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SURFACE TREATMENT OF SMALL DIAMETERS ON THE 16C20 MACHINE MACHINING OF SMALL DIAMETER SURFACES ON THE 16K20 LATHE

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Abstract
This article examines the process of workpiece positioning during the reaming of various deep holes. This process enhances surface cleanliness and ensures high processing quality. When forming deep holes with small diameters, it is advisable to use methods that provide high precision, surface smoothness, and improved machinability of parts while maintaining their hardness at a level of at least HRC≤445. Such methods include reaming and broaching.

Keywords: Reaming, Drilling, Taps, Counterbores, Boring Tools, Lathe Machines.

Introduction

1. In mechanical engineering, it is a machine tool designed mainly for processing parts with rotating surfaces. It makes up the main group of metal-cutting machines. With the help of a lathe, it is possible to turn surfaces, cut internal and external threads, drill, countersinking (finishing drilled holes), boring holes, threading with dies and taps, as well as lapping parts.
The main movement is made by the workpiece (initial part), the auxiliary movement is made by the cutting tool (cutter). The workpiece rotates from the machine spindle, which receives movement from the gearbox, and the cutter moves with the slide slide using the lead shaft or lead screw (when threading). The lead shaft and lead screw are driven by the feeding mechanism of the lathe.

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There are different types of lathes: center, threading, turret lathes (with a turret), single-spindle and multi-spindle, carousel (with a spindle located vertically), multi-cutter and others.

Lathes are divided into conventional, universal, as well as automatic and semi-automatic with numerical control (CNC). Conventional and universal lathes are used for one-off and small-batch production, while automatic and semi-automatic lathes are used for mass (large-scale) production.

The main parts of the lathe are: base with tray for collecting chips and coolant, bed, caliper, tailstock (movable) and their guides, headstock (fixed) with gearbox and spindle, feed box, apron, carriage, cross sled, swivel part for attaching the cutter, electric motor. The carriage and cross slide can be moved manually or automatically.

A lathe motor is a single- or multi-speed induction motor. In some cases, other drives are also used, for example, hydraulic drives. At present, large enterprises mainly use automatic and semi-automatic lathes with numerical control (see carousel, turret).

2. A wood lathe is similar to a metal cutting machine, but it is designed to process wooden parts with rotating surfaces. It can be with the workpiece fastening in the centers or with side fastening.

Machining of Small Diameter Deep Holes in Mechanical Engineering

Machining of deep holes of small diameter (d = 1...3 mm, l = 4...100 mm) is one of the most difficult technological tasks in mechanical engineering. This is especially evident when it is necessary to achieve high accuracy and cleanliness of processing. At present, in various branches of manufacturing enterprises, when processing deep holes of small diameter in various metals and alloys, the methods of drilling, countersinking and reaming are widely used. However, there are certain technological challenges when machining deep holes.

Therefore, it is advisable to use the technology of deployment (drilling) during the final processing of holes. However, the lack of substantiated proposals and recommendations for the use of this technology, as well as the insufficient number of scientific studies in this area, require further study and solution of this problem. An important task is to identify technological shortcomings and defects in the

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deployment process, develop recommendations for improving equipment and technology, introduce advanced methods in production to increase the service life of tools and increase labor productivity.

The main tasks that arise in the processing of deep holes by the manching method are the analysis of the causes of the above problems and their solution. In this regard, the following tasks were set:

1. Analysis of methods for processing deep holes of small diameter;
2. Study of tool materials used in the machining of small diameter deep holes;
3. Optimal selection of methods that ensure high accuracy and cleanliness of deep hole machining.

Analysis of Small Diameter Deep Hole Machining Methods

Small diameter deep hole machining methods

When machining deep holes of small diameter (d = 1...3 mm, L = (4... 100)(d) The following methods are used in various metals and alloys: drilling, electrochemical machining, EDM stitching. Laser and cathode beam methods are also used to pierce holes.

Drill materials used in drilling include high-speed steels and carbides. In addition, drills with a carbide cutting part are used, as well as unidirectional drills with an internal supply of coolant and lubricant [1].

Standard twist drill bits made of high-speed steel are used at depths of $h \leq 20d$. In this technology, chips are removed by periodically removing the drill bit from the hole, resulting in a decrease in productivity. To increase productivity, it is advisable to use specialized drilling machines with automated feeding [3].

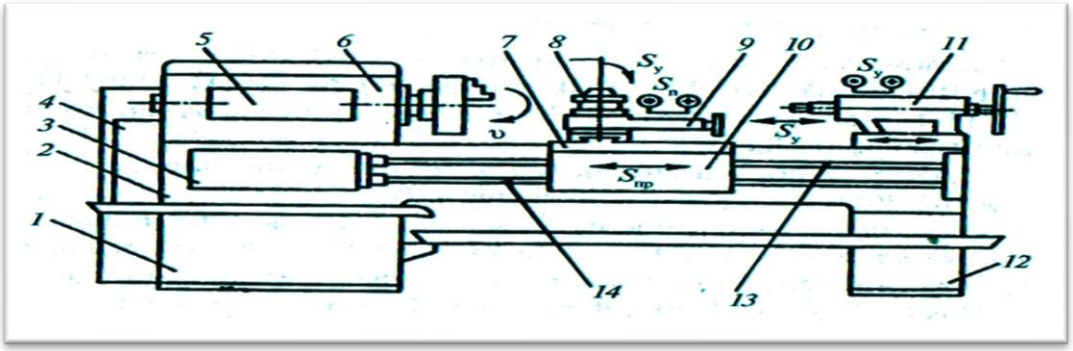

Figure 1-1. 16K20 machine for machining small holes of small diameter.

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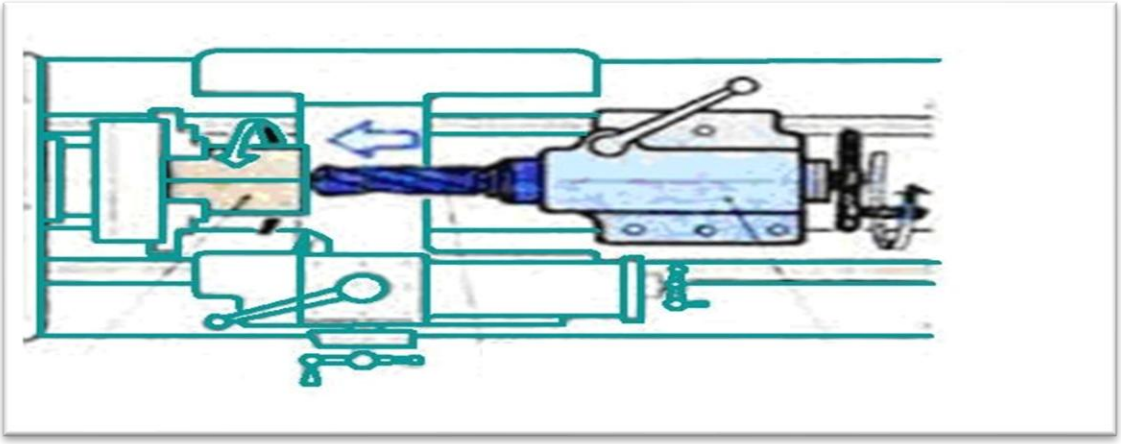

Figure 1-2. Hole deployment – ball deployment; b – single-tooth deployment; c – single-tooth deployment with a guide; d – multi-tooth deployment with a guide; d – multi-tooth deployment with a guide and a reverse shank; e – multi-tooth mandrel with stretching; ж – two-tooth press mandrel.

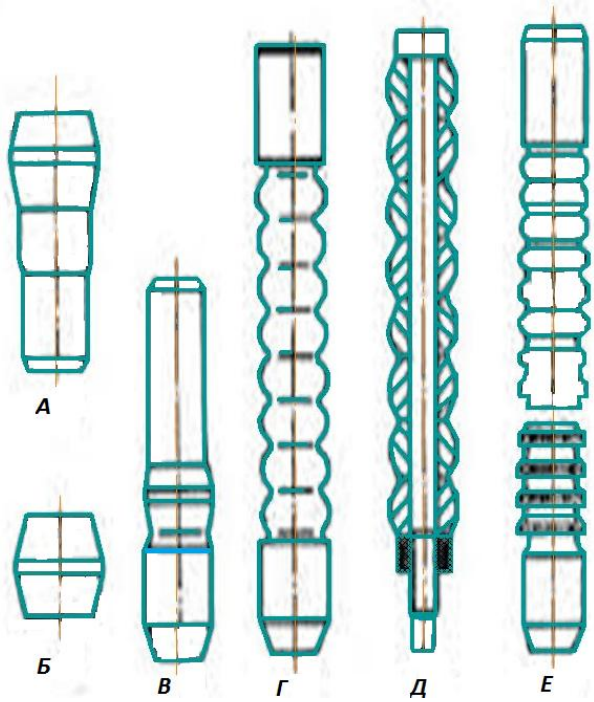

Figure 1.3. Stitching and broaching – single-tooth stitching;
b – single-tooth stitching; c – single-tooth stitching with a guide; d – multi-tooth stitching with a guide; d – broach with a multi-tooth guide; e – multi-tooth stitching with a guide and a reverse shank.

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The working part of the stitches and broaches has a cylindrical band connected to two conical sections. The optimal cone angle is 6...10°, the thickness of the cylindrical tape is 0.1...3 mm [4].

It is advisable to make piercing and broaching from hard alloys, as they have high hardness and prevent mutual sticking of the tool and the processed material. Tools with a diameter of d ≥ 10 mm are made prefabricated. The materials of the tools are hard alloys of the VK grade (VK6, VK8, VK15, VK20) [2].

One of the main parameters of the technological process of reaming is the tension and the number of cycles of tooth deformation. These parameters allow you to determine the degree of deformation of the workpiece and affect the final result. Increasing the total tension and decreasing the tension on the tooth leads to a deterioration in the accuracy of the hole and an increase in surface roughness.

The cleanliness of the treatment during deployment is slightly affected by the speed in the range of 1-30 m/min.

Cooling and lubricant (OSM) has a huge impact on the deployment process. It reduces the tension between the tool and the surface layer, and also reduces the deforming force.

Structural carbon and low-alloy steels are used.

When machining holes in stainless, high-alloy steels and alloys with mandrels, special lubricants containing epoxy compounds, graphite, molybdenum disulfide and boron nitride are used.

In general, when performing the technological process of deployment, the accuracy of the holes is (IT6... IT7), surface roughness – (Ra = 0.05...0.1 μm) [5].

Findings

1. Machining of deep holes of small diameter (d = 1...3 mm, l = 4...100 mm) in mechanical engineering is one of the most difficult technological tasks.

2. For machining deep holes of small diameter (d = 1...3 mm, L = (4... (d) Drilling, electrochemical and electrical discharge piercing techniques are used in various metals and alloys. Laser and cathode beam methods of piercing holes are also used.

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