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FORMATION OF BLOCK-MODULAR FACE MILLING CUTTERS WITH ADJUSTMENT OF GEOMETRIC BLADE PARAMETERS

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Design variants of adjustment models for adjusting cutting blocks in block-modular cutting tools and adjustment variants of face milling cutter in the radial and axial directions are considered. Possible variants for adjusting mechanisms and forming scheme of block modular face milling cutters with adjustment of the geometric blades parameters are proposed.

Currently, leading manufacturers of face milling cutters have a tendency to create cutting tools that consist of interchangeable structural elements. At the same time, in many such designs it is possible to adjust the accuracy and geometric parameters of the cutting tool due to additional interchangeable structural elements and modules.

But it is worth noting that in foreign instrumental systems the use of intertype modularity, which allows to use the same blocks and modules not only in milling cutters, but also in other types of tools, such as turning tools, countersinks, drills, etc., is difficult.

In this regard, the creation of modular cutting tools, in particular, face milling cutters, consisting of blocks and modules unified for different types of tools, and having a technological design for the conditions of any tool production, which, despite the lack of precision in the manufacture of individual elements, by adjusting the geometric parameters of the blocks and modules ensures, the achievement of the specified accuracy of the cutting tool and, therefore, specified parameters of manufactured products, is relevant.

Designs of block modular cutting tools have been developed [1-6] based on a unified cutting block. Experimental studies of the reliability and stiffness of fastening cutting inserts and cutting blocks have been conducted [7-8].

To reduce the nomenclature of block-modular face milling cutters, it is proposed to use a tool with adjustment of the geometric parameters of the blades in the end and radial directions.

For *n* directions of adjustment and m variants of precision execution, you can get:

$$K = n \cdot m$$

variants of adjustment mechanisms.

If the options for the face (F), radial (R) and face-radial (F–R) directions of adjustment and coarse (C), precise (P) and increased accuracy (IA) precision execution options are taken into consideration, various adjustment mechanisms can be attained depending on the direction and accuracy of adjustment. Such possible variants are presented in the diagram (Fig. 1):

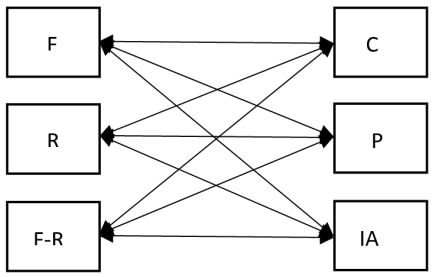

Figure 1. – Possible variants for adjusting mechanisms

Bearing the following notation:
CI – type (geometrical form) of cutting inserts,
CB – cutting block designs,
CM – clamping module designs,
AM – adjustment mechanism designs, which are divided into
AMER - (adjustment mechanism designs for runout adjustment),
AMRR - (adjustment mechanism designs for radial runout adjustment)

AMERR - (adjustment mechanism designs for end and radial runout adjustment),
HM – housing module designs,
BMFMC – block modular face milling cutter designs, were received:

1. Generalised code for forming adjustable block-modular face milling cutters:

$$CI \cup CB \cup CM \cup AM(AMER \cup AMRR \cup AMERR) \cup HM \rightarrow BMFMC$$

2. Scheme of forming adjustable block-modular face milling cutters in tabular form (Fig.2)/

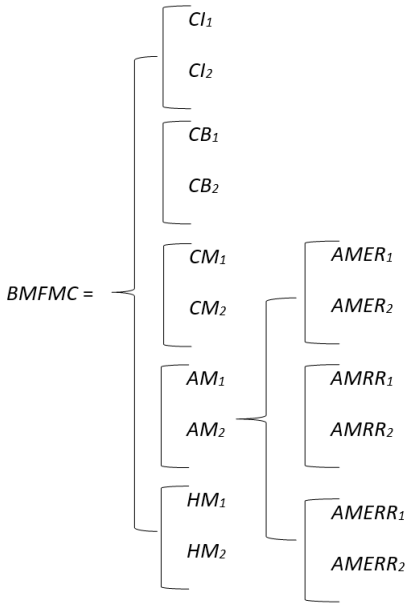

Figure 2. – Scheme of forming adjustable block-modular face milling cutters

Based on the proposed code and the scheme for forming block-modular face milling cutters, designs of block-modular face milling cutters with various variants for adjusting geometric parameters have been proposed. The proposed scheme for the formation of block-modular face milling cutters can simplify the work with a wide range of elements as it is easy to formalise and, therefore, to automate the design process of tools.

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