New Dipole Feeder

—tuned feeders, yet!

A. F. Stahler AA6AX
5521 Big Oak Drive
San Jose CA 95129

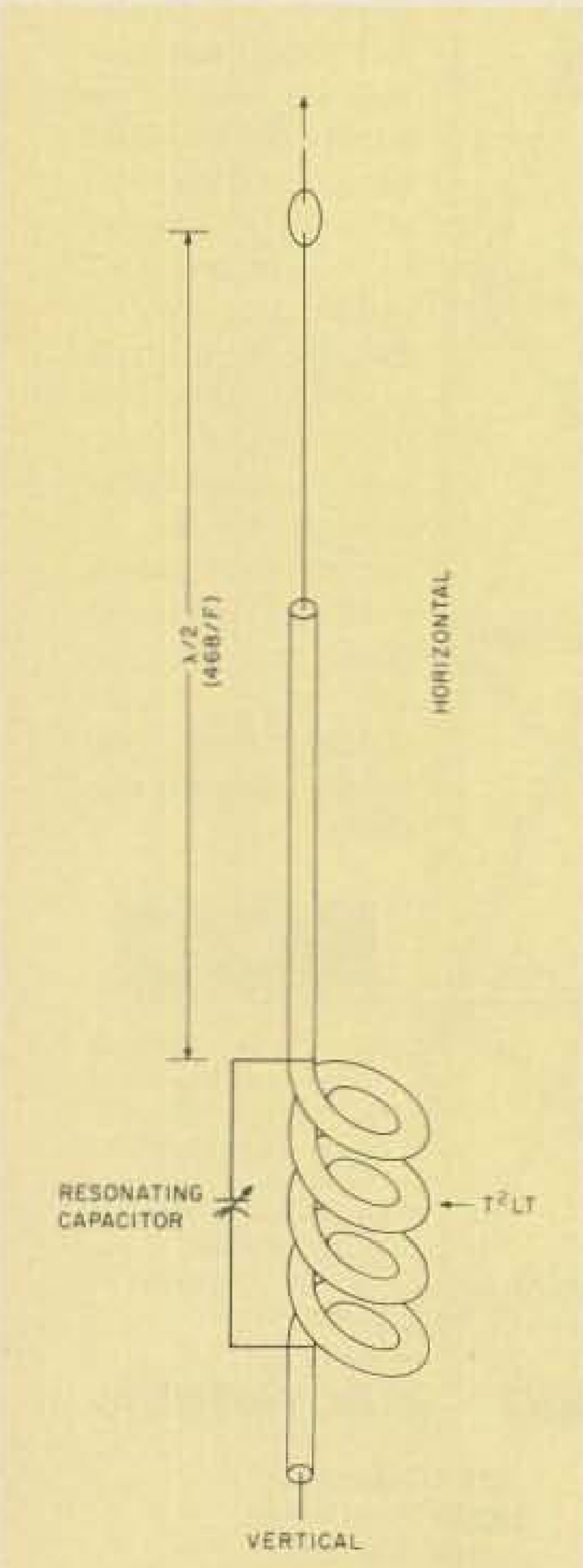

Fig. 1. The T^2LT endfed antenna.

A previous article[1] of mine described the T^2LT (Tuned Transmission Line Trap), its construction, and its use to prevent feedline radiation when used with a centerfed horizontal dipole. There are many applications for this unique device. The object of this article is to describe the use of the T^2LT to end feed either horizontal or vertical dipoles.

Fig. 1 shows a sketch of the T^2LT used to end feed an antenna. The coil is made of the shield of the coaxial feedline; the capacitor is the value required to resonate the coil at the operating frequency. The number of turns in the coil may be as few as one. With a low number of turns, the resonating capacitor will be large, the Q high, and the bandwidth narrow. The antenna performance increases with the Q of the T^2LT.

The T^2LT operates in this application because of the ability of coaxial cable to simultaneously carry differing currents on the inside and the outside of the shield of the coax. Usually, a current flowing on the outside of the shield of a coaxial cable is undesirable. However, in this case, this outer current is the antenna current of one side of a half-wave dipole, and it is required for the unit to operate as a half-wave antenna. Fig. 2(a) shows the current distribution in a half-wave dipole, and Fig. 2(b) shows the corresponding current distribution in the T^2LT endfed dipole. To behave as a half-wave dipole, the T^2LT endfed antenna must have the same current distrubution on the outside of the coax shield as the dipole of Fig. 2(a). In particular, this current must go to zero at the ends of the dipole. The end of the wire insures zero current at the far end of the half-wave antenna, but the characteristic of the current at the T^2LT end depends upon the impedance of the T^2LT.

Impedance is defined as the ratio of the voltage to the current. Since the current at each end of a dipole antenna is zero, the impedance at the

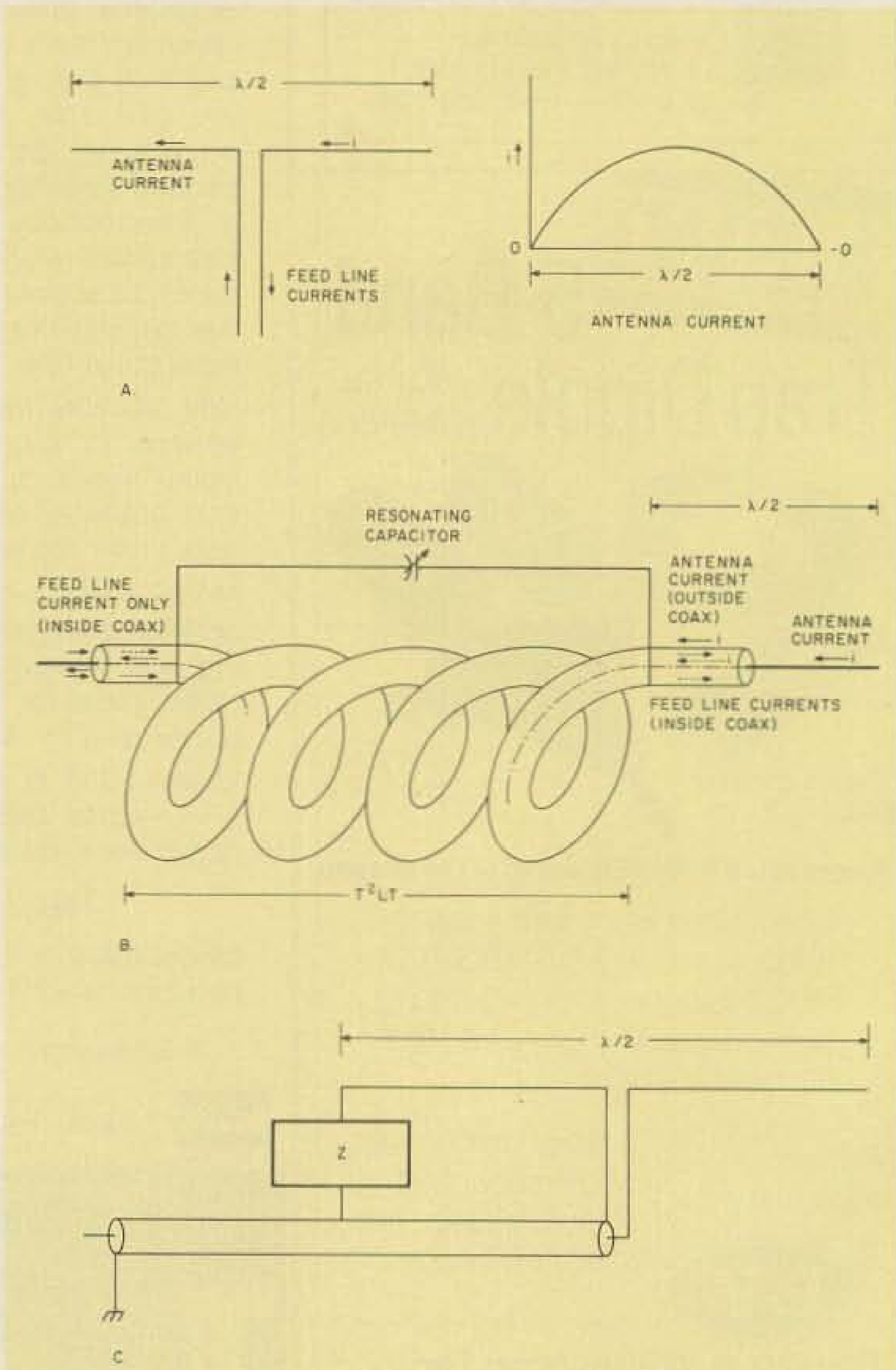

Fig. 2. Antenna current distributions. (a) Dipole currents. (b) T^2LT currents. (c) Equivalent connection — endfed dipole.

ends of a dipole antenna cannot be defined. The only impedance that can be connected between the end of a dipole antenna and ground, without changing the current distribution of the antenna, is an infinite impedance. A parallel resonant tank circuit, theoretically, has infinite impedance across its terminals. Real, high-Q resonant tank circuits can have an impedance greater than 100,000 Ohms. A low-loss high-Q T^2LT can, therefore, approach the desired infinite impedance.

Fig. 2(c) shows, topologically, how the impedance of the T^2LT is connected to one end of the half-wave dipole antenna. Fig. 3 shows the radiated power, measured at a distance of 10 wavelengths, from a 20 meter dipole as a function of the impedance connected between ground and one end of the antenna. Here it can be seen that a very high impedance is required of the T^2LT if the antenna is to perform properly.

Some authors[2,3,4,5] have described an endfed dipole with an rf choke instead of a T^2LT. These authors incorrectly presumed that the impedance at the end of a half-wave dipole antenna was defined and was approximately 4,000 Ohms. This, however, is the impedance of a half-wave radiator fed against an ideal ground plane,[6] not the impedance at the end of a half-wave dipole. Fig. 3 indicates why these previously published designs of endfed dipoles have never become popular.

On the contrary, my T^2LT vertical antennas have given excellent DX performance. Using a 2-Watt HW-7 on 20 meters, I consistently receive an S-8,9 report from VE6s in Calgary. That must be where the first skip lands.

Captain Lee[7] discusses the advantages of a ground-isolated vertical dipole but adds, "How one is to feed this antenna from a practical standpoint is never mentioned." I say, do it with a T^2LT! The T^2LT-fed vertical is ground independent and thereby avoids the extensive ground system required for conventional verticals.[8] This antenna permits DX performance when using battery-powered, portable — even QRP — equipment. I have successfully used the T^2LT to feed shortened antennas, less than $\lambda/4$ in length, which answers the height problem associated with a half-wave vertical. The shortened antenna requires an appropriate unbalanced to unbalanced impedance matching transformer at the dipole center.[9]

Photos A and B show details of a T^2LT endfed antenna that was hastily constructed for OSCAR downlink communications. The T^2LT is simple to build, easy to adjust, and it outperforms conventional vertical antennas. ■

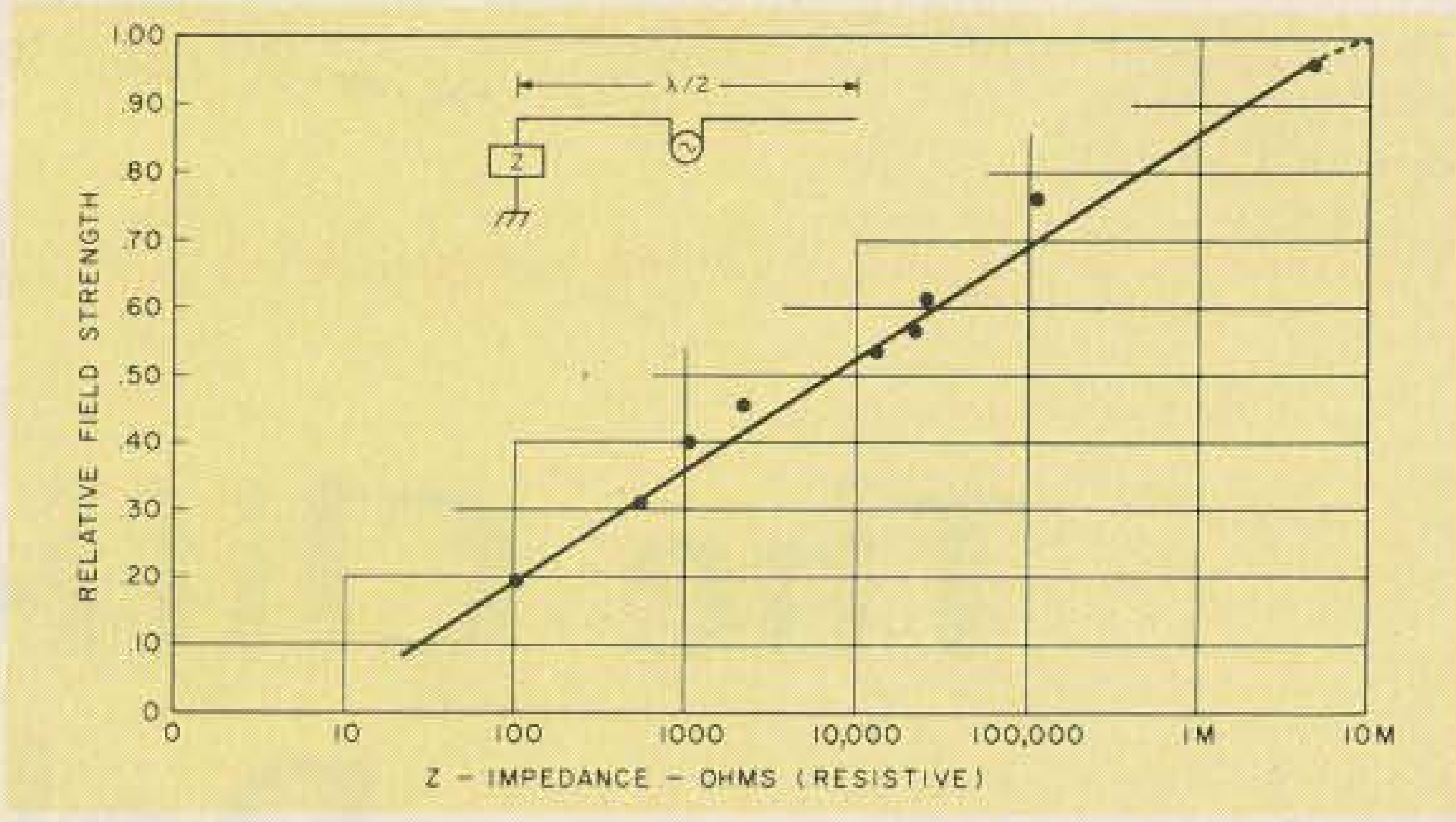

Fig. 3. Field strength as a function of impedance between dipole end and ground.

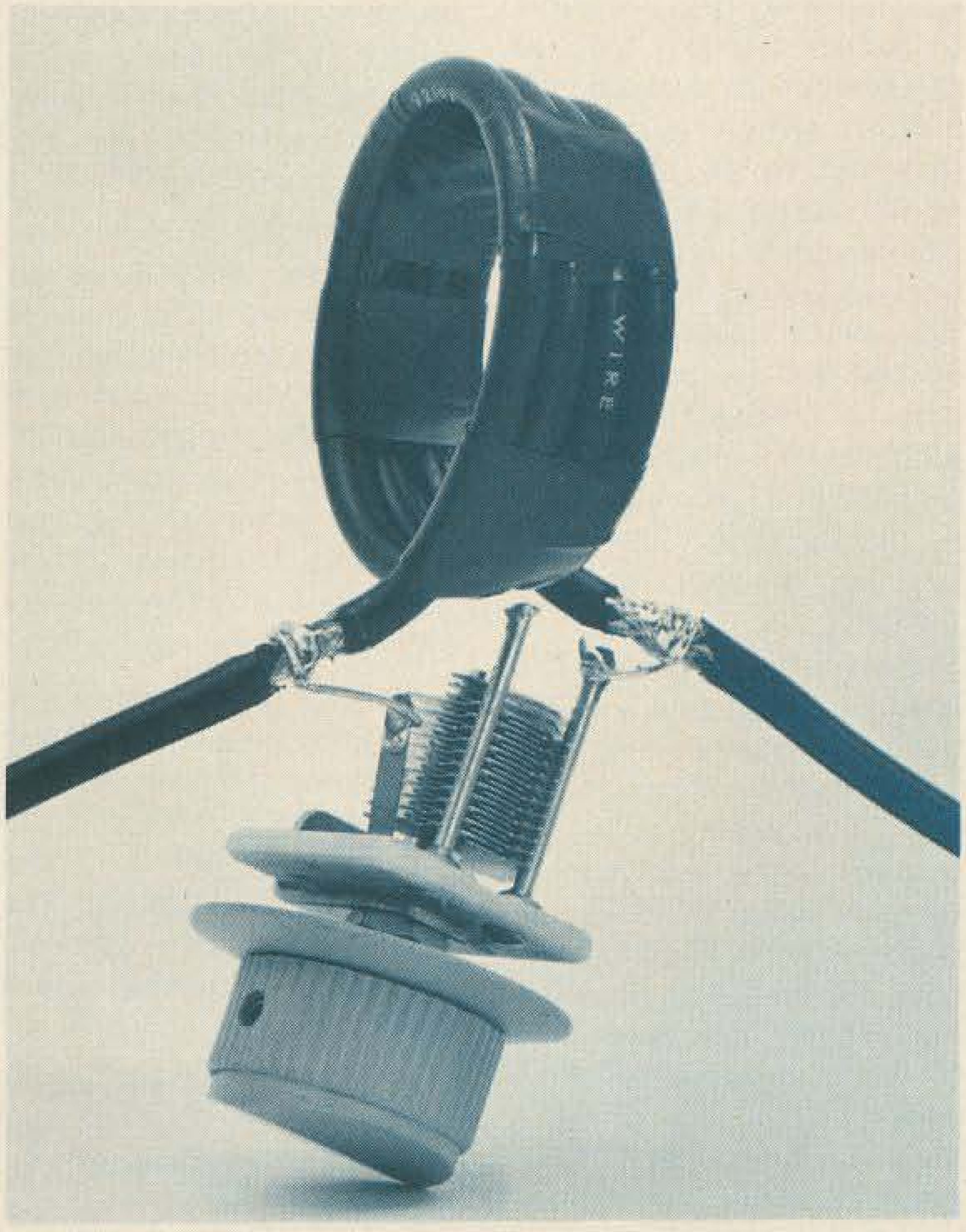

Photo A. T^2LT of 10 meter vertical dipole.

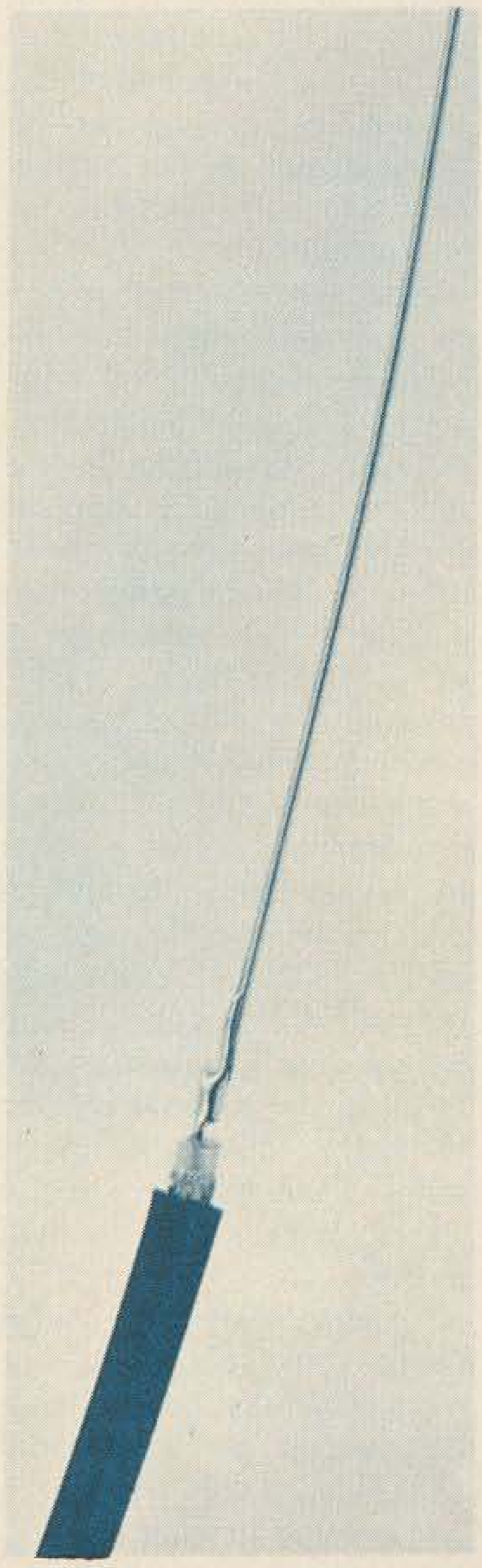

Photo B. Electrical center of T^2LT vertical antenna.

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