

## «EFFICIENCY OF MULTI-CUT SHAFT MACHINING ON A LATHE»

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### ANNOTATION

The article describes the methods of processing stepped shafts on lathes, the choice of method and cutting tool, the method of processing stepped shafts using thrust cutters is described in detail.

**Keywords:** Stepped shafts, coaxiality, perpendicularity of ledges, through thrust cutters, multi-cutting machining.

### INTRODUCTION

When processing smooth shafts, grinding on cylindrical grinding machines was considered, using oscillating grinding, which made it possible to preserve the cylindricity of the shafts to the greatest extent.

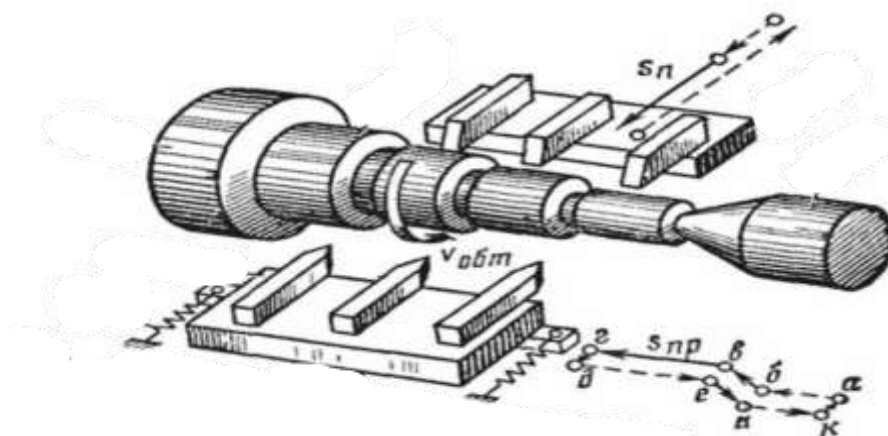
Stepped shafts are also widespread, these are shafts with several sections of different diameters and lengths.

In the case of stepped shafts, machining of each shaft step requires cutting, which is carried out on a lathe.

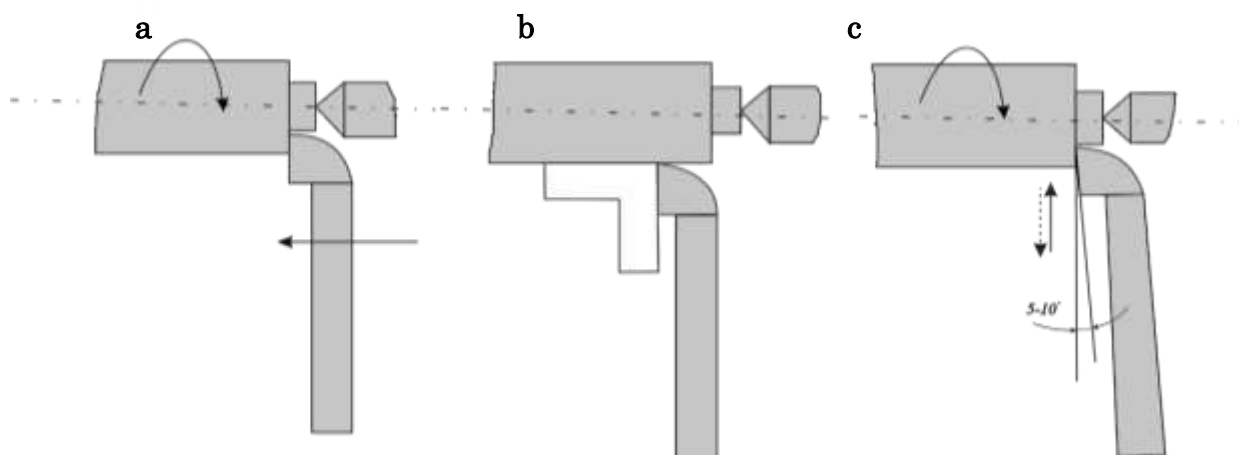
Stepped shafts come with one-sided or two-sided stepping, the accuracy of their processing is subject to such requirements as: coaxiality of cylindrical sections and perpendicularity of the ledges to the axis of the shaft.

The coaxiality of surfaces with one-sided stepping can be ensured by machining them in one setting in the chuck or with back center support. This eliminates the influence of installation errors on the accuracy of the location of the surfaces. Parts with double-sided stepping are turned in two installations and finished, as a rule, in centers. If the difference in the diameters of the steps is significant, it is recommended that they be roughed with a more rigid installation - in the chuck and the rear center.

It is more correct to process stepped shafts on machines of the turning group, since they have the ability to carry out several operations at the same time. This will require a multi-cutter setup.



To achieve the perpendicularity of the ledges to the axis of the part, the processing of stepped shafts is carried out with through thrust cutters. At the end of turning, they can cut a ledge of small height, up to about 5 mm, with a longitudinal feed. The cutter in this case is mounted on the machine so that the main cutting edge is perpendicular to the axis of the part along the square. Higher ledges are cut with a transverse feed. In this case, the cutter is set so that the angle between the main cutting edge and the ledge plane is  $5-10^\circ$ . (fig.2)



To use cutters with a lead angle of  $90^\circ$  between the steps of the stepped shaft. The quill in the body is mounted at an angle of  $15^\circ$ , and the transition ledges on the copier have an inclination to the axis of  $75^\circ$ . Therefore, the cutter moves away from the part in a direction perpendicular to its axis.

To reduce the processing time of stepped shafts, it is advisable to draw up and observe a rational sequence for their turning and a constant longitudinal position of the workpieces on the machine.

For the manufacture of stepped shafts in large batches, a noticeable increase in labor productivity can be achieved by setting the lathe along the longitudinal and transverse stops. The constant longitudinal position of the workpieces on the flock can significantly reduce the time spent on test readings and length measurements when manufacturing parts in batches. To do this, the left end of the workpiece is pressed against an adjustable stop screwed into the sleeve and fixed with a lock nut. The stop in assembled form is installed in the conical hole of the spindle. For the same purpose, the end face, ledges or undercut of the cams of a lathe chuck can be used.

When choosing and operating through cutters, one should also take into account their different resistance (the time of direct work from sharpening to regrinding). Under equal conditions, thrust cutters are less resistant, having a sharper and less durable top, prone to overheating. In universal work, through-cutting cutters are used for both rough and fine turning. For rough cutters, the top is rounded with a radius of  $r = 0.5-1$  mm, for finishing cutters,  $r=1.5-2$  mm. Moreover, with an increase in the radius of curvature of the top, the roughness of the treated surface decreases.

The longitudinal stop is fixed on the front guide of the frame. Its position is set during the manufacture of the first workpiece, in which the linear dimensions are maintained according to the marking or limb. To process several steps on the part, measuring tiles are placed on the

bed guide between the stop and the carriage of the caliper. Short stepped surfaces are processed using multi-position adjustable drum-type stops.

An example of turning a stepped shaft with a longitudinal stop and measuring tiles is shown in fig. The step is turned until the caliper approaches the tile. Having removed it, they grind the step until the moment when the caliper rests against the tile. After that, the tile is removed and the step is turned directly to the stop.

Automatic shutdown of the mechanical feed of the caliper when approaching to the stop is carried out by the safety mechanism of the apron, designed for a certain feed force. On machines that do not have such a mechanism, the feed should be turned off a few millimeters before the caliper approaches the stop. The remaining length is processed by moving the caliper manually. If this condition is not met, machine failure is inevitable.

Cross stops are located on the caliper. Their fixed part is fixed on the carriage, the movable part with an adjustable rod - on the cross slide. To process several steps of different diameters, measuring tiles are installed between the parts of the stop according to the height of the ledges. When using such stops, the handwheel of the transverse movement of the caliper should be turned smoothly without applying significant effort, otherwise, due to the deflection of the parts of the stop, the set size will go astray.

### LITERATURE

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