

ELLIPTICAL VIBRATORY APPARATUS
ABSTRACT OF THE DISCLOSURE

An elliptical vibratory apparatus comprises:

a first controller which includes at least a first phase shifter, a first high-gain amplifier and a first saturating element; a first power amplifier for amplifying an output of the first controller; a first vibratory exciter receiving an output of the first power amplifier for generating a first vibrational force in a first direction; a first vibrational system of an elliptical vibratory machine, receiving the first vibrational force; first vibrational displacement detecting means for detecting a vibrational displacement of a movable part of the elliptical vibratory machine in the first direction; a second controller which includes at least a second phase shifter, a second high-gain amplifier and a second saturating element; a second power amplifier for amplifying an output of the second controller; a second vibratory exciter receiving an output of the second power amplifier for generating a second vibrational force in a second direction; a second vibrational system of the elliptical vibratory machine, receiving the second vibrational force; a second vibrational displacement detecting means for detecting another vibrational displacement of the movable part of the elliptical vibratory machine in the second direction; a closed loop being formed by the first controller, the first power amplifier, the first vibratory exciter, the first vibrational system, the first vibrational displacement detecting means, the second controller, the second power

amplifier, the second vibratory exciter, the second vibrational system and the second vibrational displacement detecting means, the output of the second vibrational displacement detecting means being negatively fed-back to the first controller in the closed loop ;

wherein shift angles of the first and second phase shifters are so predetermined that there is a phase difference of 180 degrees between the output terminal of the second vibrational displacement detecting means and the input terminal of the first controller, when these terminals are cut off from each other, and a predetermined phase difference can be obtained between the vibrational displacements of the first and second vibratory systems for the optimum condition of the elliptical vibratory machine, the first vibratory system being self-excitedly vibrated at its resonant frequency and the second vibratory system being self-excitedly vibrated.