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A SET OF ATTACHMENT FOR HEAVY TYPE GRADERS

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Traffic safety related to the quality of surface cleaning pavements of snow, snow and ice formations and ice, as these factors change grip surface properties i.e. one of the most important conditions for ensuring safety. Interaction of tires with a road surface characterizes a friction coefficient, which varies from 0 to 1.0. In order to ensure safe traffic it is required that friction coefficient don't lower than the minimum. This minimum value is considered to be 0.3 [1] at lower values of the friction coefficient a risk of accidents increase dramatically.

A vehicle breaking distance increases on icy coated road surface significantly, as indicated in Table. 1, a wheels rolling easy sliding, this increases the likelihood of accidents [4].

Table 1 - The average length of braking distance

Speed, km / h	The average length of the braking distance, m	
	On dry road surfaces	On icy covered road surfaces
20	3,1	10,5
30	7,1	23,6
40	12,6	42,0
50	19,7	65,6
60	28,3	94,4
80	50,4	167,9
100	78,7	262,3

Improving the transport and operating vehicle wheels gripping with icy coated road surface is carried out by:

- spreading friction materials;
- removing snow and ice formations;
- using anti-icing agents to prevent the formation of snow and ice deposits.

According to these directions means of struggle against winter slipperiness are developed: friction, chemistry, thermal and mechanical.

The most economical and technologically easy to use and environmentally friendly is a mechanical way.

Existing harvesting machines in which main work tool are blades and brushes are used successfully in the snow removal process, but they are not able to destroy ice quite effectively and in time because of its high strength and a constructive inadaptability of the work tool.

Nowadays three units working machinery use simultaneously to provide required quality of cleaning road surfaces. The existing scheme of cleaning roads from snow and ice formations shown in Fig. 1.

According to the drawing (Fig. 1) a grader moves first and destroys the top layer of packed snow and ice by moldboard, after that an ice cleaver UDM-2000 breaks remaining snow and ice formations, in final a machine equipped with a brush work tool sweeps away the destroyed ice formations towards a roadway.

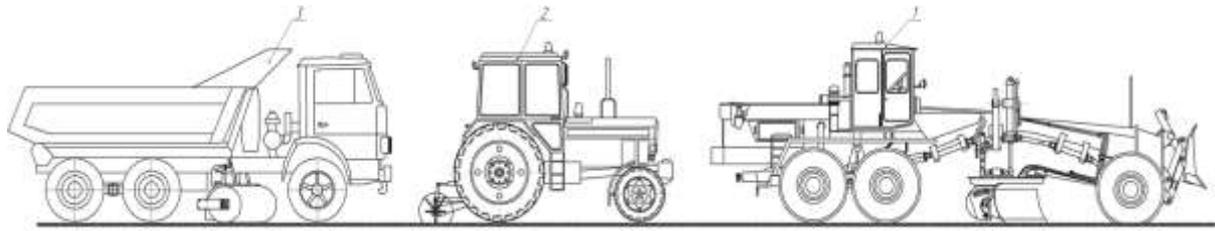


Fig. 1 - The existing scheme of clearing roads of snow and ice formations 1 - grader heavy type; 2 - cleaver ice UDM-2000; 3 - machine equipped with a brush work tool

The existing scheme of cleaning snow and ice formations isn't economically profitable.

Development a set of attachments for snow and ice formations, mounted on a grader will allow to reduce amount of used equipment, this will reduce the economic costs (the cost of fuel and wages) to remove snow and ice formations.

The scheme of proposed attachment that mounted on the grader, is shown in Fig. 2.

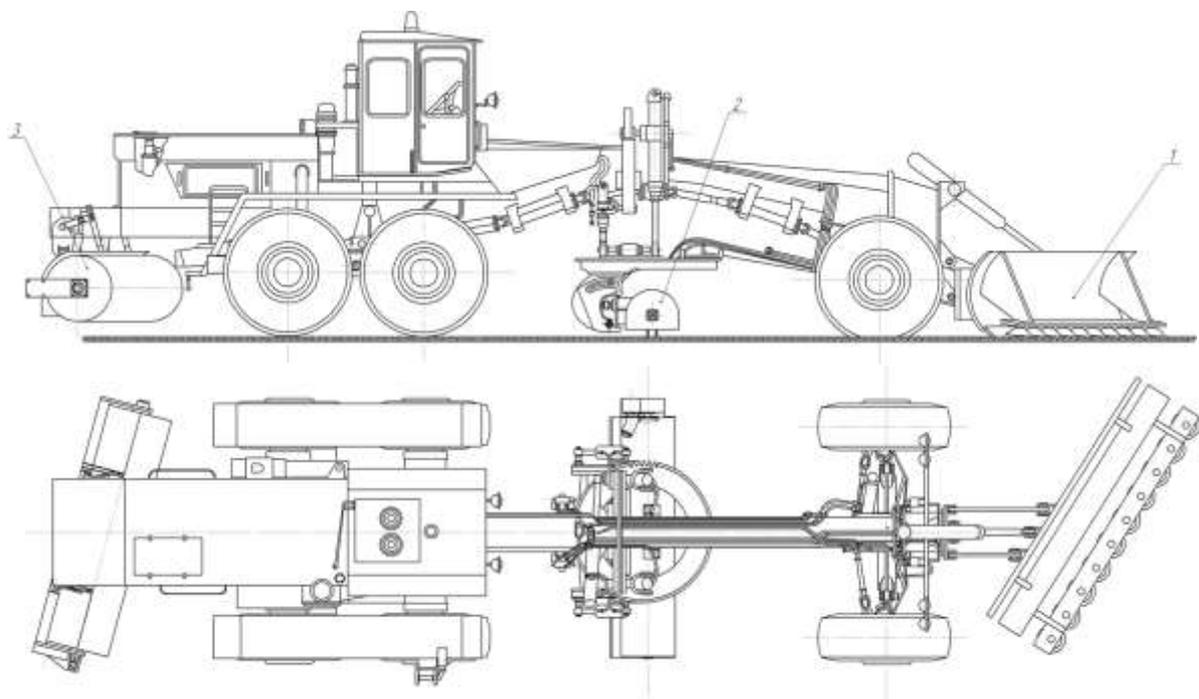


Fig. 2 - Scheme of the proposed attachment mounted on the grader 1 -a Front work tool with a rotary instrument; 2 - a chain stroke work tool; 3 - a brush

A set attachments is a set of units and mechanisms, allowing to carry out a number of basic vehicle manufacturing operations to destroy the snow-ice formations.

To improve the cleavage snow-ice runup that equipment designed as a moldboard with disc instrument at angle $40-45^{\circ}$ placed at the bottom of it, wherein an inclination angle of the disk to the lower surface of the snow and ice runup is not more than 5° . Setting cutting disks at such angle ensures optimal cutting force and power-consuming of the whole process. Setting the moldboard at an angle $40-45^{\circ}$ ensures optimal working areas overlap of adjacent disks i.e. semi-blocked cutting by all discs except the front, edge during movement of the machine base, thereby it provides increasing productivity. Blades crashing into snow-ice runup, destroy it, products of destruction moved along the moldboard and shifted away from

the machine at motion. The work tool allows effectively remove snow and ice runup of up to 10-15 cm thick from the pavement

Snow and ice formations left after the passage of moldboard on the road surface, and a thin layer of ice thickness up to 3 mm are broken by chain work tool, that installed on a turntable of a traction frame. Chain work tool is designed as a horizontal drive shaft installed to a vehicle longitudinal axis at an angle of 10 to 15, and rotating in a direction opposite the direction of rotation of the machine`s wheels.

Road sweeper brush 3 is set behind the grader, it provides remote snow and ice formation shattered by chain work tools away from the machine.

Application the kit of attachments will allow to reduce the number of cars involved in the process of removing snow and ice formations with road surfaces, combine operations to destroy and remove the snow and ice formations, increase productivity and efficiency of basic techniques, reducing the economic costs of removing snow and ice formations (fuel - 62.4%, wages maintenance personnel - 63.8%). Compared to the conventional dozer blade a moldboard equipped with disk tool reduces the power consumption of the removing snow and ice formations process in 2,3 times.

The application of such technical solution will allow to provide the required quality of cleaning road surfaces, aircraft parking, driveways, taxiways, increase the friction coefficient of the road surface and thus improve traffic safety.

References

1. Recommendations for roadway paving with a rough surface. Approved by Decree of the Ministry of Transport of Russia from January 5, 2004

4. Byalobzhevsky GV and others. The struggle against winter slipperiness on the roads. - M.: Transport, 1975. - 175 p.