Abstracts

Ultrasonic Waveguide Systems for Surface Waves

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Wave guides for Rayleigh surface waves have been made by depositing thin strips of gold plating on a fused quartz substrate. (Rayleigh waves propagate on the surface of a solid in a mariner similar to water waves on a liquid). The principle of guidance is a property common to all wave systems, sonic as well as electromagnetic - a wave will be guided along the axis of a perturbing strip if the net phase velocity in the presence of the strip is lower than that of the uniform medium. Thus the electromagnetic equivalent of this guidance system is microwave dielectric waveguides and fiber optics rather than metal tubes. A complete system of ultrasonic circuitry can be constructed which performs the functions normally expected of waveguides. Experiments were performed in the 10 to 35 MHz range because the ultrasonic transducer art is well developed at that frequency and because the wavelength of sound would be large enough to examine the distribution of energy in the waveguides with probes on micromanipulators. The gold strips are about a hundredth of a wavelength thick and several tenths of a wavelength in width, The dispersion curve for the lowest guided mode has been determined and found to accurately agree with theory. The Q of the transmission lines have been over 5000 and waves have been guided around bends with very low loss. A number of elements such as power dividers, directional couplers and resonators have been made by plating different patterns on the substrate.

❑ Return to main document.