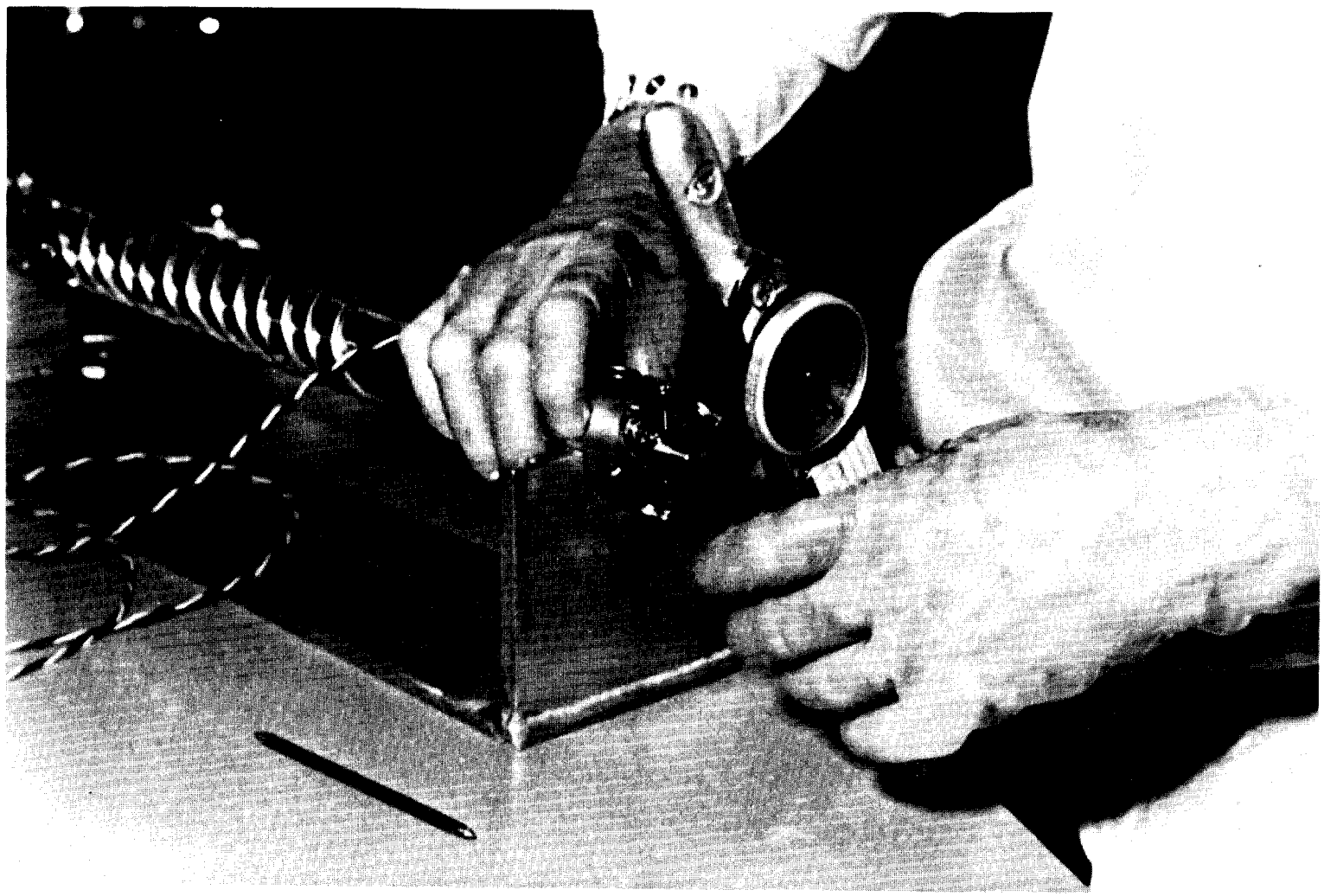

Figure C4-11.- Tightening the motor end cap bolts to establish the proper torque.

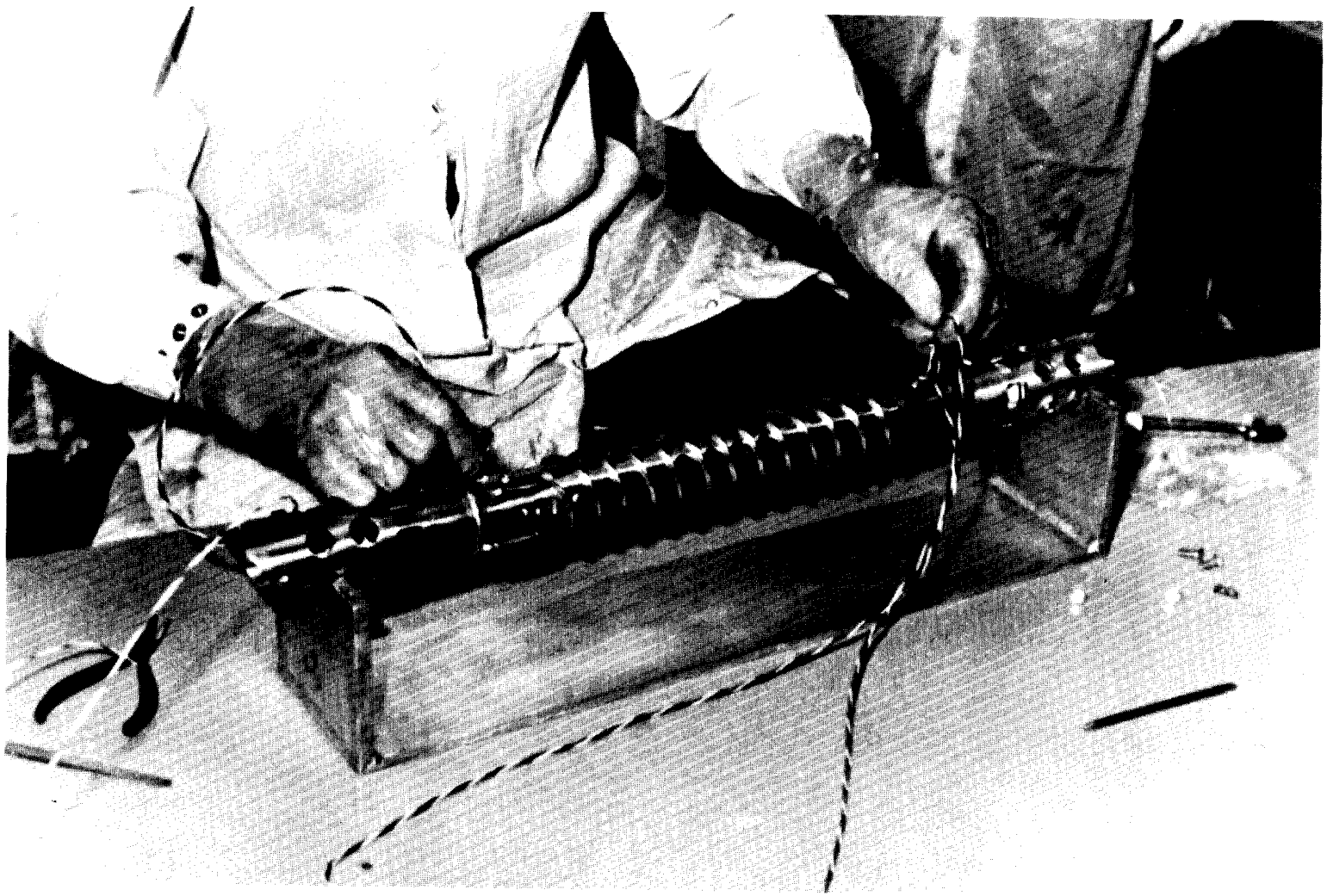

Figure C4-12.- Installing lower motor lead wires in heater conduit.

The installation of the upper motor follows the same general sequence except that once the leads emerge from the tube they do not reenter the heater tube but remain as a twisted bundle of four wires encased in a Teflon sleeve.

Next a small copper band is formed around the upper and lower motor wire bundles in the areas where the impellers of the fans are located to assure that the wires maintain the required clearance with the impellers (approximately 0.030 inch) (figs. C4-13 and C4-14). The ends of these bands are sweat soldered together to retain the wires. The motor leads external to the heater tube are then encased in Teflon shrink tubing. White tubing is used for the lower motor leads and clear tubing is used for the upper motor leads.

The leads are then installed for the heaters. One wire from each heater is soldered to its thermostat. The lead wires (20-gage silver-plated copper with Teflon insulation) are soldered, one to the other terminal of the thermostat and the other wire to the second lead of the nichrome heater element. Separate leads (four total; two for each heater) are provided to extend to the electrical connector fitted outside the dome at the top of the vacuum jacket. Again a cleaning operation is performed to remove any solder flux. Standard 60-percent tin and 40-percent lead solder is used for all electrical connections.

The entire heater and fan probe assembly is subjected to a detailed component acceptance test to assure proper operation. The unit is placed in a controllable temperature oven. Starting from about 100° F, the oven temperature is slowly lowered until the closing of each heater thermostat is noted by means of a Wheatstone bridge. While in this closed position, the resistance value of each heater element is measured and recorded. The oven temperature is then slowly raised to detect the opening temperature for each thermostat. With the unit removed from the oven, the resistance value of each motor winding is measured and recorded. The heaters and motors are subjected to a dielectric strength test at 500 V dc with a maximum allowable leakage current of 0.25 milliamps permitted. The insulation resistance of both heaters and both motors is measured and must indicate a minimum of 2 megohms isolation. The proper operation of the motors is verified in two vertical orientations at full voltage and at two vertical and one horizontal orientations at reduced voltage (80 ± 2 V ac). The time in tenths of hours and number of motor starts are recorded for each test sequence and this is added to the previous history for continuity. The entire assembly is then cleaned for liquid oxygen service, bagged, and stored for future use.

The upper coil assembly as shown on figure C4-5 consists of five coiled tubes to provide the necessary resistance in the heat flow path, an adapter to fit the tank neck, a seal-off plate for the side of the coil housing (vacuum dome), end fittings for the feed lines (that connect

Figure C4-13.- Inserted copper band to retain motor wires.

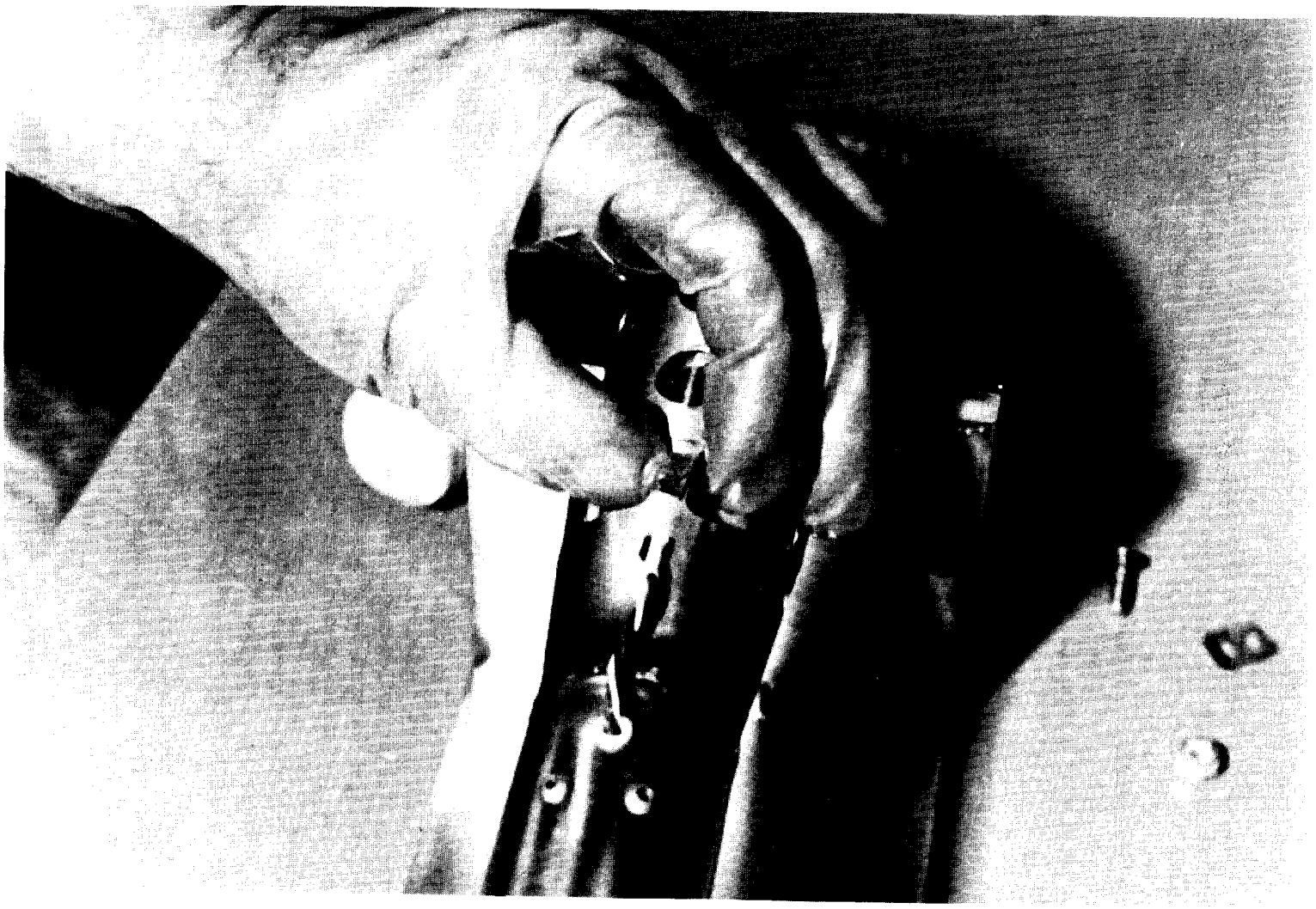

Figure C4-14.- Forming copper band to retain motor wires.

to the vapor cool shield), and a connector adapter fitting. These tubes are formed by a subcontractor in Denver. The material for all tubes is Inconel 750. All bending is performed using a flexible chain mandrel of Ampco bronze and Ucon lubricant (water soluble). The various piece parts are carefully cleaned and jigged for Heli-arc welding into an assembly. The supply line filter is installed and safety wired. The assembly is X-rayed, recleaned, and bagged for future use.

The quantity probe is a purchased item which is procured from Simmonds Precision complete with leads and temperature sensor installed with leads attached (fig. C4-15). This unit is made of two concentric aluminum tubes for the capacitance-type quantity (density) probe with Teflon spacer buttons located in drilled holes in the inner tube to provide centering action. The lower ends of the concentric tubes terminate in a glass-filled Teflon bushing. This bushing acts as a lower pilot support and also provides a nonconducting extension of the inner tube which is also utilized as a dip tube for the filling and detanking operations. The axial relationship of the inner and outer aluminum tubes is controlled by a single rivet installed through Teflon bushings near the upper end of the assembly.

The upper end of the outer aluminum tube is supported in a large glass-filled Teflon bushing which is riveted to an Inconel tube for final support to the tank adapter. This upper bushing has two axial holes to provide routing for the motor and heater leads. The temperature sensing element is mounted on the side of this bushing. Axially aligned pins through two 0.44-inch cross-drilled holes are used as junction points between the short leads from the temperature sensor and the 48-inch-long extension leads. Two 22-gage wires are used for each extension lead of the sensor (a total of four wires). The capacitance element leads consist of a shielded 20-gage wire for the inner tube and an unshielded 20-gage wire for the outer. Two channel-shaped clips are riveted to the upper ends of the aluminum tubes to solder the lead wires on. The quantity sensor leads are encased in a clear Teflon shrink sleeve. The temperature sensor leads are encased in a separate clear Teflon shrink sleeve. All solder joints are made with 60-percent tin, 40-percent lead solder.

After incoming inspection of this Simmonds-manufactured assembly verifies conformance to the purchase specifications, the unit is cleaned for liquid oxygen service, bagged, and stored for future use.

The parts required for the complete assembly of the quantity probe are then drawn from storage. The first operation is the installation of two insulated pull wires through the holes provided in the quantity probe to route the heater and motor leads. The quantity probe wires, temperature sensor wires, and two pull wires are pulled through the electrical conduit by first pushing a single wire through. All wires are attached to this pull wire to be pulled into the conduit (figs. C4-16 through C4-19). The

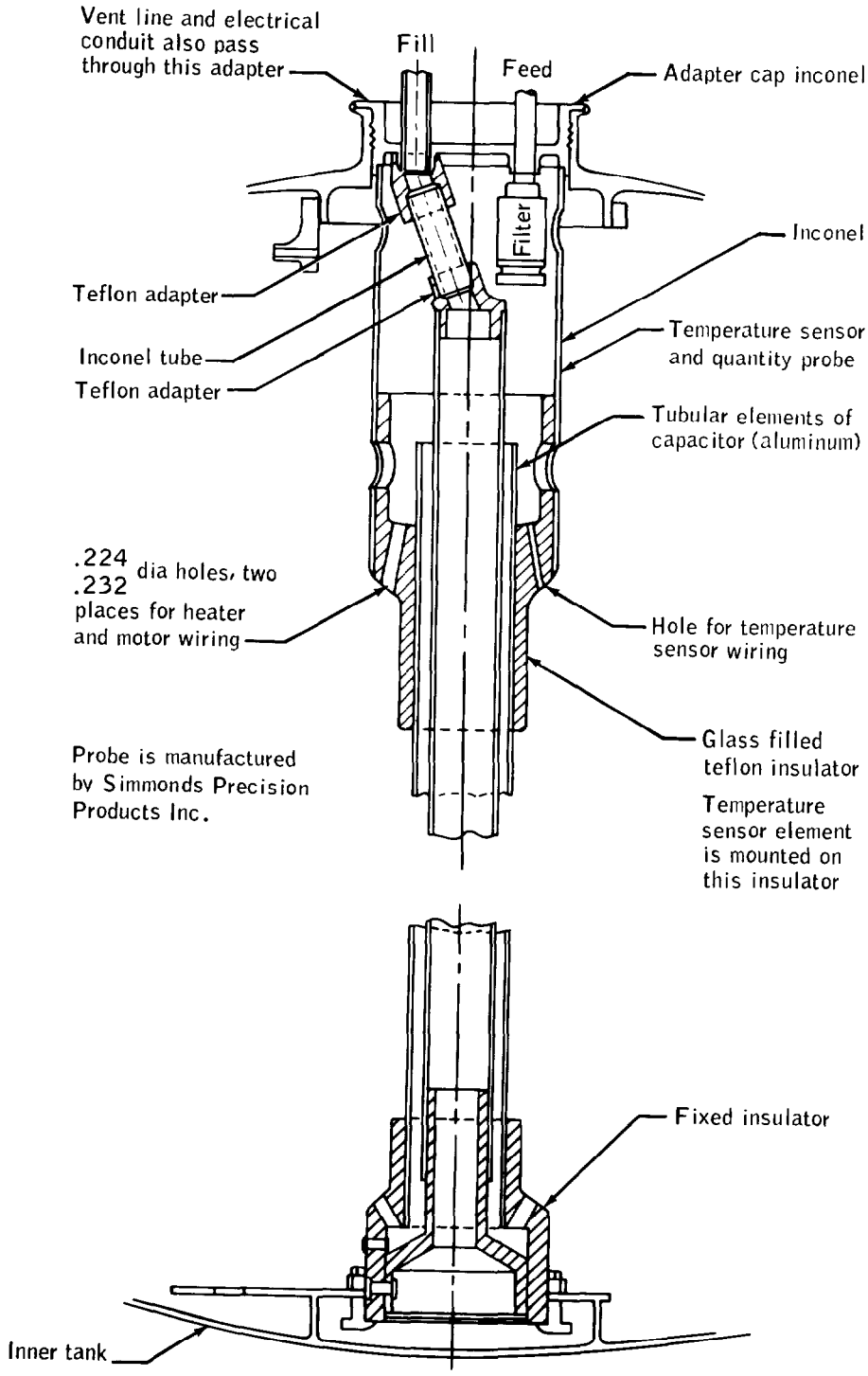

Figure C4-15.- Cross section of quantity probe.

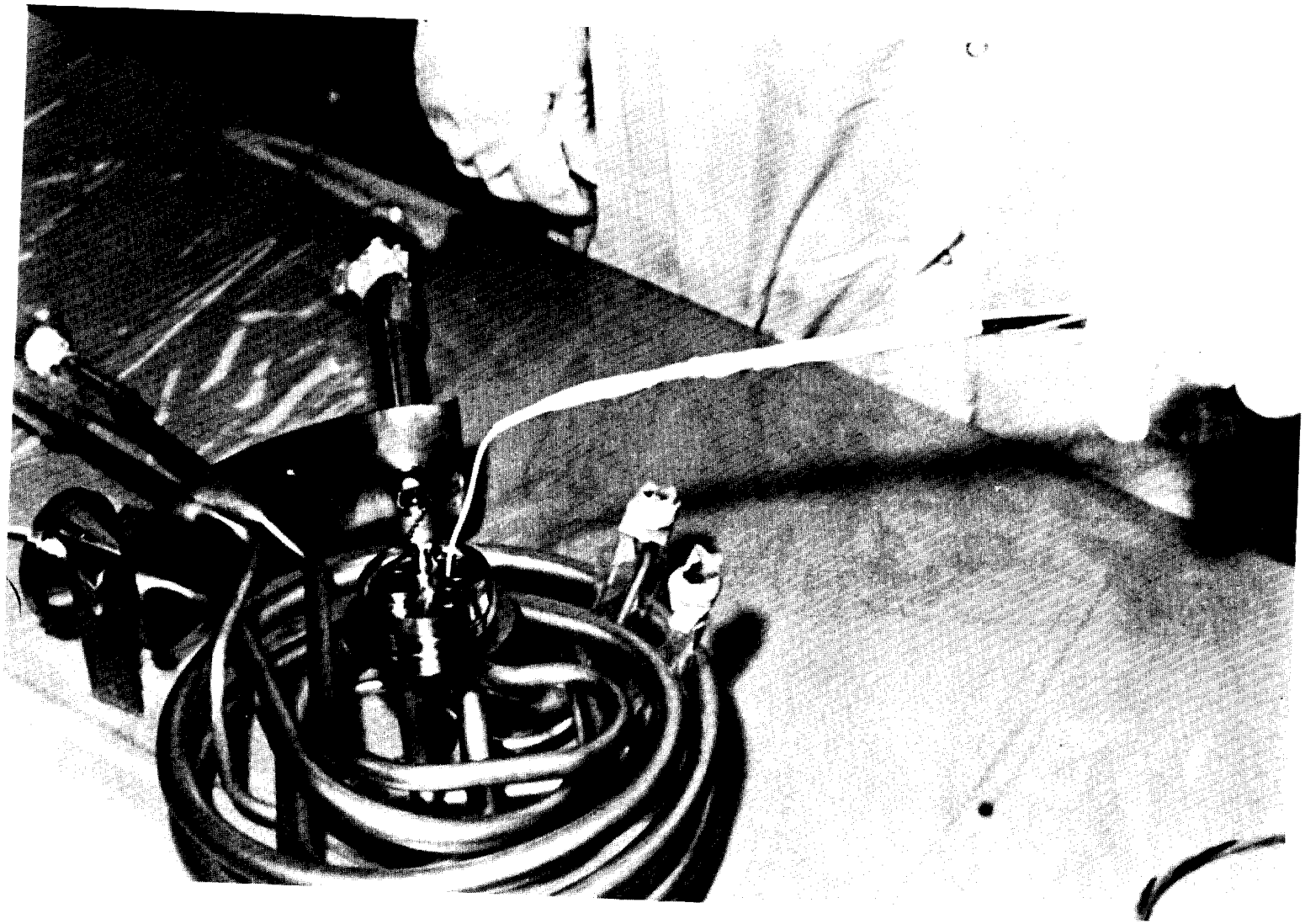

Figure C4-16.- Pulling quantity probe wires into upper coil assembly.

Figure C4-17.- Feeding quantity probe wires into upper coil assembly.