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Brief 67-10336

NASA TECH BRIEF

Device Enables Calibration of Microphones at High Sound Pressure Levels

The problem:

To devise a means of accurately calibrating microphones at high sound pressure intensities (up to 190 dB; where dB = 20 times the common logarithm of the sound pressure intensity, referred to a pressure of 0.0002 dyne per sq cm). Air is not a suitable coupling medium for the calibration because of the inherent nonlinearity at these high sound intensities.

The solution:

A coupling device employing a liquid instead of air as the coupling medium. With this device, microphones can be calibrated at sound pressure intensities ranging from 110 dB to 175 dB in the frequency range of 16 Hz to 10 kHz.

How it's done:

The device incorporates a small liquid-filled cavity driven at one end by means of a piston consisting of a cylindrical stack of electrically excited piezoelectric disks having an effective diameter of 1.5 inches. The cavity, in the shape of a rectangular prism at one end and a conical frustum at the other, has an overall volume of approximately 1.2 cubic inches. An ac voltage applied across the faces of each disk (all of which are connected in parallel) sets the composite piston into mechanical vibration over a displacement amplitude required to produce the desired sound level. Motion of the sealed piston against a diaphragm tends to compress the liquid in the cavity, thereby producing relatively high calibration pressures for small displacements. These pressures vary proportionally to the displacement of the piston. Needle valves in the device isolate the flow of liquid to and from the cavity and also to and from a pressure gage, which is used to set the sound level. The needle valves have a built-in safety adjustment which protects the microphones from excessive pressures.

Notes:

1. The system can operate in an automatic mode by using a standard microphone as a control sensor. Feedback from the standard microphone controls the calibration signal level.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10336

Patent status:

No patent action is contemplated by NASA.

Source: Albert Gillen
of Gulton Industries, Inc.
under contract to
Marshall Space Flight Center
(MFS-11980)

Category 01