American Journal of Science and Learning for Development

ISSN 2835-2157
Volume 2 | No 12 | Dec -2023

Stamps for Pressing the Body of Picobur and Shoroshka Details

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Abstract: *the article describes the works that are being carried out in the field of design and production of tools for drilling rocks, provides the results of theoretical and experimental research. Shown are the proposed schemes of punches for producing bit forgings.*

Keywords: *radial extrusion, die, punch, deformation, stamp.*

Scientific research on the design and production of rock crushing tools is being conducted in many scientific centers and universities. Including "Volgaburmash", "Uralburmash" (Russia), Huges Christensen, Reed Hycalog (USA), TIX (Japan), DDZ (Ukraine), National Research Technological University "MISiS", Russian National Gas and Oil University named after IM Gubkin (Russia), "UZLITNEFTGAZ" JSC and Navai Mining and Metallurgical Combine (Uzbekistan).

The Central Production Base under JSC "UZBEK GEOLOGICAL EXPLORATION" is currently one of the largest enterprises producing drilling equipment and spare parts in our Republic. At present, the company manufactures drill bit, picobur, paw and other details by mechanical processing method. When producing complex details in this way, the waste output reaches 50-60%. In the era of developing science and technology, the demand for quality products is increasing again. At the same time, the minimum consumption of material in production is becoming an urgent problem.

a) b)

d)

Figure 1. Details produced at the Central production base of "UZBEK GEOLOGICAL EXPLORATION" JSC: a) paw, b) drill bit d) picobur

The Central Production Base under JSC "Uzbekgeologkidiruv" exports its products to all regions of the Republic of Uzbekistan and Central Asian countries. There is a demand for drilling equipment from the Republic of Uzbekistan in such enterprises as "NKMK", "OKMK", "Uzavtoroad", "Uzbekistan Railways".

Based on the introduction of drilling details produced by the Central Production Base of JSC "Uzbekgeologkidiruv", reducing the purchase of drilling details from abroad and localizing the production was defined as one of the main tasks.

The design department of the Central Production Base of Tashkent State Technical University and "Uzbekgeologkidiruv" JSC is designing high-performance parts in cooperation.

For example, in order to increase the service life of the "Pikobur" detail, reduce material consumption, and increase its economic efficiency, a compression method of volume stamping in a hot state was proposed. A stamp project was developed for volumetric stamping (Fig. 2).

In practice, there are direct, reverse, radial and combined types of extrusion. This method can reduce metal consumption by 10-15%. As a result of plastic deformation, the surface of the detail is refined. This increases the resistance of the detail to wear and external forces.

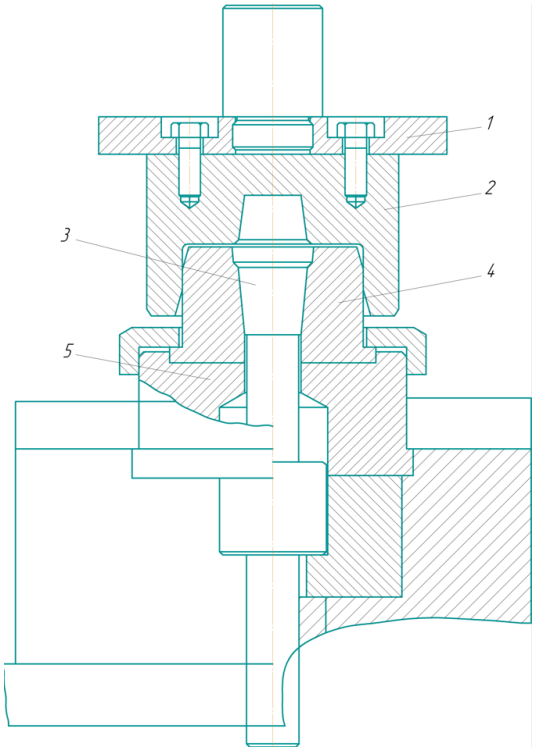

Figure 2. Pikobur extrusion stamp project. 1-top plate, 2-punch, 3-die, 4-matrix, 5-bottom plate.

According to the proposed method, a workpiece of the required size is cut from a cylindrical rod made of steel 40X material. The cut workpiece is dimensionally stamped in a hot state using a stamping device. The stamped semi-finished product is subjected to machining operations to obtain the required surface accuracy and to open holes.

The principle scheme of the stamp for radial extrusion is presented in Fig. 3. The stamp is fixed on the upper moving plate 7 with a punch 4 and a bushing 5 covering it. In addition, the half-matrix 3 is attached to the plate 7 with the help of pullers 6. The lower plate 12 houses the lower half-matrix. in the cavity of the semi-matrix 10, an anti-punch mover 1 is installed, which is covered by a bushing 11. When these matrices are combined with each other, they form a spherical working space. A lever 2 is installed to tightly press the two matrices together (Fig. 3).

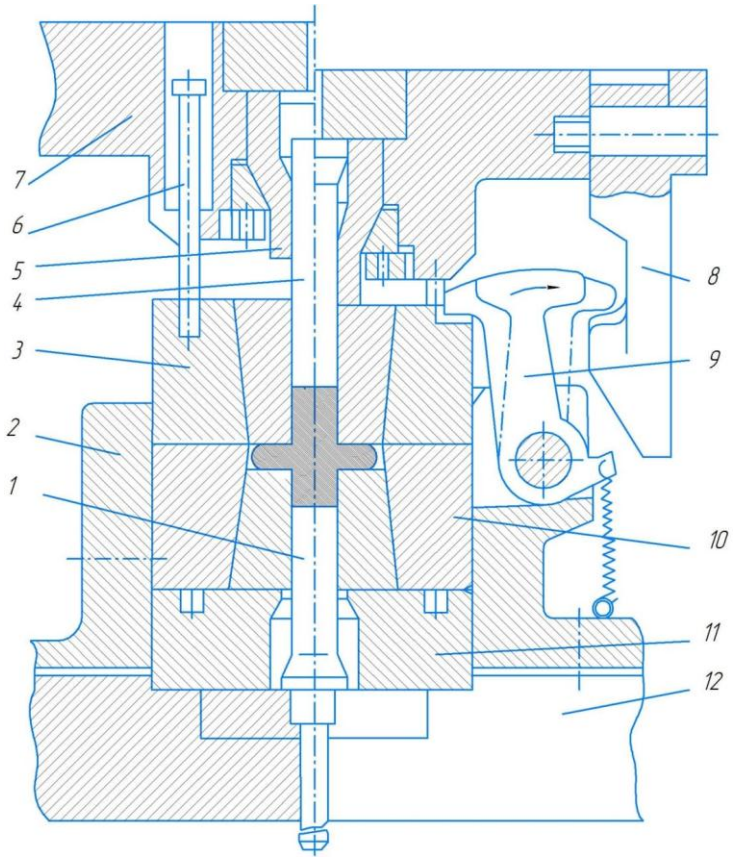

Figure 3. A typical diagram of a press designed for radial extrusion .

Scalloped drill bits can incorporate a variety of roller cone bits. Usually the number of bits can reach up to six. Each sphere has one, two or three cones, and the axis of rotation can be shifted or not shifted relative to the drool (Fig. 4).

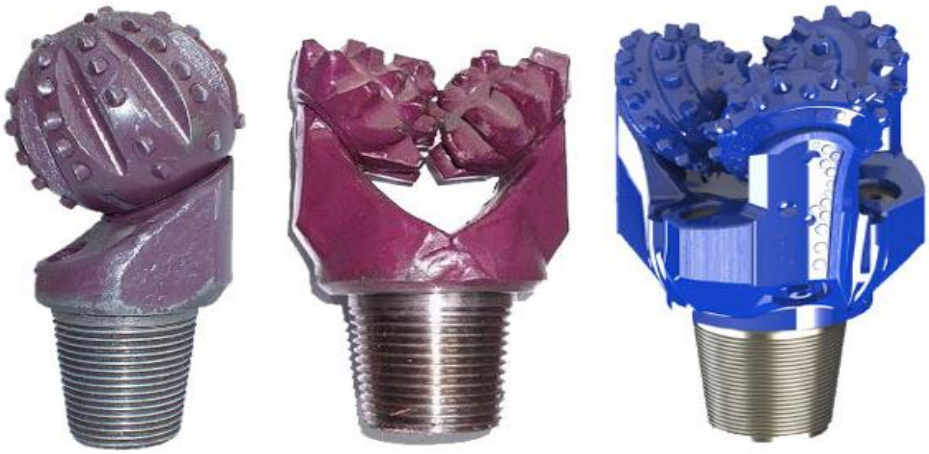

Figure 4. One-, two- and three-pointed dolots

According to the results of the study, the state of stress and the main technological parameters in the process of pressing the bits detail proposed by the authors were determined (Fig. 5). 20% less deformation stress is required for the reverse extrusion process than for the extrusion process in a cylindrical matrix . Accordingly, the stability of the stamping tool increases and expands the areas of use of the extrusion process.

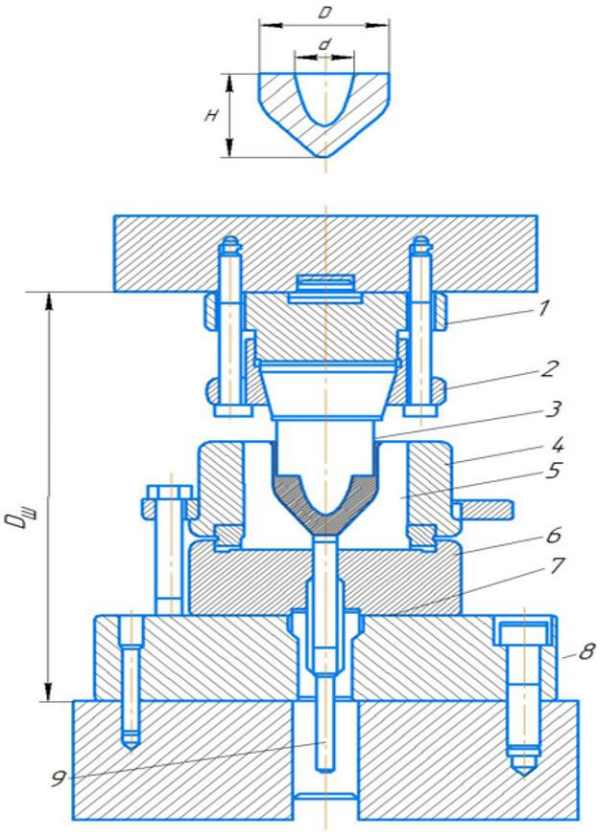

Figure 5. A sample closed stamp scheme. 1-punch plate; 2-punch holder; 3-punch; 4-matrix screen; 5-section matrix; 6-matrix subplate; 7-centering bushing; 8-stamp plate; 9-pusher

Stamping dies have been used for a long time and effectively in the manufacture of equipment in stamping equipment. According to the results of production practice and research, high-speed copiers and hammers are effective in stamping the curveship presses, steam-air hammer deposits and the stamp equipment itself. Engravings of stamps are made with 0.1-0.3 mm margin for final mechanical processing.

Workpiece deposit is prepared based on the dimensions of the container (slope angle 1.5°), and grooves are made instead of engravings. This reduces the deformation stress. The work was carried out in the following sequence: the mechanically processed workpiece was sent to be heated in a gas furnace. In order to prevent smoldering, the upper part of the workpiece is covered with zinc-coated metal. The heated workpiece is placed in the master-stamp container and punched three times with a tension of 18000 kgs·m. The interval was 35 seconds.

Figure 6 shows the scheme of the master stamp.

It should be noted that the mass of the matrix workpiece subjected to deformation may be several times greater than the mass of the detail produced in this equipment. In particular, the package of matrices seen above was equal to 35 kg.

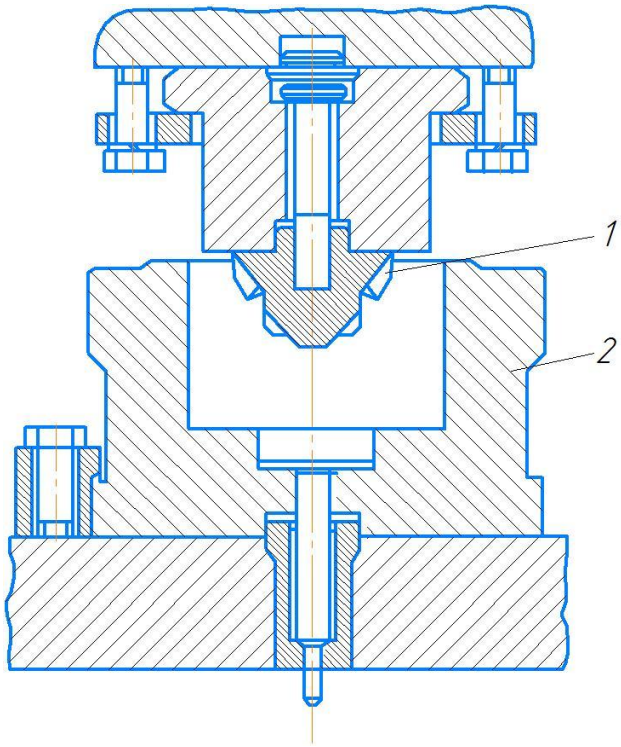

Figure 6. Master stamp scheme. 1-detail; 2-stamp

Based on recommendations, master punches should be made of 9XS steel. In this case, steel HRC 48-52 is obtained, and surface roughness corresponds to classes 9-10. As a result, the stability of punches is 1.5 times higher than the stability of punches made of 5XNM steel.

Before heating, the surface of the matrix is rough - this corresponds to classes 9-10. As a result, the surface formed is rough - this is suitable for 7-8 classes.

Recommended lubricant: 40 silver graphite and 60% motor oil.

By stamping the engravings, the time spent on the preparation of the equipment is reduced by 3-4 times.

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