Your local hardware store or home supply outlet may have an amateur radio department without your even knowing it. Some commonly found items can easily be transformed into a new antenna.

How To Build A Super Slinky Stealth Antenna

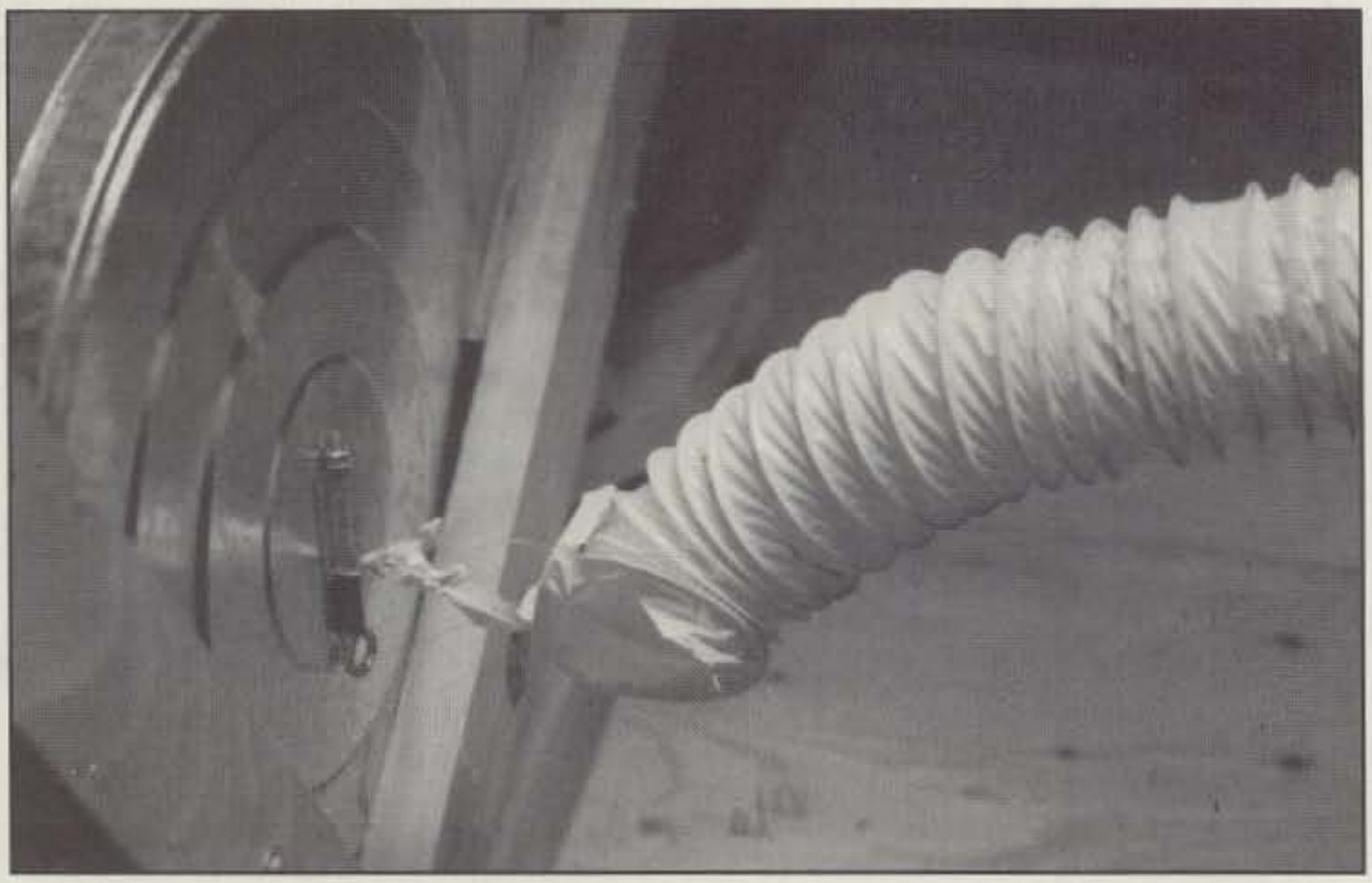
BY BERNIE COLER*, KC7CP, AND FRANK KING, AA7XA

In the world of high-tech antennas, my super slinky can be classified as strictly super low-tech. It's simple, and it works. You can buy the materials for this antenna just about anywhere, from discount outlets to your neighborhood hardware store. The primary low-tech elements are lengths of flexible clothes-dryer vent coils and trash-can lids.

Nearly 18 years ago when we bought our lot on the beautiful Oregon coast, we thought it would be our retirement paradise. I dreamed of super amateur radio time and lots of antennas. Our choice Oregon coast land had just what we needed. It was 500 feet from the Pacific Ocean atop a 100 foot cliff with no power lines or other utility cables in sight, and it was over a half mile from the state highway. We bought the lot, waited for retirement, and dreamed our dreams.

When construction started in 1993, the big blow hit. Ours was a private residential community with strict CC&R antenna prohibitions. No wonder there were no utility cables showing! We hadn't read the fine print. No amount of pleading and vividly describing the value of amateur radio could budge the management. They did allow a small chimney-mounted stinger for 2 meters, but what about an antenna for the high-frequency bands? There had to be a way.

How about disguised antennas such as a vertical inside a flagpole? The management had thought about that one, too. Flagpoles could not be over 8 feet long and had to be attached, at an angle, to the side of the house. Fine wire of 26 gauge or less hung on trees? We have plenty of



A close-up view of the dryer vent coil attached to the garbage can lid. The lid makes a great capacitance hat. Monofilament fishing line anchors the antenna to a firm support.

those over 50 feet high, but the fine wire wouldn't withstand frequent gale-force winds. We are on a headland with over 180 degree ocean horizon. I tried the fine-wire thing and it broke after one week.

How about driving my roof gutters? Sorry. They're vinyl. Frustrated, I decided it was time to hit the books: the *ARRL Handbook;* the antenna handbooks; and loads of other material, including stuff on mobile units and literature from AEA, MFJ, and all the usual sources.

The antenna had to fit through my small attic hatch into a space 4 feet high and 31.5 feet long. Meanwhile, I was doing everything I could to make my new QTH near perfect with a good RF ground. My system is a three leg star of 8 foot long ground rods with one in the center. All are connected and soldered at the top to 3/4 inch copper tubing. One leg of the star is right at the house foundation, so that with a suitable hole in the basement wall, a 5 foot long piece of braided copper terminates at a flat copper plate on which sits my new ICOM IC-737 with an automatic antenna tuner. Our builder installed a 2 inch OD PVC pipe running from the basement to the attic.

I had done everything I'd read or been told to do to ensure success—except for the antenna. By then I was leaning to-

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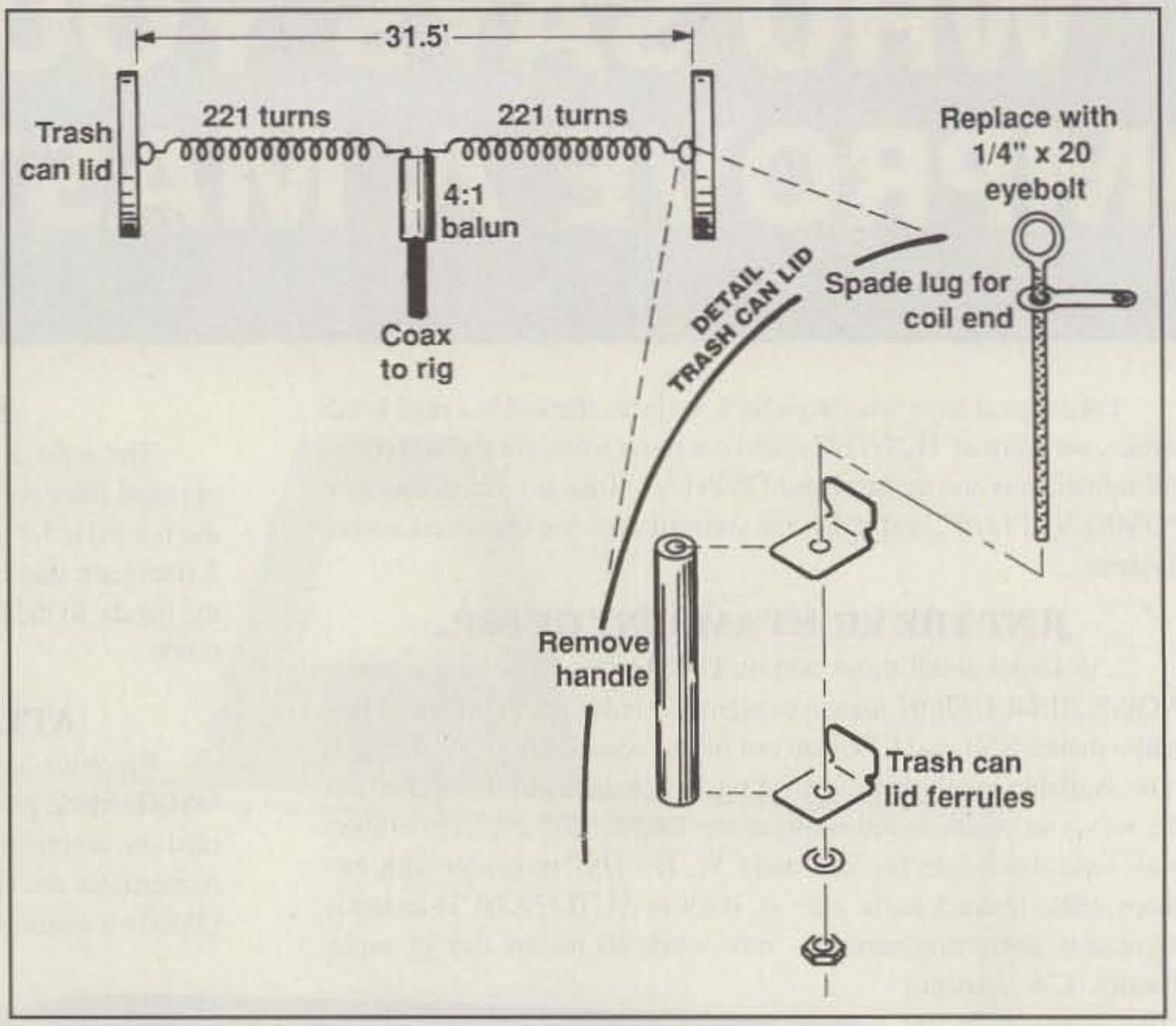

Fig. 1– The basic diagram for the Super Slinky Stealth Antenna.

wards some form of linear loading. I got a copy of Antennas West's "Slinky Helical Antennas for Portable and Small Space Use." It wasn't very encouraging. It was a bad day on the Oregon Coast.

I was in a foul mood when I charged into our local hardware store to buy something I needed. There it was. Lightning flashed, thunder rolled, trumpets blared, and bells rang. I knew this was what I was after.

At the rear of the store, in housewares, one of the salesmen was cutting a piece of dryer vent, a coiled metal spring covered in thin white vinyl and used to vent a clothes dryer. In a shaking voice I asked the salesman if he had a full box of the coil. He did. I dashed out to the car for my volt-ohmmeter, a magnet, and a tape measure. My readings showed:

• End-to-end coil resistance 3.8 ohms—a continuous coil.

• Coil material—magnetic, some form of spring steel; corrosion resistance is poor, but vinyl coating helps.

• Coil diameter—4 inches, wire length, 453 turns by painful hand count, × PI = 474 feet.

What a slinky! The slinky article referred to performance limitations of the much shorter 2 inch diameter child's toy, including problems with connecting several together end to end. The authors hadn't looked at dryer venting. I almost kissed the salesman.

As I was putting the coil back in the box, I spotted a display of large, galvanized-metal trash cans and lids. Yes, this was my day!

Don't we know the need for capacitance hats at the ends of a dipole both for bandwidth enhancement and to reduce problems of high end-of-antenna RF flash over? The trash-can lids were round and had rolled edges and a ferrule in the middle for the handle. The 24 inch diameter lid would fit through my attic hatch. I bought two lids, and with the vent coil I raced home.

From one corner of my garage to my workshop I had a clear 38 foot long run. I could set up the antenna before going up into the cramped attic. Cutting the coil exactly in the middle, I spliced in an Antennas West 4:1 current forcing balun, attached a length of coax to my MFJ Model 204B Antenna Bridge, and began to measure. Removing only five turns from each coil and adjusting the coil to as uniform spacing as I could, I was able to achieve readings in each amateur band from 80 to 10 meters. Everything, including the WARC bands, was between 18 and 143 ohms. And my ICOM Auto-Tuner could handle a 3:1 mismatch.

I then prayed that it would work as well in that cramped hell hole of an attic. I crept and tip-toed around that attic, being oh so careful to step only on the ceiling joists. My XYL would not have appreciated feet crashing through our brand-new ceilings.

The antenna works. How well? Not as well as a beam, long wire, or other well-known variety, but a 31.5 foot by 4 foot attic has its limits. The antenna is very good on receive. I have to turn off all my fluorescent lamps in order to hear well. However, if you can't hear 'em you can't work 'em.

Construction Hints

Lesson one was learned at the hardware store when I took out the coil to count turns. It was like a kid's toy, only ten times worse. Just like a snake, the coil comes alive when free. To control the thing you need about 5 feet of heavy stick. I used a broom shoved through the middle of the entire coil before cutting in the middle. Save the broom for lesson number two.

Lesson two deals with supporting the helix. I used 50 pound test monofilament fishing line. This is fine stuff, provided you use special care. The entire coil weighs only 4.25 pounds, but if you try to remove the sag from the line while it does its job of supporting the helix, you will break the line. That happened three times before I got smart and supported the coil with the broom stick. Then, using my fisherman's scale I applied a 40 pound pull on the fishing line. That gave less than one foot of sag—good enough. Also be careful to use fisherman-type knots, which will jam properly but not cut the line. I used the improved blood knot, a drawing of which can be found in any fishing bible. Finally, to avoid breaking the line (which would necessitate another trip to the attic) I carefully rounded off and cushioned any area around which I wrapped the line for support. I also avoided sharp corners to keep the line from breaking.

Lesson three can be ignored by those who have a bigger attic with a fully planked floor. Get in good physical shape. I recommend lots of duck-walking. See your local, friendly football coach.

Construction details are shown in fig. 1. The diagram shows how the antenna is installed in my attic.

Additional Slinky Information

Although I made antenna bridge measurements, I am not providing the details because this is a very flexible form of antenna. You can stretch it longer, alter coil spacing for possible special performance in a particular band of interest, and so on. Happily, when the antenna was mounted in my attic, my measurements were not changed significantly by the loading of adjacent house-wiring, shingle nails (lots of those nearby), and other assorted builder's hardware. Who knows? Maybe that's why the Super Slinky works as it does.

I used the impedance calculations from the *ARRL Handbook* for the helix coil inductance, giving a lumped value for the entire coil of nearly 227 microHenrys, and for the trash can lids a capacitance of nearly 0.2 picoFarad. Then from the same handbook the self-resonance of the combination is at a frequency of 31 MHz. My QTH is so hilly, rocky, and full of trees that there is no way to make a measurement of my antenna pattern. I do know from our house plan that the peak of the roof is 26.5 feet above grade, so the probable average antenna height is 24 feet. Coax cable length from my transceiver up through the installed PVC pipe is 30 feet of double-shielded RG/8U.

If you have any questions, send an SASE to me at P.O. Box 508, Gleneden Beach, Oregon 97388, and you will get a speedy response, unless, of course, the fish are biting.

How much did I spend for this nearly all-band kludge? At our Ace Hardware emporium I paid $19.95 for the dryer venting and $3.75 each for the trash-can lids. The fishing line came out of my tackle box, and the coax cable came from the junk box. The balun is a 4:1 current forcing unit from Antennas West, also the source of the Slinky article. For the blood, sweat, and tears shed in the attic, there's no charge. I'm enjoying the antenna, which, the same as the house, is oriented from northeast to southwest.

When it's late at night, only a few lights show from houses here and there. Our little settlement is very quiet. Those are the nights when you will find me working my rig. So far I have worked most of the eastern seaboard states (including Maine and Florida), Texas, and the Midwest. I have gotten as far north as Alaska, but I haven't worked Hawaii yet. However, my contacts on the slinky include New Zealand, Japan, Portugal, and Sweden. All were worked barefoot with less than 100 watts.

If the managers of our development only knew. You can't foil hams. ■