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THE K1WA 7-MHZ "SLOPER SYSTEM"

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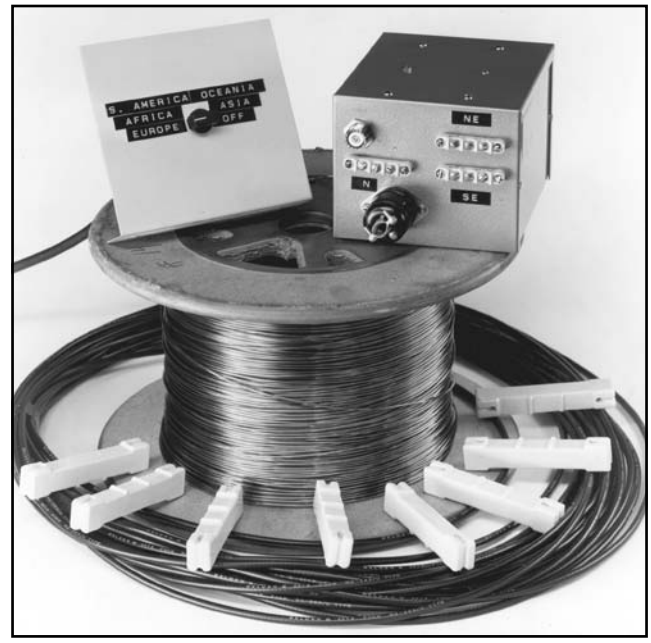

Fig 88—The basic materials required for the sloper system. The control box appears at the left, and the relay box at the right.

One of the more popular antennas for 3.5 and 7 MHz is the half-wave long sloping dipole described previously. David Pietraszewski, K1WA, 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 7-MHz 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 7-MHz system uses several "slopers" equally spaced around a common center support. Each dipole is cut to $\lambda/2$ and fed at the center with 50-Ω coax. The length of each feed line is 36 feet.

All of the feed lines go to a common point on the support (tower) where the switching takes place. The line length of 36 feet is just over $3\lambda/8$, which provides a useful quality. At 7 MHz, the 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 that can be electrically rotated. All but the driven element of the array become reflectors.

The physical layout is shown in **Fig 87**, and the basic materials required for the sloper system are shown in **Fig 88**. The height of the support point should be about 70 feet, but can be less and still give reasonable results. The upper portion of the sloper is 5 feet from the tower, suspended by rope. The wire makes an angle of 60° with the ground.

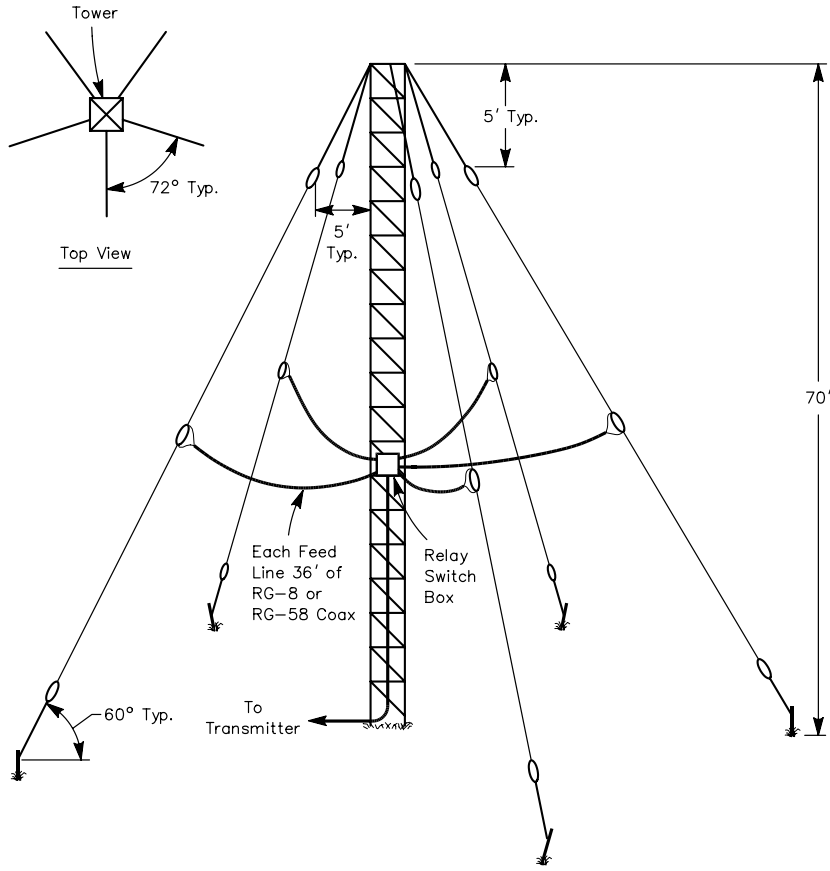

Fig 87—Five sloping dipoles suspended from one support. Directivity and forward gain can be obtained from this simple array. The top view shows how the elements should be spaced around the support.

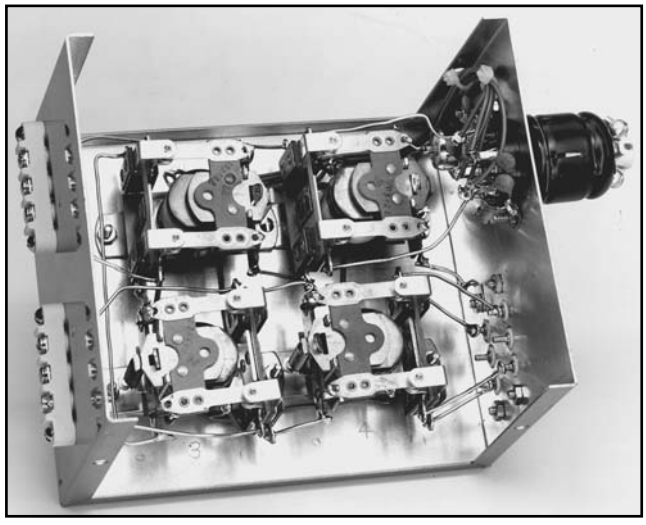

Fig 89—Inside view of relay box. Four relays provide control over five antennas. See text. The relays pictured here are Potter and Brumfeld type MR11D.

In **Fig 89**, the switch box is shown containing all the necessary relays to select the proper feed line for the desired direction. One feed line is selected at a time and the feed lines of those remaining are opened, **Fig 90**. 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 90B.

Measurements indicate that this sloper array provides up to 20 dB front-to-back ratio and forward gain of about 4 dB over a single half-wave sloper. **Fig 91** shows the azimuthal pattern (at a 5° takeoff angle) for the K1WA array, compared to a 100-foot high flattop dipole and a full sloper suspended from a 50-foot tower. These patterns were calculated for average ground conditions. Just for fun, look at

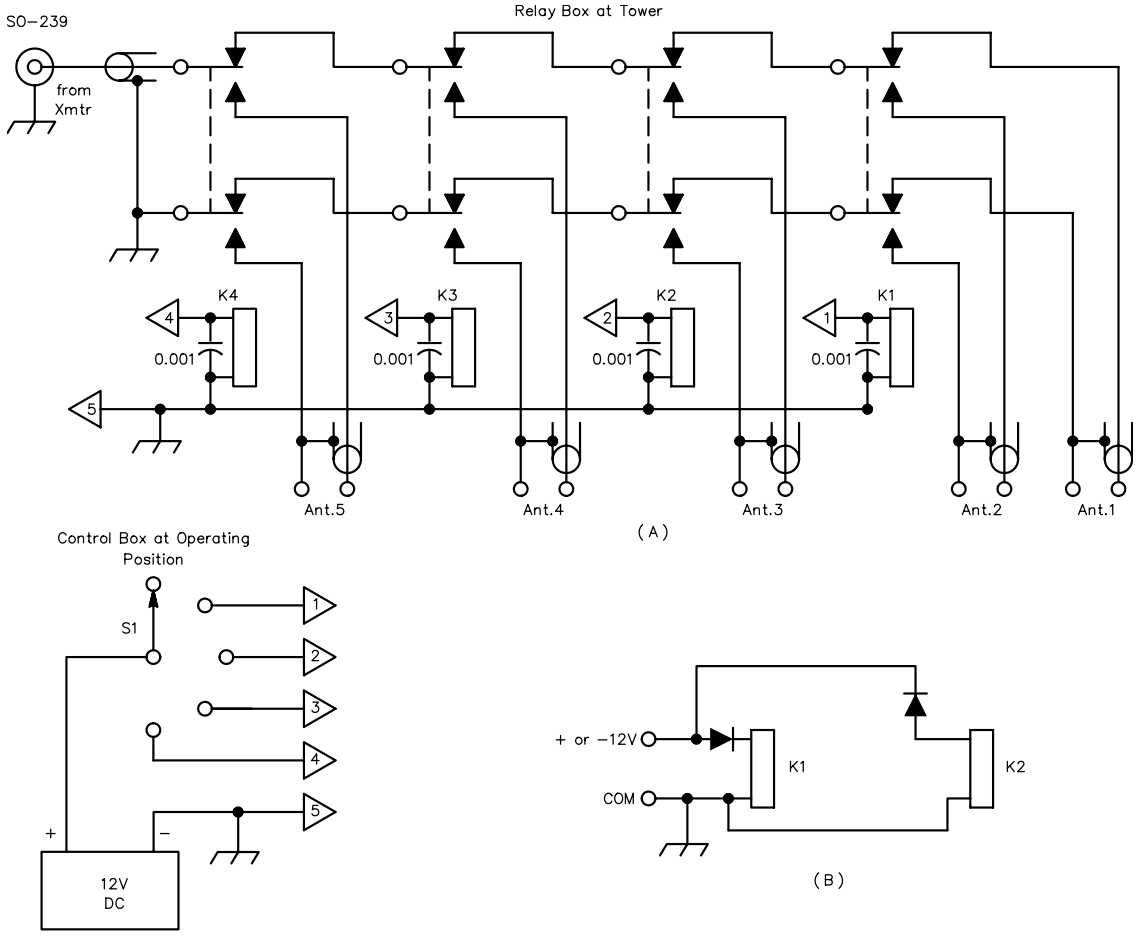

Fig 90—Schematic diagram for sloper control system. All relays are 12-volt dc, DPDT, with 8-A contact ratings. At A, the basic layout, excluding control cable and antennas. Note that the braid of the coax is also open-circuited when not in use. Each relay is bypassed with 0.001-μF capacitors. The power supply is a low current type. At B, diodes are used to reduce the number of control wires when using dc relays. See text.

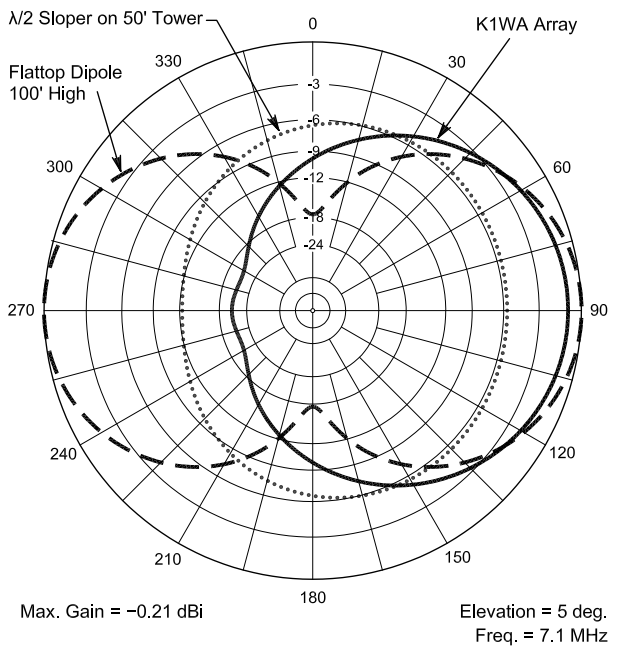

Fig 91—Azimuth pattern for K1WA 40-meter sloper array (solid line), compared to a flattop dipole (dashed line) at 100 feet and a halfwave full sloper on a 50-foot tower (dotted line). The K1WA array has an excellent front-to-back ratio and almost as much gain as the high flattop dipole. These patterns are for average ground.

Fig 92, which shows a comparison between a 100-foot high flattop dipole and a K1WA array placed over saltwater. Now that's a real barnburner at low takeoff angles! Such a seaside system would be very competitive with a rotatable 2-element "shorty-40" type of Yagi.

If one direction is the only concern, the switching system can be eliminated and the reflectors should be cut 5% longer than the resonant frequency. The feature worth noting is the good F/B 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 3.5 MHz for similar results.