DYNAMICS OF SOLID AND DEFORMABLE BODIES SYSTEMS AT COMPLEX MOVEMENTS

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In modern construction and mechanical engineering special acuity get problems of dynamics and durability of extend deformable systems, being components of devices and apparatus, making a complex movement in fields of forces of inertia and gravitation. Examples of such designs are orbital stations, space reflectors and aerials, elements of solar batteries and power stations, systems with solar sail. Necessity of stacking on time of transportation and deployment in destination make expedient application in specified designs of systems, made of solid bodies, flexible rods, plates and soft shells.

The behaviour of systems of solid and deformable bodies, consisting from solid bodies, connected flexible rods, rotating of flexible plates and soft shells, in central force field is described by complex systems of ordinary differential equations and equations with private derivatives, made in view of dependent from orientation of system of gravitational forces and forces of inertia.

Dynamics of space reflector with spherical reflecting surface, centre of weights of which moves on circular orbit in gravitational field is investigated. Geometrical parameters and amplitudes of free oscillations of reflector are determinated, at which the reflecting shell saves the given form.

Dynamics of controlled deployment of a reflecting surface of space reflector is investigated, the required plane form of which is supported by rotation. The reflector consists of the cylindrical central body and eight membrane sectors, united

with central body by cables [2,3]. In transport position the membrane sectors reeled up on the bobbins, which disposed in the central body. In necessary point of the orbit a central body untwists to a required angular velosity, after this the control deploiment of membrane sectors takes place.

Differential equations of an absolute and relative movement of reflector are constructed. With their help an intense condition of a membrane and deployment time of a reflecting surface is determined.

Problem about oscillations rotating with constant angular speed reflector with membrane reflecting surface, centre of weights of which moves on circular orbit in gravitational field is delivered and resolved. Differential equations, describing periodic movements of a membrane in a small vicinity of condition of stationary rotations are constructed. Gravitational forces and forces of inertia are accounted. Carried out researches have allowed to make a conclusion about opportunity of maintenance by centrifugal forces of small deviations of a membrane from plane form at movement of its centre of weights on circular orbit in central force field.

In communication with necessity of reorientation space reflectors in space a problem about oscillations of a circular flexible plate with central rigid insert [1], rotating with constant angular velocity concerning axis of symmetry, perpendicular it plane is resolved. An axis of own rotation of a plate makes plane turn with constant angular velocity. Results of research of oscillations of flexible plates at complex rotation have allowed to make a conclusion about essential influence to their amplitude of the size of a central insert and angular speed of turn of an axis of rotation.

Developed mathematical models, methods of theoretical research and the packages of the applied programs are introduced into practice of research and design organizations and are used at research of dynamics of extend space systems.

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