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THE CALCULUS OF ULTRASONIC RESONATORS, USED TO PRODUCES VIBRATION HAVING HIGH ENERGY, BY APPLYING PROPAGATION RELATIONS THROUGH ELASTIC MATERIAL

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Rezumat. *Această lucrare prezintă o metodă pentru determinarea tensiunilor mecanice şi variaţia lor în cazul sistemelor de transmitere şi amplificare a vibraţiilor mecanice produse de transductoarele piezoelectrice de mare intensitate. Metoda permite rapid vizualizarea a 3 parametrii: forma de variaţie a secţiunii, forma de variaţie a amplitudinii de vibraţie (care se poate verifica prin măsurători cu un accelerometru, cu un microscop sau cu metoda descrisă în [2]) şi forma de variaţie a tensiunilor mecanice pentru orice variaţie de secţiune care poate fi descrisă printr-o ecuaţie matematică.*

Abstract. *This paper presents a method for the determination of mechanical tensions and their variations in the case of transmitting and amplifying systems for mechanical vibrations produces by high intensity piezoelectric transducers. The method quickly enables the viewing of 3 parameters: the shape of section variation, the shape of the amplitude vibration variation (which may be checked by measuring with an accelerometer, with a microscope or with the method described in* [2]*) and the shape of the mechanical tensions variation for any section variation which may be described through a mathematical equation.*

Key words: propagation equations, ultrasound vibration

1. Introduction

The method enables the drawing of the three variation shapes for any sections variation which can be mathematically described and for more complex systems formed by systems which transmit and amplify the ultrasonic energy vibrations.

2. Methods

The propagation relation of longitudinal plane waves through bars with variable sections is given by [1]:

$$\frac{d}{dx}\left[A(x)\cdot\frac{d\zeta}{dx}\right]=\frac{A(x)}{c^2}\cdot\frac{d^2\zeta}{dt^2}\text{ ; where }c^2=\frac{E}{\rho} \tag{1}$$

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