Foil Electrets Provide Simpler TOUCH-TONE® Dials

News of Acoustics Research

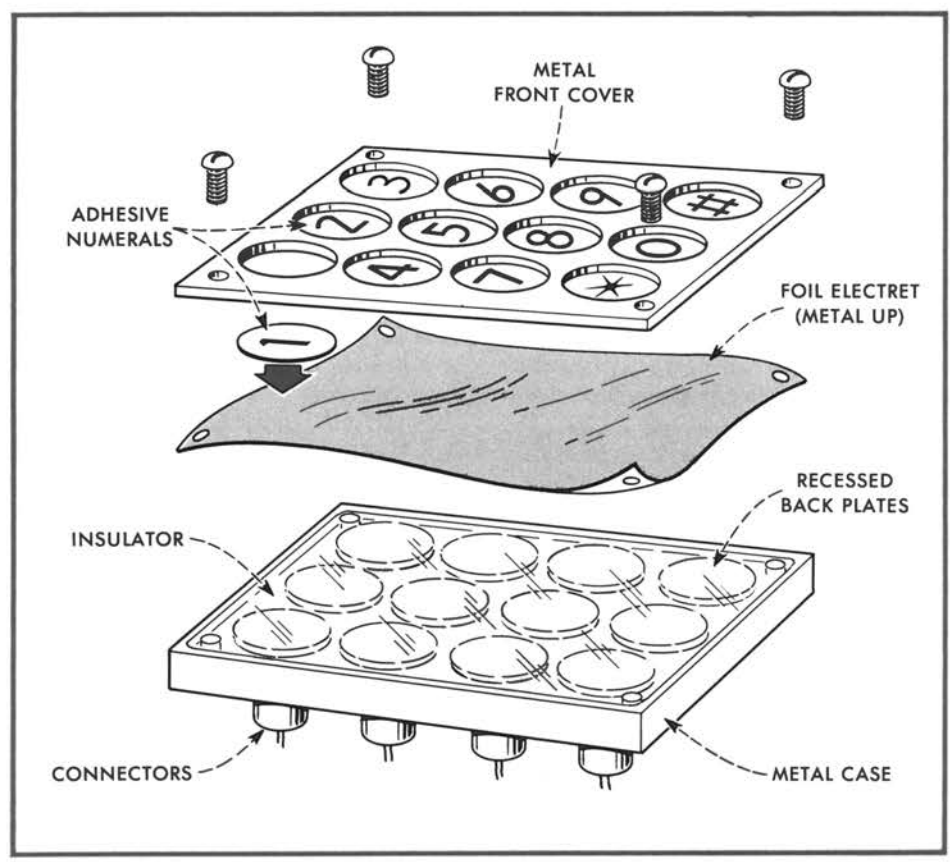
A new, compact dialing mechanism for TOUCH-TONE® telephones is being tested by Bell Labs scientists at Murray Hill, N. J. The new dial does the same job as conventional electromechanical pushbuttons, but in less than half the space. The dial uses a paper-thin sheet of electrically charged material, called a foil electret, and thus eliminates the pushbuttons and their metal contacts. Simply touching the material produces an electric signal strong enough to activate telephone dialing circuitry. The experimental dialing mechanism may be simpler to manufacture, and its smaller size may allow greater latitude in future telephone design.

In addition to being used as "touch" dials, foil electrets may someday replace conventional keys in electric typewriters, teletypewriter machines, and computer terminals. Foil electrets can also be used to make transducers sensitive enough to respond to sound waves, and are being used commercially in microphones, earphones, and other similar applications.

For the new dialing mechanism, Bell Labs scientists G. M. Sessler, J. E. West, R. L. Wallace, and A. E. Hirsch, Jr. use a foil electret, metallized on one side, to cover a backplate that includes 12 conductor elements. Each element is located at a number position on a conventional Touch-Tone dial. A 2-mil air gap separates the foil from the backplate. A metal cover with a finger-size aperture at each number position completes the assembly. When a user depresses the foil through an aperture, the stored charge in the foil electret (injected with an electron beam or other process during manufacture) causes a current to flow through the selected conductor element on the backplate into the telephone dialing circuitry. When the pressure is released, the resilient foil returns to its original shape.

The foil electrets are made by introducing electric charges into a 1-mil thick sheet of halocarbon, such as Teflon, that is coated with metal on one surface. Different charge densities could be produced at each number location on a dial so that different positions would produce different output voltages when depressed. Thus, only a single output circuit would be required, since the charge densities provide the coding for each particular digit.

Neither the charges nor the material are adversely affected by frequent touching. Output voltages of the dials used in the Bell Labs experiments did not change measurably after some 400,000 automatic touch operations performed by a motor-driven plunger.



The foil-electret dial comprises a cover plate with fingertip-size holes, a foil-electret sheet, and an insulator block with a connector for each digit. Pressure causes current to flow through the connector directly beneath the pressure point.