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During machining cylindrical cutter limbs of cattle, in some areas hooves cutting conditions differ significantly from the main surface. Analytically determined causes deterioration of the surface and provide recommendations to improve it without changing the cutting tool.

Cutting mode, deformation, ductile shear, shearing, biological material.

Problem. Pruning and clearing - one of the most important and time-consuming operations, which are among the compulsory measures of disease prevention cattle hooves. The purpose machining hooves horn is cutting excess and providing them with optimal shape, which ensures even distribution of load across the bearing surface of the limb. This processing hooves should have little roughness and sinks and cracks on the surface are not allowed.

Analysis of recent research. In accordance with known theory cutting wood [1] There are several methods of education quality of the cut surface. Each of the conventional methods involves a type of deformation processed material: ductile shear, shearing, bending of the rupture, plastic bend. Stress state chips determined in the plane stress fracture nn2 largest tensile and shear τzs σr [2]. Given the particular processing of biological material (kopyttsevoho horn) is most suitable for all conditions is ductile shear, which provides education and drainage chip creates smooth cutting surface. The condition of formation of plastic shear in the plane of fracture are:

$$\tau = \tau_{\text{пр.зс}};\ \sigma_{\text{р}} \leq \sigma_{\text{пр.р}} \qquad (1)$$

where - true strain in the shear plane nn2; - Limit of elasticity in shear the material to be cut; - Valid the tension in the plane of destruction; - Limit of elasticity of the material in tension.$\tau\tau_{\text{пр.зс}}\sigma_{\text{р}}\sigma_{\text{пр.р}}$

Controlled deformation power chips with these conditions determined by the following relationship:$\text{F}_{\text{д}}$

$$\text{F}_{\text{д}} = \frac{2\tau_{\text{пр.зс}} \cdot \text{h} \cdot \text{b} \cdot \cos\psi}{1+\sin\psi} \qquad (2)$$

where h - depth of cut; b - width of cut; - Actions angle (the angle between the vectors forces) and Fd Fdr - power chips strain, the resultant force.ψ

For this type of deformation of the material was empirically set to cut cylindrical cutter biological material [2]. The proposed cutting tool that works in the prescribed cutting mode, depending on the physical and mechanical properties of the material is treated most of the supporting surface hooves of cattle. But there are areas hooves, where cutting conditions significantly different from the other surface.

The purpose of research. Given the sharp change in the conditions of individual sections provide high quality treated surface without changing the cutting tool. Using the well-known scheme of forces acting in the area of chip formation (Fig. 1) establish the causes of changes in the conditions of the cutting process and its impact on the basis of indicators cylindrical cutter cutting mode.

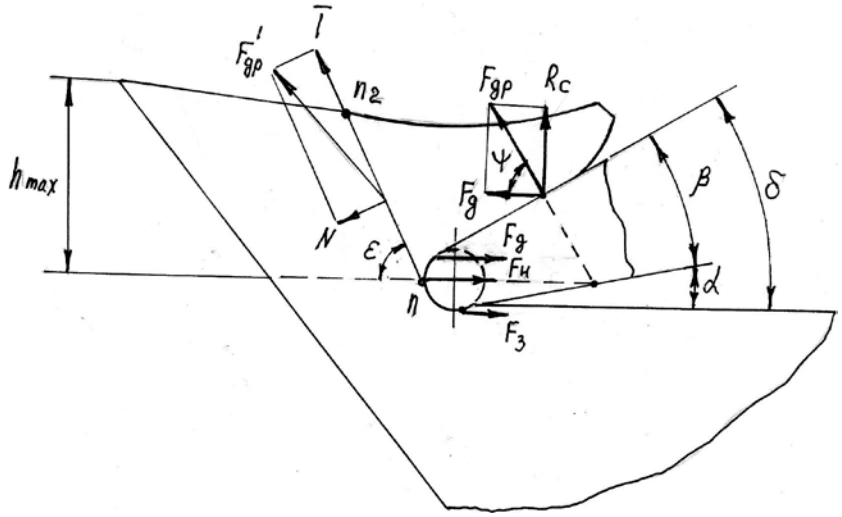

Fig. 1. Scheme of forces operating in the area of chip formation in the cutting biological material cylindrical cutter.

During the processing of cattle hooves special cutting tool [2] it was observed that the most loaded areas bearing surface of limbs form the chip significantly different from the majority of chips. Unlike the main chip is formed as a thin strip, in some areas, these strips were made up of individual elements, about the same size. This form shows the chip formation in these areas other type of deformation - Split. The treated surface formed vm`yatyny with jagged edges, surface waviness appears.

The formation of chips by cleavage of its elements across the grain is provided when:

$$\tau_{зс} = \tau_{в.ск.}; \sigma_р \leq \sigma_{пр.р} (3)$$

where - true strain in plane shear fracture; - Tensile strength of the material in shear; - Valid in the tension zone of destruction; - Limit of elasticity of the material in tension.$\tau_{зс}\tau_{в.ск.}\sigma_р\sigma_{пр.р}$

Change of deformation chips can be explained by a change in one of the criteria for the cutting process. Expression (3) can be written in the following form:

$$\tau_{зс} = \frac{F_д}{A_{зс}} = \tau_{в.ск.} \quad (4)$$

where - power chip deformation - plane shear or cut; Where - cutting width; - Depth of cut.$F_д A_{зс} A_{зс} = b \cdot hbh$

Most sensitive to changes in factor is the same area as in the process of cutting biological material (kopyttsevoho horn) is "" and "" is not a constant. At the end kopyttsevoyi wall hooves of cattle and the most loaded areas (average of the wall) these values are significantly different from the values of the main body kopyttsevoho horn. Sharp, local decrease in the area of cutting leads to increased stress shift that reach these places boundary shear strength - $A_{зс} bh \tau_{в.зс.}$

Power deformation chips in these conditions can be determined by relationship:

$$F_д = \frac{2\tau_{в.зс.} \cdot h \cdot b \cdot \cos\psi}{\sin\psi - f_\tau \cos\psi + \frac{1}{\cos\eta_\tau}}, \quad (5)$$

where - angle actions - the coefficient of friction; - Angle of friction.$\psi f_\tau \eta_\tau$

The length of the element chip nl determined by the relationship:

$$l_к = 2h \frac{\tau_{в.зс.}}{\tau_{в.зм.}} \cdot \frac{\cos\eta_д \cdot \cos\psi}{\sin(\delta + \eta_д)\left(\sin\psi - f_\tau \cos\psi + \frac{1}{\cos\eta_\tau}\right)}. \quad (6)$$

Move tool x1, corresponding to the formation of a single element chips:

$$x_1 = l_к(\cos\delta + \sin\delta \cdot ctg \cdot \varepsilon). \quad (7)$$

In view of the fact that the angle (the angle at which the voltage reaches) maximum value:$\varepsilon_c \tau_{зс}$

$$\varepsilon_0 = \frac{90^\circ + \psi - \eta_\tau}{2}. \quad (8)$$

Determine:x_1

$$x_1 = l_к \frac{\cos\delta + \sin(\delta + \psi - \eta_\tau)}{1 + \sin(\psi - \eta_\tau)}. \quad (9)$$

To establish the nature of the changes in the formation of this type of chips necessary to determine which factors affect the strength and deformation chips as they are able to influence its value:

$$F_д = \sigma_{в.зм.} \frac{1 + \sin(\psi - \eta_\tau)}{\cos\delta + \sin(\delta + \psi - \eta_\tau)} \cdot \frac{\sin(\delta + \eta_д)}{\cos\eta_д} \cdot x_1. \quad (10)$$

From this relationship implies that the constant characterizing the mechanical properties of the material and geometric parameters of cutting tools, power chip deformation depends on the position of the cutting tool relative to the surface of cutting - parameter.$F_д x_1$

When compared dependencies that determine the strength deformation chips in terms of two types of deformation: plastic shear (2) and shear (5) found that under the same terms that characterize the

geometric characteristics of the cutting tool and some mechanical properties of biological material, the force will be greater in second case. This is because the expression (5) the numerator is the boundary shear strength, while the expression (2) - Yield shear. Empirically determined that, as for kopitsevoho horn density and moisture content [2]. The difference in terms of mechanical properties is 30%, so the force and deformation under shear chips to be more for the same amount.$F_д \tau_{в.зс.} \tau_{пр.зс.} \tau_{в.зс.} = 5{,}44 \pm 0{,}126 МПа \tau_{пр.зс.} = 7{,}94 \pm 0{,}232 \rho = 1300 \frac{кг}{м^3} k_\eta = 30 F_д$

To reduce the force deformation chips, reducing performance and conversion to another type of deformation of biological material, such as plastic shift, reduce the value of applying for a tooth cylindrical cutter.$F_д x_1 S_z$

To do this, use the tracker cutting force Fz of the depth of cut and feed t, which was established experimentally [3]. For manual cutting tool, where the value of applying for a tooth cutters. not controlled, it is necessary to temporarily increase the cutting speed, using the experimental data of influence of cutting speed of biological material on the machined surface roughness [3].$S_z S_z \upsilon$

Conclusion. Cylindrical cutters (standard) is the ultimate tool for cutting biological material, as they provide high quality machining bearing surface of the limbs of cattle in a wide range of mechanical properties kopyttsevoho horn.

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FORMATION METHODOLOGY TO BASE ELEMENT OF AGRICULTURAL MACHINES

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A general methodological principles to elementary base units of agricultural machinery.

Element base machine.

Problem. Improving the efficiency of agricultural production associated with the creation and implementation of new advanced technologies that

need to provide high-performance, reliable mechanized and automated equipment.

Analysis of recent research. Practice has shown that the creation of new, more advanced machines, providing them with high-end, improving their quality and reliability possible by composing machines with standardized units (modules) of high quality [1] and reliability [2].

Topicality of work to build the base element explains the benefits that have standardized products compared with the original [3]. Using unified element base [4] reduces timing machine design, pre-production, to increase and stabilize the product quality through the use of waste and proven components and assemblies, reduce costs of operation and maintenance of machines.

In most cases, [5] No technological need, such as working in the details of various designs. These design features are usually due to various technical equipment, production technology elements [6].

It is known that more than 60% of the firms developed Western countries do not produce machines and components for them [7]. For example, the company "Walterscheid" (universal joint), the company "Bosch" (fuel equipment, hydraulic and electronic components).