UDC 621.91.01/02

MODERNIZING THE TECHNOLOGY OF PRODUCTION OF PARTS USING BORING CUTTING TOOLS

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Increasing the efficiency of production of cutting, auxiliary tools and technological equipment is closely linked with the development of technology, technique and organization of the main production of the enterprise. It is very important that the tempos of technical progress of instrumental production don't lag behind, but correspond or even outstrip the pace of the technical development of the main production. Tool production promotes the introduction of advanced technologies in the enterprise, being its technical base [1].

The main directions of development of instrumental production lie in the spheres of activity related to the process of designing the newest tool designs, the tool selection system for a given technological process, with a qualitative choice of the technological process of manufacturing the tool, the optimal conditions for its operation. In this connection, it is possible to single out the following main directions [2-4]:

1. Increase the requirements for the accuracy of form-building and auxiliary tools. It's necessary to revise the existing normative documentation for the accuracy of tooling, according to which the designer assigns accuracy parameters in the design, as well as increasing the accuracy of the tool making, which requires improvement of instrumental technology, the use of new high-precision modern equipment and monitoring tools.

2. Increasing the requirements for the durability of cutting tools in high-speed processing with an increase in the cutting speed of blade tools to 30 m / s, grinding - up to 150 m / s. This requires the use of new instrumental materials, such as highly dispersed and alloyed hard alloys, complex and powder high-speed high-temperature steels, carbide steels and super hard materials. Increasing the durability is largely provided by wear-resistant coatings of the working part of tools and cutting plates to them.

3. Creation of new designs of cutting and auxiliary tools for high-speed machining. Such tools should have beating of cutting edges not more than 0,010 ... 0,003 mm, balancing devices for minimizing vibrations, new fixing methods (for example, clamping devices), new high-strength and vibration-resistant materials for the execution of hull parts of cutting tools and auxiliary tools.

4. Development of designs of prefabricated and block-modular tools with replaceable polyhedral plates from hard alloys, including such tools as drills, counter bores and sweeps. To this end, it's necessary to develop new designs for cutting and supporting plates, to increase their precision in manufacturing, to reduce the roughness of the surfaces of blades, to create new ways of fastening the plates, to develop new recommendations on their geometry and to increase their flexural strength. As an example, carbide-tipped plates with a special front surface shape can be cited providing the chip breaking process, taking into account the material of the part, the type of machining and the cutting modes.

5. Creation of new designs of grinding tools, such as grinding wheels with an oriented arrangement of cutting grains, high-alloy wheels, circles with cutting grains from new super hard materials and synthetic diamonds. Development and application of new ligaments, increasing the durability and stability of the circle. It's also necessary to increase the requirements for accuracy and non-equilibrium of circles capable of providing high-speed processing.

6.Equipment of technologies based on non-traditional methods of processing, new tools and devices. To such methods it is possible to carry ultrasonic processing of materials, including drilling, turning, reinforcing the work on machine tools with CNC; high-speed turning of steels and alloys of high hardness (HRC 70), including the imposition of vibrations from the hydraulic slide and ultrasonic head; final (finishing) treatment instead of grinding with a blade tool equipped with a hard alloy, monocrystalline diamond, natural and artificial; vibration milling; vibration; vibroabrasive processing; vibration-hardening treatment with the use of a vibratory slide and an ultrasound head; high-speed laser cutting of sheet material up to 3 mm thick (up to 30 m / min); precise laser cutting of steel billets up to 25 mm thick; laser drilling holes up to 0.2 mm in diameter; laser welding.

7. Development of computer-aided design tools (CAD-I) systems based on modern computers and graphic systems with the development of simulation of projected objects in virtual mode, which allows to provide visualization of the design process, achieving design optimization, high accuracy of profiling. For this, such systems are used as solid-state modeling, geometric-kinematic method for running-in of tools, the method of

aligned sections for threading tools and in the processing of screw grooves with constant or variable pitch and etc.

An example of intensive development, including instrumental production, is MAZ, which has won recognition of its products not only in Belarus, but also far beyond its borders. Within the framework of the practice held at this enterprise, it was proposed to modernize the technological process for manufacturing the MAZ-9506 car lift body (Figure 1).

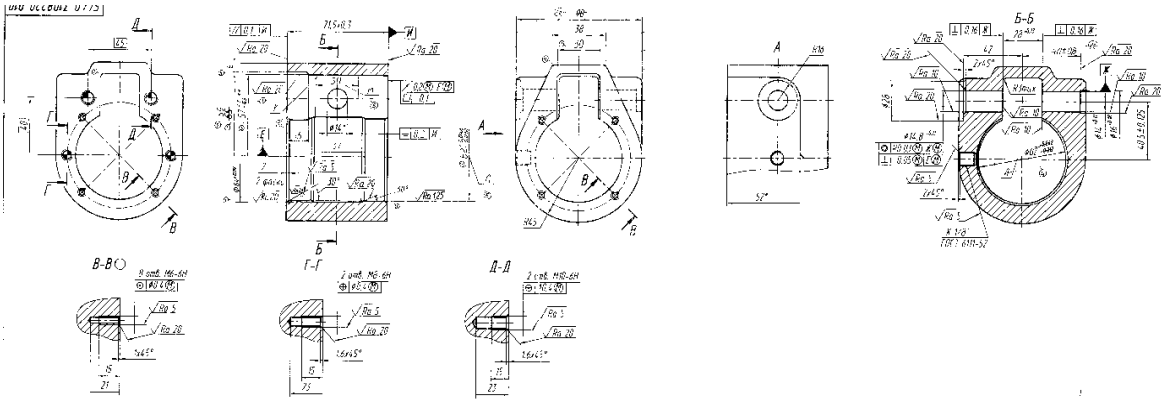

Fig. 1. The body of the MAZ-9506

MAZ 9506 is a two-axle semitrailer truck, which is designed for transportation of a wide range of loose goods as part of a road-train with a truck-tractor equipped with hydraulic equipment, on all types of roads. One of the proposals for modernizing the technological process was to reduce the cost of the coordinate-boring operation for boring the exact main hole $\cap\ 62^{+0.042}_{+0.012}$ It was proposed to replace the existing cutting tool – the boring cartridge of a foreign company Sandvik Coromant (Sweden) by much cheaper analogue existing in Belarus. Having considered various options, a boring cartridge was proposed which was developed in the framework of the regional scientific and technical program "Innovative Development of the Vitebsk Oblast" by the educational institution "Polotsk State University" in conjunction with the open joint-stock company "Orsha Tooling Plant" (JSC "OIZ") (Figure 2) [5].

Interchangeable composite inserts with super-hard tool materials can be used as a cutting blade in the boring chuck, consisting of a holder and a cutting blade fixed by soldering or gluing. Basically, these incisors of the insert correspond to GOST 25487 "Boring cutters with carbide inserts with cylindrical shank for coordinate boring machines". It should be noted that the opening of the mechanism for installing the boring tool must be maximized in terms of setting the range of the tool to be installed. Smaller sizes can be installed by using adapter cylindrical bushings, the outer diameter of which corresponds to the diameter of the hole in the boring chuck and the inner diameter of the connecting cutter.

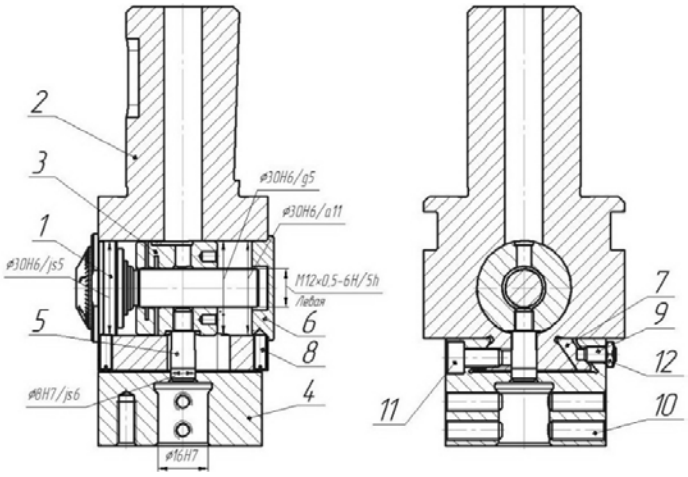

Fig. 2. Boring chuck

The movement mechanism of the tool in the boring chuck in the holder includes an accurate closed on both sides groove that provides precise orientation in space relative to the axis of the base mandrel. The design of the tool moving mechanism should have minimal dimensions, accurate and rigid fixation in the direction of the acting cutting forces, which leads to the complication of the structures of individual structural elements, due to overlapping and overlapping functions of various parts of the boring cartridge.

At present, JSC "OIZ" produces various technological equipment, including boring cartridges. But competition with leading Western firms forces the plant to transform and find new ideas to reduce the cost of producing cutting tools, which leads to a reduction in costs for the products of the main production of MAZ. To do this, it was proposed to improve the existing technological process of processing the basic component "Tool slide" of the boring cartridge (Picture 3).

The technological route for the workpiece "Tool-slider" includes the following operations:

005 Lathe

Lathe model 16K20

010 Milling

Vertical milling machine model 6R10

015 Coordinate-boring

The machine of coordinate-boring model 2421

020 Sanding

Surface grinding machine model 3G71

025 Sanding

Grinding machine model 3D756

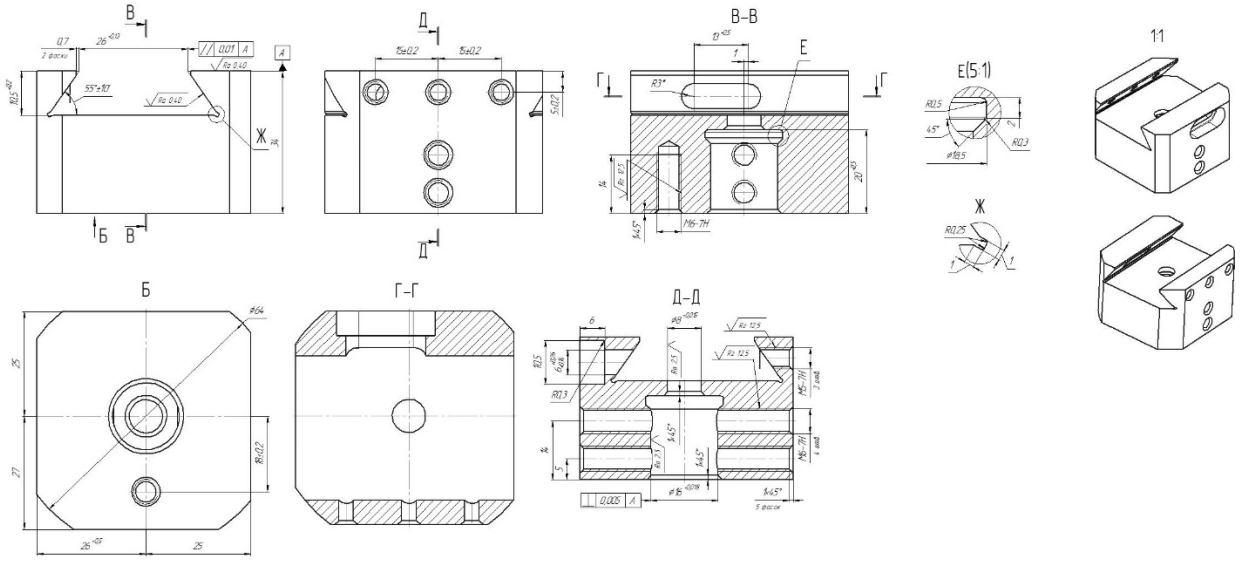

Fig. 3. Slide tool

Modernization of the technological process in comparison with the existing one consisted in reducing the number of used equipment, reducing the main time, and as a result of the reduction of the total labor intensity and the price of the products. Replacement of three universal machines: screw-cutting lathe 16K20, vertical milling 6P10 and coordinate-boring 2421 to the machining center ROBODRILL α-LiB series allowed to reduce the laboriousness of manufacturing the part and reduce the price of the boring cartridge as a whole.

The use of a domestic boring cartridge in the manufacture of the hoist housing reduces the cost of the tool, improves the accuracy and quality of the processing

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