This same loop antenna may be used on the twenty- and fifteen-meter bands, although its pattern will be somewhat different than on its fundamental frequency. Also, a slight mismatch will occur, but this can be overcome by a simple matching network. When the loop is mounted in a vertical plane, it tends to favor low-angle signals. If a high-angle system is desired, say for 80 meters, the full-wave loop can be mounted in a horizontal plane, thirty or more feet above ground. This arrangement will direct most of the energy virtually straight up, providing optimum sky-wave coverage on a short-haul basis.

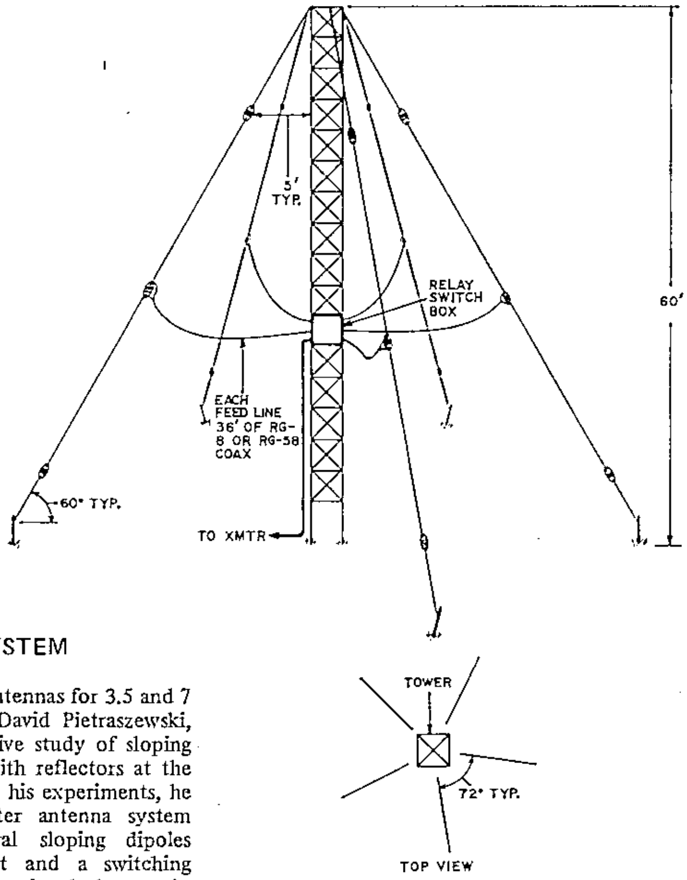

Fig. 8-12 — Five sloping dipoles suspended from one support. Directivity and forward gain can be obtained from this simple array. Top view shows how the elements should be spaced around the support.

40-METER "SLOPER" SYSTEM

One of the more popular antennas for 3.5 and 7 MHz is the sloping dipole. David Pietraszewski, K1THQ, has made an extensive study of sloping dipoles at different heights with reflectors at the 3-GHz frequency range. From his experiments, he developed the novel 40-meter antenna system described here. With several sloping dipoles supported by a single mast and a switching network, an antenna with directional characteristics and forward gain can be simply constructed. This 40-meter system uses several "slopers" equally spaced around a common center support. Each dipole is cut to a half wavelength and fed at the center with 52-ohm coax. The length of each feed line is 36 feet. This length is just over 3/8 λ, which provides a useful quality. All of the feed lines go to a common point on the support (tower) where the switching takes place. At 7 MHz, the 36-foot length of coax looks inductive to the antenna when the end at the switching box is open circuited. This has the effect of adding inductance at the center of the sloping dipole element, which electrically lengthens the element. The 36-foot length of feed line serves to increase the length of the element about 5%. This makes any unused element appear to be a reflector.

The array is simple and effective. By selecting one of the slopers through a relay box located at the tower, the system becomes a parasitic array which can be electrically rotated. All but one element of the array become reflectors, while one element is driven.

The basic physical layout is shown in Fig. 8-12. The height of the support point should be about 60 feet, but can be less and still give reasonable results. The upper portion of the sloper is five feet from the tower, suspended by rope, and makes an angle of 60 degrees with the ground. In Fig. 8-13, the switch box is shown containing all the necessary relays required to select the proper feed line for the desired direction. One feed line is selected at a time and opens the feed lines of those remaining. In this way the array is electrically rotated. These relays are controlled from inside the shack with an appropriate power supply and rotary switch. For safety reasons and simplicity, 12-volt dc relays are used. The control line consists of a five conductor cable, one wire used as a common connection; the others go to the four relays. By using diodes in series with the relays and a dual-polarity power supply, the number of control wires can be reduced, as shown in Fig. 8-15B.

Measurements indicate that this sloper array provides up to 20 dB front-to-back ratio and forward gain of about 4 dB. If one direction is the only concern, the switching system can be eliminated and the reflectors should be cut 5

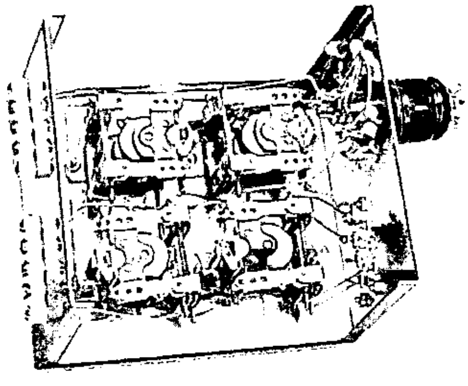

Fig. 8-13 — Inside view of relay box. Four relays provide control over five antennas. See text. The relays pictured here are Potter and Brumfield type MR11D.

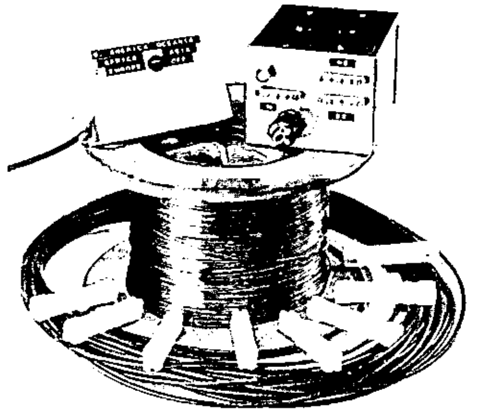

Fig. 8-14 — The basic materials required for the sloper system. Control box at left and relay box at right.

percent longer than the resonant frequency. The one feature which is worth noting is the good front-to-back ratio. By arranging the system properly, a null can be placed in an unwanted direction, thus making it an effective receiving antenna. In the tests conducted with this antenna, the number of reflectors used were as few as one and as many as five. The optimum combination appeared to occur with four reflectors and one driven element. No tests were conducted with more than five reflectors. This same array can be scaled to 80 meters for similar results. The basic materials required for the sloper system are shown in Fig. 8-14.

Bibliography

Source material and more extended discussion of topics covered in this chapter can be found in the references given below.

Elliott, "Phased Verticals for 40," *QST*, April, 1972.

Hubbell, "Feeding Grounded Towers as Radiators," *QST*, June, 1960.

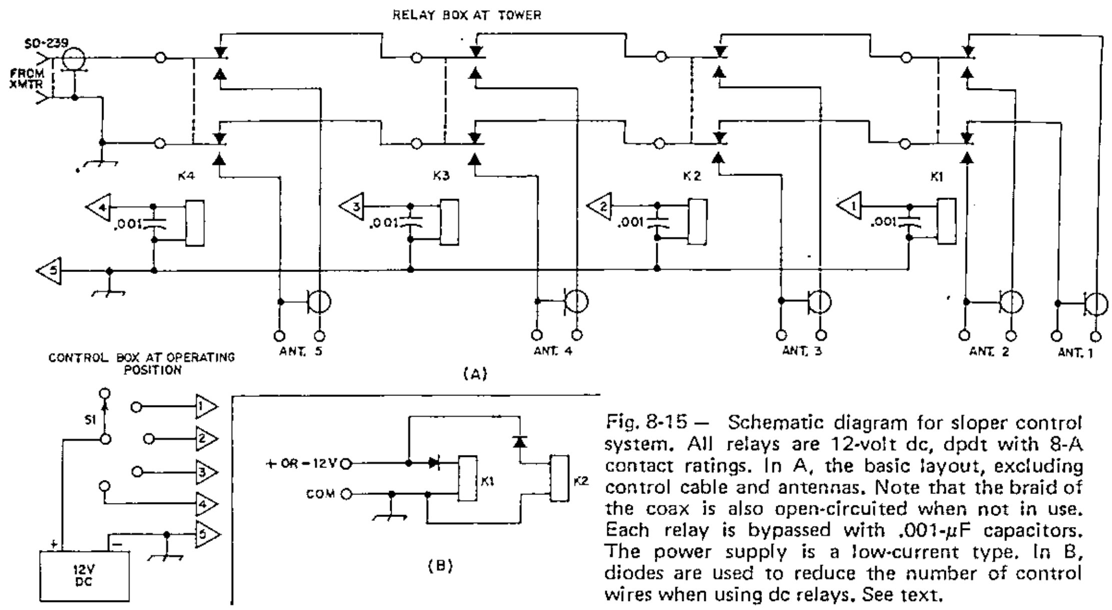

Fig. 8-15 — Schematic diagram for sloper control system. All relays are 12-volt dc, dpdt with 8-A contact ratings. In A, the basic layout, excluding control cable and antennas. Note that the braid of the coax is also open-circuited when not in use. Each relay is bypassed with .001-μF capacitors. The power supply is a low-current type. In B, diodes are used to reduce the number of control wires when using dc relays. See text.