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Study of Motion of Stem Part, Grain and Their Cuts in the Separator

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ABSTRACT: This article considers the analysis of the acting forces on the parts of the stem, grain and their bran in the separator, their drawings are made.

KEYWORDS: kinematics, dynamics, rotor separators, the normal reaction force, energy consumption.

I. INTRODUCTION

E.I. Lipkovich, B.D. Zonov, B.P. Kutepov, A.M. Churin, V.V. were engaged in scientific studies of the interaction of the working bodies of the rotor separator with stems, straws and other materials, as well as the processes taking place in the separator. Soldatenkov and others [1-5].

In their studies, they removed more taking out the kinematics and dynamics of rotor separators, sorting grain in them, studying the energy consumption of the separator, but did not sufficiently study the interaction of the working bodies of the separator with parts of the stems. In addition, in the designs of the separator produced, it is required to study the interaction of the rotor fingers with the masses of the stem and grain feeding them. The mass supplied to the separator consists of three components: the stem, grain and their bran and they move under the action of the working bodies of the separator in different ways. Therefore, we consider their action first in general, and then in a separate form.

II. METHODS

After capturing the stem and fodder mass with the rotor finger and pulled into the separator, under the action of a large centrifugal force, the mass slides out of the finger and hits the inner surface of the deck. As a result, when the grain passes through the holes of the deck and moves downward, part of the stems due to the large size, do not go through the holes and continue to rotate, it strikes against the guide plates, inclined at an angle to the deck. As a result of this, their direction of movement during rotation changes, they begin to move in the longitudinal.

Therefore, we separately consider the movement of a part of the stem under the action of the aforementioned working bodies.

The painting of the palms separator. Part of the stem and the grain mass inside the grinding apparatus capture the fingers of the rotor and pull them inward. As far as the rotor has a high rotation speed, the mass captured by the finger, when the rotor is rotated at a certain angle, begins to act centrifugally, and slides along the finger towards its vertices.

In this, the centrifugal force Fm, the gravity force G, the air resistance Fb, the punished force Fk, the normal reaction force N, the friction force F Tr affect the mass.

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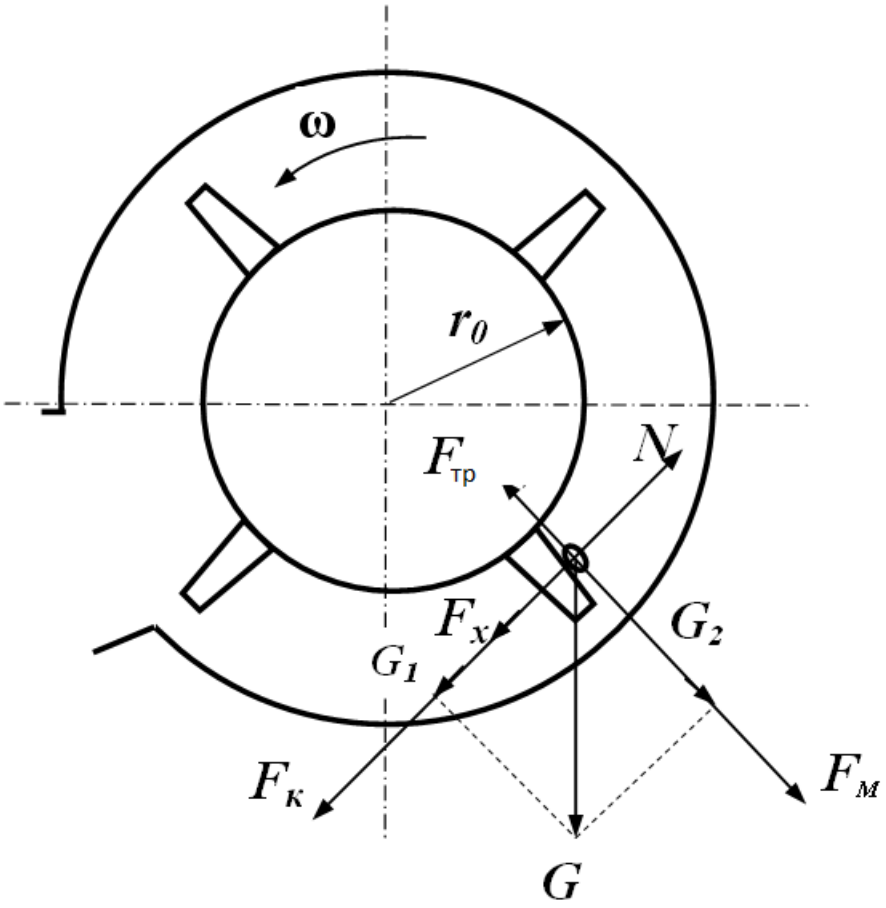

(Рис.1.1.)

Fig.1.1. Effects on particles when exposed to a separator finger.

III. ALGORTHMS USED

According to the fundamentals of theoretical mechanics and diagrams, these forces are equal to the following [6-7].

$$F_м = m\omega^2(r_0 + l);\ G = mg;\ G_1 = G\sin\omega t;\ G_2 = G\cos\omega t;$$

$$F_x = mk_nV;\ F_k = 2m\omega\dot{l};\ N = G_1 + F_x + F_k;\ F_{mp} = fN$$

Part of the stems, grain and their bran, which are under the action of a finger and apply as a material point, we derive the differential equation of motion along the finger:

$$m\ddot{l} = F_M + G\cos\omega t - F_{mp}, \qquad (1.1.)$$

Here is the acceleration of a particle crawling on a finger, m / s 2

IV. RESULTS

Putting the value of the above forces in this expression, reducing by m and making some replacements, we obtain the following expression:

$$\ddot{l} + 2f\omega\dot{l} - \omega(\omega - fk_n)l = g\cos\omega t - fg\sin\omega t + \omega r_0(\omega - fk_n), \quad (1.2)$$

Here is the angular velocity of the particle, s-1;

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r_o is the radius of the rotor, m
l is the length of the fingers of the separator, m
g- gravity acceleration, m / s2
f - coefficient of friction
k_n - sail coefficient
v- air speed m/s
l' - particle velocity along the finger, m / s
t-time of movement.

V. CONCLUSION

Thus, the analysis of animations shows that the movement of the part of the stem inside the grinding apparatus mainly depends on the radius of the rotor and speed.

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