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IMPROVING OF FIXING SYSTEM OF CUTTING PLATES IN BLOCK-MODULAR CUTTING TOOLS

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The paper present research system of fixing cutting plates and blocks in block-modular cutting tools.

Reliability teams cutting tools to a large extent determined by the reliability of fixing plates in the housing. There are many designs of clamping mechanisms, taking into account the working conditions of the cutting tools and features for their manufacture. These systems reflect the current trends in the design of cutting tools: high precision of manufacturing of cutting plates, the closed grooves and precisely manufactured to accommodate the cutting plates, the cutting plates clamping mechanisms with a minimum number of structural elements, such as a screw or a lever. The implementation of such systems in terms of domestic production tool is not always possible, as it requires special equipment and precise, high-quality components elements. Therefore urgent to establish a system fixing cutting plates technological conditions for domestic production and not inferior to the best foreign systems reliability.

The system of fixing cutting plates, including the following key elements (Fig. 1): the cutting plate (pos. 1) is set to open width direction groove cutting block (pos. 2). Fixing module of (pos. 3) is configured as a "T-shaped" strap, "the horizontal shelf" which is introduced into one part of the cutting plate hole and is pressed against the front surface of the cutting plate, while the other part is brought into contact with the bevel of the cutting block. The "horizontal shelf" of "T-shaped" strap is installed by planting in open longitudinal groove the cutting block. "Vertical shelf" of strap is designed as a screw threaded into "horizontal shelf" of strap and installed in the "oval-shaped" hole of the cutting block. When the strap screw is performed simultaneous movement of strap in horizontal and vertical directions, and the strap of the cutting plate on the base, the side surface and the hole.

In the proposed system, the grooves are made open and reliability of fixing of cutting plate is provided except moves in radial, axially and tangentially relative to the machined surface of the work piece.

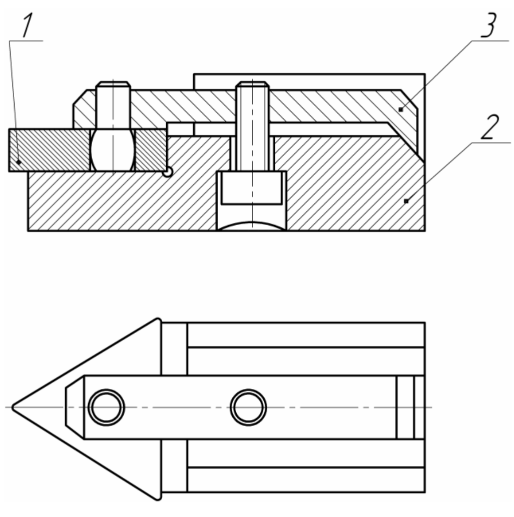

Fig. 1. The system of fixing cutting plates

The design of the cutting block (Fig. 2) includes a cutting plate with hole installed into the transverse open groove relative to the geometric axis of the housing at a certain angle α. Clamping of plate provided a "T-shaped" strap placed in an open longitudinal groove of the housing of block and having formed at an angle α "strapping planar part" and "support part" in the form of plane or spherical surface. In the strapping part is a pin incoming hole of cutting plate. Strapping planar part in contact with the front surface of the cutting plate and support part – with a flat surface of the housing of block arranged at a predetermined angle ψ. Clamp of strap by using screws threaded into it and freely entering the "oval-shaped" hole in the housing of block.

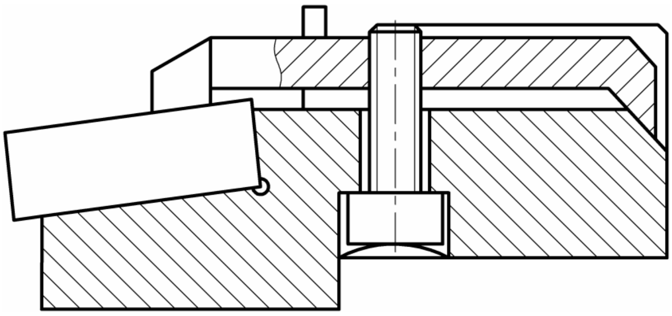

Fig. 2. The design of the cutting block

Proposed design of cutting block differs from known analogues following:

1. Clamp made T-shaped as opposed to most similar found structures (the L-shaped). And strapping part has «leverage» smaller than the reference.
2. Clamp is placed in a groove of the housing on the landing provides free movement in the longitudinal direction and fixed in the transverse, i.e. clamp works as a "yoke", the retaining plate on the transverse displacements.
3. Strapping part has a bevel at an angle α, the value of which is chosen as the value of the posterior angle of the cutting plate and a few adjusted for self-locking angle for the contacting materials.
4. The supporting part is performed flat or spherical and contacts with beveled angle ψ plane of housing of cutting block, whose value is chosen based on the possibility of longitudinal displacement of strap.
5. Pin included in the planting to hole of strapping part and has a spherical end (part of the hole of cutting plate).
6. Clamping screw enters freely into the housing bore and is slid able transversely direction in relation to its axis.
7. Housing of block is cylindrical, allowing its installation in the housing module whole tool and clamp two hollow cylindrical elements with radius "samples" of the corresponding cylinder of the housing, and a tightening screw them.
8. Design of elements of clamping as cutting plates and housing of cutting block provides action of clamping forces on the direction of the cutting force components that ensures additional sampling possible gaps in the design of the cutting process.

Fixing system of the cutting block in the housing module (Fig. 3) also technological and reliable. Cutting block mounted on the cylindrical surface in the hole, where previously through the other hole entered into one element of the clamping mechanism ("cotter"). Then introduced another "cotter" and both "cotter" tightening screws, thus providing reliable clamping of cutting block between two "cotters" and exclusion of movement of cutting block in all directions. The exact location of "cotters" relatively cutting block considers direction acting on cutting plate cutting forces – clamping force directed along the cutting forces, which eliminates gaps in the contact elements during vibration system.

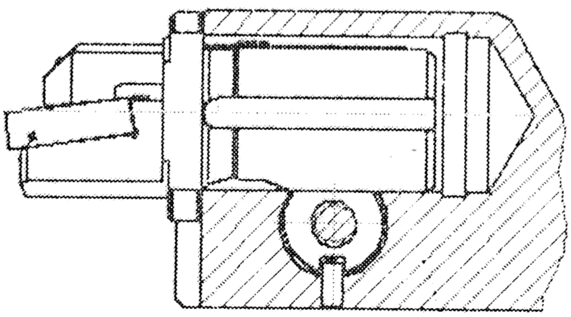

Fig. 3. Fixing system of the cutting block in the housing module

Thus, the reliability of the proposed design of block-modular cutting tools is dependent on the accuracy of performing linear and angular parameters of the components, material selection and details of the heat treatment, and compliance with the sequence of assembly and adjustment tool.

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RESEARCH OF PRESSURE DROP AND EFFICIENCY OF NEW DESIGN OF VALVE TRAY

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The article represents a new type of valve tray which is used in tray columns. This type is the result of optimization of the common valve tray. This article includes a design of a new type of the valve tray and experimental results of its efficiency and pressure drop which are illustrated in the diagrams.

Separation of mixtures is considered a major operation in the chemical industry and related branches of production. Separation processes based on the principles of mass transfer require effective columns to approach the perfect separation of mixtures. Trays, random packing, or structured packing can be used inside of columns. They use different mechanisms of mass transfer, but the main feature for all is a good approach to equilibrium through the generation of large amounts of interfacial area. This interfacial area results from the passage of vapor through the perforations of trays, or the spreading of liquid on the surface of packing [1]. The choice between a tray and backed column for a particular application can only be made with complete assurance by costing each design. However, this will not always be worthwhile, or necessary, and the choice can usually be made, on the basis or experience by considering main advantages and disadvantages of each type like. For example, tray column can be designed to handle a wider range of liquid and gas flow-rates than packed towers; packed columns are not suitable for very low liquid rates and the efficiency of tray can be predicted with more certainty than the equivalent term for packing and we usually get a higher efficiency in trays than in packing. For these and many others reasons, we have preferred column trays [4].

The bubble-cap tray is a flat perforated plate with risers around the holes, and caps in the form of inverted cups over the risers. The caps are usually equipped with slots or holes through which the vapor comes out. Sieve tray is a flat perforated plate. The most common type of tray is a valve tray [2]. In valve trays, perforations are covered by lift able caps. Vapor flows lift the caps, thus creating a flow area for the passage of vapor. The lifting cap directs the vapor to flow horizontally into the liquid, thus providing better mixing than it is possible in sieve trays.

Sieve and valve trays have comparable capacity, efficiency, entrainment, and pressure drop. Bubble-cap trays have lower capacity and efficiency, and higher entrainment and pressure drop than sieve and valve trays. The cost of bubble-cap trays is the highest. Sieve trays are the least expensive, but valve trays do not cost much higher than sieve trays. Maintenance, fouling tendency, and effects of corrosion are the least in sieve trays, although they are not much greater for valve trays. In general, bubble-cap trays are mainly used in special applications. For most other services, either sieve or valve trays are the best choice. Sieve trays have advantages when the service is fouling, or corrosive, or when turndown is unimportant, while valve trays are preferred when turndown is essential. With high energy costs, the energy saved during even short turndown periods usually justifies the relatively low cost difference between valve and sieve trays. This has made valve trays most popular in the industry [2, 3].

For these reasons we have chosen valve tray for developing and designing a new type of valve tray. We will pursue the following optimization goals: high efficiency, low moderate pressure drop, high capacity, and low cost.

Principle of work of the tray is shown at the following (Fig. a). The valves will move up and down in response to changing vapor flow rates. At normal flow rate, the valve is roughly in the middle position. At low vapor rates, the valve settles over the perforation and covers it to avoid liquid weeping. The valves should be heavy enough to prevent excessive opening at low vapor flow rate. As the vapor rate is increased, the valve (1)