

ADJUSTMENT ACCURACY PARAMETERS OF FACE MILLS

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The variants of customization mechanisms design for setting adjustable face mills in the radial and face directions are presented.

The use of modular face mills on machine-building enterprises reaches 25% of the total amount of the assembly cutting tool. At the same time the most common are assembly face mills, consisting of interchangeable modules, the use of which reduces the production costs. The use of assembly modular construction mills is due to their high reliability and precision surface machining of parts. The design of modular face mill has been developed [1] and on the basis of the mill structure a cutting block lays [2]. The reliability and accuracy of the mounting cutting block design in the body module and the cutting insert in the cutting block is considered in [3].

An assembly mill can be provided with the adjustment module [4], allowing more to expand technological capabilities of the cutting tool. The adjustment module allows [5]:

- firstly, to provide a turn of cutting insert at a front angle with simultaneous change of location vertices diameter of cutting inserts and its face layout,
- secondly, to adjust over a wide range the cutting blocks layout relative to each other,
- thirdly, to adjust cutting edge angle λ by rotation of cutting block around its axis.

Thus there can be implemented progressive schemes of flat surfaces parts cutting [5]:

1. With the machining allowance division between cutting edges of tool by the cutting edges step arrangement of insert, for example, «peakless» schemes of blades step arrangement along the tool rotation axis to increase the resistance; schemes with blade arrangement in a helical or curved line in the planes parallel and perpendicular to tool axis of rotation to increase productivity and quality of treatment;
2. With the machining allowance division between cutting edges by adjusting of diameter cutting inserts arrangement of vertices in a plane perpendicular to the tool axis of rotation;
3. Cutting with cutting block chaser, which allows the formation of high-quality surface of the part, both a plane parallel and perpendicular to the tool axis of rotation.

Milling cutter design allows you to adjust it to the optimum diameter to the required geometry. Fig.1 shows some variants milling cutter adjustment to the required diameter D and front angles φ и φ_1 of cutting insert by rotation of the adjustment module in the body module, and changing cutting blocks layout H in adjusting module.

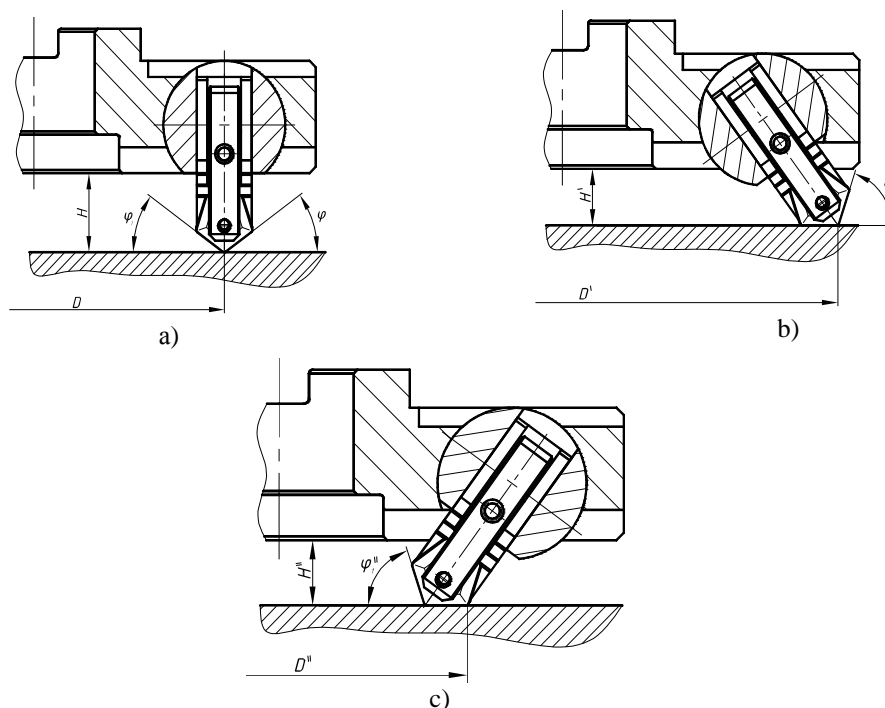


Fig. 1. Configuration variants of adjustable face mills in the radial direction

Fig. 1, *a* shows milling cutter design with arrangement the cutting block on the long side perpendicular to face of milling cutter body, wherein applying the different cutting inserts allows changing front angle φ .

Fig. 1, *b* shows the cutting block which unwrapped the outside of milling cutter body, and it enables the processing of greater width workpiece surface and adjusts the value of front angles φ и φ_1 .

Fig. 1, *c* shows the cutting block which unwrapped the inside of milling cutter body, and its also allows you to adjust the size of the processed surface of the workpiece and the geometric parameters of the tool.

Fig. 2 shows some possible adjustments variants in the face direction of the cutting block.

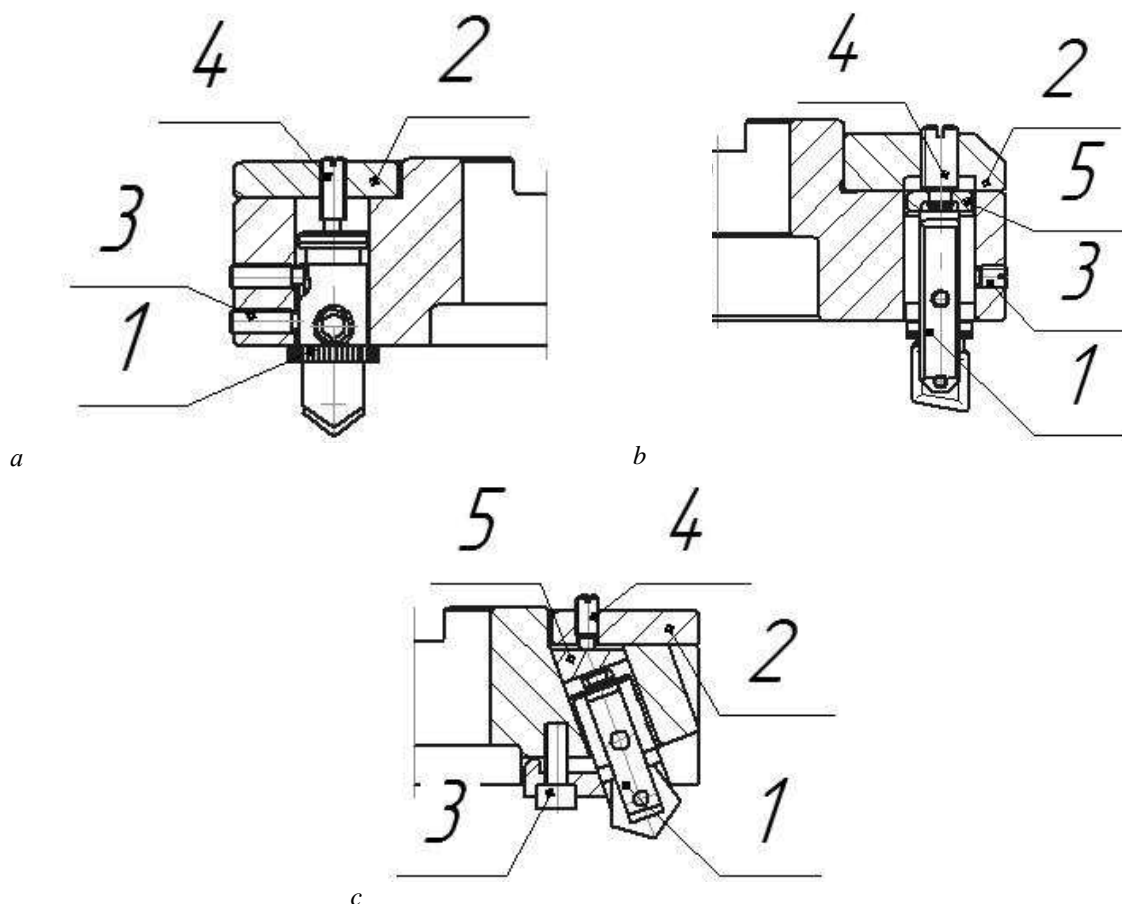


Fig. 2. Configuration variants of adjustable face mills in the face direction

Fig. 2, *a* shows the variant with screw 4 that is screwed into the body 2 of the cutting tool with the arrester in the end of cutting block 1.

Fig. 2, *b* shows the variant in which for the adjustment is used screw 4 screwed into the body 2 of the cutting tool and in contact with the cutting block 1 through the sleeve (washers) 5. Variants of this design may vary depending on the performance of screws and constructions of fixing and mounting cutting of blocks 3. The use of the sleeve 5 promotes the redistribution of load on the cutting block 1 and the smoothness of its movement.

Fig. 2, *c* shows the variant which involves moving blocks by screw 4 and the wedge 5. Variants of this design may vary depending on the constructions of wedges 5, adjusting screw 4 and fastening element of blocks 3. Using of the wedge 5 provides smooth movement of the cutting block 1.

Meanwhile, for all variants shown in Fig. 2, it is possible to change the adjustment accuracy for roughing, semi finishing and finishing milling. This can be achieved by the use of screws with thread corresponding accuracy. The usage of the combinations of the adjustment mechanisms which have been shown in Fig. 1 and 2, leads to an expansion of technological capabilities of modular mills and reduce the overall range of cutting tools.

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