Proceedings of the Iowa Academy of Science

Volume 33 | Annual Issue | Article 73

1926

The Theory of the Two-Way Quincke Tube

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Recommended Citation

Stewart, G. W. (1926) "The Theory of the Two-Way Quincke Tube," *Proceedings of the Iowa Academy of Science, 33(1),* 251-252.
Available at: https://scholarworks.uni.edu/pias/vol33/iss1/73

rotate simply about one end. At any particular instant it rotates about some point which may be situated anywhere along its length. However, about whatever single point the arm may be rotating, such rotation can be resolved into two simultaneous rotations about the two ends. Therefore for purposes of analysis we may consider that the tracer arm rotates only about the ends, and we may express the area in terms of that rotation, as already stated.

IOWA STATE COLLEGE,
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A COMPARISON OF POWER OUTPUT OF CONICAL, HYPERBOLIC AND EXPONENTIAL TRUMPETS

G. W. STEWART

(ABSTRACT)

These measurements are presented as illustrative of the advances that have been made in the measurement of acoustic power. They refer of course to single cases, but they are of interest in showing the actual fluctuations of both components of impedance and of the power output in the three types of trumpets stated in the title.

STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.

THE THEORY OF THE TWO-WAY QUINCKE TUBE

G. W. STEWART

(ABSTRACT)

The long known Quincke two-way tube has been assumed to eliminate transmission by interference only at a frequency corresponding to a difference of path of one-half wave length. The author has derived the theory of the action and finds that the ratio of transmitted to incident energy is

$$[4 \sin (\alpha_2 + \alpha)/2 \times \cos (\alpha_2 - \alpha_3)/2]^2 \times [1 - 2 \cos (\alpha_2 + \alpha_3) + \cos (\alpha_2 - \alpha_3)]^2 + 4 \sin^2 (\alpha_2 + \alpha_3)]^{-1}$$

This shows that the conditions of zero transmission are $\alpha_2 - \alpha_3 = (2n + 1) \pi$, where n is an integer, which has long been known, and $(\alpha_2 + \alpha_3) = 2n \pi$, if $(\alpha_2 - \alpha_3) = 2n_1 \pi$ where n_1 is an integer. Since $(\alpha_2 + \alpha_3) > (\alpha_2 - \alpha_3)$, it is seen that, in general, these new minima of transmission are much more numerous than those formerly known. Experimental tests verify the correctness of the theory.

STATE UNIVERSITY OF IOWA,
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DIRECT ABSOLUTE MEASUREMENT OF ACOUSTIC IMPEDANCE

G. W. STEWART

(ABSTRACT)

Advantage is taken of the author's theory of the transmission in an acoustic line with an attached branch which alters the intensity and the pressure phase of the transmitted sound. By the measurement of the relative intensities and phases with and without the branch present, it is possible to obtain the components Z_1 and Z_2 of the impedance, $Z = Z_1 + iZ_2$, of the branch. If *s* is the area of the conduit, P_0 and P'_0 the two pressure amplitudes, ε the change in phase, ϱ the density of the medium, *a* the velocity of sound therein,

$$Z_1 = (\varrho a/2s)\ [A/(A^2 + B^2)] \text{ and } Z_2 = (\varrho a/2s)\ [B/(A^2 + B\ )],$$

wherein $A = (P_0/P'_0 \cos \varepsilon - 1$ and $B = -(P_0/P_0) \sin \varepsilon$.

The method involves only the *relative* magnitudes of pressure amplitudes and the direct measurement of phase change. In the present application the pressure ratio is determined by altering a comparison source, and the phase is measured directly. The method involves only one simple absolute measurement and is a strictly acoustic method somewhat analogous to methods of measurement long used in electricity.

STATE UNIVERSTY OF IOWA,
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VARIATION OF THE INTENSITY OF THE SPECTRAL LINES OF MERCURY WITH THE VELOCITY OF THE EXCITING ELECTRONS

W. D. CROZIER

(ABSTRACT)

A study has been made of the variation of the intensity of the spectral lines of mercury when excited by impact of electrons of