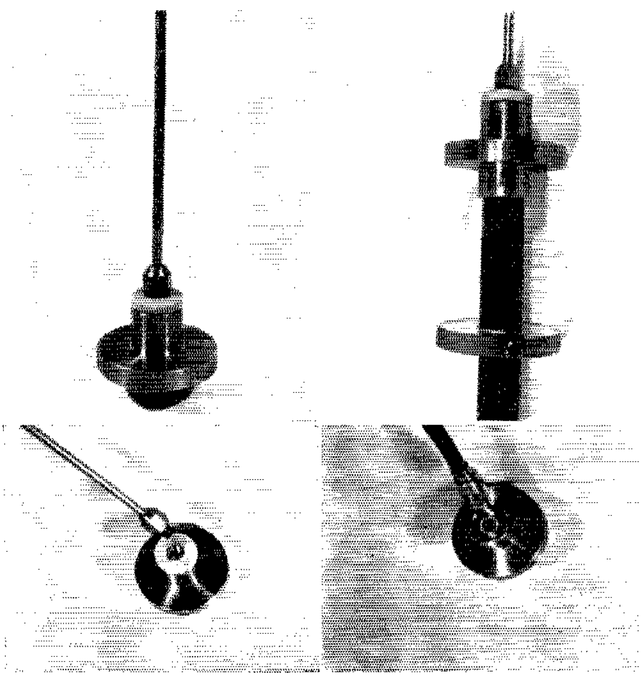
In the vertical coaxial type of antenna the point where the whip, skirts and feed line are combined is probably the most important part of the antenna. This is the point that was given prime attention. It's hard to give an exact name for this point, but we'll call it the "skirt support." Careful study was given as to what kind of metal to use and what shape would be the best. Steel, aluminum and brass are a few of the metals that could be used. We decided that brass was best because it will weather very well and it is very easy to handle in a lathe. Drilling and tapping also turned out to be a simple matter. The skirt support was made of one solid piece that added to the electrical length of the upper half of the antenna.

It is very important that the pieces described be made accurately, so that when they are assembled their centers are exact or close to it.

Construction

The mechanical details of the antenna design are shown in Fig. 1. The whip used for the top half can be purchased at almost any ham parts dealer selling mobile ham gear or, if other types are needed, assorted lengths of aluminum tubing can be ordered through your local hardware dealer. The center bushing that actually holds the whip in the support was made of brass because of its good conducting qualities and the elimination of corrosion and rust problems.

The insulator that is inserted into the support could be made of almost any good insulating plastic such as polystyrene or



Views of the coaxial-antenna skirt support and components in different phases of assembly. Reference to Fig. 1 will identify the parts.

♦

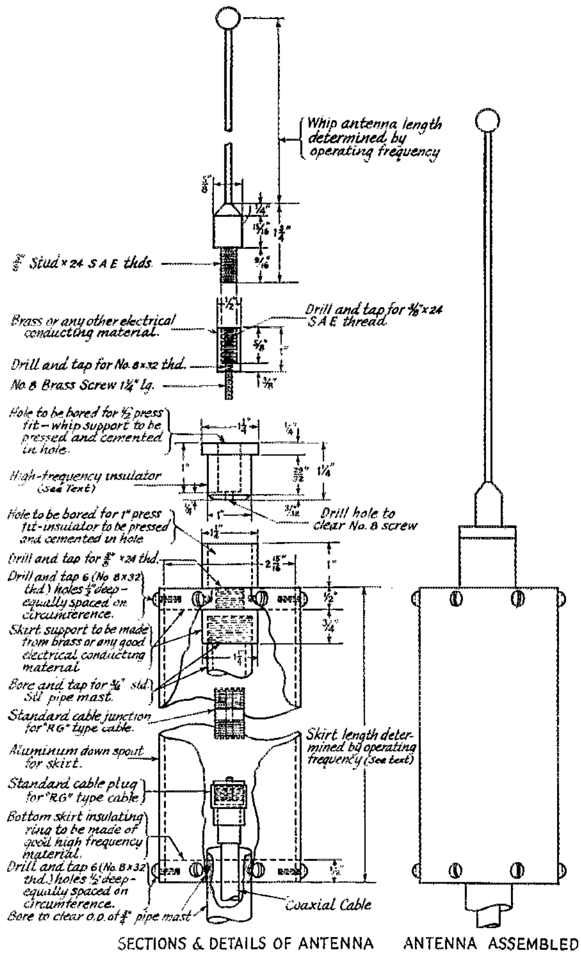


Fig. 1 — Mechanical details of the coaxial antenna.

♦

lucite. Probably the easiest material to obtain is the plastic handle of a screw driver. When the insulator is inserted into the support, a plastic cement or solvent should be used to make sure the insulator is secure in the support and to prevent the possibility of moisture getting into the base of the insulator. In our case, the brass used for the antenna was obtained from the local scrap-metal dealer at a very reasonable price.

After the parts have been machined, the coaxial junction is tightened into the skirt support. A No. 8 brass screw was used to connect the bushing, and the whip is screwed into the coaxial junction. The threads to hold the junction in place can be made on a lathe, or a special tap can be used. It may be possible to borrow the latter from a neighborhood machine shop or a friend in the machinist trade. The thread which the mast is screwed into can be pipe thread or, better yet, a uniform thread with no taper as is used on conduit. Whatever type of pipe is used for the mast, care must be taken to make sure there are no burrs or sharp edges near the thread end that is screwed into the support, because the coaxial connector that the feed line is connected to comes very near the inner wall of the mast.

The insulation at the bottom of the skirt is also made of good plastic. The thickness can vary according to the material available. We found that half-inch sheet plastic was quite suitable. Care should be taken that the screws fastening the skirt to the insulator are as short as possible, to assure clearance between the ends of the screws and the mast.

Depending on the height, the mast should be made of suitable material to support the antenna under a variety of weather conditions. The skirt used for 10-meter operation is Sears-Roebuck aluminum rainspout, which has a 3-inch outside diameter and is sold in 10-foot lengths for about two dollars.

The dimensions of the whip and skirt are obtained from the following formulas, to the nearest sixteenth of an inch.

Length of the top section or whip:

Frequency in Mc. divided into 235.6.

Length of the bottom section or skirt:

Frequency in Mc. divided into 243.3.

Examples of a few lengths for whip and skirt for 10-meter operation are as follows:

Freq., Mc.	*Skirt Length*	*Whip Length*
28.5	8′ 6 7⁄16″	8′ 3¾16″
29.0	8′ 4 11⁄16″	8′ 17⁄16″
29.6	8′ 2 ⅝″	7′ 11⅛″

This antenna was in operation on the 10-meter band, fed by a length of RG-11/U coaxial cable 35 feet long. The standing-wave ratio was less than 1.5 to 1.

Up until now no tests were made on the other bands; however, we believe the design would be applicable. Like any vertical antenna, height will add much to the effectiveness on ground wave. The antenna also does a surprisingly good job with skip conditions.