No. 42: A Hilltopper Portable Dipole

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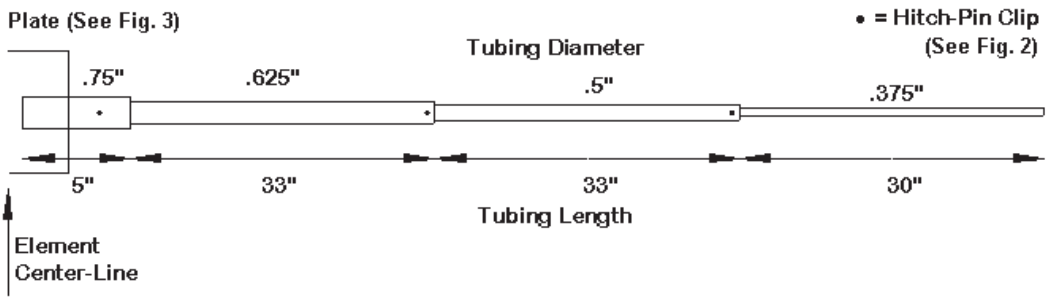
A rotatable dipole is a very useful antenna for portable or hilltop operations. Unlike a vertical that should have a ground plane, the dipole is horizontal and needs none. Of course, we do have to think about a support mast. It may consist of 3-4 5' sections of TV mast or even a painter's pole--each with at least 3 guy ropes and tent stakes to stabilize the system.

But what about the antenna? We can make a dipole from wire, tubing, end-to-end whips, and a bunch of other materials. The featured system for this episode is made from tubing. We can easily obtain 3 6' lengths of aluminum tubing from sources like Texas Towers at very reasonable prices. We shall need 6' of 5/8" diameter, 6' of 1/2" diameter, and 6' of 3/8" diameter tubing. T6063-832 is the most usual tubing to use because each size nests well inside the next larger size.

A good portable antenna should require an absolute minimum number of tools for assembly in the field. How about 1 wrench to tighten the center plate to the mast. We shall need no other tools to assemble and disassemble our antenna.



General Tubing Layout for Each Half of Element

Fig. 1

Fig. 1 shows the basic tubing layout on each side of the center plate. We cut the 6' tubes in half. Then we carefully smooth the cuts so that the 3' sections will slide easily inside each other. The two larger tubes need a 33" exposure, with 3" inside the next tube. The smallest tube needs only a 30" exposure, and you can either cut off 3" or have 6" of tubing inside the next size. With 5" on the center plate (discussed a bit further on), we shall have 101" each side of center or 202" overall--a good size for the lower MHz of 10 meters.

When not in use, slide the tubes for each side of the dipole inside each other. You will end up with an easily stored 3' long set of element pieces. As well, you will always have the correct sections in place, just in case the holes for comparable pieces on each side are not perfectly aligned for complete interchangeability.

Our fastener will be the hitch-pin clip--also known as the hairpin cotter pin and some other names. For clarity, **Fig. 2** shows the shape of the clip.

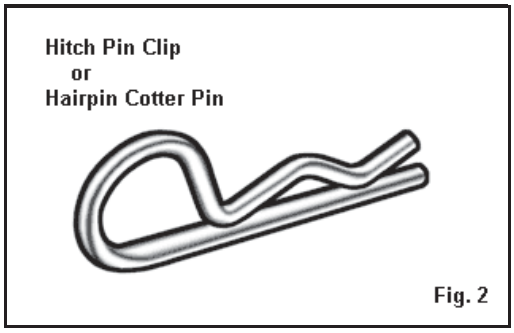


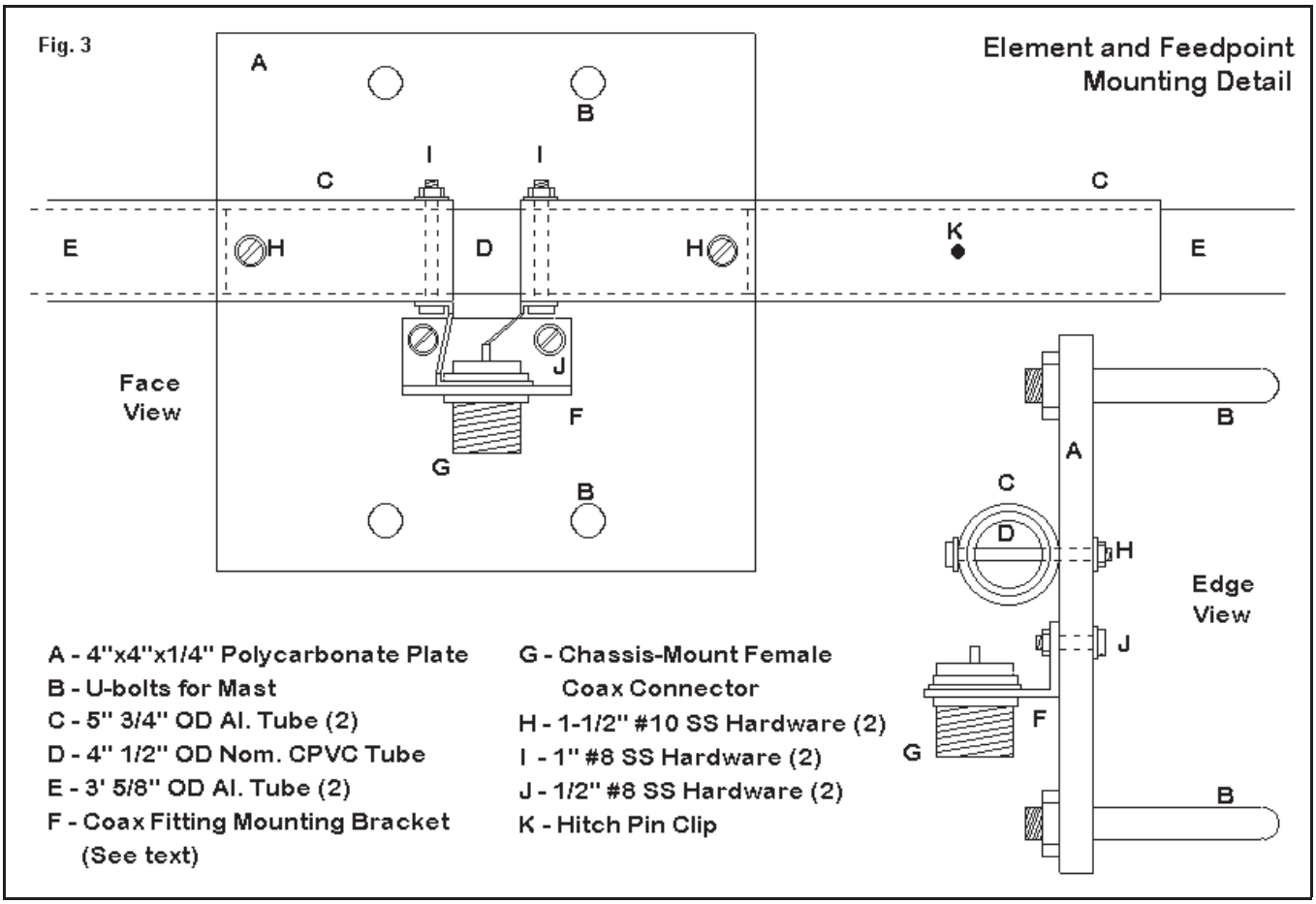
Fig. 2

We drill holes through each pair of tubes at the center of the tubing junctions all the way through. Clean the drilled holes. The hole size depends on the clip material diameter. Choose clips designed to fasten tubes of the diameters that you are using. When we assemble the antenna in the field, we simply align the holes and press a hitch-pin clip through them. The sections are secure.

The electrical contact from one tube to the next depends on the tubes themselves. Hence, it makes sense to be sure that the tubing ends are clean inside and out before each field use. Do Not use the hitch-pin clip system for a permanent home antenna, since the tubes may accumulate dirt that may interrupt electrical contact. But for short term field use, this system work very well indeed.

To avoid losing clips in the grass or gravel of the field site, you can tie a bright ribbon to each one. For storage, you can clip all of the clips to a designated master clip.

Now all that we need is a center section so that we can assembly the elements and connect a length of coaxial cable. **Fig. 3** shows the system that I am using.



I had some polycarbonate (tradename: Lexan) plate 1/4" thick in the shop. However, you can use plywood or acrylic for the center plate. A 4" by 4" square will do the job. At the top and bottom of the plate, drill holes for U-bolts that are sized to the mast diameter that you will use.

Note that the elements cross the plate just above the centerline in order to leave room for a coax connector. I used a short section of 1" by 1" L-stock, 1/16" thick for my connector. The connector is the version that mounts in a chassis hole. It is useful to cut the 5/8" connector hole and screw holes before cutting the stock to its final inch and a quarter length, and a bench vise helps hold things in place during this work. The plate is a bit wide than it needs to be for the connector so that the screw holes will miss the mast behind the plate. In fact, I placed the heads of the screws on the mast side of the plate so that the nuts would not interfere with the mast.

Note that a short lead runs from the connector center pin and the ground lug to each side of the element. The element center pieces consist of scraps of 3/4" tubing lying around in the shop--cut-offs from old projects. In each 5" piece of 3/4" aluminum tubing, we need two sets of through holes. One set holds the tube to the place near the plate edge. The other

set--at right angles to the first set--is at the inner end of each tube. The hardware holds solder lugs for the connector leads.

We need one more piece of material for our assembly. 1/2" nominal CPVC just fits inside of 3/4" aluminum tubing. a 4" piece runs through the inner ends of each of the plate tubes. The CPVC keeps the tubes perfectly aligned and maintains the gap between them. A gap of about 1/2" between the ends of the 3/4" tubes works well, but 3/8" to 1" gaps are fine.

Since we used about 2" of each 5" tube on the plate with the CPVC inside, we have 3" of tubing extending off each side of the plate. This is the necessary 3" overlap for the 5/8" section of element tubing. Of course, we use hitch-pin clips to secure the element section to the center plate tubes. When complete, we should never have to touch the nuts and bolts on the center plate in the field. (Check their tightness before taking the antenna to the field.) We simple hitch-pin the entire dipole together for use, connect a coax cable, and operate. Of course, fastening the plate to a mast and raising the mast will help our signals immensely.

My YL (Jean, N4TZP) stitched up an old but sturdy bath towel into a carry bag with a draw-string. So the dipole pieces are protected from dirt and bumps, but are always ready for use. In the bag, I have a dedicated wrench sized to the U-bolts ready for action. The 4" by 10" center plate assembly and the 2 3' long element assemblies make a compact package to carry. I have a bright ribbon on the center of the wrench, matching the ribbons on the hitch-pin clips. Incidentally, I store the mass of hitch-pin clips in one of the holes on the 3/4" center plate tubes. My goal is always to make everything ready to use and difficult to lose.

A little over 10 years ago, just before I started this series of antenna columns, I wrote an article for *10-10 News* about a rotatable portable dipole using some materials adapted from the ground plane radials of an old CB antenna. I think that I like the present field antenna a little bit better. It stores in a smaller space and the materials are easily obtained. As well, the total cost is in the cheap range. While the shop work requires some care, the field work is as simple as I know how to make it.

The antenna is also adaptable for use on upper floor apartment balconies. In fact, if your balcony is at least 20' above ground, you can use a horizontal mast and hand turn the antenna from horizontal to vertical polarization. It works well either way. The antenna is also usable in emergency situations, whether the emergency is a matter of community communications when other circuits are down or simply a matter of the main station beam failing just as the band opens.