Build A:

CB and VHF Discone

Looks A Bit Strange, But It Covers 27 To 275 MHz Without Retuning!

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What with the newer scanners arriving on the scene all set to cover enormous chunks of frequency spectrum, my rooftop had started to look a bit like the control tower at a major airport. With a CB antenna, one for the 30 to 50 MHz "low band," another for the 150 to 174 MHz "high band," plus a few special-purpose antennas, things were getting crowded.

The concept of combining virtually all of my requirements into one single ultimate wideband antenna eventually crossed my mind. No matter how many chunks of metal and wire you shove into the air above your house, I suppose you never really stop searching for something that approaches being that impossible, ultimate type of skyhook, especially when you know that each band and radio service calls for a different shape and size.

On the other hand, the discone antenna—originated almost 50 years ago and rediscovered recently—comes awfully close to being the answer to my search. It offers a near-perfect match to 52-ohm coax cable, an operating range of 10-to-1 in frequency, and freedom from any critical tuning adjustments. It has low wind resistance and, despite what you might think from looking at it, the discone is vertically polarized. Another plus is that it offers greater groundwave coverage than many other vertically-polarized antennas. This comes about because its most effective portion is located right at the top of the pole; other types of vertical antennas have their most effective portions part-way down the mast which usually results in a closer "communications horizon."

Okay, this isn't an amazing revelation. Discones are available commercially, such as the one offered by Encomm, Inc. (2000 Avenue G, Suite 800, Plano, TX 75074), so nothing I've said thusfar should come at you like a bolt from the blue. On the other hand, perhaps you'd like to try scratch-building one of these devices, and that's where I come in.

Building A Discone

Before starting construction, it's best to know just what a discone antenna is and what it is supposed to do. Basically, the dis-

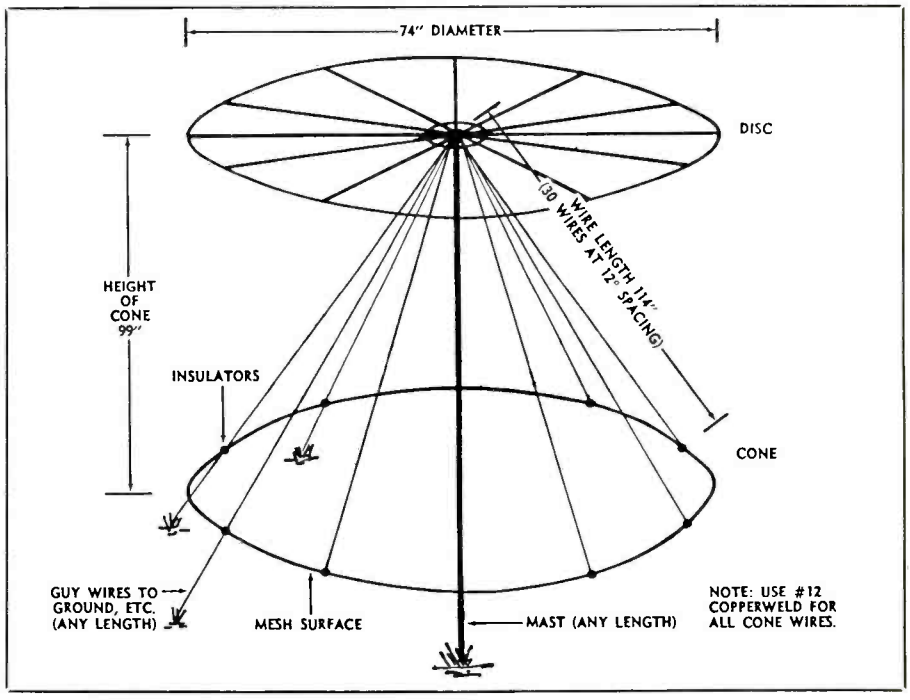

Figure1: Discone, overall view.

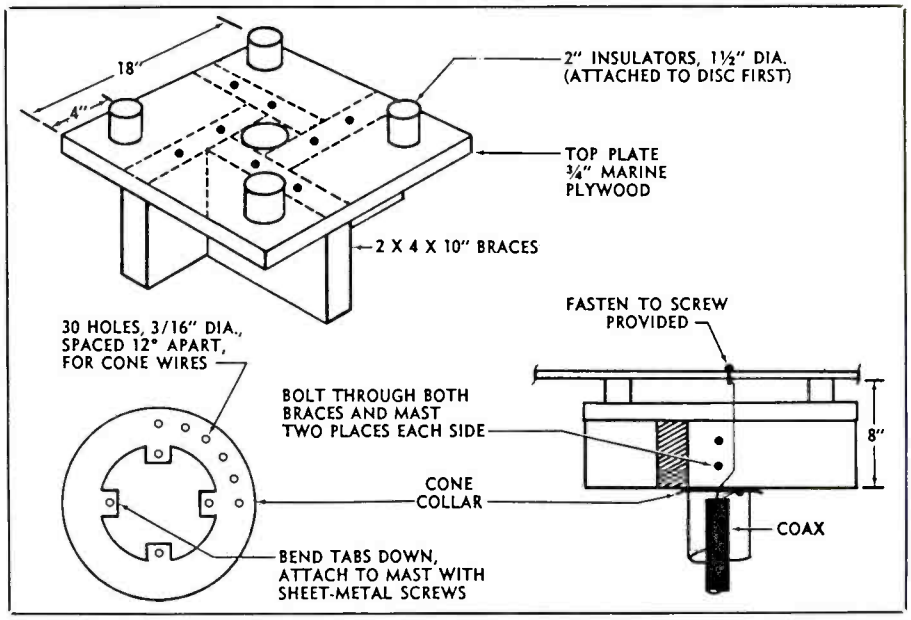

Figure 2: Insulator details.

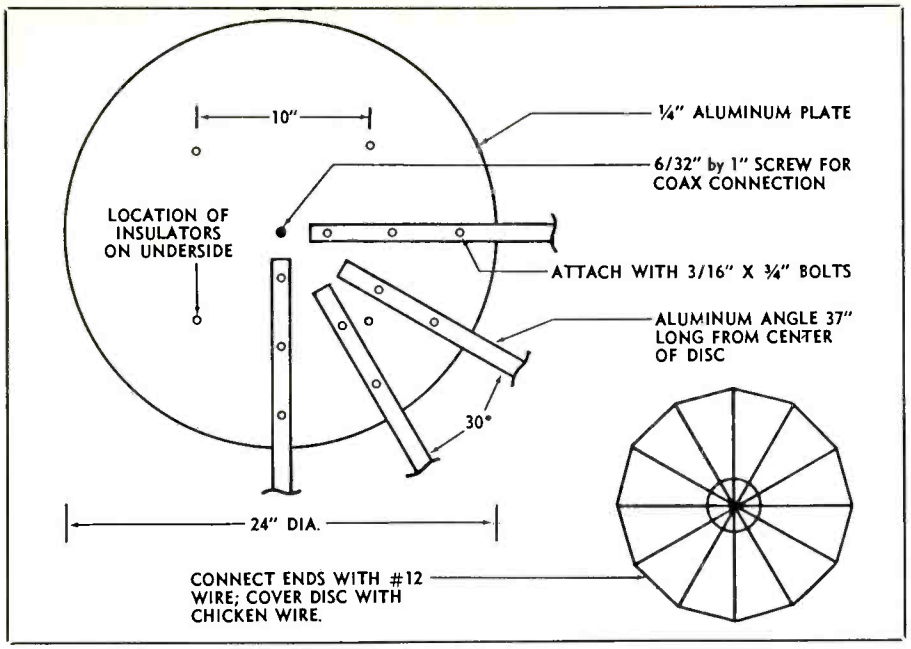

Figure 3: Details of disc assembly.

cone consists of an inverted (with the point towards the sky) metallic cone with a large disc (also metallic) balanced on the point. The disc is really fastened firmly, and insulated instead of balanced—but at any distance it looks like a balancing act (see Figure 1).

The coax feed line comes up inside the cone. The shield of the coax connects to the cone, and the center conductor connects to the disc. Thus, the cone becomes a continuation of the shield, while the disc becomes a reflector connected to the center wire.

In practice, outgoing RF energy hits the disc and is reflected out the open side of the affair. If the "slant angle" of the cone sides is correct, though, the outgoing signal can't tell what's happening to it and the SWR will be down to 1.0.

The important things electrically, then, are to keep the slant angle of the cone sides proper and to keep the top disc level. Good insulation between disc and cone at the center is also essential.

Mechanically, an 11-meter discone is quite an impressive array and could offer much, much wind resistance. If you built one out of solid sheet metal, the first breeze would tend to whip it away like a sail. However, a fine-mesh screen looks to RF like a solid sheet of metal if —and *only* if—the spacing between conductors in the screen is small compared to the wavelength of the RF. This is the key to our construction.

For instance, a screen spacing of 0.01 wavelength is plenty close enough to look solid to RF. Yet at 11 meters this becomes a spacing of 0.11 meter or 4½ inches (approximately) so that you could use very coarse fencing mesh for lowest wind resistance.

Best results were obtained with a type of fencing usually called "chicken wire" screening. This has a hexagonal screen pattern about an inch wide between conductors. You can use it for the surface of both the cone and the disc, cutting wind resistance to an absolute minimum.

However, the chicken wire is too flexible to stand up by itself. You must put a framework behind it for support. Wooden framing is okay, but aluminum angle stock is just as easy to work with and lasts longer.

The only really tricky part about the whole antenna is construction of the insulator that goes between the disc and the cone. It's shown in detail in Figure 2; follow the drawing closely and you won't go wrong.

Actual construction procedure is as follows: First, put up your mast. It can be any length greater than 10 feet. Next, fasten the insulator-and-guy-ring structure to the top of the mast. Now, connect the coax to the insulator-and-guy-ring assembly. Put together the disc assembly on the ground and get it into position on the insulator aloft (this may require some help). As a safety measure, DO NOT erect this anywhere near the powerlines as it could cause a severe hazard if it should topple over into those lines. Attach the guy-wires to the assembly and secure them at anchor points selected so as to give the proper slant angle. Finally, cover the guy-wire structure with chicken wire, soldering the joints, and you're ready.

The disc assembly referred to above is shown in detail in Figure 3. It should be completely assembled on the ground and lifted to the top of the pole before securing to the insulators—otherwise, the affair will be too top-heavy.

When you're finished, hook the other end of the 52-ohm coax to your communications gear and fire up. If you intend to use this for several different bands and purposes, *do not* have any scanners or other receivers connected and operating from the discone while you are transmitting. PC