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IMPROVEMENT OF THE CAM-DISC CLUTCH DESIGN FOR THE MILLING MACHINE

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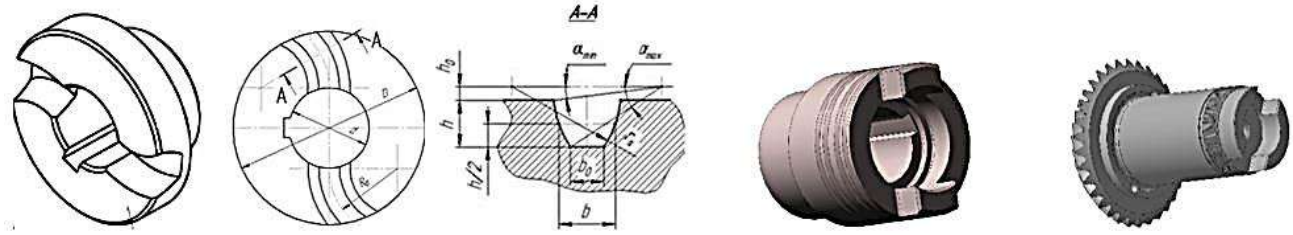
Phenomena occurring in the kinematics of motion transmission from an autonomous drive to a vertical spindle head in the presence of radial displacement of coaxial shafts are investigated. Research of a more advanced design of a Double-Slider Clutch (DSC), which provides an increase in the accuracy of processing and the reliability of the operation of a metal-cutting machine was carried out. The main idea is connected with the search for constructive solutions to increase the contact area of its components, which results in the intensity decrease of the working surface wear and a decrease in the level of stress in the contact.

A general view of an improved version of the DSC design is shown in Fig. 1 [1]. Its difference lies in the fact that the slots on the clutch halves and the cams on the disk being congruent surfaces are made in the longitudinal direction along the arcs of circles (longitudinal modification). At the same time, the profiles of the cams and slots in the normal section (transverse modification) are also outlined by an arc of a circle with a radius r_n (Fig. 1, c.)



a b c d e

Fig. 1 – DSC design: a – half-clutch; b, c – contact geometry; d, e – 3D models

An analytical form to determine the main parameters of the DSC-modified design according to the criterion of the side faces strength of the cams/slots has been created. The main parameters are the radii of the longitudinal line of the cams/slots and their profiles in the normal section; corners of the profiles at the top, etc. A feature of the proposed geometry is the displacement of the profile circle center relative to the line of the maximum width of the cam/slot by a multiple of their height.

It is shown by calculation that the improvement of the cams on the clutch halves and the slots on the disk reduces the bearing stresses on the contact surfaces by 14% and 25% without changing the overall dimensions of the clutch.

Reference:

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