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Front Plow for Smooth, Furrowless Plowing Equipped with Angle Marks

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Abstract: In the proposed technology, with the help of frontal plug bodies, the upper left and right edges of the overturned slabs are first cut with the help of an angle cutter, so that the difficulties in the process of overturning are eliminated and the resistance to traction is reduced. The developed angular plow frontal plow is designed for 4-5 class tractors, its working speed is 6,5-8,5 km/h, coverage width is 2,1 m and processing depth is 25 cm. The angled frontal plow, developed on the basis of theoretical and experimental studies, reliably performed the specified technological work process, and its performance fully corresponds to the agrotechnical requirements and the technical assignment.

Keywords: soil, front plow, body, smooth plowing, cornercutter, disc coulter, triangular wedge.

Introduction

When processing with frontal plows, the blade is rotated on the edge of the edge, and its edges are deformed. Due to the fact that the frontal plug housings are located symmetrically to each other, their edges touch each other and compress when turning the blades at 180° degrees. This allows soil to build up in front of the housings and cause them to clog. It is known that soil compaction in front of the housing requires excessive energy consumption [1-3].

In the technology we offer, first the upper left and right edges of the blade are cut with the help of an angle cutter and turned to its center, then the blade is turned 180° at the border of its edge. The angled blade rolls without any obstructions at the limit of its position, and the plow quality is improved and the traction resistance is reduced [4,5].

Method

On the basis of the experimental researches, an experimental copy of the frontal plow with an angle cutter was prepared, and field and farm tests were conducted in the farms of Kashkadarya region [6].

The developed angled frontal plow drive unit has a symmetrical frame 1 with respect to the longitudinal axis, housings 2 and 3 whose working surfaces are opposite to each other to the right and left, zapluzhniki 4, support-leveling g It consists of a frame 5, disk-shaped blades 6, two supporting wheels 7, angle cutters 8 and a suspension mechanism 9.

Figure 1 shows the construction scheme of the developed angled frontal plug.

The plough frame is a welded construction and consists of longitudinal and transverse beams. Housings are mounted on the crossbar with the help of hooks. Between each pair of opposing housings are screw-type zaplukhni, which are attached to plowshares by means of a special device [7].

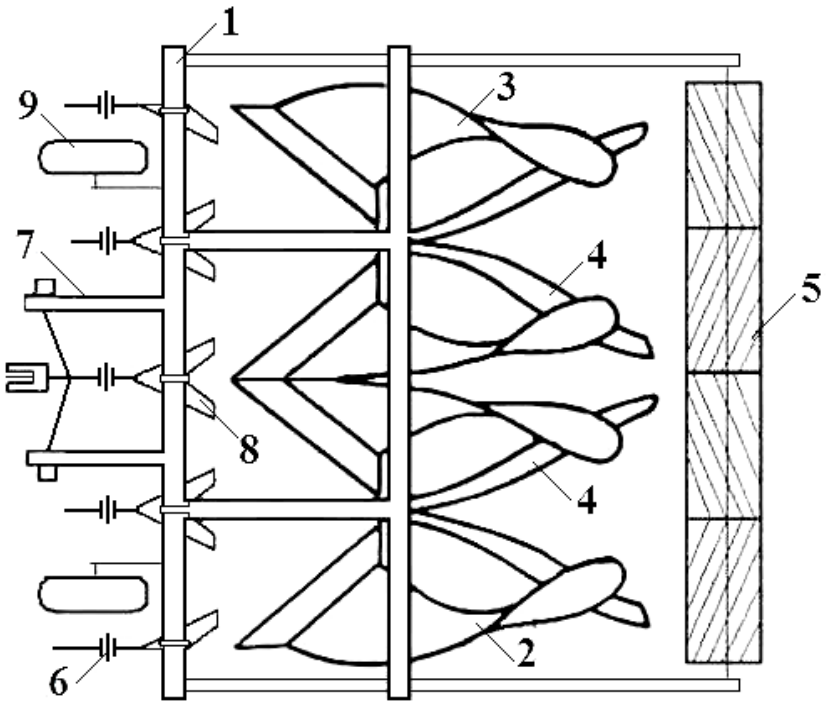

Figure 1. Frontal plugging with a flat cutting angle cutter constructive scheme

1 – frame, 2 and 3 – right and left turning bodies, 4 – router, 5 - support-leveling roller, 6 - disk-shaped blades, 7 - support wheel, 8 – corner cutter, 9 – suspension mechanism

The base leveling reel is hinged to the plug frame with the help of hammers. By changing the compression force of the springs, it is possible to change the quality of grinding the soil with the roller. The burchakkeskich is attached to the frame of the plow by means of special clamps and is placed in the middle of the pair of bodies and the nose of the ploughshare in a straight line [8].

The body consists of a welded head and a ploughshare hardened to it, a pin, a pole, a tipper and a wing attached to its back. Plug's suspension is designed for use with tractors of this class. Disk blades and support wheels are serially produced. Frontal plow support wheel adjustment mechanism allows to change plow depth within 22-30 cm.

The height of the developed angle cutter is 22 cm, the length is 27 cm, the angle of entry of the front edge into the soil is 50°, the opening angle of the wing is 32°, the twist angle is 55°, the slope angle of the side edge is 36°, the slope angle of the working side relative to the horizontal plane is 31°, and the depth of processing It is 12 cm [9].

The angular cutter frontal plug developed in the tests was aggregated and used on Magnum and T-4A tractors. The working depth is 25 cm, and the working speed is 7,5 km/h.

In these tests, the following indicators of plugs were determined: coverage width; driving depth; completeness and depth of burial of plant remains; level of soil fertility.

The developed angled frontal plow is designed for use with 4-5 class tractors, its working speed is 6,5-8,5 km/h, coverage width is 2,1 m and processing depth is 25 cm (2 - picture).

Figure 2. An experimental version of the angular frontal plugin

In the tests, the indicators of the frontal plug with an angle cutter were compared with the indicators of the ordinary frontal plug and the standard O'P-4/5-40 plug.

In the experiments, the moisture and hardness of the tested field soil was checked at intervals of 0-10, 10-20, 20-30 and 30-40 cm. According to the test results, it was found that the average moisture content of the soil is 11,6%, and its hardness is 4,13 MPa (Fig. 3).

Figure 3. A view of the angular frontal plugin in action

Results and Discussions

Table 1 shows the results of plow coverage width, plowing depth, completeness and depth of burial of plant residues, and the degree of soil erosion.

1- table

№	Indicator name	Value of indicators			
		According to the initial requirements	According to the test results		
			LD-100	PF-4	O'P-4/5-40
1.	Speed of movement, km/h	6,5-8,5	7,5	7,5	7,5

2.	Coverage: $M_{o'r}$, cm ±σ, cm *v*, %	 ±10 cm - <10	 210,8 2,8	 211,2 2,9	 203,2 3,1
3.	Driving depth: $M_{o'r}$, cm ±σ, cm *v*, %	 up to 30 - <10	 24,3 1,74 6,1	 25,8 1,78 8,97	 24,8 1,71 5,81
4.	Burial completeness of plant remains, %	>95	85,3	95,6	91,9
5.	Burial depth of plant remains: $M_{o'r}$, cm ±σ, cm	 >10 -	 10,9 1,3	 13,3 1,8	 11,9 3,1
6.	mount of the following size fractions, % >50 mm 50-25 mm <25 mm	 < 10 - > 5	 6,2 13,4 80,4	 5,1 11,1 83,8	 5,7 13,1 81,2
7.	Comparative fuel consumption, kg/ha	-	29,32	26,21	30,86

As can be seen from the table, all the quality indicators of the frontal plow with an angle cutter fully meet the requirements of agrotechnics.

In the tests, the frontal plug with an angle cut, the normal frontal plug and the O'P-4/5-40 plug reliably performed the specified technological process, and no serious defects were observed. When using the experimental version of the developed angled frontal plow on farms, the fuel consumption per hectare decreased by 4,65 kg compared to the O'P-4/5-40 plow and 3,11 kg compared to the conventional frontal plow [10].

Conclusions

The angled frontal plow, developed on the basis of theoretical and experimental studies, reliably performed the specified technological work process, and its performance fully corresponds to the agrotechnical requirements and the technical assignment.

When using the developed frontal plow with an angle cutter, compared to the existing technology, productivity increases by 1,14-1,18 times and 2,11-2,27 kg less fuel is consumed per hectare.

According to economic calculations, operating costs are reduced by 26,8 percent when using the developed angled frontal plow for plowing land.

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