SELECTION OF AN AUGER DEVICE FOR A MACHINE FOR SPREADING AND COMPACTING IMPROVED ROAD CONSTRUCTION MATERIALS

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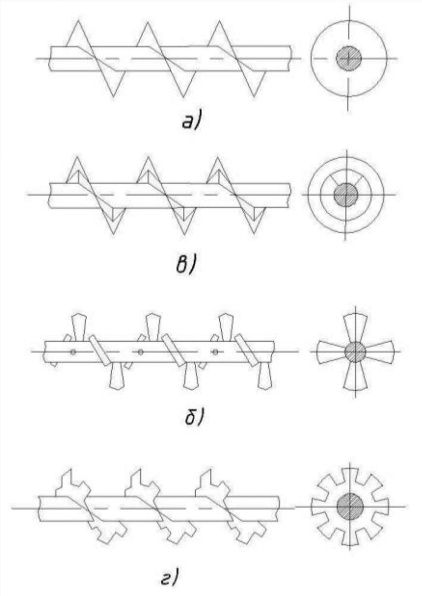
Decree PQ-4035 of 27 November 2018 by President Mirziyoyev - "Design and road works on the basis of advanced development of the country's road transport infrastructure, introduction of advanced technologies and best foreign practices to further improve its quality, as well as comprehensive improvement of the state management system in the field of road construction in connection with the five priority development areas of the Republic of Uzbekistan in 2017-2021 he mentioned a few thoughts.

To this end, creating new machines and improving existing ones is the challenge of today. In our previous research we talked about the design of an improved machine for spreading and compacting road construction materials. Our current research shows that we are conducting a series of studies to select augers for an improved machine and to put into practice the optimum.

Augers are divided into single, winged and shaped augers according to their structure (picture 1).



a) integral; b) ribbon; c) feathered; d) fashionable

Picture 1: Types of augers

For transporting loose, granular and powdery materials, including soil, integrated auger types are used; for transporting coarse solid materials (coarse gravel, sandstone, limestone, etc.) belt augers are used; for transporting pasty and clayey and sticky materials (cement-sand mixtures, concrete mixtures) and used in moving materials.

Based on the recommendations above, it is advisable to choose one type of auger.

Theresults of previous studies show that the movement of pieces of road construction material along its axis under the action of an auger rotating around a horizontal axis can be expressed by the following differential equations.

$$N_ш \cos\alpha_R - f_ш N_ш \sin\alpha_R - mR\left(\frac{d^2\varphi}{dt^2}\right) - f_T N_T \cos\beta_R = 0; \qquad (1)$$

$$mg\sin\varepsilon - f_T N_T \sin\beta_R - f_ш N_ш \sin\alpha_R - N_ш \sin\alpha_R - mR\left(\frac{d^2\varphi}{dt^2}\right) = 0; \qquad (2)$$

$$mg\cos\varepsilon - mR\omega_0^2 + mR\left(\frac{d\varphi}{dt}\right)^2 - N_T - 2mR\omega_0\frac{d\varphi}{dt} = 0, \qquad (3)$$

therein $N_ш$ – normal auger reaction force on the ground;

$f_ш$ – coefficient of soil friction on the auger screw;

$\alpha_R = arctg\,\frac{l_ш}{2\pi R}$ – angle of elevation of the screw line on the outside radius of the auger;

$l_ш = 2\pi R tg\alpha_R$ – auger pitch;

R – auger screw radius;

m – chunk weight;

g – acceleration of gravity;

N_T – normal reaction force of the ground;

f_T – the coefficient of soil friction;

β_R – angle between the absolute velocity vector of the chunk and the auger axis;

$\varphi=\varphi(t)$ – angle of lag of a piece of soil when the auger rotates at a constant angular velocity ω_0;

t – Current time;

$\frac{d\varphi}{dt} = \omega_T$ – angular speed of ground motion;

ε - angle defining the position of the piece of soil relative to the vertical plane, deg;

$\psi = \omega_0 t$ – Angle of rotation of the propeller in t time;

$mR\frac{d^2\varphi}{dt^2}$ – tangential force of inertia;

$m\omega_0^2R$ – centrifugal force of inertia in translational motion;

$mR\left(\frac{d\varphi}{dt}\right)^2$ – centrifugal force of inertia in relative motion;

$2m\omega_0R\frac{d\varphi}{dt}$ – Coriolis force;

$ma_R\frac{d^2\phi}{dt^2}$ – axial force of inertia.

In summary, from our research we can say that it is reasonable to use a single-screw auger as an auger for an improved machine for spreading and compacting road construction materials.

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