In Article obobschennoy Flag raising the problem of optimal control Tehnicheskoe system. Postavlennaya problem with razvyazana pomoshchju Dynamic programming method. As a result of Local Government will provide a optymalnoe obratnoy in video communications. Based on analysis Bellman equation and the maximum terms Hamilton function shows the Communications Between Dynamic programming method and the maximum principle. Established in terms of optimum control region zakrытoy permissible values.

Funktsyonal, control, optimization, the maximum principle, dynamycheskoe programming, zamknutaya region.

The generalized statement of the problem of optimal control of a technical system has been carried out in the article. The statemented problem has been solved by dynamic programming. This gave the optimal control in the form of feedback. Based on the Bellman equation and the condition of the Hamiltonian maximum analysis shows the relationship between the methods of dynamic programming and the maximum principle. The optimal control condition is set for in a closed feasible region.

Functional, control, optimization, maximum principle, dynamic programming, closed area.

UDC 631 352

ANALYSIS cutting EQUIPMENT PLANTS FOR BEZPIDPIRNOHO mowing

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The analysis of structures and working process of cutting machines for cutting plants bezpidpirnoho - belt-segment, segment-chain, rope-segment, and tape rotation, in which found that the best conditions of agricultural production meets the rotary cutting device, but none of them does not meet the requirements for cutting and chopping crop residues and grounded fundamentally two types - new bunk cutting machines with parallel and consistent work knives.

Cutting machine belt segment, segment chain, cable segment, belt, rotary, two-level unit.

Problem. Up to 50 years of the last century when mowing plants dominated segment-paltsovi cutting machines, which are fixed on the uneven bars cross fingers with protyrizalnymy plates on which set of cutting segments than equipped to drive back and forth motion.

This cutting machine cutting plants is done by pinching them between thumb and protyrizalnoyu plate segment is cut at the stem supported protyrizalnoyu plate, resulting in little mowing stalk deviate from the vertical position. Therefore, these devices provide stable cutting height of plants and low loss LEAFY mass through the almost complete absence of grinding and forming a neat roll (mowing) cut grass, creating optimal conditions for pick-up.

The main disadvantage of this cutting machine is a low allowable operating speed (12 km / h) and therefore low productivity, since its growth to ensure pererizuvannya stems of plants should increase in proportion and average speed of the blades, which causes high dynamic loads on the knife and the destruction of his back. In addition, these cutting machines unsatisfactory work in fields infested items hardness, especially chunks of metal that jammed between the plates and protyrizalnymy segments and cause their destruction or knife and tear.

Analysis of recent research. For performance cutting plants in the early fifties of the last century abroad and in the former Soviet Union carried out intensively work on finding new types of cutting machines.

Basic search direction was intended to exclude from design cutting machine working elements perform reciprocating and protyrizalnyh stops.

As a result of the search was created five new types of cutting devices that satisfy these conditions:

1. The belt segment.
2. Chain segment.
3. The cable segment.
4. Belt.
5. Rotary.

The belt-segment cutting machine [1] consists of a wedge-shaped belt (Fig. 1) mounted on the master and slave pulley and idler pulley fitted, the axis of rotation which placed vertically. By V-belt fastened cutting elements that are similar in design to the blade segments paltsovoho segment-cutting machine. Moreover wedge belt made of elastic (rubber) performances, some of which are cut into oblong holes Paz and segments made of elliptical shaft which are inserted into the tension of the belt holes. This attachment provides the opportunity to deviate segment when dealing with subjects hardness.

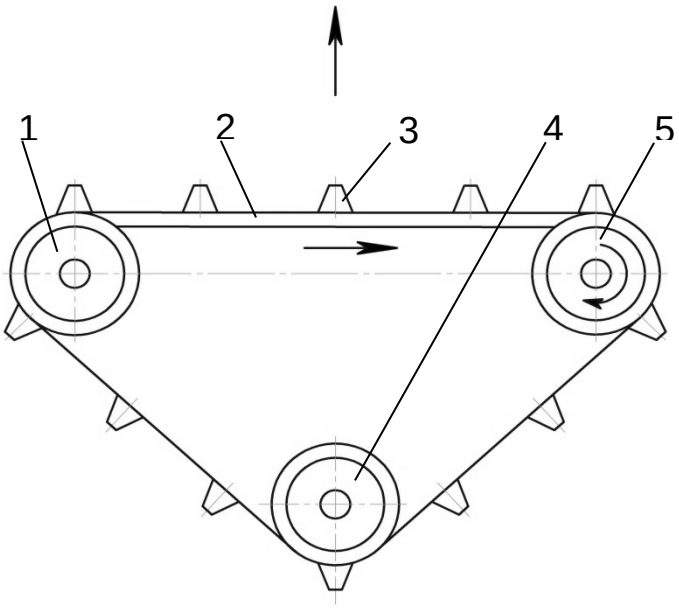


Fig. 1. The belt cutting machine Segment 1 - driving pulley; 2 - wedge-shaped belt; 3 - segment; 4 - tensioner pulley; 5 - driving pulley.

Chain segment cutting machine [2] differs from belt-segment machine that his cutting elements similar design, but not attached to the V-belt, and with brackets to the roller-core circuit, which is set to master and slave sprocket, but the axis rotation of stars placed horizontally, with one asterisk driving and the other suspended. Segments pivotally attached to a chain and each segment fixedly mounted on the circuit protective plate made of an elastic material. This enables the segment at a meeting with the subject of high hardness deviate from the subject due to deformation of the plate, and after passing it through the elastic plate segment sets the working position.

Cable segment cutting machine [3] like a belt-segment differs from it in that segment 5 is not attached to the V-belt, and the circular rope 4 (Fig. 2).

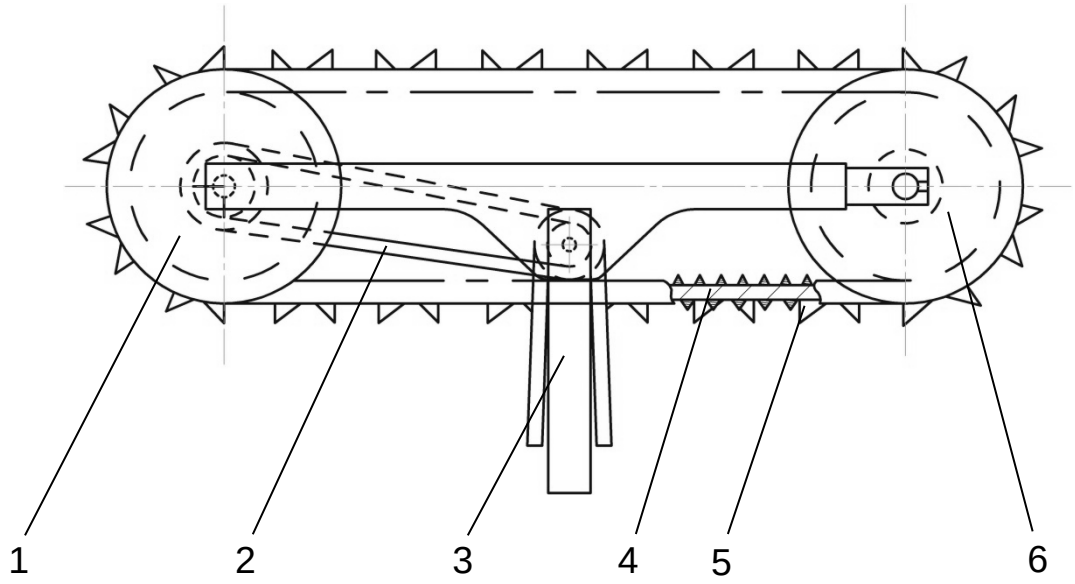


Fig. 2. The cable segment cutting machine: 1 - driving pulley; 2 - drive belt; 3 - frame; 4 - circular rope; 5 - segment; 6 - tensioner pulley.

4 rope pulleys mounted on 1 and 6 with vertical axis of rotation, but not three, but two. Lead pulley 1 connected with 2 strands wedge mechanism about a rotational movement, and the second pulley tensioner and pulley 6 1 and 6 attached to the vertical axis, mounted on frame 3.

Ribbon cutting machine [4] is like a band saw for wood cutting his body is designed as endless flexible steel tape, one end of which is made of teeth or not. The film is set like a chain-segment saw body on poles with horizontal axes of rotation, but four of them and they are made in the form of pulleys. These pulleys mounted on axes on a bar on each of its two ends. This makes it possible to raise the upper single branch tape to mount above the height of plants, which eliminates the possibility of damage it stems of plants.

Rotary cutting machine [5] consists of a shaft (Figure 3) connected to the drive mechanism in a rotating motion. This rigid shaft holder, integrated with knives.

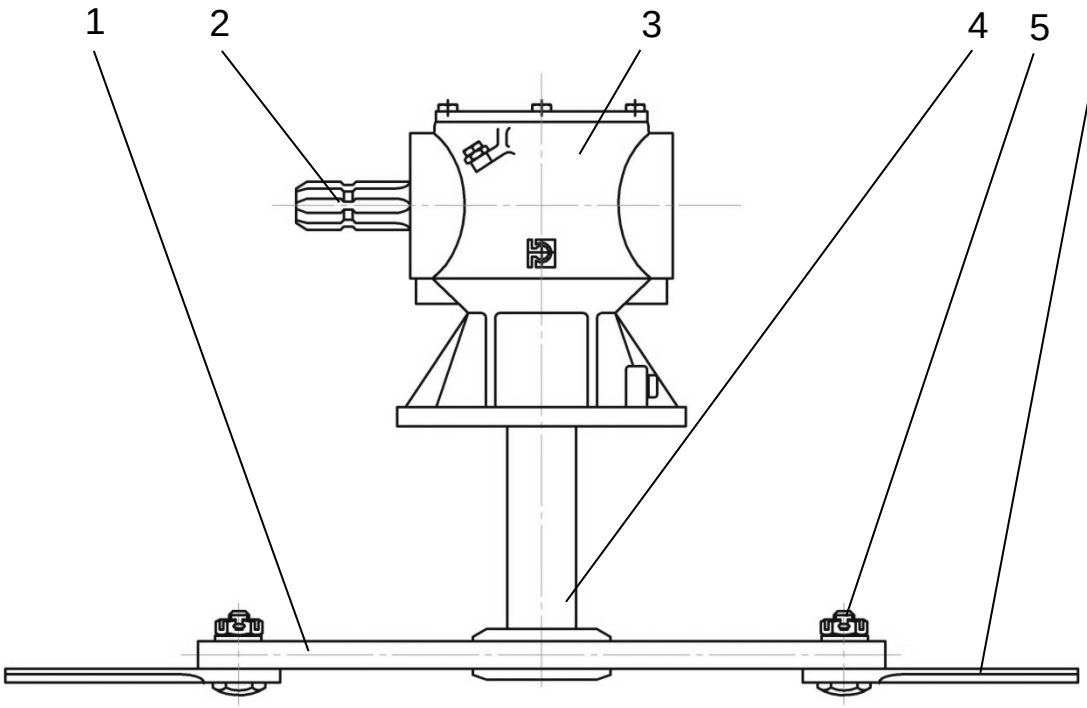


Fig. 3. The rotary cutting machine: 1 - holder; 2 - drive shaft; 3 - conical reducer; 4 - drive shaft; 5 - hinge; 6 - knife.

The main feature of this cutting devices is that their knives pererizuyutsya vilnostoyachyh stems of plants, that is their bezpidpirne mowing.

However, this feature causes a minimum working time of each of these cutting machines. That is, these devices provide cutting cutting plants do not at any rate their knives, but only if the speed exceeds the minimum limit, which for each plant species is an individual.

Results workflow bezpidpirnym cutting machines with cutting plant for the first time more fully given in [6, 7]. Moreover, studies have shown the critical speed for mowing grass is 45 m / s, corn 20 m / s, and the most critical speeds close to 80 m / s, with dry stem metlyuhu and mouse.

Comparative analysis of the above five types of cutting devices showed that the use of a belt-segment, segment-chain, rope and tape-segment cutting machines, let's call them units conveyor type machine design is greatly simplified because the drive mechanism provides transmission of rotary motion only on a drive shaft and reduces its relative metal content by reducing its dimensions, because it is close to the overall length of the working width of the machine, and the clearance width is several times smaller. As for rotary cutting machine, then the peripheral end of his work cutting edges describe a circle. Therefore, when using a cutting machine with vertical rotation axis machine plan will be a square, which fits trajectory peripheral end of the cutting edge of the

knife, which causes a large proportion of this metal content machine cutting machine per unit width.

Therefore, when designing machines with the cutting device enthusiastically over 1 m its cutting device is usually performed with a number of working groups (2 to 8), which makes it possible to dramatically reduce the length of the machine, measured in the direction of its motion, and specific metal content.

However, it is much more complicated construction machines as necessary to transmit rotary motion to the drive shaft of each working body.

As a result, construction machines with rotary cutting machine is more complicated, and the specific consumption of materials is considerably more than the previous four machines cutting machines.

However, testing of experimental models of machines with cutting devices described above, showed that the apparatus bezpidpirnoho cutting plants primarily use factor is not the complexity of the design and its specific metal content and reliability of the machine.

The fact that the high speed cutting elements such devices required for bezpidpirnoho cutting plants, dramatically reduces the reliability of the car, especially with the apparatus conveyor type.

The reason is that farmland is usually more or less clogged hardness objects (stones, chunks of metal polomanyh agricultural machinery parts, pieces of wood, etc.). Therefore, when the machine is inevitable collisions of cutting elements such objects.

Moreover, if the machine is equipped with rotary cutting device, which consists of a number of working groups, the, first, will interact with the object of cutting elements (blades) only one working body, and secondly, the working bodies of blades connected with holders reliably and so their interaction with such small objects, they are discarded blades from cutting machine and so damaged it than just one, and if the subject is great all damaged blades, but only one working body and can restore perezatochuvannyam.

If the machine is equipped with a cutting machine conveyor type, in which segments to traction element fixedly secured, then the interaction of its segments even with low hardness is subject to destruction or separation from the traction element and its loss between plants and the interaction of large segments object of this type is the destruction or isolation of all cutting elements. That cutting machine completely breaks down. Therefore, the intensity of the work to improve cutting machines conveyor type was sharply reduced, although it continues to the present day, and most researchers have focused their efforts on improving the rotary cutting machines.

As a result of the work was created rotary cutting machine with vertical rotation axis and articulated blades with holders. This design provides lower cutting machine knives force collisions with objects hardness due to their deviation from the radial position and the corresponding reduction in damage to the cutting edges of the blades.

This cutting device was installed on the first rotation sinokosartsi KRN-2.1, which was produced commercially in the former Soviet Union [8]. Mowing machine KRN-2.1 has 4 working bodies, each of which is made of two knives and set in rotary motion cylindrical gear, placed in the middle of the hollow beam. Thus two adjacent blades rotate in opposite directions, so beveled knives stem plants are placed two adjacent working bodies in one roll, ie following an house formed two rolls.

The advantage of rotary mower to segment-paltsovoyu is that it has a 25% higher working speed and therefore productivity, and it works more reliably grasslands weedy shrubs and other small objects that get stuck between the fingers and toes segment-paltsovoho machine and objects of high hardness.

In addition, a rotary cutting machine is designed with a horizontal axis of rotation and articulated blades with holders.

The peculiarity of this cutting machine is that it is installed in a metal casing and thus provides, in addition to cutting and shredding stalks, and even upload crushed mass in elderly masoprovodu connected to the casing in the vehicle (or trailer to the car body) .

Fig. 3 shows a diagram of the mower-shredder-loader KIR-1.5, which is widely used in the former Soviet Union in the procurement of green fodder [9].

In recent years rotary cutting machines have been widely used in machines for cutting and grinding stubble remaining in the fields after harvesting crops. The crushed remains securely wrapped in soil even when soil with disc harrows. This provides them perehnyvannya under anaerobic conditions and more efficient enrichment of soil organic matter.

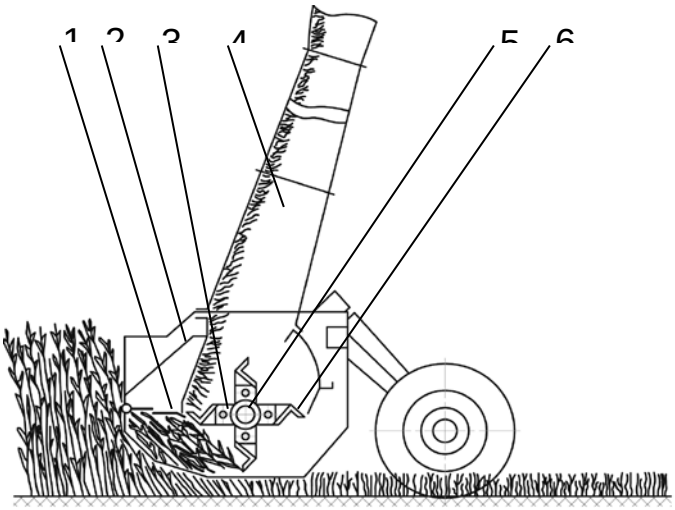


Fig. 3. Scheme mower-shredder-loader-KIR 1.5: 1 - pick plate; 2 - housing; 3 - knife holder; 4 - masoprovid; 5 - Horizontal drive shaft; 6 - hinged knife.

However, harvesting corn and canola and some other crops stubble height is 40 cmAnd to secure the soil wrapping length pieces stems not exceed 15 cm. Therefore, existing cutting machines are not suitable for crushing plant residues that remain in the fields after harvesting crops.

The purpose of research. Justification and development of cutting machines machines for cutting and grinding plant residues that remain in the fields after harvesting crops.

Results. As a result of search and research works was established two-level rotary cutting machine with vertical axes of rotation of working groups and work parallel blades, which blades mounted on coaxial axes, but located at different distances from the ground [10].

In this paper cutting machine simultaneously, ie in parallel, has two blades and upper tier than rozrizuye Sternin into two parts, and finally the lower tier than mow it. This cutting machine is installed on Choppers residues PR 4.5, which is made commercially in OAO "Krasylivsky Machine Works."

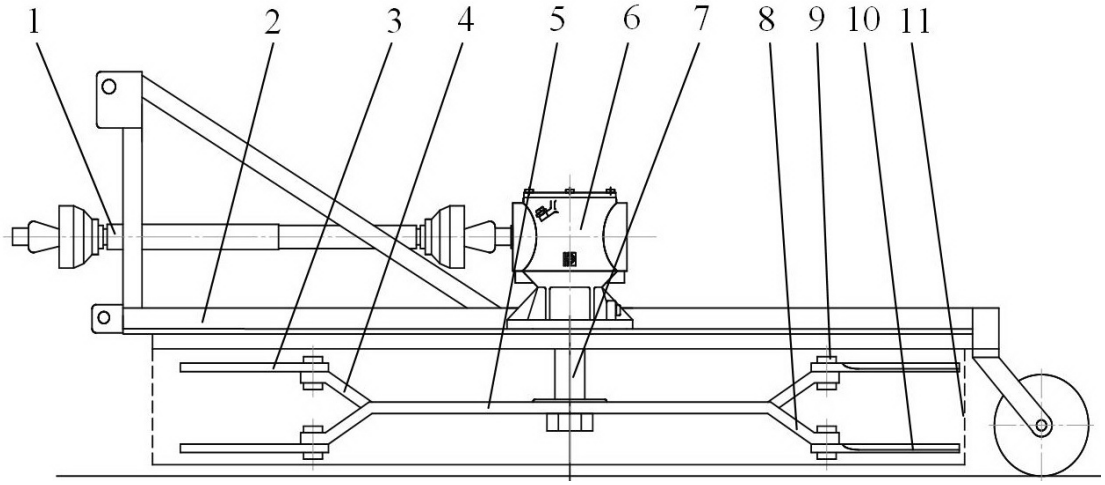
However, the use of the machine with the cutting device showed that while working on stubble corn and other crops adversely affects the chopper twofold increase shock loads on the cutting body and drive mechanism and causes increased vibration machine frame, which causes weakening of bolted joints, first fixing gear. In addition, the simultaneous action to stem Sternin two knives is a significant deviation from the vertical position Sternin. As a result, Sternin skoshuyetsya knife lower tier earlier than it pererizuyetsya knife upper tier. Therefore beveled piece of stem with a knife held the upper tier, which ran into him

at a certain depth, and begins to rotate with the knife, which leads to clogging of the cutting machine chunks stems.

Therefore developed an improved two-level cutting machine [11] consistent with the work of the blades, which initially triggered knives upper tier, and then lower.

Fig. 4 shows the circuit Choppers residues (a) and two-level cutting machine with consistent work knives (b).

The main difference with the two-tier cutting machine knives consistent work on the same machine with parallel work knife that hinge axis 9 knives fixing the upper tier and lower tier 3 10 located at one end of the holder 5, not coaxial with each other and the projection axis hinges 9 joining the upper tier 3 blades against the corresponding axes knives 10 lower tier on the horizontal plane, shifted forward in the direction of the angular velocity of knives at a distance t (Fig. 4 B), which exceeds the maximum possible diameter of the stem plants in the zone of mowing.



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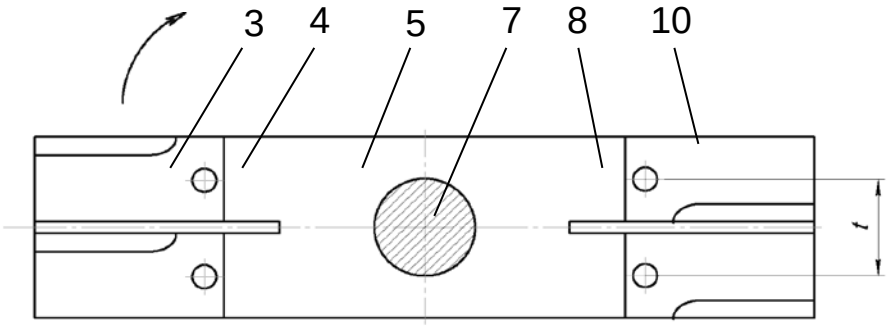

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Fig. 4. Scheme stubble chopper (a) and two-tier cutting machine with consistent work knives (b):

1 - drive shaft; 2 - frame; 3 - than the upper tier; 4 - band upper tier; 5 - knife holder; 6 - conical reducer; 7 - drive shaft; 8 - band lower tier; 9 - hinge fastening knife; 10 - than lower tier; 11 - casing.

To ensure this vzayemorozmischennya blades 3 and 10 of the holder 5 is made in the form of a steel plate at both ends which is divided into two lanes 4 and 8. At the upper tier 4 strips bent up and strip down the lower tier 8 and their ends are fixed hinges 9 knives 3 and 10, and the holder 5 is fixed to the end of the drive shaft 7 clamping bolt.

In this paper cutting machine knives upper tier 3 moving ahead blades 10 of the lower tier. This first knife cut off the upper tier 3, for example, the upper Sternin corn and only then stabbed 19 lower tier is its final mowing.

As a result, excluded Pile knives 3 upper tier chunks stems of plants, since the top of the cutting knife 3 Sternin it held its lower part, which is not cut off and only after cutting the top of the 10 Sternin knife cut off its lower part, which is held basal part ie knives 3 and 10 working consistently.

Also thanks to consistent work knives 3 and 10 upper and lower tiers 2 times reduces shock load on your body and its mechanism of drive and vibration transmitted to the body of the machine.

To extend the functionality of shredders stubble, in particular, the grinding rolls of straw after harvesting combine harvester without shredders and barge and cutting and chopping green manure, cutting machines with vertical axes of rotation of workers equipped casing. This jacket consists of a horizontal platform made of sheet steel and placed above the cutting apparatus, which is fixed on the outer shell contour. And the front and rear of the shell in most vehicles manufactured perforated, for example, a massive welded chains that are attached to the edge of the platform increments 150 mmAnd side parts from sheet steel.

Thanks to this enclosure stems of plants are in it and crushed knife cutting machine for as long as they do not depart pieces of casing perforations through the back of the shell.

This cutting machine is set to modernized Choppers residues PR 4,5M.

As for stubble chopper with the cutting device with horizontal axis of rotation, it is without any casing nerobotozdatnyy, only mower crushers loaders (Figure 3) casing equipped to guide materialoprovodom crushed mass in the vehicle, and the stubble chopper with the cutting apparatus enclosure rear wall is absent and therefore crushed stalks of plants evenly distributed over the surface of the field.

Conclusions

1. Analysis of structures and workflows devices bezpidpirnoho cutting plant-segment belt, chain segment, segment-rope, tape and rotary working bodies showed that in terms of reliability for a wide introduction of agricultural production suitable only rotary cutting machines.

2. For cutting and chopping crop residues in agriculture acquire the use of new types of machines with rotary cutting devices with vertical axes of rotation of working groups and bunk placing knives and their parallel and consistent work, also with horizontal axes of rotation of workers.

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BROUGHT analysis structures and process Rabocheye Cutting apparatov for bezpodpornoho skashyvanyya plants - remenno-segment, segment-chain, rope-segment, lentoch tion and rotatsyonnoho, the result of kotorogo set, something better in the Terms of Use selskohozyaystvennom pro-vodstve corresponds to rotatsyonnыy apparatus working cutting tools, but us not one of them corresponds to Requirements for skashyvanyya and yzmelchenyya pozhnyvnыh

ostatkov, as well as two types obosnovanno pryntsypyalno novyh dvuhъyarusnыh Cutting apparatov with parallelnoy and posledovatelnoy rabotoy nozhey.

Cutting apparatus, remennoy-sehmentnыy, chain-sehmentnыy, trosovoy-sehmentnыy, lentochnыy, rotatsyon-tion, dvuhъyarusnыy apparatus.

The analysis and design of workflow cutting apparatus for cutting plants without afflux - belt-segment, segment chain, cable-segment, and tape rotation, which results revealed that the best conditions for use in agricultural production meets the rotary cutter, but none of they do not meet the requirements for cutting and grinding and grinding crop residues and grounded fundamentally two types-new bunk cutting machines with parallel and sequential work knives.

Sutting machine belt-segment, chain-segment, cable-segment, belt, rotary, two-level unit.

UDC 631.45.631.145.614.8: 331,103,253

SOME ELEMENTS AND METHODS RESULTS dangerous process in the production of AIC

SD Lehman, Ph.D.
MV Panfilov, applicant

We describe the technique for use boolean algebra operations to research potential hazards and hazardous processes on production agriculture, predict their possible consequences, and the choice of prompt action to prevent their occurrence.

The algebra of logic, adeylohiya potential hazards, hazardous situations dangerous processes of the danger to formula-ically safe process, accidents, injuries, forecasting, operational prevention*.*

Problem. Despite the existing state system in the regulatory framework of labor safety relevant services at all levels, special measures to improve the professional skills of the workers, the actual state of safety directly in production has not significantly improved. This is evidenced by numerous injuries the workers, various accidents and other events, indicating that the poor state of health and safety at different agricultural production. In addition to the existing state "concept of safety management" did not really reflect the basic scientific ideas