A REASONABLE ADJUSTMENT OF THE ON-OFF MECHANISM OF THE NORMAL LATHE'S ROTATION MOVEMENT

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Abstract

This paper presents a reasonable adjustment of the on-off mechanism of rotation movement of the normal lathe.
The adjustment has been applied at Iosif Rangheț lathe, which was held by "Înfrățirea" Oradea Company, Chief Mechanic section, maintenance work-shop, and it consisted in the transferring of the polygonal guidance couple utilisation instead of the mobile couple shaft wedge with grooved wedge.
This adjustment was a rationalisation successfully applied in "Înfrățirea" Oradea Company, which led to an increased reliability of the Iosif Rangheț normal lathe, shown in figure 1.

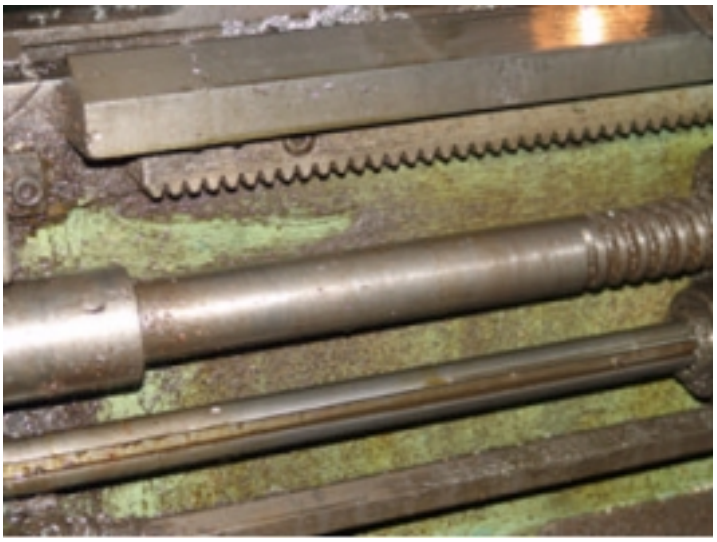

Fig. 1 The Iosif Rangheț lathe with the adjustment of the on-off mechanism of the main shaft

1. INTRODUCTION

During the functioning time of the machine-tools, a continuous wear of the friction surfaces of different machine element types of their components, occurred.

The wear modifies the initial free play of the assemblies, shape, dimensions, and also the surfaces condition. At a high value of these modifications, some mechanisms suffer a worse condition of exploitation, being necessary to repair it.

The mechanisms' main cause of deterioration or getting out of use is the wear of the surfaces in friction.

The size of wear in time unit depends on some factors: the physical-mechanical and chemical properties of the component pieces' superficial layers, the relative speed of those surfaces, the contact pressure and the lubrications between them.

Such a frequently used mechanism is also the on-off mechanism of the rotation movement of the main shaft at the normal lathe. This mechanism from the mobile transfer table has the main shaft with grooved wedge and action handle with hub and wedge. The surfaces in contact or relative movement, without relative displace (on-off), are being destroyed because of the crush, and it is necessary to replace them. This replacement is not very advantageous for the maintenance system, another solution being needed, which was found at "Înfrățirea" Oradea Company on an Iosif Rangheț lathe. The solution of the replacement is presented in this paper.

2. SOME OBSERVATIONS ABOUT THE RELIABILITY DATA OF THE ON-OFF MECHANISM OF THE NORMAL LATHE

The componence of the on-off ensemble mechanism of the rotation movement on the normal lathe main shaft and from the mobile transfer table, also includes the handle coupling mechanism with hub and wedge, with mobile joining on the tie bar with the grooved wedge. The main component parts of the normal lathe are presented in figure 2.

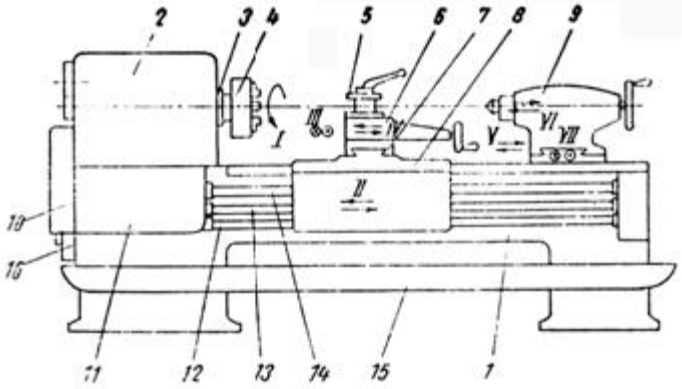

Fig. 2 The main component parts of the normal lathe

It is made of: framing 1, fast headstock 2, with the mechanism of the main movement, main shaft 3, universal chuck 4, blade holder support 5, longitudinal rest 6, cross slide rest 7, transfer table 8, footstock 9, change gears box 10, fillet and speed-change box 11 with lead mechanism's movement, tie bar 12 of the on-off handle, feed spindle 13, lead screw 14, collecting pan of the shaving and cooling fluid 15, pull in step electromotor.

Figure 3 is the photography of the tie bar with the on-off handle of a normal lathe.

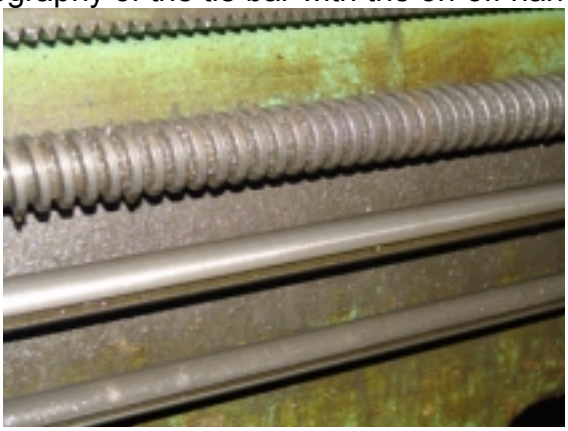

Fig. 3 Tie bar with grooved wedge of a normal lathe

The joining wear of the tie bar 12 with guiding hub is a consequence of the friction process between the wedge surfaces and grooved wedge but also of the wedge crush effect during the repeated on-off movement of the main shaft.

Also, the irrational exploitation of the lathe considerably diminishes its working life.

The reliability of the rotation and translation couple of the on-off mechanism of the main shaft, depends on a series of factors: organs with construction flaws or flawed repairs, thermo treatment inappropriate to exploitation conditions, incorrect selection of free play and of the adjustment of the fastened parts in contact, antirational methods used for fastened parts, variation of the fractioned parts, inadequate lubrication etc.

The technological analysis of the tie bar demonstrates that its replacement increases the specific costs for repair, because of the turning operation, milling grooved wedge, redress operations etc.

In the intention of increasing the on-off mechanism's reliability and also of reducing costs for repairs and maintenance at the "Înfrățirea" Oradea Company, a rationalization which limited the wear of the component pars, was suggested and applied.

3. A REASONABLE ADJUSTMENT OF THE ON-OFF MECHANISM OF THE IOSIF RANGHEȚ LATHE'S MAIN SHAFT

The reasonable adjustment achieved at "Înfrățirea" Oradea Company in the maintenance workshop in 1979 was realised during the maintenance works of the Iosif Rangheț normal lathe.

In the first option, the guidance hub has wedges which are parallel with the constant section on their entire length. The guidance hub has the possibility for axial movement on tie bar of the on-off handle, the ensemble having slack.

By acting the up and down handle when starting or stopping the main shaft, the transmission of the torsion moment is done by the pressure from the bed plate and shaft on the wedge's lateral faces (fig. 4 a, b).

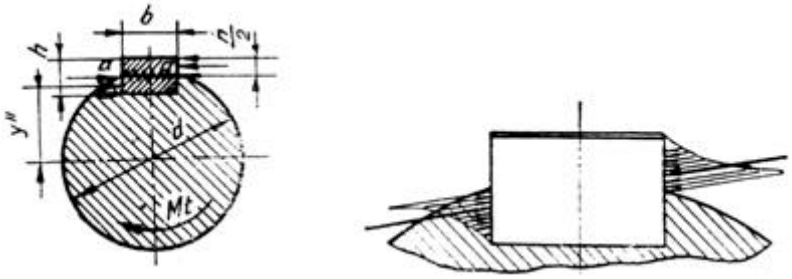

Fig. 4 Moment action transmitted on parallel wedges

The size of the moment possible to be transmitted is given by the equation:

$$M_t = \frac{1}{4} hldp' \quad [\text{daN} \cdot \text{cm}] \tag{1}$$

where *h* is the height of the wedge in cm, *d* is the diameter of the wedge in cm, *p'* is the contact pressure of the wedge area, the contact Height between the wedge and bed plate being h/2.

The wedge is also subjected to shearing on the a-a section (fig. 4 a,b.) the size of the strain resulting from the relation:

$$M_t = \frac{1}{2} bld\tau_f \quad [\text{daN} \cdot \text{cm}] \tag{2}$$

where *b* is the wedge width in cm and τ_f is the unitary shearing stress in daN/cm^2.

Negative effects of the repeated hitching and unhitching are also present in the case of the shaft with wedge whose margins are being destroyed.

In order to eliminate the disadvantages of the assembling with parallel or longitudinal wedge and in order to increase the transmitted moment, the second option has been applied at “Infratirea” Company Oradea, having the on-off mechanism, with the mobile assembly with polygonal profile, known from the specialised literature.

The profile used had hexagonal shape, for the tie bars a 22 hexagon bar was chosen, unprocessed, and for the bed plate a cast iron muff was chosen with inner hexagonal cavity processed by mortising.

Figure 5 represents a photograph with the modification of the on-off mechanism of the main shaft is rendered in the case of a Iosif Rangheț lathe cu profiled hexagonal tie bar, achieved 30 years after application.

Fig. 5 Opposed on-off mechanism with hexagonal tie bar at a Iosif Ranghet lathe

4. CONCLUSIONS

1. The sensible construction undertaken at “Infratirea” Oradea Company, at a Ioif Rangheț lathe is simple and easily reproduced.
2. The assembly with hexagonal profile, bed plate-shaft is extremely reliable, with a big exploitation interval and an increased resistance to wear of the parts in friction.
3. The construction achieved ensure a proper lathe functioning.

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