FOUDATION OF THE SHARP ANGLE OF THE SOFTWARE COLUMN

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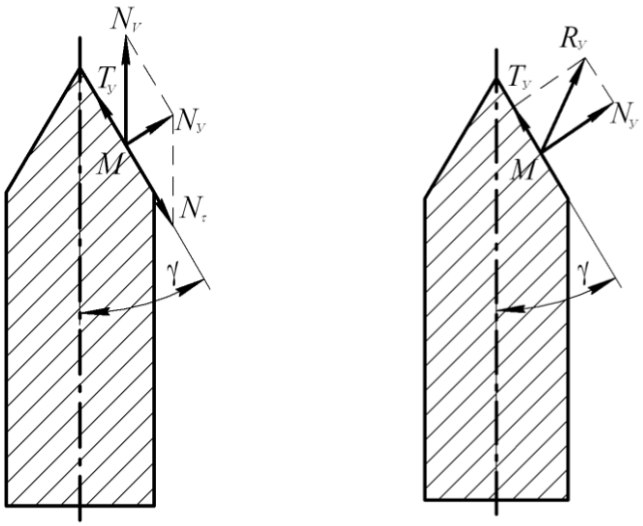
ABSTRACT

The article is based on the sharpening angle of the combined aggregate softener column with minimal tillage.

Sharpening angle of the softener column is determined by the condition that the soil in front of it does not stick and fall asleep. To do this, we consider the interaction process of of the sharpened part of the softener column with the soil particles in the horizontal plane (Fig. 1).



а б

1-расм. The sharpening angle of the softener column

detection scheme

Soil particles are affected by normal N_y and friction forces $T_y = N_y tg\varphi$ by the sharpened surface of the softener column in the horizontal plane. We divide the normal N_y force into N_V directed along the direction of motion and N_τ directed along the working surface of the column. According to the scheme shown in Figure 3.9, a

$$N_V = N_y / \sin\gamma \quad (1)$$

and

$$N_\tau = N_y ctg\gamma, \quad (2)$$

where γ is half the sharpening angle of the softener column. It is known from the literature that the following condition must be met in order to prevent the soil from sticking and falling asleep in front of the softening column [1]

$$N_\tau > T_y \cdot \tag{3}$$

Substituting the above values of N_τ and T_y into this inequality, we obtain the following

$$N_y ctg\gamma > N_y tg\varphi_1 \tag{4}$$

or

$$\gamma < 90\text{-}\varphi_1 \tag{5}$$

When this condition is met, the soil particles move in the direction of the R_y force, which is equally affected by the N_y and T_y forces (Fig. 1, b), and at velocity.

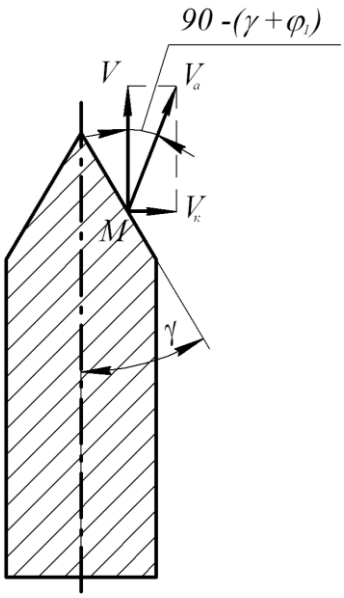


Figure 2. Scheme for finding the velocity of soil particles under the influence of a softening column

According to the scheme shown in Figure 2

$$V_a = V\frac{\sin\gamma}{\cos\varphi_1}, \tag{6}$$

where V - the forward velocity of the unit.

And we find the transverse (perpendicular) component of the velocity V_a to the direction of motion

$$V_\kappa = V\frac{\sin\gamma}{\cos\varphi_1}\cos(\gamma+\varphi_1). \tag{7}$$

It is expedient to find the sharpening angle of the smoothing column, provided that the speed V_k has a maximum value.

To find the value of the sharpening angle of the column that maximizes V_k, we apply expression (7) to the extremum at an angle γ. To do this, we take the first-order product from the expression (7) at an angle γ and set the result to zero [189]

$$\frac{dV_к}{d\gamma} = V\cos\varphi\left[\cos\gamma\cos\left(\gamma+\varphi_1\right)-\sin\gamma\sin\left(\gamma+\varphi_1\right)\right]=0 \qquad (8)$$

or

$$\cos\left(2\gamma+\varphi_1\right)=0. \qquad (9)$$

From here we get the following

$$\gamma=\frac{\pi}{4}-\frac{\varphi_1}{2}. \qquad (10)$$

Бу олинган ифодага φ_1 ни маълум бўлган қийматларини (25-35^0) қўямиз ва γ бурчак 27-33^0, 2γ эса 54-66^0 оралиғида бўлиши кераклигини топамиз. Демак, юмшаткич устунининг ўткирланиш бурчаги 54-66^0 оралиғида бўлиши лозим.

We put the known values of φ_1 (25-35^0) in this expression and find that the angle γ should be in the range 27-33^0 and 2γ in the range 54-66^0. This means that the sharpening angle of the softener column should be in the range of 54-66^0.

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