

*In the presentation of the study Logistics rassmatryvaetsya As tools, allows us kotoryya Require naymenshymy with transport costs. Logistics in selskohozyaystvennom production aimed at decision voprosov, kasayuschyhsya materyalnyh flows with tovarodvyzhenyya (raw materials, materials, spare parts) with a view ekonomyy and obtaining profits. Thus, the study conducted by napravleny on optimization materyalnyh flows in agriculture, with lohystycheskyh Using approaches.*

**Keywords: Logistics, building and construction of transportation, route, materyalnyy flow**

**Annotation.***In the present study, the logistics is viewed as a tool that allows the use of vehicles with the lowest cost. Logistics in agricultural production aimed at addressing issues related to the physical distribution of material flows (raw materials, spare parts) to save and profit. Thus, studies have focused on optimizing the material flow in the agricultural sector, with the use of logistic approaches.*

**Key words: logistics, multimodal transport, route, material flow**

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## **TRENDS ROTARY MOWERS, PLYUSCHYLOK FROM ANCIENT TIMES TO THE PRESENT**

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**Abstract.** *Grounded geometric, kinematic and power parameters and modes cutting machine for cutting high-yielding grass regardless of its condition and conditioner machine dynamic performance feed preserving values and reduced losses at harvest artificial hay and silage.*

**Keywords: trend, development, mower, conditioner**

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**Formulation of the problem.** Without going into the details of when and how agriculture arose, and remember only that described by the Roman historian Pliny the Elder. He recalled that in I century BC (BC), the Gauls (Roman Empire) proposed car, which was a box that rested on two wooden wheels, the front of which is fixed obchisualna

comb. To the other end of the box were attached to the shafts, which harnessed traction force (horse, ox, mule), which is pushing this cart. When moving the ears of grain crops *zatyskalysya* between comb teeth and worker moving nearby, paddle knocked them into a box, filling it [1]. Obviously, if there were an ox, the man has come to agriculture along with tame cows, sheep, goats. Generally - all animals are herbivorous creatures.

**Analysis of recent research.** Already in those times, and this - more than 2000 years, the main concern was not only a farmer obtaining food, but also animal feed.

Animals within six months of the most mined feed on natural pastures or in fields planted with feed crops: alfalfa, clover, timothy and more. As for the other months, the man had to provide feed as hay or silage later proposed. For this new asylum Aug invented by which *zhnytsya* (it was the work of women) *zatyskuvala* top of the handful of stems in the hands of the left hand (this created additional resistance) and right by pressing and *protyahuyuchy* sickle cut the stems. In this way *zrizuvaly* grain crops, which is the first step in obtaining food. This section is called retaining, performance *zhnytsi* for daylight hours was 0.15 ha And grain losses - 4%. Gradually Aug passed in her hair. It is used as a cereal crop at mowing, and when mowing grass.

Mowing - this is the work of men. To work the oblique is also not easy, but there is no need to bend your back and productivity and more - 0.30 ha per day, but higher grain losses - up to 20%. For reliability of spit mower gives it a speed of 3 ... 5 m / s and often *pidhostryuye* or *klepaye* it. When using the spit - it is *bezpirdirnyy* cut.

Harvest crops and grasses, natural and cultivated for hay and silage nature "took" a small amount of time. Because grain and forage crops are not under the roof, so the inventors thought was aimed at creating high-performance machines.

As the foregoing, this corresponds exactly with the mower cutting apparatus *bezpirdirnoho* cutting. Mowers such vehicles were horse-drawn, knives and sickles in the form (Figure 1). These mowers or harvesters were suitable for harvesting crops, as this grain losses totaled 20%. In 1800, Robert Meares received a patent in Britain for a cutting device which vegetation *zrizuvav* the principle of scissors.

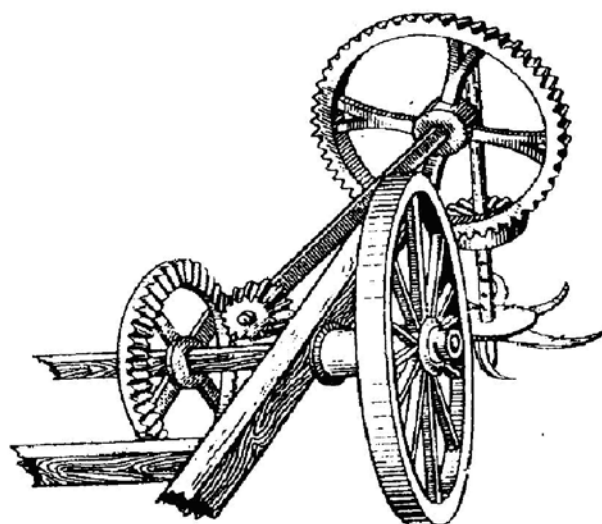


Fig. 1. Mower rotary Beuys, 1799

In 1826 Scot Patrick Belle invention combines together all the time and built the first zhatnu machine suitable for cutting cereal crops. Header set in motion by horses that pushed her from behind. In addition reaper was still reel that led up to the vegetation cutting machine. In fact it was cutting device segment-paltsovoho type of reciprocating knife that retaining cutting. It was used in the first in the world to combine the American horse-drawn in 1828, reaper-lobohriykah (known since 1842), Header-samoskydkah (since 1855), Header-snopov`yazalkah - (from 1856-1867 years.) and is used today, but more perfect.

Before describing the structure and the principle of rotation kosarokplyuschylok to forage as hay and haylage, consider what is an animal feed - hay and haylage [5].

Hayes - a grass mown during budding naturally or artificially dried to a moisture content of 15-17% and below. There seeded grass hay (Bobove, grass and grass-legume) and natural grasslands (meadow, wet meadow, steppe, etc.). The feed value of hay is determined by its taste, carotene content and more. Are valuable grass legume family (vetch, clover, alfalfa, etc.), Grass (foxtail meadow, chaff, awnless etc.). Cereals are one of the most valuable pieces of hay. With valuable herbs knotweed, quinoa, amaranth and others. The feed value of certain plant parts different: in more than pieces of paper stems crude protein - 2-3 times, minerals - by 1.5 times, carotene - in 7-15 times. The difference in the nutritional value of the leaves and stems of legumes more than cereal. Most hay is obtained by drying the artificial grass for hay. Store hay in stacks, stacks or special storage.

Haylage - rich animal feed. Harvest in its towers, trenches and pits avtokonservuvannyam pryv'yalenyh for 4 ... 24 hours. 40 ... 50% humidity grass, grass-legume and others. plants. Grasses are harvested at the beginning of earing, beans - in the budding phase. In silage fully

preserved leaves. When harvesting silage nutrient losses are 8 ... 12% of their content in the grass, while at Wagon - 25 ... 30% hay in the natural drying - 30 ... 40%. Best haylage are seeded with grass.

**Results.** Artificial drying herbs to produce hay and haylage ensure mower conditioner. In Mower-conditioners retaining and retaining without cutting herbs used for rolling flattening rollers (Fig. 2) and obhumovanni steel, smooth and grooved straight and spiral grooves. The depth of the grooves and their angle inclined to the roller generatrix different, some flattening devices have screw grooves placed at different angles to the geometrical axis.

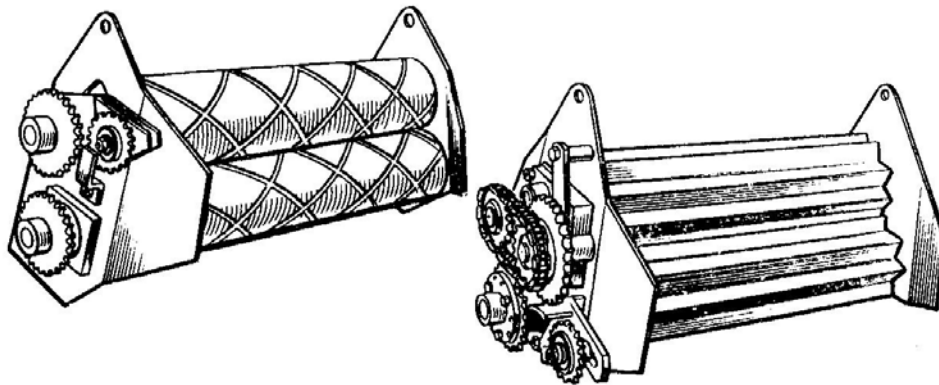


Fig. 2. conditioner rollers mower-conditioners KPRN-3.0.

For work-mowers pluschlyok on high-use grass mower-conditioners bezpidpirnoho cut type KPRN-30 (Russia) that the structure of the cutting device similar to the device house KRN-2,1 (Russia, 1974). Mower-conditioner KPRN 3.0-trailer, width -3,0 m, Rotors - 6, rotor drive - bottom, rotor speed - 1936 r / min, the blades on the rotor - 1 flattening rollers are the same as in the mower-retaining pluschlyok cut.

Noteworthy vision inventors for using trajectories cutting grass stems Mower-conditioners retaining and cutting bezpidpirnoho. The experience at work mowing retaining cutting (cutting machine segment-paltsovoho type of reciprocating knife) cut the stems are transported inflorescence back against the direction of the mower (Fig. 3, a), and when working rotary mowers that bezpidpirnoho cut, cut stems are transported on the contrary - inflorescence move forward on the mower (Fig. 3, b).

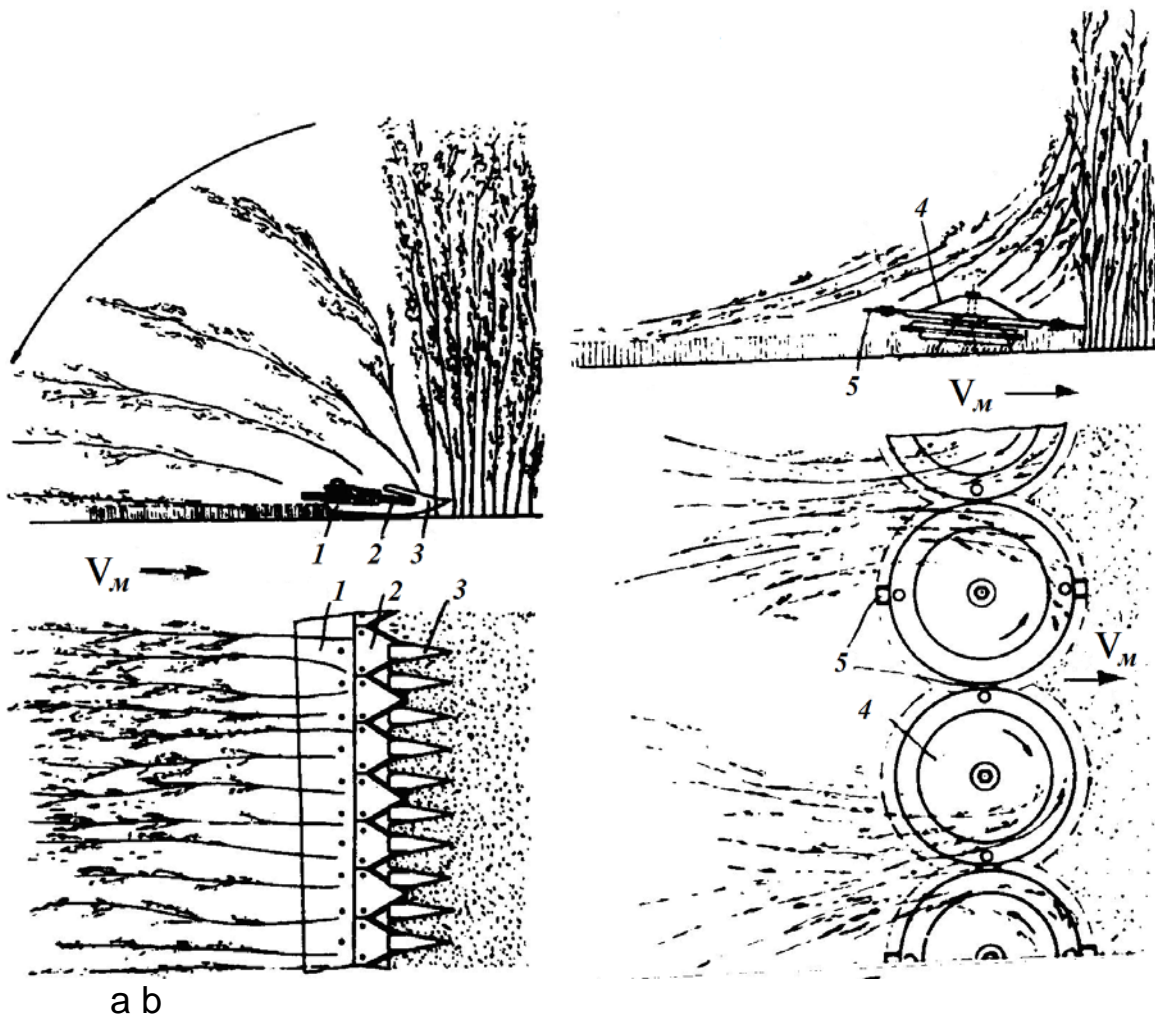


Fig. 3. The direction of the cut stems, and - at work retaining mower cutting; B - at work without retaining the mower cutting; 1 - paltsovy timber; 2 - Segment; 3 - finger; 4 - drive; 5 - A knife; VM - the direction of movement of the mower.

Supporters of retaining profitable using cutting direction of the cut stems of cereals (inflorescence forward) in straight-processor PC 2 (USSR, 1957) the company "Massey Ferguson" to combine "MF-36". In this way they continued the tradition of thrashing molotylnykv hand, when it started thrashing of Kolosov of cereal crops. This grain is selected separately as seed.

Supporters bezpidpirnoho cut grass for artificial method of preparation of hay and silage using rotary mower-conditioners and vehicles dynamic performance. These devices represent a horizontally rotating drum (shaft) of the pivotally suspended bylamy that remove herbal weight cut off of the cutting machine splyuschuyut stems and steer them in the loose swath or swath that is easily blown by the wind. According firms abroad, this device compared to the roller, provides more intense dry grass clippings. However, such devices during

harvesting legumes increased loss of leaves inflorescence. That is why the Rolling machines for rolling recommend legumes, bylni - grasses. The company produces the John Deere mower-conditioner with bylnym device (Fig. 4a), but speed shaft with adjustable bylamy - 610 rev / min. (For alfalfa) and 850 r / min. (For grasses). It should be noted that the number of models with bylnymy devices in foreign countries is increasing annually.

Fig. 4 b shows a diagram of the rotary mower-conditioners overhead drive with two rotors bylbynym apparatus. Width 2.4 m such a machine, and blades on the rotor 5, which is not typical for mowers, pluschylok this class, in which the blades on the rotor 1 or 2. Increasing the number of blades at the same speed circular blade, inevitably leads to re-cut the stems are truncated, and this yield loss.

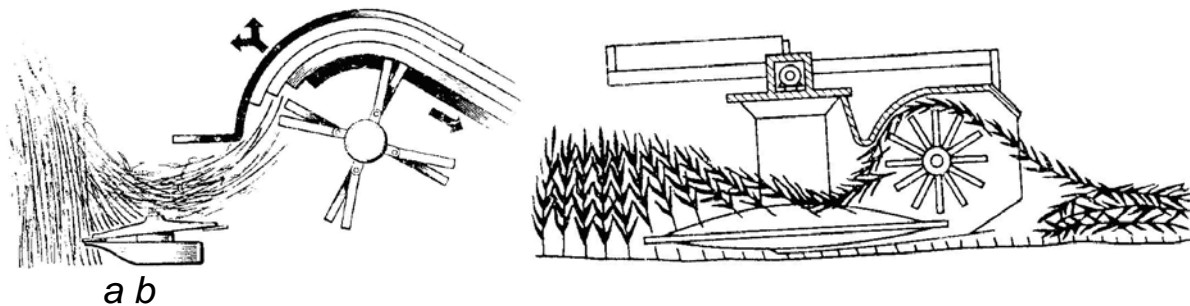


Fig. 4. Scheme process rotary mowers, pluschylok: A - model 1320 company John Deer (USA); b - Heston Model 1180 company (USA).

Experts tested the parameters of rotary mowers, pluschylok width from 3.02 to 3.20 m leading companies abroad, an overview of these parameters are shown in Table. 1.

Data Table. 1 suggest that firms produce abroad mower-conditioners with circular blades speed up to 90 m / s are theoretically possible with a working speed of up to 38.37 km / h. Of course with such parameters of hay and haylage will highly. But the question - "Where can I find these grasslands, which can move with such speed skoshuvalnoho unit?".

**1. Overview of parameters mowers pluschylok-width from 3.02 to 3.20 m.**

Firm	Claas	Deutz-Fahr	Fella	JF Stoll	Krone	Kuhn	Lely
Model	Disko 3100C Contour	Disk Master 632 T	SM 310 TL	GX 3205	Easy Cut 320	GMD 802	Splen dimo 320M
Width, m	3.02	3.18	3.00	3.10	3.15	3.11	3.20

Number of discs pcs	7	8	6	8	7	8	8
The diameter of the discs cm	42	45	47	34	43	40	35
Speech knives mm	55	73	60	52	62	55	67
Rotation speed drives, rev / min.	3250	2920	2880	3000	2925	3000	3000
Circular blade speed, m / s	90	84	89	80	85	80	72
Working speed (theoretical), km / h	21.45	38.37	20.74	18.72	21.75	19,80	24.12

Rotary mower-conditioners domestically produced consistently perform workflow at the speed of the circular knives 65 m / s and the speed of the unit up to 15 km / h. This is our field load on the tractor is not easy. Artificial hay and silage is done not only through mechanization and electrification as well.

An interesting solution to this issue offered young scientist AA Soblirov [4], designed and manufactured in his tractor-mower pluschyltsi. In this mown grass simultaneously subject to mechanical and electrical processing. Mown grass flattening first passed through rollers, which supplied voltage from the set-on mower pluschyltsi electric generator. This squashed by weight is always current. The simultaneous effect of mechanical pressure and electrical current causes the destruction of plant tissues, rupture cell membranes, resulting in the release of moisture is a green material and the process of evaporation of water from it sharply accelerated. Such combination treatment in 1,8-2,5 times reduces the next drying herbs and nutritional value of hay or silage remains high, 2 times greater than the natural drying. Possible locations for the rolling deck of cut stems conditioner unit dynamic performance can be that shown in Fig. 5 [3].

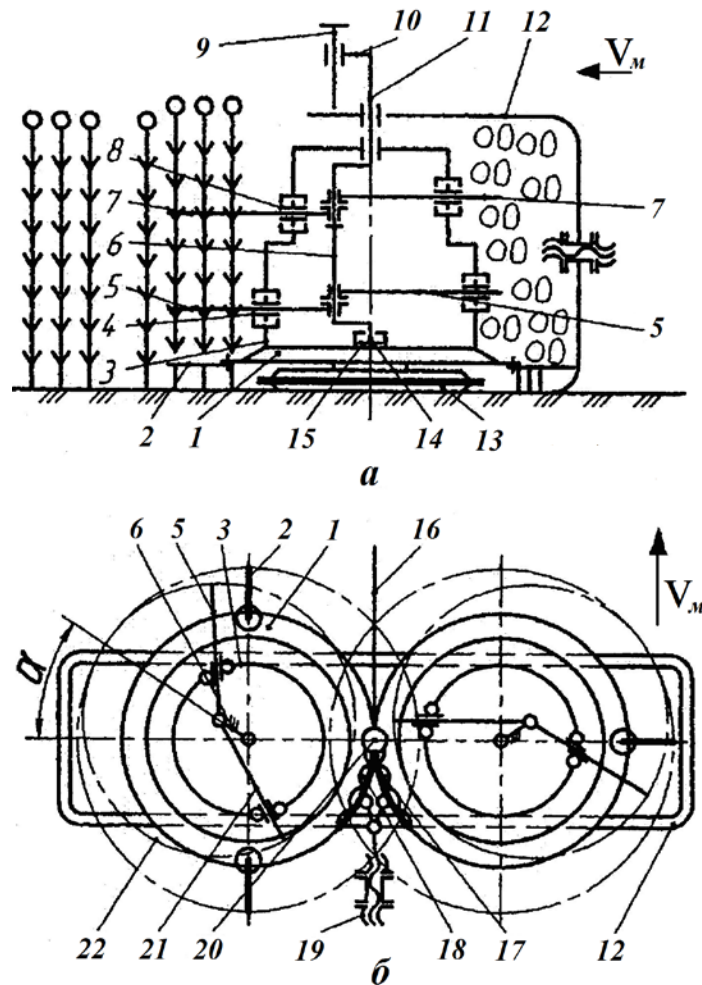


Fig. 5. Scheme rotary mower-conditioners, and - a side view; B - view from above; 1 - drive; 2 - knife; 3 - two-step drum; 4 - Eye; 5 - beater; 6 - crank axle; 7 - beat the top tier; 8 - Eye top tier; 9 - a bolt; 10 - the lever; 11 - long pin; 12 - frame; 13 - body cylindrical gear; 14 - short pin; 15 - hollow bolt; 16 - divider; 17 and 18 - disc; 19 - Adjustment mechanism and the gap between dekamy bylamy; 20 - Dec. axis of rotation; 21 - beat second tier; 22 - Bill trajectory of movement.

This device includes a rotary mower with lower disk drive 1 with 2 knives and cylindrical gears, located in the gear housing 13. The disc 1 is rigidly fixed transmission cylindrical drums 3. The upper stage drum have smaller diameters (circular speed greater), and the lower level - on the contrary. Eyelets 8 pivotally placed on the steps of the drum 3 through freely skipped beat 5, free to rotate on the axis of the crankshaft 6. The latest short pin 14 is based on a hollow bolt which is attached to the drive 1. The long axis of the crank pin 11 freely passed through the upper part of the stepped barbana and a fixed frame 12 mower-conditioners and bolt 9 rigidly fixed to this frame. Position crankshaft axis adjustable. This



design rotary mower-conditioners makes it possible to place the deck 17 and 18 for rolling bylamy 5 cut off the stems of the plant. The gap between dekamy bylamy and regulated by a special mechanism 19. To evaluate the quality of the cutting and rotary mower conditioner units-conditioners worth recalling some of the key findings. High-speed filming process of cutting grass machine bezpidpirnoho cutting two knives in their circular speed of 100 m / s indicates that the adjacent knife disc has to cut off the stem 8 times, while the angular velocity of 65 m / s - 2 times with the same applying to than (working speed). This rejection stems from the initial position accordingly: the first strike was 3 mm, while the second and third - 5. The number of strokes of the knife blade at the angular velocity of 65 m / s during the cut was 3 mm, for the period to cut the stem - 2. in the circular blade speed of 100 m / s blade strikes the stalk and cut during the period was to cut off stems 8 stalk deviation from the original position no.

When testing house KRN-2,1 (Russia, 1974 Podolsk MVD), with an aggregate of 4.2 m / s, in which the circular blade speed of 65 m / s, and knives on disk 2 crop losses were common 2.52 kg / ha, one of stubble height increased 0.05%, particles stems from the repeated cut to 6 cm - 1.09%, the presence of particles truncated stems from 6 to 15 cm - 0,79%, or crop losses due to repeated cutting was  $1.09 + 0.79 = 1.88\%$ . This takes into account that the next harvest rake particles stems up to 10 cm are not collected.

For retaining the mower cutting type KS-2.1 overall yield losses at speeds of 4.2 ... 5.0 m / s were - 1.25 kg / ha. This crop losses from excessive heights were cut to 0.53%. It should be recalled that the work of mowing COP of 2.1 at a speed of 15 km / h without frequent zabyvan cutting machine is virtually impossible. At first view of yield loss due to re-cut the stems cut mower KRN-2,1 relatively minor. However, it should be borne in mind is the possible yield losses under these transactions artificial hay and silage, rolling, grassy mass rake raking, transportation to the place of mass prov`yalenoyi skyrtuvannya or sinazhnoyi the tower or picking and pressing rolls in packs and more. If these operations do not yield to avoid additional losses.

### **Conclusions**

1. The rotary mower conditioners will come in the future use of rotary cutting apparatus bezpidpirnoho cut as those that can operate at speeds of 15 km / h regardless of the state of vegetation, high-yielding, matted, high - that have great performance.

2. rotary mowers, pluschalok regardless of the number of rotors: 8, 6 or 4 - desirable that the rotors turning in opposite pairs against the second drive rotor bottom using cylindrical gears (spur or helical) form a

rotor in the form of an elliptical (oval) drive, the minimum number of blades on the rotor 1, optimally 2, circular blade speed of 65 m / s.

3. The rotary cutting machine is not expedient to use screw rotors [2] for cutting overlapping areas of adjacent rotors and avoid re-cutting the stems of cut, as the complicated construction of mower-conditioners, screw rotors create air flow, which consumes extra power. Also known reliable in the elliptical rotors and blades arko podibnoyi form (KRS mower-2 Kyiv Plant. Lepse 1993).

4. It is not advisable to inflate the angular velocity of rotor blades up to 90 m / s, and the rotor speed to 3250 rev / min., Which allows the mower to work at speeds up to 38 km / h - it's not real.

5. conditioner dynamic performance devices continue to find widespread use thanks to cutting inflorescence stems move forward in the direction of the mower-conditioners or using artificial process in the design [3].

6. There is a need to research the impact of electric current to cut grass rolling apparatus proposed AA Soblirovym [4, S. 42, 102].

### List of references

1. History vehicles from zhatnoho cart Galla obchisuvainoyi Header: monograph / AM Pohorilets, OP Derkach, IL Rogovskiy. - K.: AhrarMediaHrup, 2013. - 125 p.
2. personnel Senouborochnyye mashyny VI and complexes / VI personnel, GK Vasiliev. - M.: Engineering, 1983. - 304 p.
3. Ukraine Patent 80883 Cl. AO1D 43/00. Rotary mower conditioner / A. Pohorilets, VS Maydanovych, Borisenko VA. - Publish. 12.11.2007, Bull. №18.
4. RM Slavina not only mechanization ... / RM Slavina. - M.: Ahroproyzdat, 1987. - 240 p. (S. 102).
5. Compact Ukrainian Encyclopedia. Volume. 3. - K., 1972. - hay, haylage. - C. 243.

**Abstract.** *Obosnovannyye heometrycheskiye, kynematycheskiye and Power Options and regimes work of cutting apparatus for skashyvannya vysokourozhaynykh grass nezavysymo from ego and conditioner apparatus STATUS Dynamic action with values kormovykh Saving and Reduction in the loss of crop harvesting yskusstvennoy sen and senazha.*

**Keywords:** trends, development, mower, conditioner

**Annotation.** *Reasonable geometric, kinematic and power parameters and modes of operation of the cutting apparatus for the cutting of high grass, regardless of its status and calender machine dynamic action while preserving nutritional value and a decrease in yield losses in the artificial hay and silage.*

**Key words:** trend, development, cutting machine, flatting machine