SCHEME OF RIPPER MACHINE FOR FOREST FIRE EXTINGUISHING IN THE WAY OF SOIL TOSSING

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The scheme of ripper machine for forest fire extinguishing in the way of soil tossing that will not counteract the movement of the machine, and will respond to the various inclusions in the soil is studied.

Keywords: **ripper, Lagrange equation of the second kind, the elastic member, stiffness coefficient.**

Formulation of the problem. For fighting forest fires or steppe ґruntometalni advisable to use special machines able to direct the flow of truncated soil in the area focus most effectively in the absence of water [1]. The structure hruntometalnoyi machines must necessarily include a device for cutting and loosening the soil on which depends the effectiveness of the performance of the whole mechanism as a whole. Structure baking powder must meet certain requirements. Namely, reduce power inputs during movement hruntometalnoyi machine, and "avoid" possible inclusion in soil (stones, roots, etc.). These requirements come from the fact that baking has direct contact with the ground. The above points to the need to develop effective schemes baking powder with these properties.

Analysis of recent research and publications. Similar in technology is loosening soil cultivators agricultural machines. Reid stands cultivator ensured by springs or metal strip (paws) [2]. This allows the front to respond to the inclusion in the soil, and use elastic element of the working body as energy storage during the processing of soil layers [2,3]. But the principle of the farm cultivators is counteracting direction of the movement of machine, which greatly increases its energy costs. It is therefore not advisable to effect technology transfer ripper cultivation. Literature review revealed the absence of appropriate action baking powder schemes soil ґruntometannya mechanism that would not interfere with the movement of the car and react to the inclusion in the soil stones, roots, etc.

The wording of Article purposes. Develop a scheme ripper Soil hruntometannya mechanism for fighting forest fires, which would not oppose motion machine movement and would react to unwanted incorporation in the soil.

Main part. The scheme ripper Soil hruntometannya mechanism consists of two parts - arc metal legs with spring mechanism and lambda-Chebyshev. This curve is fixed at one end element lambda mechanism (Fig. 1).

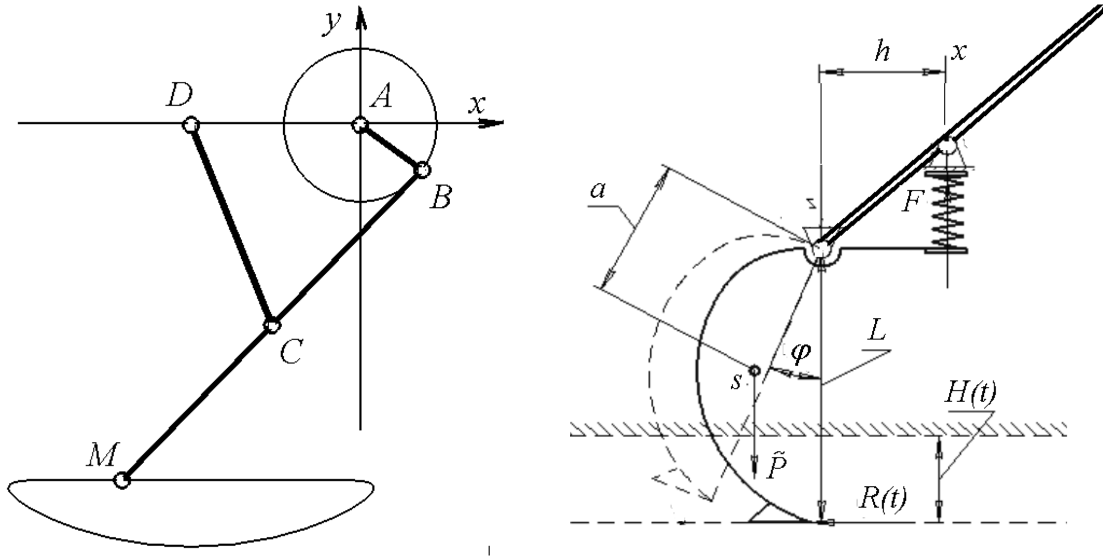

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Fig. 1. Scheme of Soil ripper components:
a) lambda Chebyshev mechanism;
b) arc metal legs with spring

Dimensions elements lambda mechanism Chebyshev *AD = 2,215 r; DC = CM = DC = 2,823 r* are chosen depending on the radius *AB = r*, which rotates clockwise. In the fixed point M arc metal legs with spring, which is the working body ripper circuit ground. That metal paw with spring moves along the kinematic curve that defines the point *M*. To describe the actions arc metal legs with spring will continue to use the local coordinate system. Also assume that the system has two degrees of freedom. For generalized coordinates take paws rotation about the point *M1* and the deformation of the spring along the axis *Ox*.

Fig. 1b shows a spring-loaded rack baking powder, where the main be parameters: *V* - speed hruntometalnoyi machines, *f* - angle of rotation of the metal paws, *S* - the center of mass of the metal legs, P - mass of metal paws, *F = abs (CX)* - strength elastic springs where *s* - the spring stiffness coefficient, x - its deformation. Other options are explained below.

The chosen scheme ripper ground (Fig. 1) in practice, will implement a mechanism that does not oppose the displacement machine as cultivators, but rather its "step by step" movements facilitate its movement.

This will reduce engine power and, consequently, reduce fuel consumption. To describe the dynamics of a metal spring clutches use a system of differential equations in [2]:

$$= m\left(\frac{d^2}{dt^2}u(t)\right) - m\,a\left(\frac{d^2}{dt^2}v(t)\right)\cos(v(t)) + m\,a\left(\frac{d}{dt}v(t)\right)^2\sin(v(t)) = 0 \qquad (1)$$

$$Jz\left(\frac{d^2}{dt^2}v(t)\right) - m\,a\left(\frac{d^2}{dt^2}u(t)\right)\cos(v(t)) + m\,g\,a\sin(v(t)) + c\,v(t)\,h^2 = A\sin(w\,t)$$

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Here, the following notation: *u (t)* - the angle of rotation of the metal paw at time *t; v (t)* - magnitude of deformation of the spring; and - the distance from the axis to the center of gravity of the metal paws in unloaded condition; *h* - the distance from the axis of the mounting metal paws spring axis; *c* - stiffness of the spring; *m* - mass of metal racks paws; *Jz* - the moment of inertia profile metal paws; *A* - the amplitude of the action forced labor; *w* - frequency of action forced labor; and - the distance from the axis to the center of gravity of the metal paws; *h* - the distance from the axis to the axis of the spring; *g = 9,81*.

Untie system (1) will be numerically using Runge-Kutta method with initial conditions: *u0 = 0; u'0 = 0; v0 = 0,3*. For comparison, choose the values of [2] (all in arbitrary units): *m = 16,5; c = 151; a = 0,4; h = 0,18; Jz = 2,723; A = 3.*

In addition, the elastic element must be tuned so that the natural frequency of the system frequency equal power disturbances, ie *w = k = 28,95*, where *k* - circular frequency fluctuations metal paws:

$$k = \sqrt{\frac{mga + ch^2}{Jz - ma^2}}\,. \qquad (2)$$

Then optimal rigidity of the elastic element, the effect of which reduces the bearing capacity of the soil in the horizontal direction, and hence the horizontal component traction resistance can be determined [2, 3] by the formula $c = \frac{k^2\ \ J_z - ma^2\ \ - mga}{h^2} \approx 151$.

Suppose we do not know the value required frequency *w* involuntary action force to provide technical movements ripper circuit elements (in fact in this case the formula (2) it can be calculated and we have *w = 28,95*). We show that for comparing the desired value *w* can be obtained using the new method - projection focus. It is necessary to numerically solve the system of equations (1) and construct an approximate picture integral curve in phase space *{u, Du, t}*. Images consist of a plurality of segments connecting the successive points obtained from the approximate solution of systems of equations. This will depend on the particular illustrate the importance of "managing" the parameter *w*. At random value *w* in the phase space *{u, Du, t}* formed "confused" integral curve, the projection of which on the phase plane *{u, Du}* will also be "confusing" phase trajectories (Fig. 2a), resulting in non-technological movement elements ripper.

If you change the values of "manager" parameter w has changed and the nature of the phase trajectory. When the critical value *w = 28,95* it changes at a qualitative level - turn into "focused" curve (Fig. 2b). That is phase plane *{u, Du}* if observed optical effect "pointing to sharpen" the confusion phase trajectories (OHP held focusing [4, 5]).

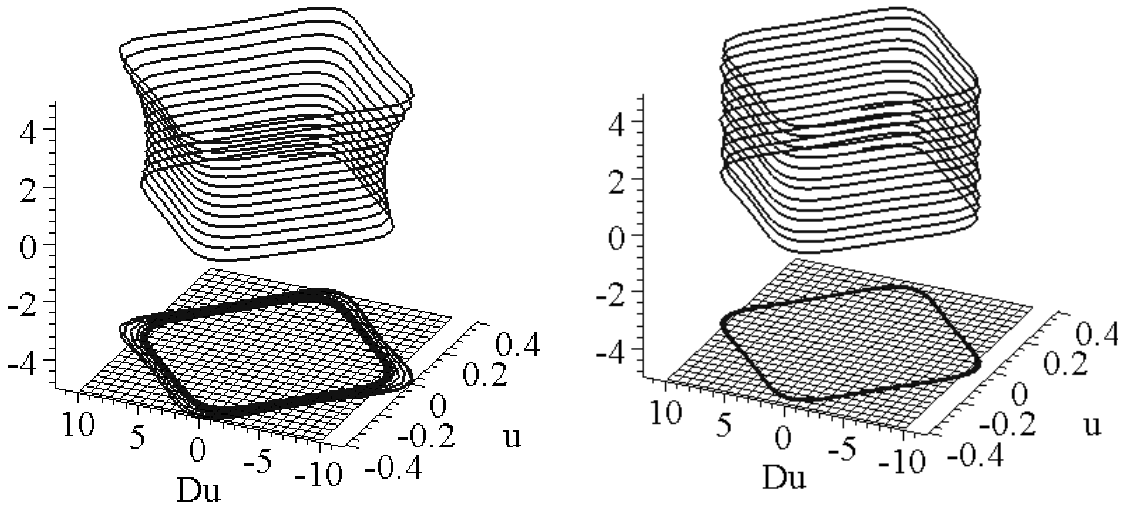

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Fig. 2. Integral curves and phase trajectories for:

a) random value *w*; b) the calculated values $w = 28{,}95$

Considering the value $w = 28{,}95$ in the process of solving the system of equations (1) will calculate the approximate time the angle $u\ (t)$ and extension springs $v\ (t)$, which will provide the technological interrelated movements ripper circuit elements.

Conclusions. This scheme projection focus to evaluate the magnitude of the frequency w involuntary forces acting on the metal leg ripper soil. This value agrees with the theoretical, calculated using the formula (2).

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