RESEARCH MOTION OF A PARTICLE ON THE INNER SURFACE OF A VERTICAL CYLINDER, WHICH PROVIDES ROTATIONAL AND TRANSLATIONAL MOTION

M. Klendiy, Ph.D.

Separated subdivision NUBiP of Ukraine «Berezhany Agrotechnical Institute»

The movement of material particles on the plane, which performs rectilinear oscillatory motion, thoroughly considered Acad. P. Vasilenko. This is considered as a horizontal plane and inclined from the horizontal oscillations transverse vibrations and oscillations in the direction of inclination of the plane. P. Zaika considered spherical particle motion in the horizontal plane, which performs translational vibrations in a circle. The movement of material particles on the plane that carries circular oscillating motion was first unleashed M. Zhukovsky in a geometric interpretation analytically studied Jia-Shu-Huayem generalized and extended to the case of elliptic vibrations II Blehmanom.

The purpose of research - the study of the movement of material particles on the inner surface of the vertical cylinder which performs rotational movement around its axis, and the point of the axis in the forward movement describing horizontal circle.

The system of differential equations that describe the motion of a particle on the inner surface of the vertical cylinder which rotates on its axis and additionally performs translational vibrational circular motion in the horizontal plane. For its solution was applied numerical methods of integration using Simulink system package MatLab.

The problem of determination of kinematic characteristics of the particle, its relative motion along the inner surface of the cylinder, which also is in two movements: translational and rotational. The cylinder rotates around its vertical axis, and the axis performs translational motion so that each point it describes a circle in the horizontal plane. If the rotational motion of the cylinder is missing, the same circle describes each point of the cylinder.

It is shown that increasing the angular velocity of rotation of the cylinder ωts around a vertical axis on the value of ω (angular velocity axis translational movement of points on a circle) can go to the planetary motion of the cylinder, considered in the work. In a completely different approach in the preparation of differential equations (add translational and rotational movements in and add two rotational movements, as well as various independent variables in these equations) obtained the same results for the same absolute movement points cylinder.

Also shown that under certain initial conditions (falling particles to the desired starting point with the required magnitude and direction of the relative velocity), it moves with constant velocity relative sliding in a spiral cylinder.

Analytical description of the movement as a partial solution of differential equations. Failure initial conditions described particle moves by other trajectories with variable speed sliding and possible temporary "sticky" at some points of the trajectory.