has no solutions, then the boundary value problem (7) has no solutions in the class of piecewise continuous differentiated by discontinuities of the first kind with, for continuous vector functions.$c_r = c_r^* \in \mathbb{R}^r c_r^* z_0(t, c_r^*) z(t,\varepsilon): z(\cdot,\varepsilon) \in C^1([a,b]/\{\tau_i\}_I) z(t,\cdot) \in C[\varepsilon], \varepsilon\epsilon[0,\varepsilon_0] z(t,0) = z_0(t,c_r^*) tt = \tau_i \varepsilon\epsilon[0,\varepsilon_0]$

Conclusion. A theorem and the necessary conditions for the existence of boundary rozv'yazkivslaboneliniynyh zadachdlya systems of ordinary differential equations with impulse action in the critical case.

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Will provide a porozhdayuschyh equation for the amplitudes slabonelyneynыh CRITICAL kraevыh problems with ympulsnыm Impact, something determines neobhodymoe Terms existence of solutions of such problems.

Slabonelynyyna krytycheskaya kraevaya problem with ympulsnыm Impact, obobschennыy operator Green, amplitudes equation, nonlinear vector function.

An equation for generating the critical amplitudes of weakly nonlinear boundary value problems with impulse action that defines necessary condition for the existence of solutions of such problems.

Slaboneliniyna critical boundary value problem of impulsive, generalized operator Green's equation for generating amplitudes.

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RESEARCH POWER CHARACTERISTICS SHELVES PLOWING COMPONENT OF A RATIONAL SURFACE CURVATURE

VP Kurka Engineer

The description of the methods of field research and made aniliz the data, to compare the characteristics of power efficient plowing component shelves with existing curvature.

Shelf plowing component, power characteristics, traction resistance, tillage, tenzometruvannya

Problem. To create new designs tillage of working that will reduce the energy intensity of tillage process and improve quality performance, there is a need for developing new methods of constructing surface tillage and working body design of the device, which will allow more to describe the interaction of tillage working with the soil, and vtanovyty the relationship between the physical and mechanical properties of soil tillage and surface curvature of workers.

Analysis of recent research showed that at the present stage of tillage agricultural machinery main attention is paid to reduce power consumption process

tillage. One of the main provisions reducing energy consumption is the optimization of surface curvature Soil-working body, taking into account soil properties.

The purpose of research. Comparison of Power Characteristics plowing component rack with a shelf PLN 3-35 rational curves, which was built on the basis of the theoretical data through field doslidzhden.

Results. After the theoretical research to find a rational curvature shelf plowing component, by resolution of the variational problem of finding the minimum of movement of soil on the shelf were obtained surface curvature equation:

$$S_{xy} = x_{yk}\frac{y}{y_k} + t\left(V_{xy0} - \frac{y}{y_k}Vx_{y0}\right) + t(b_1(y-y_k)^2 t + b_2(y-y_k)^3 t^2 + b_3(y-y_k)^4 t^3 + b_4(y-y_k)^5 t^4) + x_{y0} \quad (1)$$

$$S_{xz} = x_{zk}\frac{z}{z_k} + t\left(V_{xz0} - \frac{z}{z_k}Vx_{z0}\right) + t(b_1(z-z_k)^2 t + b_2(z-z_k)^3 t^2 + b_3(z-z_k)^4 t^3 + b_4(z-z_k)^5 t^4) + x_{z0}$$

To search for extremum (the functions sxz and sxy), which provide a minimum of functionality were obtained numerical values of the coefficients of equations.

For substitution coefficients in the equation when building surface plowing component shelves, changing their numerical values were recorded following dependencies:

$$a_1 = 0.01\sqrt{z} - 0.005,\ a_2 = 0.00054z^2 - 0.0003z + 0.00004 \quad (2)$$

$$a_3 = -0.000101z^2 + 0.0000404x - 0.0000375\ ,$$

$$a_4 = 4.9 \times 10^{-6} z^2 + 2 \times 10^{-6} x - 0.19 \times 10^{-6}\ , b_1 = 4.9y^2 - 2.7y + 0.4\ ,$$

$$b_2 = -0.9y + 1.16\ , b_3 = \sqrt{0.45y + 0.000042} + 0.97\ ,$$

$$b_4 = 0.1195y^2 - 0.005y + 1.0011$$

After the substitution of basis functions (2) according to (1) obtain the final equation of surface curvature plowing component.

Setting the step between the planes that divide the surface of the shelf into a number of segments, each plane by substituting numerical values we get an array of points that describe the curvature in this range. After receiving an array of data points in each plane using the software "COMPASS 3D» on them was built plowing component surface with rational curvature.

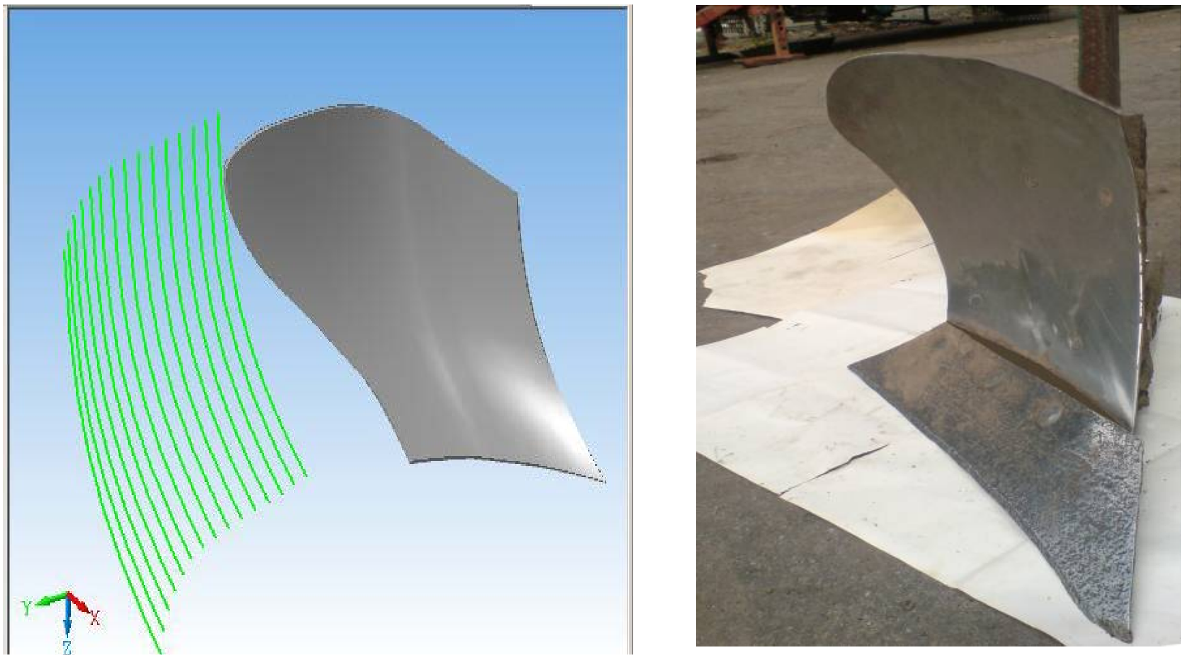

Fig. 1. Building on the shelf surface obtained coordinates.

In conducting experimental studies rack attached rational curvature at the plowing component PLN 3-35. Shelf has sign character, as the radius of curvature in the vertical plane of the front end of the path to the shelves and in the horizontal plane upward on the shelf surface changes. We have developed a design for the device dynamometruvannya agricultural implements in tillage [1], which was mounted plow with experimental shelf.

The device consists of three measure sensors that are in tension-compression and frames to measure the resistance of components that move paralenno direction of the respective components of the resistance of the resulting soil investigated.

$$F_{верт} = F_{p1} - F_{x1}, F_{попер} = F_{p2} - F_{x2}, F_{позд} = F_{p3} - F_{x3} \quad (3)$$

where F_{p1}, F_{p2}, F_{p3} - The resistance of the vertical, and longitudinal component porerechnoyi at your pace.

F_{x1} - The force with which the vertical frame of the plow body acts on the sensor at idle.

F_{x2} - The power to move transverse frames (including vertical frame and plow)

F_{x3} - The power to move the longitudinal frame (with vertical and transverse frames and hull plow).

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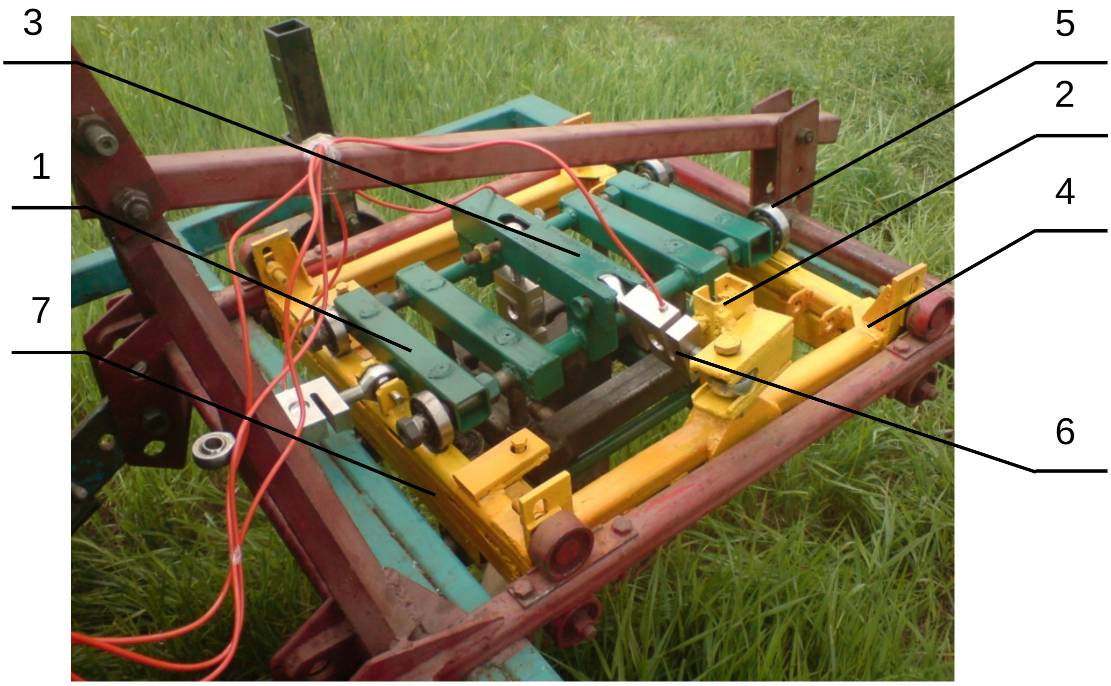

Fig. 2. Experimental setup: 1, 2, 3 - sensors for measuring respectively the longitudinal, lateral and vertical component of the resultant force of resistance; 4, 5, 6, 7 - frames, which see under longitudinal, lateral, vertical components of the resistance and the resulting frame for attachment of the assembly to the tractor.

For numerical values of the components (longitudinal, lateral and vertical) resulting in the resistance of soil tillage performed calibration sensor for determining the change in voltage from the power applied to the sensor, which, according to the data (Table. 1) is characterized by the following relationship:

1. calibration of sensors.

Load H	Values sensors,	Load H	Values sensors,
1	2	3	4
1000	0.003277	11000	0.0036065
2000	0.006557264	12000	0.039344257
3000	0.009835963	13000	0.042622956
4000	0.013114663	14000	0.045901655
5000	0.016393362	15000	0.049180355
6000	0.019672061	16000	0.052459054
7000	0.02295076	17000	0.055737753
8000	0.02622946	18000	0.059016452
9000	0.029508159	19000	0.062295152
10000	0.032786858	20000	0.065573851

$$F = 0.041011 + 304999U$$

where U - voltage, V;

1

2

4

3

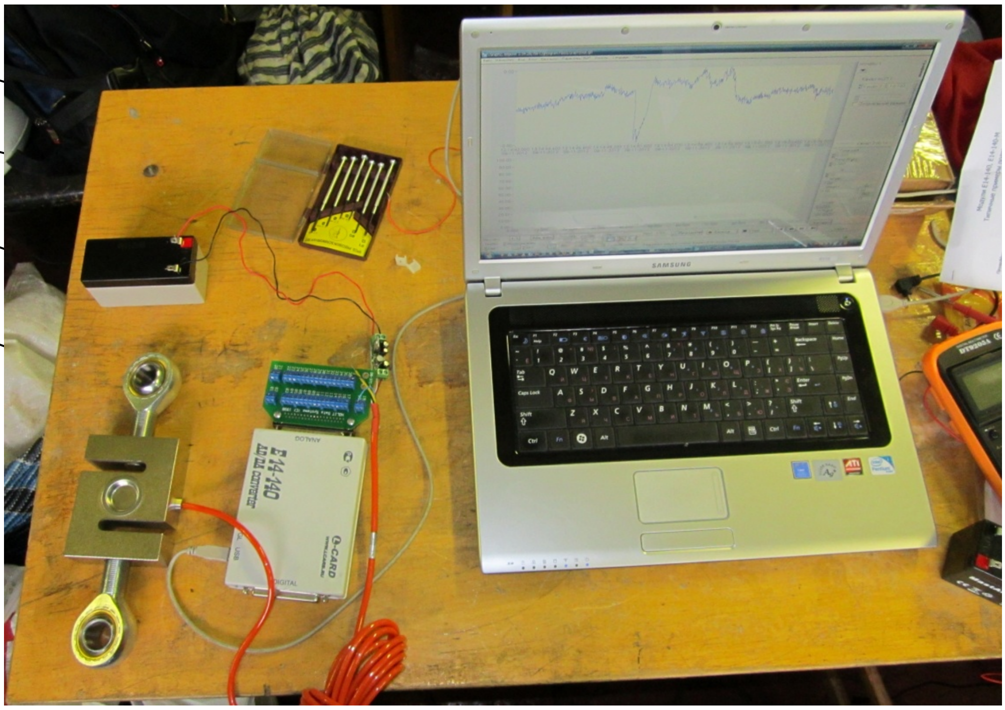

Fig. 3. Wiring Sensor 1 - power source (battery); 2 - Voltage Regulator; 3 - strain gauges; 4 - ADC; 5 - PC.

To improve the accuracy of measurements and obtaining reliable data to power characteristics of experimental studies shelf plowing component, conducted a comparative assessment shows the sensor when exposed to plow and mount the sensor in place at idle frames.

2. The calibration frames.

Nava-of-ntazhen, H	At fixing probe, in	To plow (Longitudina.) In	Different -this,%	At fixing probe, in	To plow (Side), B	Different -this,%
100	-0.002860	-0.002772	3.09	-0.003036	-0.003167	4.1
200	-0.002976	-0.002892	2.82	-0.003060	-0.003180	3.7
300	-0.003065	-0.002997	2.2	-0.003083	-0.003193	3.4
400	-0.003107	-0.003016	2.92	-0.003129	-0.003224	2.9

End Table. 2

Nava-of-ntazhen, H	At fixing probe, in	To plow (Longitudina.) In	Different -this,%	At fixing probe, in	To plow (Side), B	Different -this,%
500	-0.003163	-0.003074	2.8	-0.003171	-0.003245	2.2
600	-0.003198	-0.003107	2.84	-0.003179	-0.003255	2.3
700	-0.003184	-0.003125	1.83	-0.003183	-0.003260	2.3
800	-0.003221	-0.003165	1.74	-0.003179	-0.003261	2.5
900	-0.003280	-0.003212	2.08	-0.003196	-0.003271	2.2
1000	-0.003279	-0.003207	2.2	-0.003219	-0.003277	1.7

a) b)

Fig. 4. calibration frames, which receive side (a) and longitudinal (B) component of the resultant force resistance.

PIP. 5. Plowing plow body of experimental shelf: 1 - supporting wheels

When calibration frame that measures the vertical component of the resultant force resistance, used overhead crane. Since the direction of the load during calibration frame in place the sensor mount and the plowing match, only determined efforts to move the frame at idle adjusted by weight plowing component and frame that it takes effort. When conducting field research traction cultivation depth remained constant zyavdyaky support wheel, allowing the surface to copy field and prevent bias frames, they also regulated cultivation depth. Tenzorama was placed parallel to the plane of the field.

During the field research among the important factors that influence the energy performance and quality of plowing is moisture and density. Sampling of soil moisture and density along the length of estrus was taken in sequence three times.

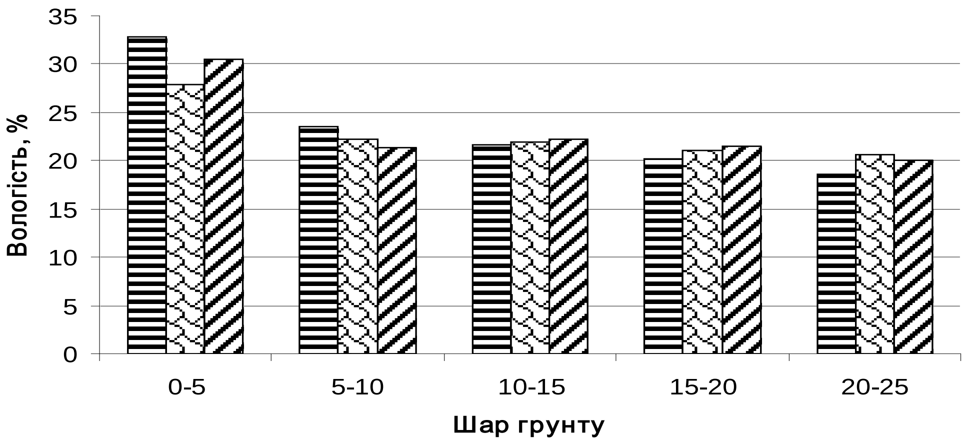

Fig. 6. Schedule changes of humidity in soil layers.

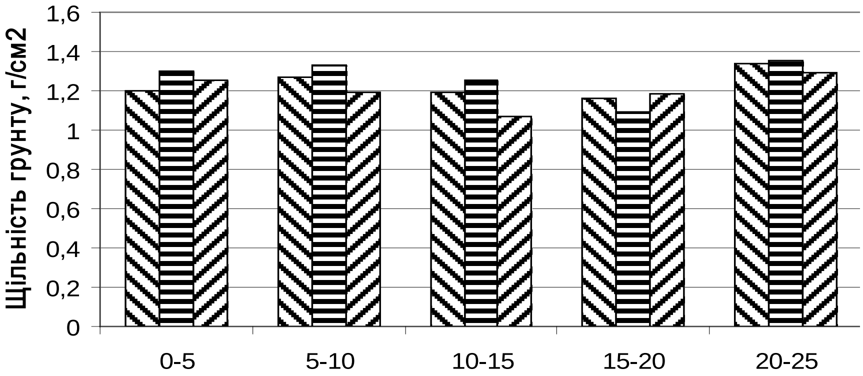

Fig. Figure 7. The change in density in soil layers.

The average values of moisture during the research were: a layer of soil 5 cm - 30.38% to 10 cm - 22.43%, at a depth of 10 - 15 cm was 21.95% in the soil layer 15 - 20 - was 20.86% and 19.78% respectively over the range 20 - 25 cm.

The density of the soil varied widely: a layer of soil 5 cm - 1,251 g / cm3 to 10 cm - 1.264 g / cm3 at a depth of 10 - 15 cm was 1.174 g / cm3, a soil layer 15 - 20 - was 1.146 g / cm3 and 1.328 g / cm3, respectively, for the range of 20 - 25 cm.

Figures 8 - 10 The data obtained during field studies to compare the characteristics of power shelf housing plow PLN 3-35 and experimental shelves with rational surface curvature. Data analysis showed that the depth of soil 25 cm experimental shelf at different speeds in the range of 6 - 9 km / h the average values of the longitudinal component of the resistance were lower by 18.6%, respectively, of the side - 18.4%, vertical - 17.5%.

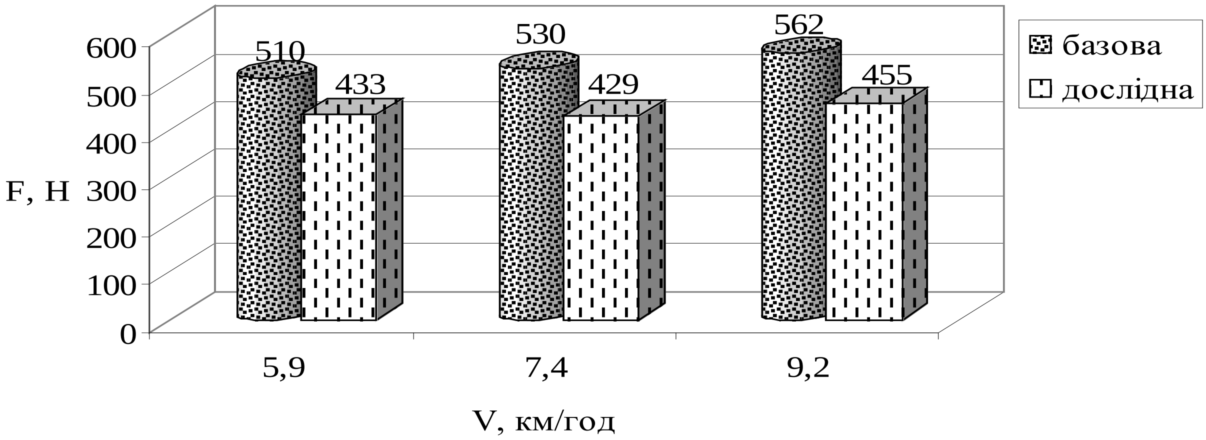

Fig. 8. The dependence of the resistance of the vertical component of velocity with depth of plowing 25 cm.

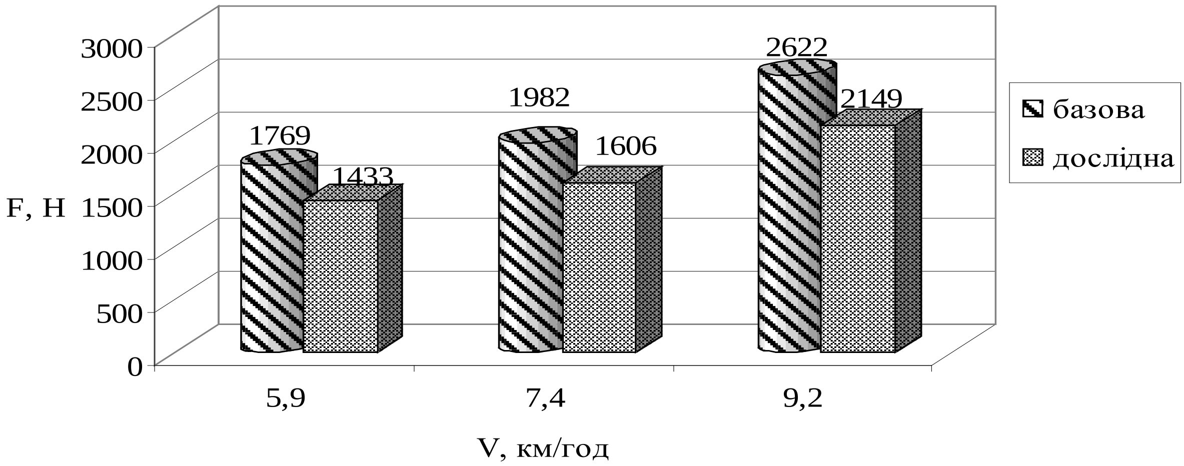

Fig. 9. Dependence of the longitudinal component of the resistance of the speed at a depth of plowing 25 cm.

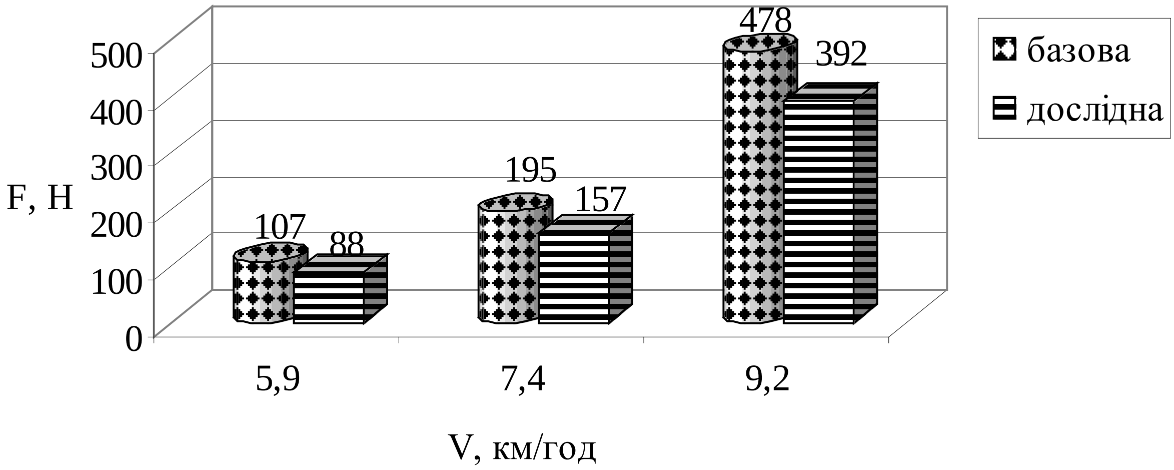

Fig. 10. Dependence of the lateral component of the resistance of the speed at a depth of plowing 25 cm.

3. Depth of plowing

Number measurement	Plowing body plow PLN 3-35			Plowing body plow with experimental shelf		
	Depth of tillage, cm	Middle deviation, cm	The coefficient of variation,%	Depth plowing, cm	Middle deviation, cm	The coefficient of variation,%
1	24.00	1.5	6.1	24.50	1.4	5.7
2	25.80	1.7	6.6	25.10	1.3	5.2
3	25.70	2.0	7.8	25.30	1.4	5.5
4	27.70	2.1	7.6	24.90	1.6	6.4
5	26.80	1.9	7.1	26,00	1.6	6.2

a) b)

Fig. 11. Measuring the depth of cultivation (a) and surface field after plowing (b).

Conclusion. Analysis of data derived from field sampling experimental shelves with rational curvature of the surface showed decrease traction resistance when plowing in compliance ahrovymoh on quality soil. The proposed device is allowed to receive the three components of the resultant force of resistance and increase the accuracy of measurement in the study of security features as the frame, which passed the efforts of Soil working body to sensors moved parallel to the forces that were investigated.

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Powered Description of research methods and conducting polevыh Flag anylyz poluchennыh data, compared to the characteristics of power otvala plowing component ratsyonalnoy kryvyznы with suschestvuyuschymy.

Shelf plowing component, Power characteristics Resistance traction, handling soil, tenzometryrovanyya

The methods of analysis of field research and data to compare characteristics of the new shelves plow with existing.

Plow, power characteristics, the resistance of the soil.

UDC 629,366

ON TURN drag coefficient Tracked vehicles

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SP Pozhidayev, Ph.D.

Dependence of the coefficient resistance to rotation of tracked vehicle turning radius, which is implemented in the new model of interaction Caterpillar tracks the supporting surface. The model provides a satisfactory accuracy of the calculated data over the entire range of possible turning radius tracked vehicles.

Tracked vehicles, the rate of resistance to rotation, turning radius.

Problem. Turn tracked vehicles, due to design features, always accompanied by Prosecutor-vzuvannyam its drivers. Therefore, the main task is to calculate the curvilinear motion since the resistance to rotation M_c That defines Mane vrenist, manageability and energy machines. As the comparison of machines with different mass-overall performance is possible only on specific indicators, over the last coefficients resistance to rotation μ Which is a specific moment resistance to rotation:

$$\mu = 4M_c/(GL), \quad (1)$$

where G and L - Under the weight of the machine and its longitudinal base.

Coefficient of resistance to rotation μ essentially depends on the radius of turn machines, but empirical formula for calculating μ Proposed AO Nikitin, does not reflect the physical nature of this relationship [1]. In this regard, currently focuses on the description of the analytical engine force interaction with the soil, which can be divided into two main areas:

• School MI Medvedev, who laid the basis for models mentioned interaction separate records resistance to rotation, friction bearing surface units and spurs with the ground, crushing and shearing the lateral surface of the ground track, nahribannya earthworks and