

Stress friction transmission and its use in precise instruments

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Precise instrument units are used in the drastic conditions of a synchrotron radiation beamline: high vacuum and hard radiation. Great accuracy of angular and linear movement is also needed. But here new requirements arise for using materials and consequently for conception of the precise mechanics. A new type of linear and angular transmission - stress friction transmission (SFT) was developed. There are some unique properties of the SFT: no clearance, small step (angular - 0.05", linear - 0.01 mkm), regulated transmission ratio, the possibility to transmit rotate and rectilinear motion into vacuum, and low price. The basic principle of the SFT is founded on making opposite sign stress (bending stress) in the contact zone of two bodies. The movement of the contact point occurs displacing bodies relative to each other. Changing of the deformation possibility produces a changing of the transmission ratio in the SFT. This property is very convenient, because it is possible to change the transmission ratio several times. A modification of the SFT is the stress friction wave transmission (SFWT). It was examined in detail for use as a high precision driver for angular movement. It was shown that the precision of the transmission is constant by automatically adjusting the transmission ratio. The equation for the "transmission ratio" was formulated. A prototype was fabricated to check the transmission. The results of the experiments have strengthened our theory.