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THEORETICAL SUBSTANTIATION OF THE PARAMETERS OF THE COMBINED MACHINE BODY

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Abstract

This article presents the results of studies on the theoretical substantiation of the main parameters of the body of the combined machine for preparing the soil for sowing potatoes.

Keywords: machine, soil, potatoes, body, technology, ripper, comb.

Introduction

Research work is being carried out around the world to develop resource-saving technologies for preparing fields for plowing and new scientific and technical bases for their implementation. "22 million people worldwide. Considering the planting of potatoes per hectare, one of the important tasks is the development of energy-saving technologies, high

quality and productivity of soil preparation for potato planting [1-15]. At the same time, great attention is paid to the development and application of machines that perform all the technological processes of tillage and preparation of potatoes for planting in one pass from the field. In this regard, the development of a structural scheme of the device for preparing fields for potato planting and substantiation of the parameters of the main working bodies, targeted research to ensure resource conservation in the process of interaction with the soil are urgent issues.

As a result of preliminary scientific research, a new technology of soil preparation for planting potatoes and a machine that implements it were developed [14, 15]. In the proposed technology, the following processes are performed simultaneously: deep loosening along the line where the pile is formed, surface loosening of the soil along the line where the irrigation ditch is formed, forming piles and irrigation ditches by overturning soil piles, crushing lumps on the surface of the pile, compacting and fully forming its soil. As a result, deep softened ridges and shallow softened ridges are formed under the field.

The aim of the study is to substantiate the main parameters of the body of the combined machine for preparing the soil for sowing potatoes.

Literature review

The problems of substantiating the type and parameters of the working bodies of combined machines are considered in many published scientific works [1-13]. F Mamatov, B. Mirzaev [2-7, 10-12], N. Aldoshin [8, 9], D. Chuyanov [7], I. Ergashev [5, 12], Z. Batirov [10] and others. The working bodies created as a result of these studies are used in combined machines with some positive results. However, these studies have not sufficiently studied the issues of substantiating the parameters of the body for the formation of ridges for planting potatoes.

Materials and methods

The laws and rules of theoretical mechanics, agricultural mechanics, and mathematical statistics were used in the research.

Research results

In order to substantiate the design scheme of the machine and the types of working bodies that implement the proposed technology, the constructions of the aggregates that are prepared by the researchers for planting in the fields were analyzed in detail. As a result, a constructive scheme of the machine was developed, which implements the technology of preparing the soil for planting potatoes to germinate. (Figure 1). It consists of a frame 1, a tractor mounting bracket 2, support wheels 3, frame-mounted sinkers 4, axle softener claws 5, right and left swivel housings 6 and 7, a guide blade 8 and a profile roller 9.

The main function of the machine's right- and left-turning bodies is to form the initial ridge. The semi-screw body was chosen as the backing shaper because it turns the paddle well and pushes it less to the side.

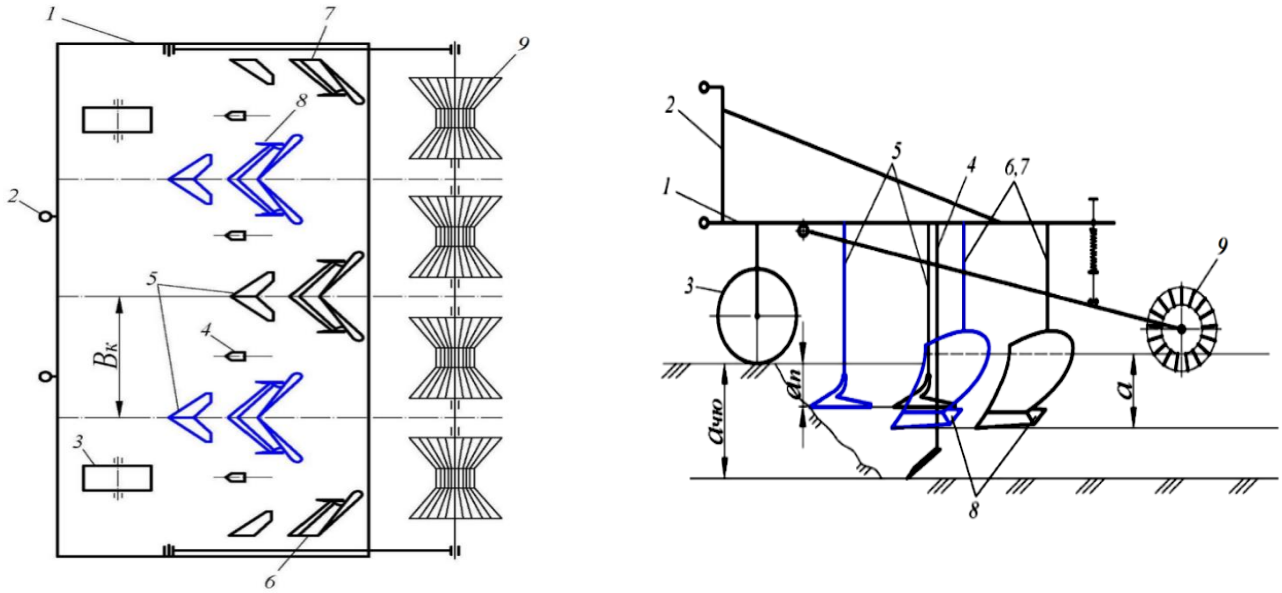

Figure 1. Constructive scheme of the machine

The following are the main parameters that affect the quality and energy performance of the case (Figure 2): height of the case $H_к$; the coverage width of the case $b_к$; the height and width of the body overturner $H_а$ and $b_{ка}$; lemex ground penetration angle e; the mounting angle of the lemex relative to the wall $\gamma_л$; the angle of inclination relative to the base of the lemex blade τ.

We define the basic parameters of the hull in terms of the formation of ridges of the shape and height required in the theoretical substantiation. According to the results of a number of

studies, we consider the shape of the first cross-section of the ridge to be sinusoidal (Fig. 3). To form a ridge in this form, the b1-width and a-thickness slabs should be cut from the two ends of the Bм width equal to the specified row spacing and turned upside down in the middle. In this case, the minimum coverage width of the housing is as follows

$$b_{к\min} = \frac{B_M}{4} \tag{1}$$

(1) When the width of the row spacing for planting potatoes by expression is 70 cm $b_{кmin}$=17,5 see. Taking into account the unevenness of the field relief and the vibrations of the machine in the horizontal plane

$$b_к = \frac{B_M}{4} + \Delta, \tag{2}$$

in this Δ – the unevenness of the field relief and the horizontal plane of the machine

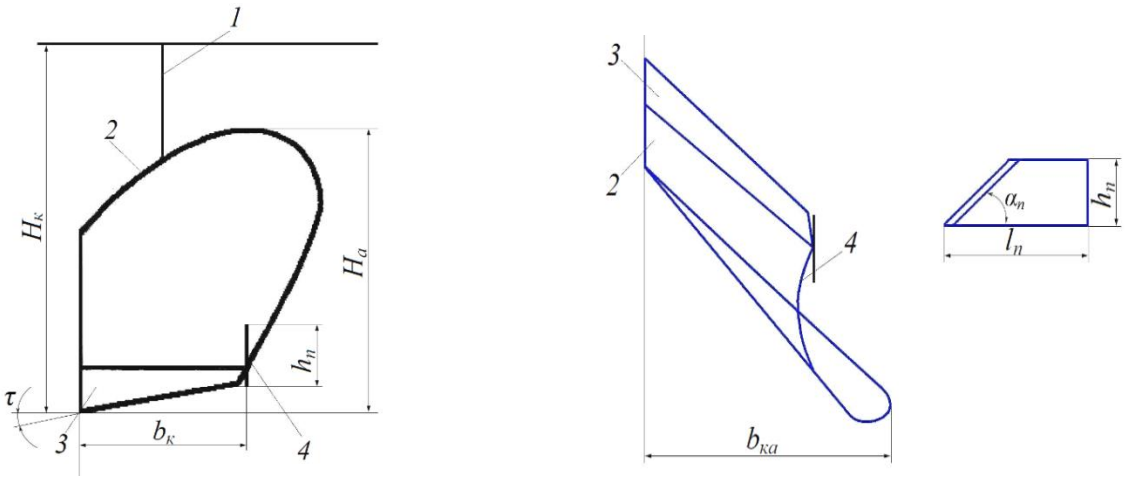

Fig.2 Basic parameters of the cortex: 1 - post; 2 - blade; 3 - share; 4 - guiding knife

a dimension that takes into account vibrations, Δ = 2,5 см.

In that case (2) Δ = 2,5 см leaving $b_к$ = 20 см we get the result.

We determine the working depth of the case on the condition of stability of the overturned fork, ie not overturning [5,6]

$$a \le \frac{b_к}{1{,}27} = 15{,}75 см. \tag{3}$$

In this case, the depth of machining along the edge of the body

$$a_э = a - \frac{1}{2} b_к tg\tau. \quad (4)$$

(4) by expression $b_к = 20$ см and $\tau = 6°$ the maximum machining depth of the housing when $a_{max} = 14{,}7$ см. During the overturning process, the volume of the soil increases. Given this situation [7]$a_{max} = 0{,}76$, $b_к = 15{,}2$ см.

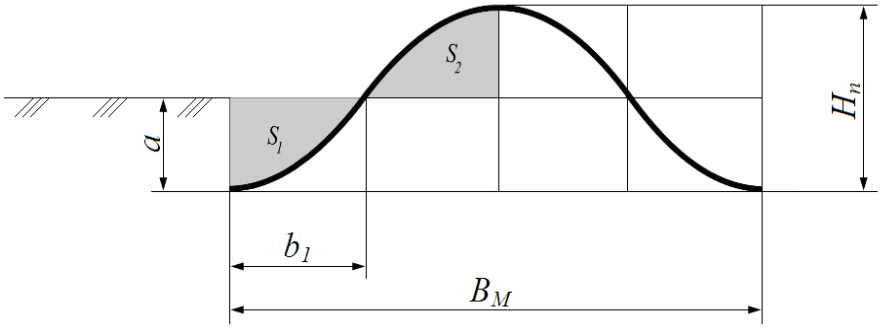

Figure 3. Scheme for determining the coverage width of the case

Considering the above, the machining depth of the housing

assume that a = 15 cm.

To determine the height of the body overturner, we see 4 overturning processes under the action of the blade body and the guide blade.

The shape of the pellet changes due to the fact that the rolling process is carried out under closed cutting conditions and the edges are deformed during this process. Under the action of a sledgehammer and a guide knife cut with a lemex from the bottom of the egat, its edge rotates and rises almost without shifting sideways around its center of gravity until it touches the edge of the untreated field. It is then rolled around the edge and laid on the field surface. Considering the above, we determine the height of the overturner

$$H_a = a + OE = a + \sqrt{a^2 + (b_n - \Delta_n^2)}, \quad (5)$$

in this $b_п$ – pallet width, $b_к = b_п$; $\Delta_п$ – width of the deformed part of the plate, cm.

(5) expression a = 15 см, $\Delta_п = 10$ см and $b_к = 20$ см put $H_a = 33$ см we find that

The height of the hull is determined by the following formula, provided that the slab passes freely through the bottom of the frame and is not clogged with plant debris and soil [8].

$$H_m = 1{,}25H_a. \quad (6)$$

H_a Substituting (6) for (5) we obtain the following

$$H_m = 1{,}25[a + \sqrt{a^2 + (b_n - \Delta_n^2)}]. \quad (7)$$

For enclosures operating in closed cutting conditions, its height is multiplied by the machining depth, ie

$$H_к = 2{,}25a + 1{,}25\sqrt{a^2 + (b_к - \Delta_n^2)}. \quad (8)$$

(8) to the expression a = 15 см and $b_к$ = 20 см the minimum height of the housing to be laid $H_к$ = 56,25 см we find that.

CONCLUSIONS

According to the results of theoretical studies, the type of housing should be semi-helical, the width of the housing should be 0.2 cm, the minimum height of its overturn and column should be 0.33 m and 0.56 m to ensure the formation of the required level of pile with low energy consumption.

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