powers up to 100 W. For lower power levels, a simpler directional coupler can be made on a single "binocular" core. The construction of a miniature coupler is described below.

Construction

A quiet tuner could be built in two ways. One employs a switch or relay to swap the transmitter for the reflected power detector. Then the meter can be put into quiet mode for ATU adjustments. Otherwise, it functions as a normal through-line meter.

Another way would be to build a dedicated SWR meter for quiet tuning. In this case, the switch can be omitted and the signal will always be attenuated by the coupling factor. This would simpler to build, and would be useful for lengthy spells of adjustment such as tuning a mobile whip.

Figure 3 shows an SWR meter that can be switched between a conventional through-line power meter and a quiet tuner, although in this form it only measures reflected power.

The resistor in series with the meter could become a variable resistor. The forward power is easily measured by disconnecting the antenna. The open-circuit termination reflects the entire power incident on the antenna port. (Although, a low-inductance short-circuit would be more accurate, especially at the higher frequencies.) The variable resistor can then be adjusted for full-scale deflection on the meter.

If a continuous display of forward power is desired, a second diode detector and meter with switched gain can be connected across the dummy load.

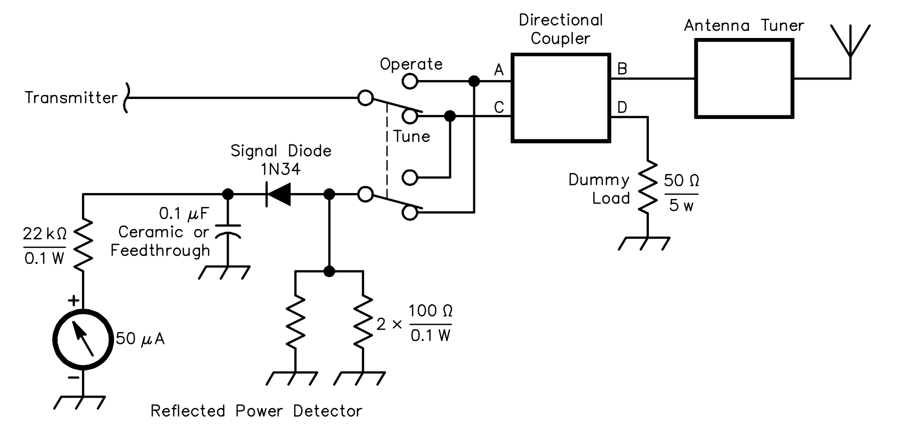

Fig 3—A schematic of the quiet tuner.

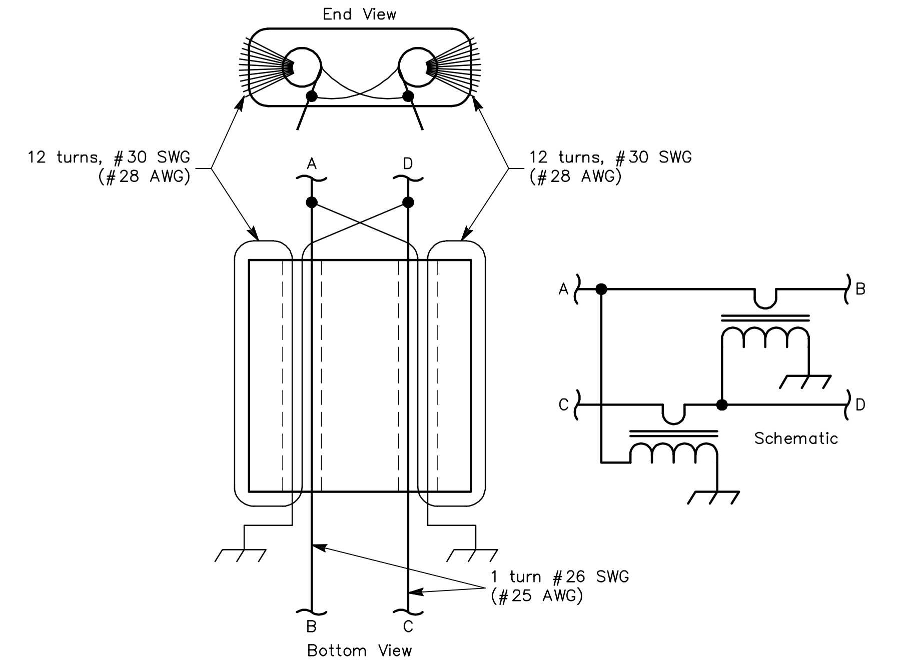

Fig 4—Construction of a directional coupler.

Directional Coupler

The directional coupler is the heart of the Quiet Tuner. This simple, small, directional coupler only uses one magnetic core. It has a wide bandwidth and adequate power handling for QRP operation.

The wire diameters are not critical. The core is a Fair-Rite 2843000302. It works happily at 5 W, but I haven't tested it above this level because I don't have a high-power transmitter. Similar cores of 43-type material (μ≈850), or near equivalents, may be used.

Fig 4 shows the construction of a suitable low-power directional coupler. Higher-power versions can be found in References 2 and 3. Start with the two 12-turn windings of insulated wire. The number of turns is the same as the number of times the wire goes through the hole. The two single-turn windings are added next: Just slide a piece of wire through each hole. The other "half" of the turn is completed by the circuitry you connect to the coupler. A different coupling factor requires a different number of turns. The coupling factor is 20 $\log_{10}(N)$, where N is the number of turns. The completed coupler is shown in Fig 5.

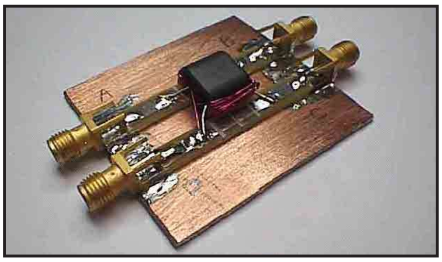

Fig 5—A completed directional coupler.

Directional-Coupler Performance Data

The measurements in Table 1 were made with an Agilent 8753C, network analyzer. The accuracy of the coupling factor is worth a mention. The directivity of a coupler is defined as follows: Directivity is the ratio (in decibels) of the power output at a coupled port, when power is transmitted in the desired direction, to the power output at the same coupled port when the same amount of power is transmitted in the opposite direction.