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"EXPEDIENCY OF PROCESSING SHAFTS AND STEPPED SHAFTS WITH THRUST CUTTERS"

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ABSTRACT: *The article describes the methods of processing stepped shafts on lathes, the choice of method and cutting tool, describes in detail the method of processing stepped shafts using thrust cutters*

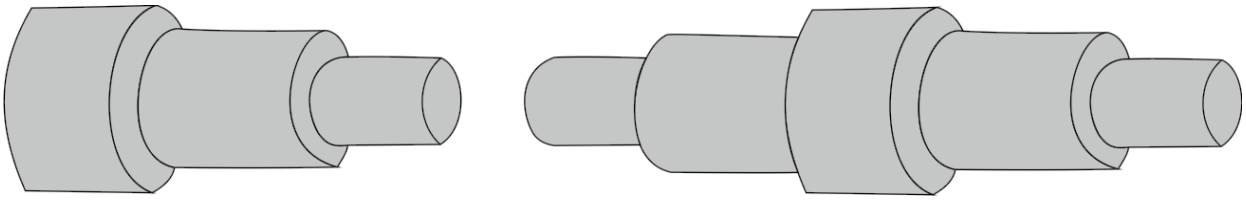
Keywords: Stepped shafts, alignment, perpendicular ledges, through thrust cutters.

When processing smooth shafts, grinding on circular grinding machines was considered, using oscillated grinding, which made it possible to preserve the cylindrical nature of the shafts in the greatest way.

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

In the case of stepped shafts, processing of each stage of the shaft requires processing with a cutter, which is carried out on a lathe.

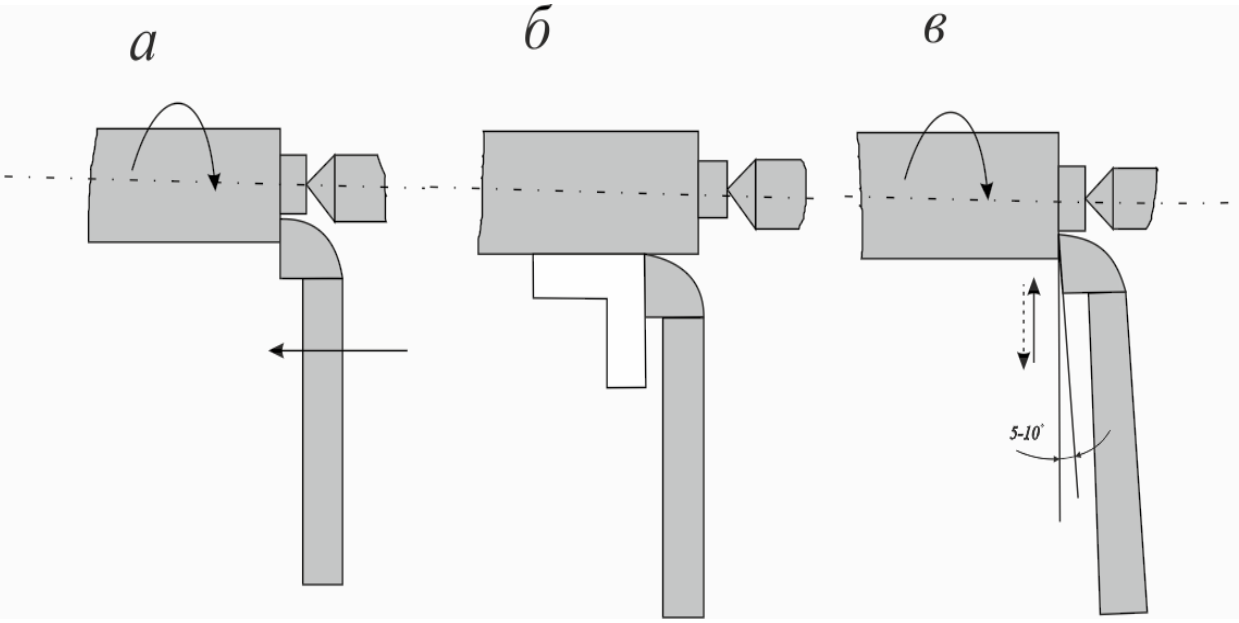
Stepped shafts can be with one-sided or two-sided stepping, such requirements are imposed on the accuracy of their processing as: the alignment of cylindrical sections and the perpendicular of the ledges to the shaft axis. (fig. 1.)



The alignment of surfaces with one-sided stepping can be ensured by processing them in one installation in a cartridge or with support from the rear center. This eliminates the influence of installation errors on the accuracy of the location of surfaces. Parts with double-sided stepping are ground in two installations and finally processed, as a rule, in the centers.

If the difference in the diameters of the steps is significant, roughing them is recommended to be carried out with a more rigid installation — in the cartridge and the rear center.

To achieve the perpendicular of the ledges to the axis of the part, the processing of the stepped shafts is carried out with through-thrust cutters. They can be used at the end of grinding to trim a small ledge with a longitudinal feed, up to about 5 mm. In this case, the cutter is installed on the machine so that the main cutting edge is perpendicular to the axis of the part along the square. Higher ledges are cut by a transverse feed. The cutter is set so that the angle between the main cutting edge and the plane of the ledge is 5-10 °. (fig. 2)

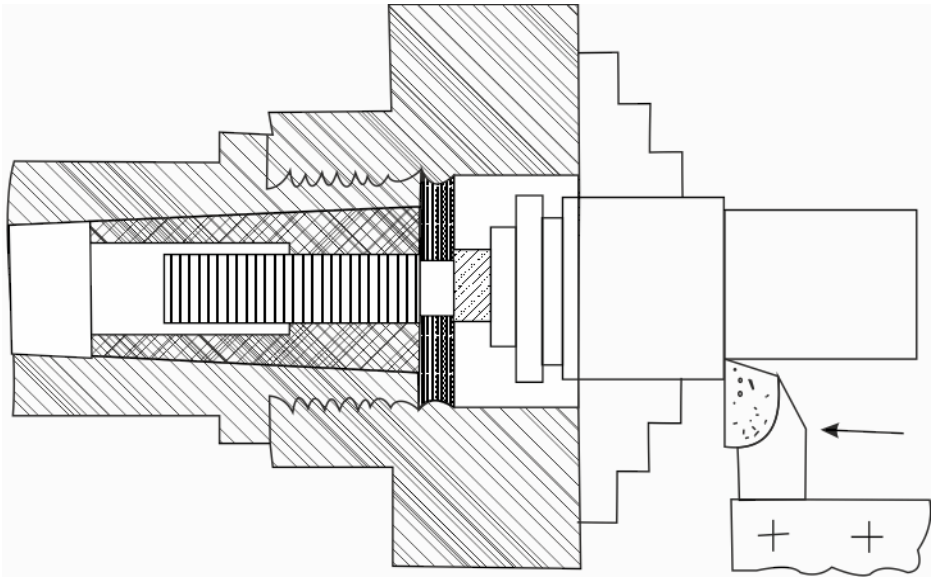


In order to use cutters with an angle of 90° between the steps of the stepped shaft. The pinole in the housing is installed at an angle of 15 °, and the transition ledges on the copier have an inclination to the axis of 75 °. Therefore, the cutter moves away from the part in a direction perpendicular to its axis.

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

For the manufacture of stepped shafts in large batches, it is possible to achieve a noticeable increase in labor productivity by adjusting the lathe along the longitudinal and transverse stops.

The constant longitudinal position of the workpieces on the stack allows you to significantly reduce the time spent on trial counts and length measurements during the manufacture of parts in batches. To do this, the left end of the workpiece is pressed to an adjustable stop screwed into the sleeve and fixed with a lock nut. The assembled stop is installed in the conical hole of the spindle. For the same purpose, the end face, ledges or turning of the cams of the lathe chuck can be used. (Fig.3)



When choosing and operating through-hole cutters, their different durability should also be taken into account (the time of direct work from sharpening to overfilling). Under equal conditions, thrust incisors are less resistant, having a sharper and less durable tip, prone to overheating.

For universal work, through-hole cutters are used for both roughing and finishing turning. In rough cutters, the vertex is rounded with a radius r = 0, 5-1 mm, in finishing ones - r = 1, 5-2. Mm. Moreover, with an increase in the radius of rounding of the vertex, the roughness of the treated surface decreases.

The longitudinal stop is fixed on the front guide frame. Its position is set during the manufacture of the first part to be processed, in which the linear dimensions are maintained according to the marking or limb. To process several steps on the parts between the stop and the carriage of the caliper, dimensional tiles are laid on the frame guide. Short stepped surfaces are processed using multi-position adjustable drum-type stops.

An example of grinding a stepped shaft using a longitudinal stop and dimensional tiles is shown in Fig. The step is ground down to the approach of the caliper to the tile. After

removing it, grind the step until the moment when the caliper rests against the tile. After that, remove the tile and grind the step directly to the stop.

Automatic shutdown of the mechanical feed of the caliper when approaching 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.

The transverse stops are located on the caliper. Their fixed part is fixed on the carriage, movable with an adjustable rod - on the transverse sled. To process several steps of different diameters, dimensional tiles are installed between the parts of the stop, according to the height of the ledges. When using such stops, the flywheel of the transverse movement of the caliper should be rotated smoothly without significant effort, otherwise, due to the deflection of the stop parts, the set size will be lost.

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