A Fortified 2m Whip

—won't bend in the breeze

Donald A. Habeck W9AMM
5973 Sugarbush Lane
Greendale WI 53129

Are you in need of a good 2 meter mobile antenna? How about an antenna for your base station? Or, do you just plain have the feeling that your station has become too commercialized and that a portion of your setup should be home-brewed? Then, why not try this antenna project? In actual checks, it was found to compare favorably with the commercially-made antennas tested. Whether you decide to use the antenna for mobile or base station operation, you'll be pleasantly surprised with its performance. The antenna is easy to construct and tune, and, best of all, it's inexpensive.

Photo A. The coil protective cover has been removed in this picture to show details of the base coil.

Design

One unique feature of this antenna is the construction of the whip. It consists of a 1/4"-diameter fiberglass rod with a shield of copper braid. This design was selected because it provided rigidity to minimize deflection during high winds or mobile operation. Research has shown that deflection of the flimsy-type whip causes degradation of the vertically polarized signal. In some instances, the efficiency of a 5/8-wave antenna actually becomes less effective than a 1/4-wave antenna.

The fiberglass rod is from the pennant-topped-type whip that is made for mounting on bicycles. Many retail stores have given away these whips as promotional items. They also are readily available from department stores and bicycle shops for approximately $1.25.

The impedance matching coil is 3 turns of no. 14 tinned copper wire wound on a wood thread spool from your XYL's sewing basket. It is tapped 1-1/8 turns from the ground end. A small ceramic trimmer capacitor across the coil provides a precise match in conjunction with the base coil tap. The impedance matching circuit is protected from the weather by enclosing it in an empty plastic container. Fish food had come in the container we used.

Construction and Assembly

Since no tricky construction or special tools are needed, no problems should be encountered. The fiberglass rod is prepared by drilling the 1/16"-diameter hole from the bottom as indicated in the diagram. Another 1/16"-diameter hole is drilled on the side of the rod at point A. This should be drilled at a slight angle towards the bottom to make the routing of the coil tap wire easier. The depth of this hole is only to the extent of meeting with the hole previously drilled from the bottom. When drilling these holes in the fiberglass rod, it is important to use a sharp drill and not allow the drill to heat up. It is best to cut the whip to proper length after the coil form is secured in place.

Prepare the coil form and other parts as indicated. Check that the hole in the spool is of the proper

diameter to permit the spool to slide on the rod. The notches filed into the coil form prevent the coil from slipping. The hole for the coil tap is displaced 1/8 of a turn from the alignment of the bottom notch.

After the coil form is prepared, feed the 20-AWG tap wire through the tap-wire hole and out the bottom of the spool. Slide the form over the fiberglass rod and carefully route the tap wire through the drilled hole at point A and downward through the rod, out the bottom. Allow sufficient length for the tap wire to be soldered later in the PL-259 connector. Apply epoxy glue to the appropriate rod area, slide the coil form into its proper position on the rod, and take up any slack in the top wire. The final position of the coil form should be such that the tap-wire holes in the spool and the rod line up with each other and the rod extends sufficiently below the bottom of the spool to accept the UG-176 adapter. To hold the tap wire securely in position, apply a small amount of epoxy to the tap-wire opening in the spool and at the bottom of the whip.

Two holes must be drilled in the cover of the coil protector. A 1/4" hole in the center will permit it to be slipped over the bottom of the whip. With the cover in position on the whip, use the notch of the coil form for determining the position of the second hole. This is a 1/8" hole and should be drilled in the correct position to allow the ground end of the coil wire to pass through the cover and be soldered to the PL-259 connector. After both holes are drilled in the cover, epoxy the cover (threads towards the coil form) to the bottom of the wood spool. Position the feedthrough hole in the cover so that the tap occurs at 1-1/8 of a turn when the coil is added.

With epoxy applied to the bottom of the fiberglass rod, slide the UG-176 reducer onto the rod and up against the container cover. Check that none of the other parts has slipped from its proper position. At this point of construction, it is best to allow the epoxy to harden before proceeding.

After the epoxy hardens, the UG-176 reducer can be screwed into the PL-259 and the tap wire soldered in the center pin. Measure 42½ inches from the top of the coil form and cut the whip to length.

The next step is to slide the copper braid shield over the fiberglass rod. Tinned braid is recommended. However, if this is not readily available, the shield from RG-8/U coax cable will work fine. If the braided shield is too snug to readily slip over the rod, the diameter of the shield can be enlarged by squashing the braid together a little bit at a time. If the diameter of the shield has to be enlarged to any extent, be sure to allow for the shrinkage in length that will occur. The braided shield is slipped over the full length of the rod down to the coil form. The shield can be snugged to the rod by running your hand tightly along the braid.

One end of the coil is secured by routing a 24" piece of 14-AWG wire through the hole in the cover and soldering it to the side of the PL-259 connector. With the one end secured, the 3-turn coil can then be easily wound on the form and soldered to the whip shield. Solder the tap wire 1-1/8 turns from the coil bottom (ground) and the trimmer capacitor across the entire coil. Cut off the braid shield so that it extends 3/8" above the top of the rod; twist and

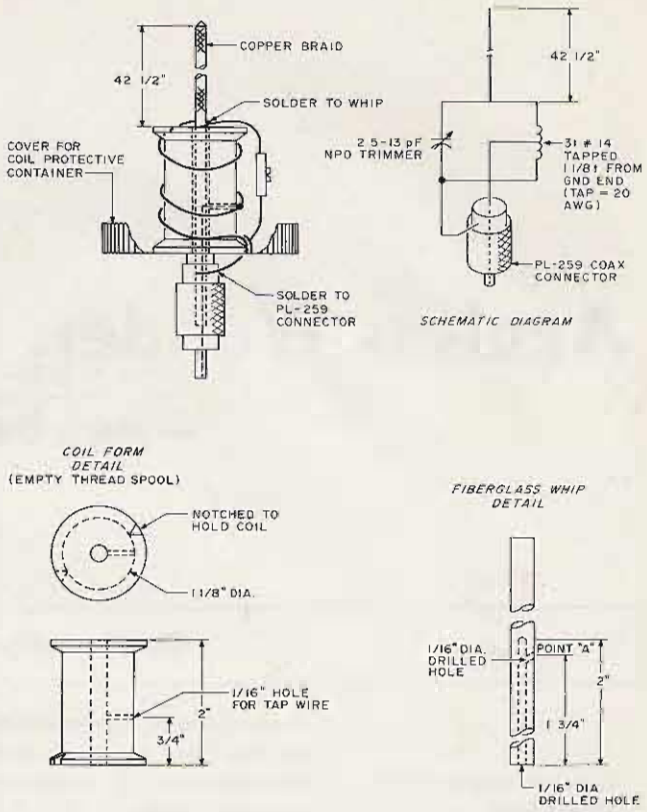

Fig. 1. A rigid 2 meter antenna for base or mobile operation.

solder. To protect the whip from the weather, shrink tubing, plastic electrical tape, or a protective spray can be used.

Mounting

For base station operation, I used a simple L-shaped aluminum bracket with an SO-239 connector, RG-58 coax, and four 19¼" ground radials. This arrangement is secured with U-bolts to the mast above a triband beam. For mobile operation, the bracket design is dependent on the type of car and individual desires. For my mobile operation, I mounted a simple bracket and connector arrangement directly to the luggage rack.

Tuning

The easiest method to tune the antenna is with a field-strength meter at a distance of approximately 2 to 3 feet. With the antenna connected and the transmitter keyed on an unused simplex channel, adjust the trimmer capacitor with a non-metallic screwdriver for a peak field-strength indication. The vswr will be minimum at this point. Numerous antennas have been built, and, on all occasions, vswrs of less than 1.2 to 1 were obtained. The antenna, of course, should be situated away from all objects and as high off the ground as practical during tuning procedures.

With a 5/16"-diameter hole drilled in the bottom of the plastic container to accommodate the whip, slide the container over the whip and screw it into its cover. If the container affects the tuning of the antenna, drill a hole in its side and retune the antenna with the container in position. With RTV, seal the top opening of the container, but not the bottom. The hole in the cover will help prevent any moisture from accumulating.

Do you want to generate conversation? Just mention on your local repeater the fact that you're using a home-brew antenna. ■