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Research of Angular Fluctuations of the Skating Rink of the Car for Processing of the Ploughed Fields

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ABSTRACT. In article results of theoretical researches on definition of ways of decrease in amplitude of angular fluctuations of a skating rink of the car for preparation a trace are given to a trace of the plowed lands to sowing of the grain and repeated crops arising in the course of work because of variability of physic-mechanical properties of the soil.

KEYWORDS: Car, processing, earth, skating rink, press spring, rigidity of a press spring, angular fluctuations of a skating rink.

I. INTRODUCTION

In Uzbekistan such cultures as vegetables and potatoes which are sowed on a winter wheat and in the areas freed from it are sowed on recently set lands before they are put directly. In this case the arable land is prepared for crops, and then landing.

It is well known that on new wetlands there is a set of holes which do not allow to make high-quality crops, an irrigation and mutual processing and also have negative effect on development of plants. It is also necessary to note that for crops and reproduction of seeds the surface of a plow has to conform to requirements for landing at the level of degradation of the soil and levels of alignment and concentration.

Proceeding from these highlights, preparation of new wetlands has to consist in consolidating all layer of a paving and to level and level a surface.

II. SIGNIFICANCE OF THE SYSTEM

In article results of theoretical researches on definition of ways of decrease in amplitude of angular fluctuations of a skating rink of the car for preparation a trace are given to a trace of the plowed lands to sowing of the grain and repeated crops arising in the course of work because of variability of physic-mechanical properties of the soil.The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion

III. LITERATURE SURVEY

On the basis of the above the car which was tested by the experimental car for sampling on sites of dumping of silt [1] was developed and developed.

On the basis of the analysis of technological processes requirements, publications and various working groups were developed for production of the car with the punched disks, the roller and a roller. In operating time of the car disks of a piano crush and put the curtailed pallets, then straighten a flat surface of a flatter. After that in the soil there is a coil, density of a surface of a plow decreases, and it forms a soft layer of earth.

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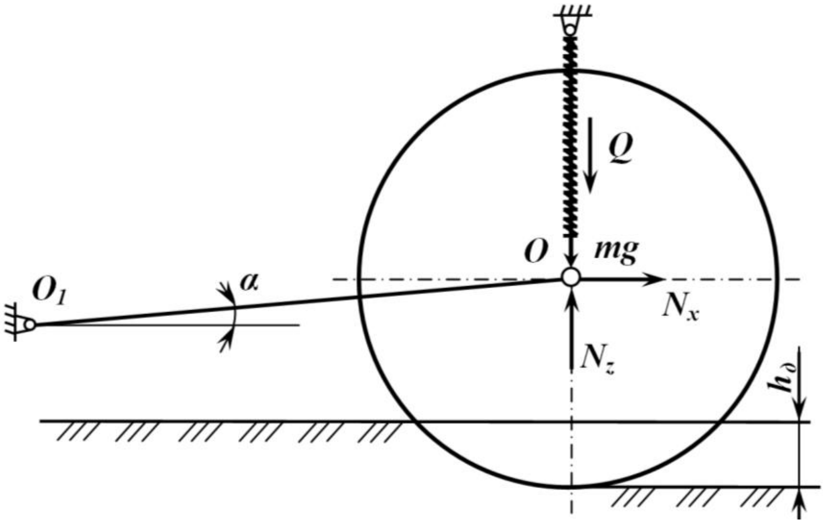
IV. METHODOLOGY

Results of a theoretical research of angular fluctuations in the longitudinal plane of a roller of the machine are presented in article.

Horizontal N_x and direct N_z of force (see the Photo) constantly change because of changes of the field and physic-mechanical properties of the soil at rotation of a club. As a result the roller is in process of the movement along the car with angular fluctuations around a point of O_1which is connected to the longitudinal plane. It, of course, leads to the fact that the surface of the field is unevenly processed along all this.



Researches scheme of the movement of the skating rink.

Therefore, roller point corner amplitude to a point of O1 has to be less than the probability. To solve this problem, we create and we solve the differential equation of the movement of a roller in the longitudinal plane. We accept the following restrictions:

- the unit moves on a straight line with an identical speed;7
- O_1 friction by friction less also does not influence vibration of a roller;
- Vibrations of the combined block do not influence vibration of a skating rink;
- the mass of the skating rink and ring connecting it to a skating rink is brought to the center of rotation of a roller;
- The equilibrium state of a pulley is horizontal, and a corner makes it a small corner.

From a horizontal corner of a cape we see a corner and (drawing) as the generalized coordinate.

Using the differential equation of rotation around an axis of a solid body [2], we receive the following:

$$J\frac{d^2\alpha}{dt^2} = (N_z - Q - mg)l\cos\alpha - N_x l\sin\alpha, \qquad (1)$$

in it *J*- torque on an entrance of a skating rink of the O_1 bearing, kg · m2;
Q –pressure force spring, H;
m – mass of a skating rink, kg;
g –acceleration free falling, m/s^2;
l –burden skating rink length, m

αsince the angle is small, we can type (1) in the following form: $\sin\alpha=\alpha$, $\cos\alpha=1$

$$J\frac{d^2\alpha}{dt^2} = (N_z - Q - mg)l - N_x l\alpha. \qquad (2)$$

We consider that the reaction force of the soil [2,3] N_z is composed of the sum of the varied N_y forces that depend on the strength of $N_д$, the strength of the$N_z$and the field and the physical and mechanical properties of the soil.

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$$N_z = N_y + N_\partial + N_t. \quad (3)$$

Given this statement, (2) the expression is as follows.

$$J\frac{d^2\alpha}{dt^2} = (N_y + N_\partial + N_t - Q - mg)l - N_x l\alpha. \quad (4)$$

Static equilibrium position

$$N_y = h_\partial C_n B_\varepsilon; \quad (5)$$

$$N_\partial = 0; \quad (6)$$

$$Q = Q_0; \quad (7)$$

$$N_t = 0, \quad (8)$$

In it h_∂ –vertical deformation of the soil in static equilibrium state, m

C_n – the sophistication of the earth's rolling mill with the width of coverage n/m^2;

B_ε – width of a rolling skating rink, m;

Q_0 – initial force of a tension of springs, H

The category of a skating rink copes by force operating on it from a balance point to a corner.

$$N_y = (h_\partial - l\alpha)C_n b; \quad (9)$$

$$N_\partial = -b_n bl\frac{d\alpha}{dt}; \quad (10)$$

$$N_t = \Delta R_z(t); \quad (11)$$

$$Q = Q_0 + C_н l\alpha, \quad (12)$$

Where, b_n – is width of a cover zone is one block of cylinders coefficient of resistance, H·s/m^2;

$C_н$ – is susceptibility to pressure of a backbone, H/m

(4) we deduce the values of N_y, N_∂, $N_t$and$Q$ (5) - (12)

$$J\frac{d^2\alpha}{dt^2} = \left[(h_\partial - l\alpha)C_n B_\varepsilon - b_n B_\varepsilon l\frac{d\alpha}{dt} + \Delta R_z(t) - (Q_0 + C_н l\alpha) - mg\right]l - N_x l\alpha. \quad (13)$$

Static equilibrium position

$$(h_\partial C_n b - Q_0 - mg)l = 0. \quad (14)$$

In view of this, the expression (13) has the following appearance:

$$J\frac{d^2\alpha}{dt^2} = \Delta R_z(t)l - C_n B_\varepsilon l^2\alpha - C_н l^2\alpha - b_n B_\varepsilon l^2\frac{d\alpha}{dt} - N_x l\alpha \quad (15)$$

or

$$J\frac{d^2\alpha}{dt^2} + b_n B_\varepsilon l^2\frac{d\alpha}{dt} + (N_x + C_n B_\varepsilon l + C_н l)l\alpha = \Delta R(t)l. \quad (16)$$

This expression is a non-homogeneous differential equation with the variable coefficient N_x because of the variation in power.

V. EXPERIMENTAL RESULTS

It is known from the theories of vibration that [4], (16) denotes parametric vibrations. However, because of the high soil erosion, in practice the parametric vibrations of the roller are not observed. In essence, $\Delta R(t)$ is subject to forced vibration under the force R_x of force. Therefore, in subsequent studies, we consider that power is constant and its $\Delta R_z(t)$ average value, and we consider the forced vibrations of the roller by the driving forces.

That is, we can say that the force varies $\Delta R_z(t)$ according to the law of sinus.

$$\Delta R_z(t) = \Delta R\sin\omega t, \quad (17)$$

Where, ΔR –is the amplitude of the propagating force;

ω –is the rotational frequency of the driving force.

(17), the expression (16) has the following appearance

$$J\frac{d^2\alpha}{dt^2}+b_nB_гl^2\frac{d\alpha}{dt}+\left(N_x+C_nB_гl+C_нl\right)l\alpha=\Delta Rl\sin\omega t. \quad (18)$$

or

$$\frac{d^2\alpha}{dt^2}+2n\frac{d\alpha}{dt}+k^2\alpha=H\sin\omega t, \quad (19)$$

Where,

$$n=\frac{b_nB_гl^2}{2J};\ k=\sqrt{\frac{\left(N_x+C_nB_гl+C_нl\right)l}{J}}\ \text{and}\ H=\frac{\Delta Rl}{J}.$$

The solution of the equation (19), which expresses the forceful vibrations of the rolling force under force, has the following appearance [2]

$$\alpha(t)=\frac{H}{\sqrt{\left(k^2-\omega^2\right)^2+4n^2\omega^2}}\sin(\omega t-\delta) \quad (20)$$

or taking into account the definitions

$$\alpha(t)=\frac{\Delta Rl\sin(\omega t-\delta)}{J\sqrt{\left[\frac{\left(N_x+C_nB_гl+C_нl\right)l}{J}-\omega^2\right]^2+\left(\frac{b_nB_гl^2}{J}\right)^2\omega^2}}, \quad (21)$$

Where,

$$\delta=arctg\frac{b_nB_гl^2\omega}{\left(N_x+C_nB_гl+C_нl\right)l-J\omega^2}.$$

(21), the angle of rotation of the coil pull from the equilibrium state to the largest angle

$$\alpha_{\max}=\frac{\Delta Rl}{J\sqrt{\left[\frac{\left(N_x+C_nB_гl+C_нl\right)l}{J}-\omega^2\right]^2+\left(\frac{b_nB_гl^2}{J}\right)^2\omega^2}}. \quad (22)$$

VI. CONCLUSION AND FUTURE WORK

The analysis of the (21) and (22) indicates that the quality of the roller is dependent on the moment of the inertia, the length of the extension, the pressure of the pressure tube, the propagating force amplitude and the physical and mechanical properties of the soil, and the operating conditions and the specific surface area of the rolling mill the smooth processing of the print spell is achieved by the correct choice.

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