THE EFFICIENCY OF DISTANCE SLEEVE ADJUSTABLE AT MILLING WITH BORE MONOBLOC CYLINDRICAL MILLING CUTTERS

Ефективность использования регулириемого дистанционного рукава при обработке с моноблочними цилиндричними фрезами на фезерными станками

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Abstract: *This paper work presents a simple construction of an adjusting distance sleeve with a screw – nut mechanism that is used at precise positioning of the bore monobloc cylindrical millings. The paper work presents also the efficiency of using the adjusting distance sleeve described above to the milling of the pieces on the universal milling machines or of those with C.N.*

By introducing within the milling's structure this device, we increase the milling processing productivity by substantially reducing the dismounting, sharpening, mounting and adjusting non cyclic auxiliary time of the millings, within the admissible wearing limit for the tool's durability.

The dimensional processing precision through pieces milling within the tolerance area written on the drawing is assured by the precise axial adjustment of the milling cutter at micron values quote.

KEY WORDS: EFFICIENCY, PRODUCTIVITY, DURABILITY, WEARING, SHARPENING, ADJUSTING, DISTANCING DEVICE, MILLING CUTTERS.

1. Introduction

To obtain a minimal spends cost on each operation, the generation of the used surfaces within machines construction mast be done in the shortest time possible, with a as big as possible productivity.

The chip removal processing productivity is limited by the possibility to process the chipped material, by the chipping qualities of the tool, by the tool machine, by the quality and the automation level of the technological systems.

To optimize the chipping process regarding the productivity criterion is needed to have the knowledge about the possible values that can be reached as well as the dependence that productivity has on the chipping process parameters.

2. Increasing productivity at milling by increasing the auxiliary time

From the relation (1) that defines the chipping productivity through the number of pieces realized within time unity,

$$p = \frac{l}{\tau_{buc}} \quad [buc/\min] \ (1)$$

we conclude that if τ_{buc} is smaller the productivity is as big. From the time analyses on each piece τ_{buc} as in relation (2)

$$\tau_{buc} = \tau_b + \tau_a = \tau_b + \tau_{ac} + \tau_{anc} \quad [\min] \ (2)$$

where τ_b is the base time; τ_{ac} and τ_{anc} , the non cyclic and cyclic auxiliary times.

The auxiliary times include the preparing of the work place, the activity shutdown, the organizing and technical attendance, fixing and delivering blanks, fixing and delivering tools, refreshing the chipping qualities of the tools, the approaching and retreating tool-piece, the cinematic adjustment of the tool machine, starts, stops, inter faze control.

To achieve a as big as possible productivity is necessary that the time on any piece τ_{buc} to be as little as possible. That

$$\tau_b = \frac{\pi \cdot D \cdot L_p \cdot A}{1000 \cdot s \cdot v \cdot t} \quad [\min] \ (3)$$

$$\tau_{ac}, \tau_{anc} = f(T) \ (4)$$

from relation (4) that underlines the link between real productivity and ideal productivity at diverse values of the auxiliary times, qualifiedly presented in fig.1, results that the highest values for maximal real productivity are obtained on modern machines with performing chipping tools, that assure low values for τ_{ac} and τ_{anc}.

$$P = \frac{P_0}{1 + P_0(\tau_{ac} + \tau_{anc})} \quad [buc/\min] \ (5)$$

where P_0 is the ideal productivity for τ_{ac} and τ_{anc} null.

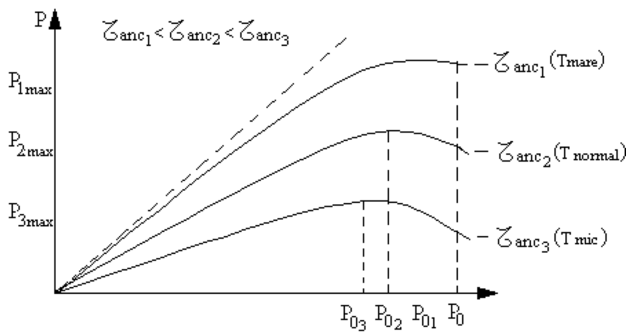

Fig.1The real productivity P quality diagram according to the Ideal productivity P_0

The optimal value for the ideal productivity P_0 from fig.1, assuming that τ_{ac} =ct and $\tau_{anc} = f(P_0)$ is obtained from:

$$\frac{\upsilon P}{\upsilon P_0} = 0 \ (6)$$

The non cyclic auxiliary times used to refresh the tools chipping quality and to the quote adjustment of the milling cutters are obtained from:

$$\tau_{anc} = \tau_r \cdot \frac{\tau_b}{T} \quad (7)$$

where τ_r is the time consumed to a tool chipping quality refreshment, obtained by using the chronometer. T is the tool's durability in minutes.

The influence that non cyclic auxiliary times have upon productivity is obtained from relation:

$$P = \frac{l}{\tau_b + \tau_{ac} + \tau_{anc}} \quad (8)$$

An efficient reducing measure of the non cyclic auxiliary time τ_{ac} within the milling process is to introduce within the chipping tool's structure distance sleeves with micrometric adjustment at quote.

3. The increasing of the precision adjustment at quote of the bore millings using the distance sleeves with screw-nut mechanism.

The tool adjustment is a process through witch with the help of a device, the value of a determined size is fixed to a tool dimension according to a size unity.

Through adjustment we bring the tool to dimension to process the pieces by chipping within tolerances limit written on the draw. The main condition concerning the adjustment devices is that the tools have to fit perfectly to compensate the modifications resulted from wearing and repeated sharpening. In practice are used diverse constructive solutions for the devices, from simple changes to fine adjustments.

The main characteristics of those devices are:

-The simple adjustment of the tool outside the tool machine;
-The rigid replacement of the tool;
-Big precision at cuttings position repeatability at the tool replacement;
-Repeatability of the cuttings most advantaged geometric characteristics;
-A tool extremely precise adjustment at micron values.

The simple construction of a precise quote adjusting devise of the bore monobloc millings with screw-nut mechanism, build and tested by authors, in conformity with brevet nr. 102722 Ro, is presented in fig.2 also having an application to the quote adjustment of the coupled cylindrical milling cutters.

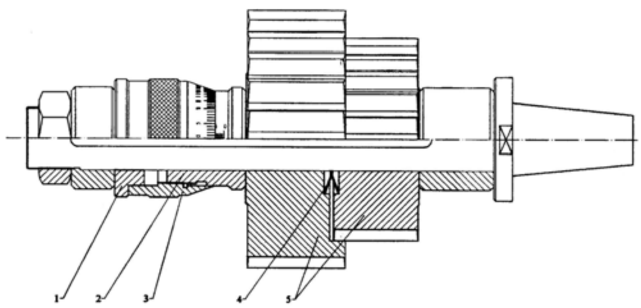

Fig.2 A distancing device with micrometric adjustment

The tested device has a bushed bearing 1 with a fix shoulder and key channel opposed to a bushed bearing 2 with key channel and exterior thread with fine step, all included in a barrel bolt nut 3 threaded on one portion and witch acts upon bushed bearing 2 being supported by it's own non threaded part on the bushed bearing 1's shoulder.

Nr. 2 bushed bearing's movement is read on a gradated scale drawn on the cylindrical part, where also is the indices materialized by the bushed bearing 3's wearied edge, auctioning with it's frontal upon milling 5 that has disposed in a frontal recess un elastic compensatory element 4.

The gradated scale has divisions of 0.5 mm that correspond to the movement of bushed bearing 2 to a complete rotation of bolt nut 3. On a bolt nut, on a conic segment are disposed 50 divisions, each division representing 0.01mm.

4. Conclusions

The utilization of the distancing devise with millings micrometric adjusted at quote, leads to decreasing of the processing time, to increase the processing's precision, and decreasing spoilage.

The axial adjustment and readjustment at precise quote of the bore milling cutters leads to considerable increasing of the effective chipping time, and also increases the adjustment precision that otherwise can not be possible.

The wearing of the milling's teeth cutting part, that doesn't necessarily lead to finishing durability, may be corrected by adjustment achieving a better tool exploitation.

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