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Autovibrations in Constructed Teeth Harrows

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ABSTRACT: The results of research on the new structure of the notched harrow are specified in the article, which is used at soil tillage before sowing processes. Classical theory of frictional automatic vibrations was used at studying the horizontal vibrations of the harrow harrow working beams. Method of relaxation auto vibrations in the process of operating the harrow is scientifically based.

KEYWORDS: Soil, boring, toothpaste, elasticity, frictional force, friction autotuning, resistance force, frequency, speed, migration.

I. INTRODUCTION

In the terms and conditions of Uzbekistan, this is an important agrotechnical device, which is widely used for soil tillage activities for seeds and other crops. This activity is performed by threaded holes for the following purposes:
–maintaining moisture content in the subsoil, removing weeds, the formation of salts on the soil surface, as well as uneven surface area;
–mitigating the formation of strong precipitation;
–softening the soil surface before sowing (harrow pre-planting);
–crushing boxes after moving or leveling and leveling the field surface;
- In some cases, mixing fertilizers, seeds, herbicides, and so on.

Many studies and research by scientists in the cotton sector have shown that although the quality of the autumn plowing is high, soil will lose its moisture and drain immediately, as soon as the land is not accumulated in due time in the spring, as a result of which the importance of autumn plowing is diminished.

II. LITERATURE SURVEY

When analyzing the data presented in the literature, the agrotechnical requirements for boring in cotton-growing regions are as follows [1x:
– depth of tillage - 4-6 cm;
– the fraction of less than about 25 cm in the softened soil, at least 80%, the size of fractions greater than 50 mm –at least 5 %;
– moisture of softened soil layer ± 1 cm;

The rate of loss of the weed-in weed should be at least 95 percent. And soil moisture layers should not be formed during processing as well.

Due to the fact that the existing harrow borates are firmly fixed, they are not adequately adjusted to the roughness of the field, resulting in the soil surface is not completely softened and the weeds are not completely eradicated. In order to avoid this, the farms are used to install two rows of pipes. However, this method results in a sharp increase in the size and energy of the boring aggregate, downsizing, and the decline in operating performance.

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An analysis of harrow surveys and patent-information materials has shown that, where the equipment running used in early spring and sowing is fully adapted to the relief, and additional vibration improves, the quality of soil tillage improves and the energy consumption decreases [2]. Based on this, constructive schemes of harrow fitting and teeth can be protected by patents of the Republic of Uzbekistan No. FAP 00909 and FAP 01174.

Notched harrow (Fig. 1) consists of tractor fitted with a tractor assembly *1*, operating components *2*, connecting rings *3*, and rug *4* which connect with theoperating components. At the same time, the operating componentis made of 5 base and *6*notches. There are three holes in the base, the rings that pass through them, and an exciting bond.

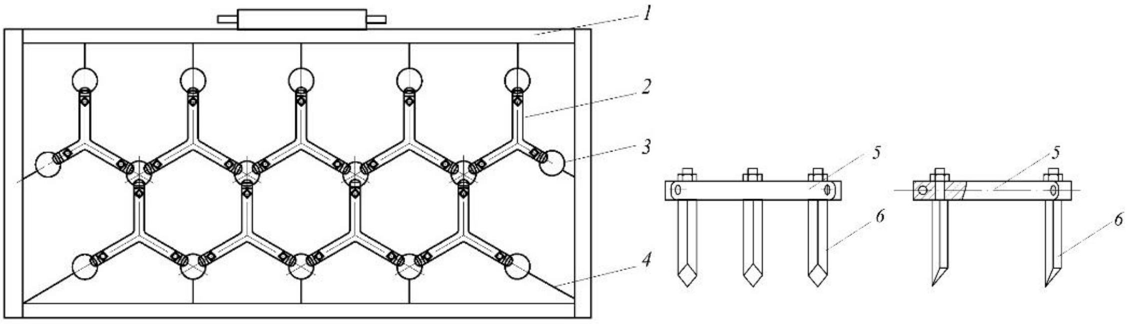

Figure - 1. Constructive scheme of threaded harrow adapted to the field release

In the working process, that is, when harrow is dragged, the operating componentlar is connected with each other through rings, and framework through rings and drawers, due to the fact that the teeth soften the soil in accordance with the unevenness of the field surface. In addition, at the expense of rings and drawers, each operating component independently tries to vibrate. As a result, the quality of processing to the surface of the field as well as the loss of weeds will improve. Due to the vibrating motion of the operating component, harrowa's resistance to pull is reduced, and the operation life increases. Due to the agrotechnical and technical requirements, all parameters and dimensions of this harrow were scientifically based [3].

The next task is to investigate the vibration of the harrow operating components. For this purpose, we refer to the classic model of frictional autovibrations. The massive body that is attached to the tangle harrow is fricted with the ribbon moving horizontally along the c = const speed. The tape moves in one direction on a regular basis.

The surface of the body and the tape will have a dry friction force. Depending on the parameters of the system, the object can move in a certain state of calculation or friction. How the body moves will depend on the velocity of the tape, the amount of frictional strength, the spring stretch ability and the relationship between them. This issue is well-researched and is illustrated in the literature [4].

III. METHODOLOGY

For the theoretical study of the movement of the operating component of the harrow engraved on tractor, we can make it equally relevant to the subject. For that, we take some simplicity and hypothesis. If we consider operating components as massive body, and the ring that connects it to the framework is called spring, and the earth is tape. We only ship the tape speed to the tractor.Instead of frictional forces, we can take the resistance force that shows the soil to the working motion. This force is the sum of the force generated by the friction of the wavelength with soil and the elastic deformation of the soil (*Figure 2*).

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When the tractor crushes the harrow, the strength of the spindle (rings) on the working surface is affected by the strength of the soil and the resistance of the soil. The force of resistance in the air must be greater than the resistance force in the movement, otherwise autovibrations will not occur.

The right side of the projectile moves with an unchanged V speed (*tractor speed*), while the left side of it receives X jumps from the point the body corresponds to the beginning of the movement. We mark the Sturgeon of spring with S. We accept the strength of resistance the simplified characteristics (Figure 3).

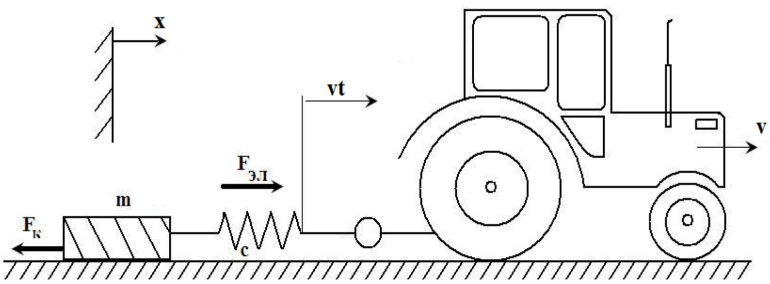

Fig. 2.

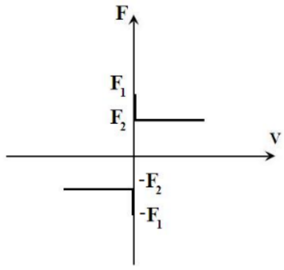

Fig. 3.

As we can see from the picture, the F1 resistance strength in a calm state is much larger than the F2 resistance force in action. When the force of elasticity of the tangent spring occurs when F_1 is equal to the force of the F_1 resistance in a calm state, a sharp movement of the operating component (suddenly moving). At that point in time, T will be the force of elasticity that moves the operating component. And the F2 force has resistance to movement. Proceeding from this, the differential equation, which represents the action of the operating componentat this time, is written as follows:

$$m\ddot{x} = F_1 - c(x - vt) - F_2 \text{ either}$$

it will be $\ddot{x} + k^2 x = k^2 vt + (F_1 - F_2)/m$,

in this case, X-moving; k^2=c/m; C –stretchabilitycoefficient of the spring; m – the mass of the operating component.

The initial conditions of this equation will be the solution of contentment when zero will be in the following view

$$x = vt - \frac{v}{k}\sin kt + \frac{F_1 - F_2}{c}(1 - \cos kt).$$

And the velocity varies in accordance with below laws

$$\dot{x} = v(1 - \cos kt) + \frac{k}{c}(F_1 - F_2)\sin kt$$

and somehow the t_1 will be equal to zero again in time. the value of t_1 can be found in the following formulas $\sin kt_1 = -\frac{2a}{1 + a^2}$; $\cos kt_1 = \frac{1 - a}{1 + a^2}$,

in this case $a = \frac{k(F_1 - F_2)}{cv}$.

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It is illogical that the operating component stops because the modules of the above expressions are always small at once. After identifying these, the operating component will also find its way through which element will be pressed until it stops:

$$x_1 = vt_1 + 2av/k \ .$$

When suspend time $t_2$of the operating component is determined from the term that the spring force in the stretch should again reach the F_1 value of the resistance force in a calm state.

The period of autotebrans can be found in the expression $t=t_1+t_2$.

IV. RESULTS

By accepting the following parameters of system, movement of the operating component was calculated based on the above expressions. Accepted parameters *m=3 kg, V=1 m/s,* F_1*=250 H,* F_2*=150 H, c=750 N/m.* Based on the number of values found in the calculation, connections were built that assess the path (Fig. 4) and the Speed (Fig. 5) that the operating component pressed at a one-time vibration.

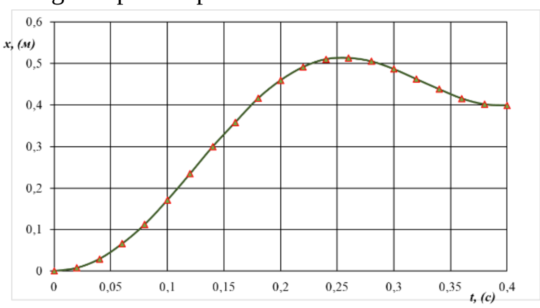
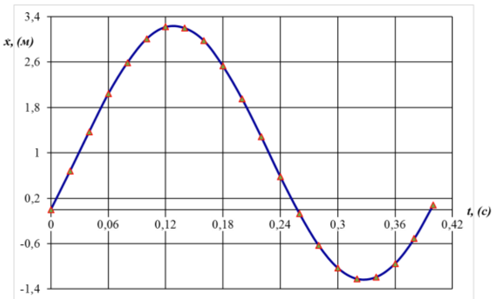


Figure 4



.Figure 5.

V. CONCLUSION

So, relying on the above theoretical research, we can get the operating componentmass, the stretch abilitycoefficient of the spring, and the autovibrations relaxation by choosing the speed of the tractor on a scientific basis.

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