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ANALYSIS OF ENTRY seeds in a closet seeding element which rotates in a continuous grain LAYER

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The article presents the analysis of entry in the closet seed sowing element which is realized by its zashtovhuvannya under pressure grain layer in a bunker under one of the three options simultaneously: prytyskuvannyam seed closet to the base; with simultaneous rotating and pushing beyond the closet and zashtovhuvannyam first seed in its place nearby; rotated back and forth seed.

Seed item closet, hopper, seed layer, pressure, force, torque, zashtovhuvannya, turn.

Problem. One of the reserves, thus enhancing productivity cereals is to create optimal conditions for plant life, which is achieved by placing them evenly over the area of power [1,2]. You can solve this problem by implementing precise seeding. For this purpose, both in Ukraine and abroad, actively conducting development to create highly sowing device. It is believed that the most promising device for precise sowing cereals is a pneumatic machine drum that provides centralized seed drills for working width [3,4,5]. The accuracy of sowing cereals depends primarily on resolving the triune task at the initial stage of implementation - providing individually selecting seed in the hopper, reliable maintenance of selected seed in a closet during transportation to the discharge zone and unloading closet [4, 6 7]. Compliance with this condition provides 100% seed sowing device closet each with equal intervals that hung carried out with no spaces.

Therefore the main task to be addressed in the design of devices for precision seeding cereals is to create an enabling environment to ensure 100% fill closet sowing seeds element.

Analysis of recent research. Analysis of theoretical and experimental studies of precision seeding [1-8] shows that they are mostly confined to the study of workflow sowing machines, determine the strength and depth of Ac-moktuvannya seed to the closet, study their structural parameters and an optimal area of plant nutrition . On the basis of these studies has been developed theory seeding process.

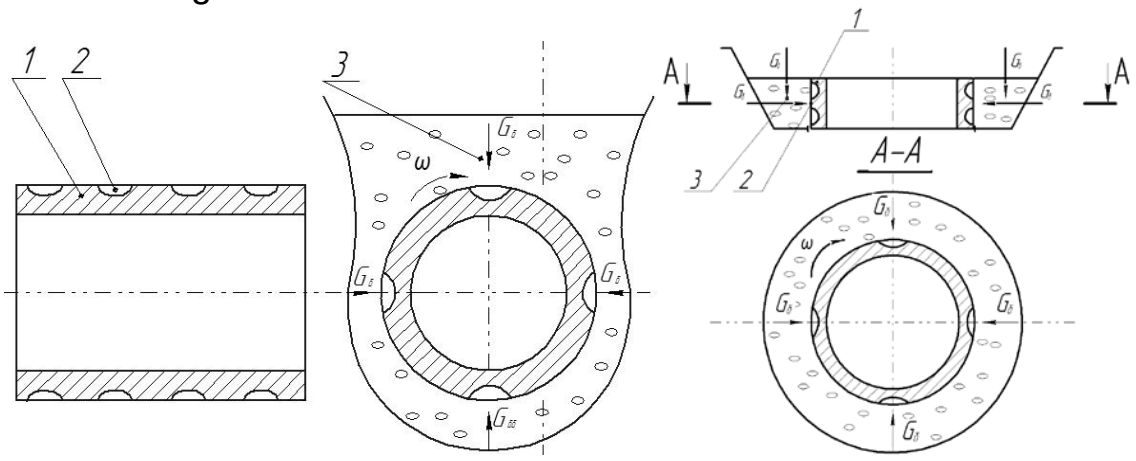
However, issues related to the process of entering directly into the closet seed sowing element rotates in a continuous layer of grain in the

literature not highlighted. So the lack of proper substantiation of entry into the closet seed sowing element and does not contribute to the development of effective technical solutions for implementation. In this regard, there is a need to conduct a further aspect of this study, the results of which will form the basis vyshykovuvannya technical solutions and mechanical-technological justification precision seeder machine settings.

The purpose of research. Given the wide variety of currently existing structural and technological schemes of seeding apparatus necessary for each of them, taking into account the orientation of the axis of rotation in space to analyze the process of entering a closet seed sowing element rotates in a continuous layer of grain, and based on the detected differences and similarities between them set the pattern accession process seed in the closet.

Results. In order to identify the causes affecting the completeness filling closet entry will analyze seed in its middle. Thus making the assumption that the seed element rotates in a continuous grain layer confined walls of the bunker. And as for sowing cereals are six sets of sowing drum [9], the analysis hold for each such unit. Schemes of forces acting on the seed element is in the grain layer for different sowing device shown in (Figure 1).

From these charts shows that during rotation in solid grain seed layer element on its outer or inner surface - periphery (depending on type), acting pressure grain layer. This vertical pressure σV causes lateral pressure σB, which in turn causes the secondary side pressure σBB [10]. It is obvious that these pressures will influence the occurrence of seed sowing in closet item.



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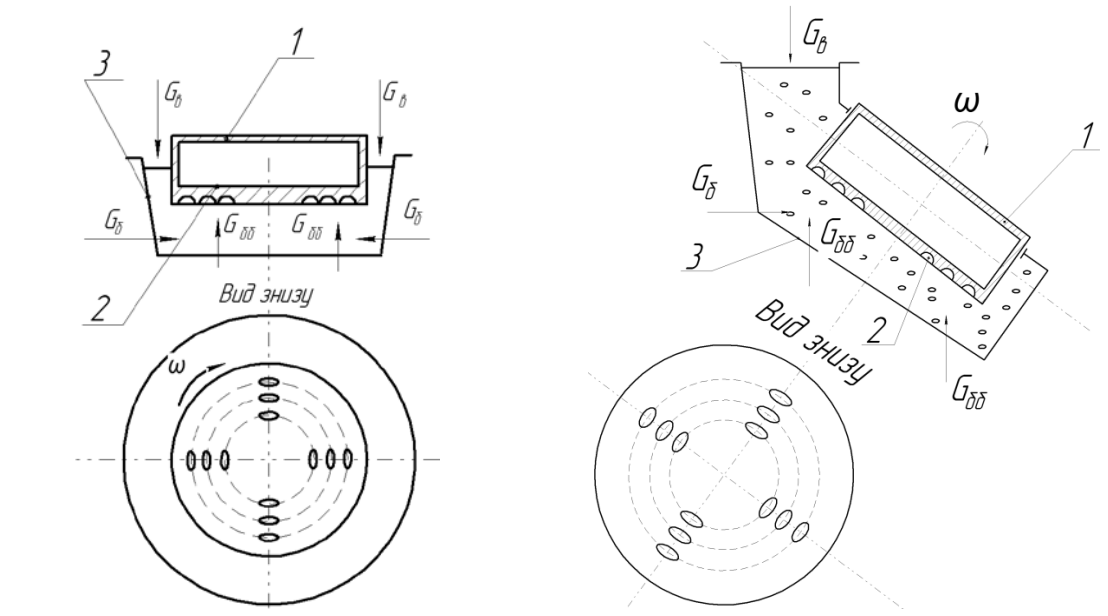

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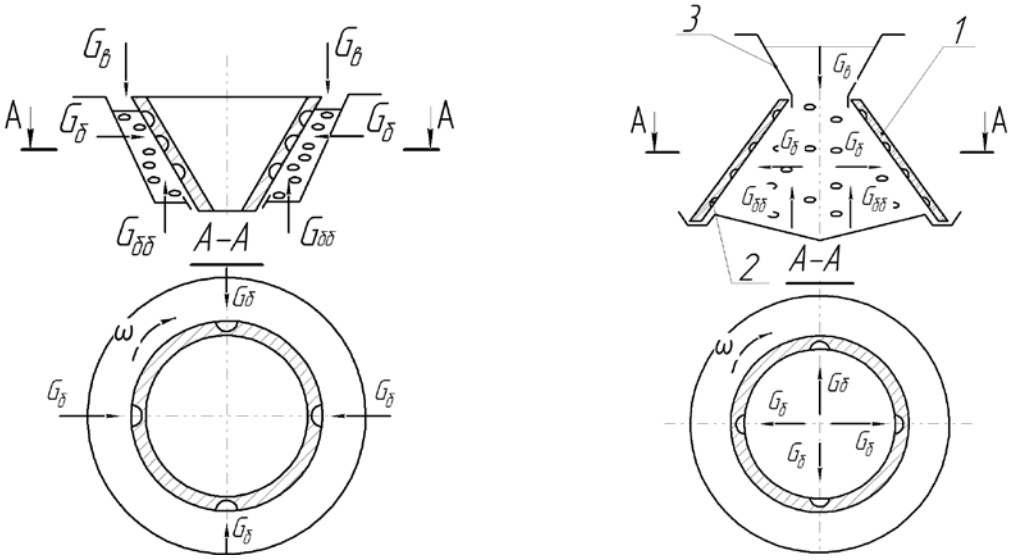

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Fig. 1. Scheme of forces acting on the seed element is in the grain layer.

Our experimental studies have shown that during rotation of the body with a cylindrical or conical surface in a continuous layer of grain, seeds and tangent to the surface, due to frictional forces longitudinal axis oriented in the diametrical plane of the body in the direction of the vector $\vec{v}$ its rotation. A similar pattern is observed when touching the seed to the bottom (end) of the cylinder or truncated cone installed on a vertical or inclined axis. The difference lies only in the fact that the seed is placed on the longitudinal axis concentric circles.

Therefore shape closet should be such that it included only one seed. This longitudinal axis of the seed must coincide with the direction of the vector of linear velocity closet. In addition, seeds must be readily enter the closet during its filling and go landings. Best satisfy these

requirements symmetric closet that has a profile basis in the form of a curved surface [3]. This direct shear held her at the points of contact with the seed form an angle α of the chord AB connecting extreme points A and B closet (Figure 2).

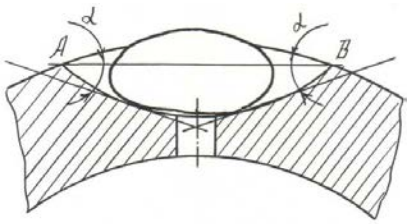
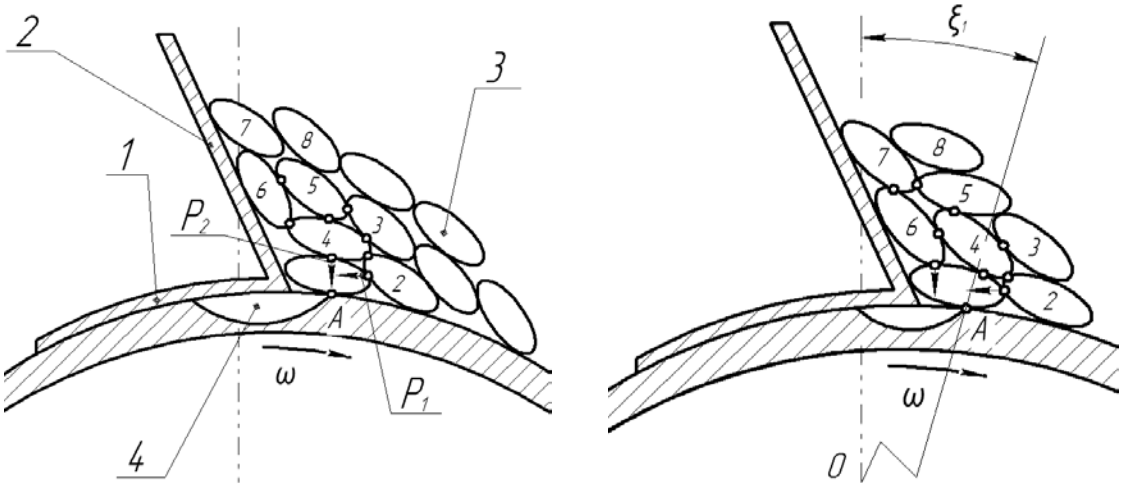


Fig. 2. Scheme of seed sowing element in a closet.

The process of joining a seed in her closet is by zashtovhuvannya seed layer that touches the surface of the seed item. Thus, there are three options for entry into the seed closet.

Consider the first option(Fig. 3). But given that the closet can be placed on the outer or inner surface of the seed element in space and take any measures, first consider the process of joining the closet placed on the outside of the sowing element in the up position (Fig. 1a). The process of entering seed in the closet will show schematically dividing it roughly into five phases occur sequentially, one after another. Grain layer depicted as separate seeds placed in parallel rows with an inclination of the longitudinal axis of the surface of the seed item.



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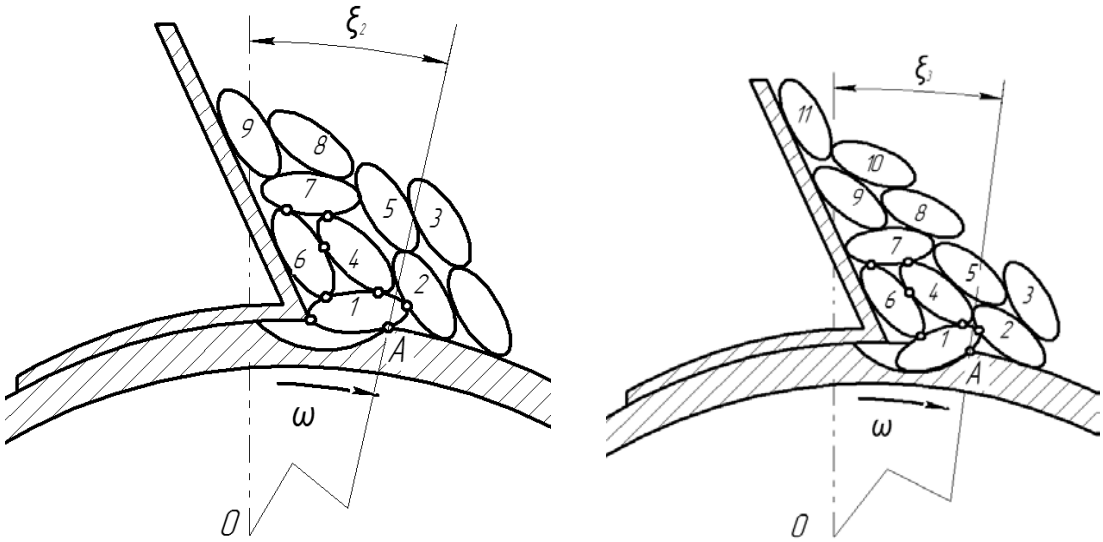

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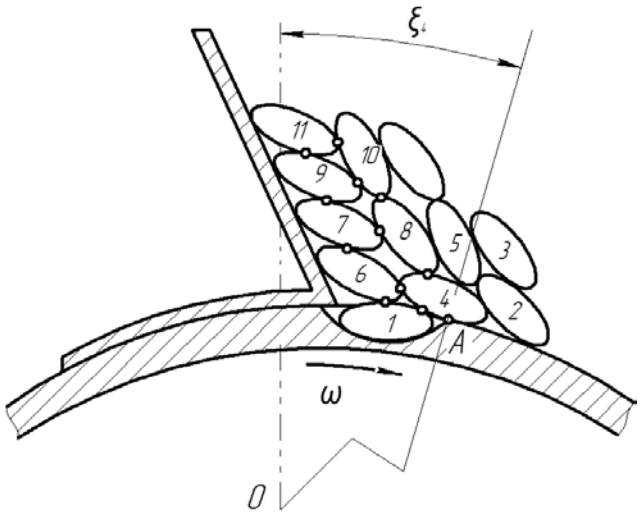

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Fig. 3. Scheme of the process of entering seed in closet placed on the outside of the sowing elements: 1 - seed element; 2 - bunker; 3 - seed; 4 - closet.

This placement corresponds to the actual placement of the seeds in the seed hopper machine.

We select one layer in the grain seed, which is located near the closet, and it will assign serial №1, and other seeds that will face direct influence on them, will assign numbers №№ 2,3,4 ... 11. Thus, we assume that the pressure from seed to seed transmitted through the point of contact. In order not to obscure pictures redundant symbols show of force arrows only those points that are directly in contact with the seed №1.

Since grain seed layer is a layer that touches the periphery (surface) seed element and it directly affects the entire process of entering seed in the closet, in Russian publications [5,7,8] for its definition introduced a special term - "layer of hranychnыy ". However, in

the Ukrainian language is not the exact translation and some authors this layer is called the "limiting layer" that does not reflect its essence. So, to introduce a special definition of a term called "peripheral layer." We believe a definition of this term provides a complete and unambiguous interpretation of its essence.

Phase 1 contained on (Fig. 3a) will be the beginning of entering seed in the closet. Consequently, the start of the rotation element sowing seeds №1 takes over number 2 seed from peripheral layer of seeds drag and top it has the pressure of the upper layer, which is transmitted at the point of contact with the seed №4. We denote these support forces *P2* and P4. Simultaneously with the displacement of the grain layer clockwise between him and the wall of the hopper is formed (call conditionally) free from seeds period in which under vertical pressure is dropping seeds №6 and №7. This point reflects the transition from phase 1 to phase 11 (Fig. 3b).

If you turn the seed element 1 in a clockwise direction at an angle relative to the wall of the bunker ε1 2 seed №1 with seed number 2 and other seeds due to the friction surface sowing element will move in the same direction. However,result of friction speed peripheral layer pryhalmovuvatys seeds will continue this layer will move with speed 0,25VK(Where *VR* - Speed of the closet) [5,7,8]. This seed №1 prytyskuvatymetsya left end of the wall of the bunker at point B, which appears normal force N. It is the friction force F, which is directed opposite to the direction of movement of seed №1. In the point of contact with the seed seed №6 №1 vertical pressure force is vertical pressure P6. Thus under the influence of pressure on the part of P6 seed №6 and pressure forces P2 on the part of the seed to seed №2 №1 arise about the point A torque M1 = P2 and M2 · l1 = P6 · l2 (here l1 and l2 - shoulder length

The transition from phase to phase 11 111 occurs at the time of sowing element for turning angle ε2, rys.3v. Thus there is a way out of the closet 4 hopper entrance to her expanding middle and seed №1 further moves toward the closet. However, the entrance to the closet still insufficient to login seed, so its left end and then slides on the wall of the bunker. This movement occurs until the left end №1 seed reaches the lower edge of the wall of the bunker and stops at point C, which will pinch it between the wall and seed №2. This position is critical, because the seed rests on the left end of the wall of the bunker and can not make the final turn around point A and enter the closet. However, under the influence of vertical pressure shifting some seeds in the top layer of the grain. Yes seed №7 under pressure seed №9povertayetsya around its center counterclockwise and right end №5 seed turns to the right and left end presses on seed №6. This phase ends 111.

From the turn of the sowing element at an angle ε3 phase occurs 1U, rys.3h in which entry in the closet expanded so much that by the force P6 pressure from the side of the seed on №6 seed №1 its left end finally slides off of the wall of the bunker and it prytyskuyetsya to the surface of closet and under the force *P2*the part of the peripheral layer zashtovhuyetsya in its middle. This is zashtovhuvannya №8 between seed and seed №7 №5, and 1U phase is completed.

A further element in turn sowing angle ε4 is the onset of phase B, rys.3d in which the seeds finally №1 zashtovhuyetsya in the middle of the closet and placed it so that it rests on the basis of only two extreme points located in the plane along the longitudinal axis of the seed. This process of entry into the closet seed sowing element ends.

The second option(Figure 4), the process of entering the seed of its rotation in the closet look similar to the example of the first option element of seed placement closet on its inner surface (rys.1z). Thus the diagram denote only the forces acting on the seed №1 at points of contact with neighboring seed.

So Mr.ry turn sowing Item 1 (Figure 4), clockwise angle *ε1* relative to its center of rotation occurs phase 1. This seed №1 take a position that one end of the wall vpyratymetsya hopper 2, and the second - in closet edge at point A. In this position she sees pressure on the part of seeds №2 and №4 and the walls of the bunker. The forces that arise in their mutual points of contact denote symbols P2, P4 and Belarus. This position will be the beginning of the entry in the closet 4 seed.

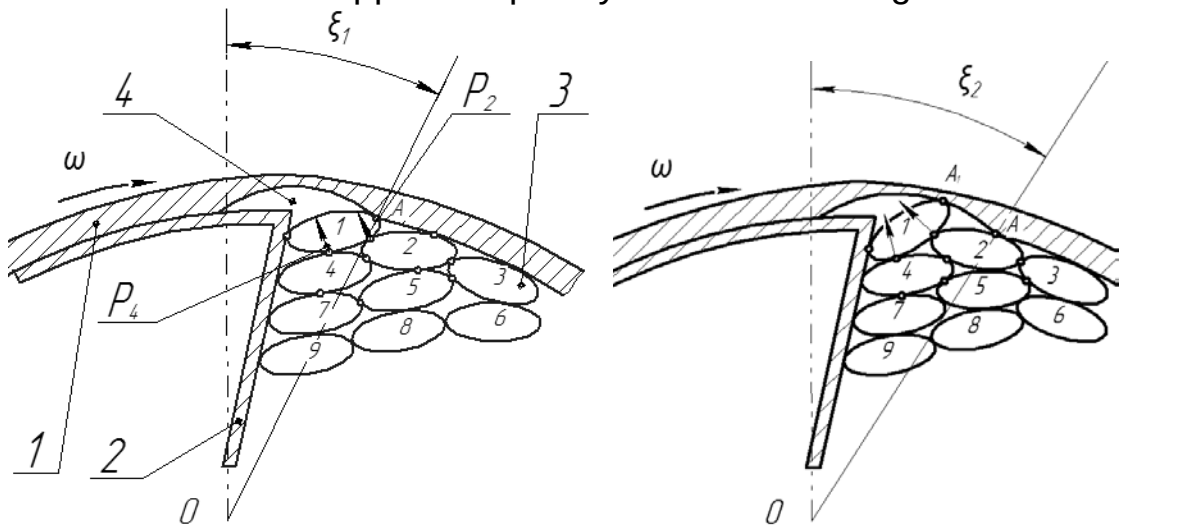
Phase 11 comes with a further element to turn the sowing angle *ε2*(Rys.4.5b). In this case, the seed №1 by the forces P2, P4 and Belarus, which are aimed at the middle chamber, prytyskuyetsya one end to the wall of the bunker, and the second to the curved surface closet and sliding on it begins to turn counterclockwise and enter it in the middle of moving while from point A to point A1.

Go to the next phase occurs when turning 111 sowing element at an angle *ε3*(rys.4v). Thus most of the closet out of the zone of overlap hopper 2 and upper seed №1, slipping on the basis closet under the influence of pressure P2 peripheral layer is transmitted through seed №2 at the point of contact, move to a point A2. This seed №1 zaschemlyayetsya between the stem and seed closet №4. Since the closet between the base and seed №2 formed a certain period, as a result of vertical pressure transmitted through seed to seed №4 №2 at the point of touching it by the force and power R'4 P3 starts to rotate around point A and move to foundations closet. This phase ends 111.

Phase 1U (rys.4h) occurs during the turn of the sowing element at an angle *ε4*. During this time the closet almost getting out of the bunker and seed №2 under vertical pressure to the surface prytyskuyetsya

closet and under the force P3 from the side of the seed №3 it zashtovhuyetsya inside closet. Simultaneously seed №2 №1 pressure on seed and it slipping on the basis closet moves until moved to the point A3 and not zaschemytsya between the wall and the seed hopper №2. This seed №1 its end presses on seed №4 and pushes it between seed №3 and №5.

From this moment begins the phase in which more is when you turn the seed element at an angle *ε5*, Rys.4d in which seeds №1 after the closet from the hopper completely freed from strangulation.



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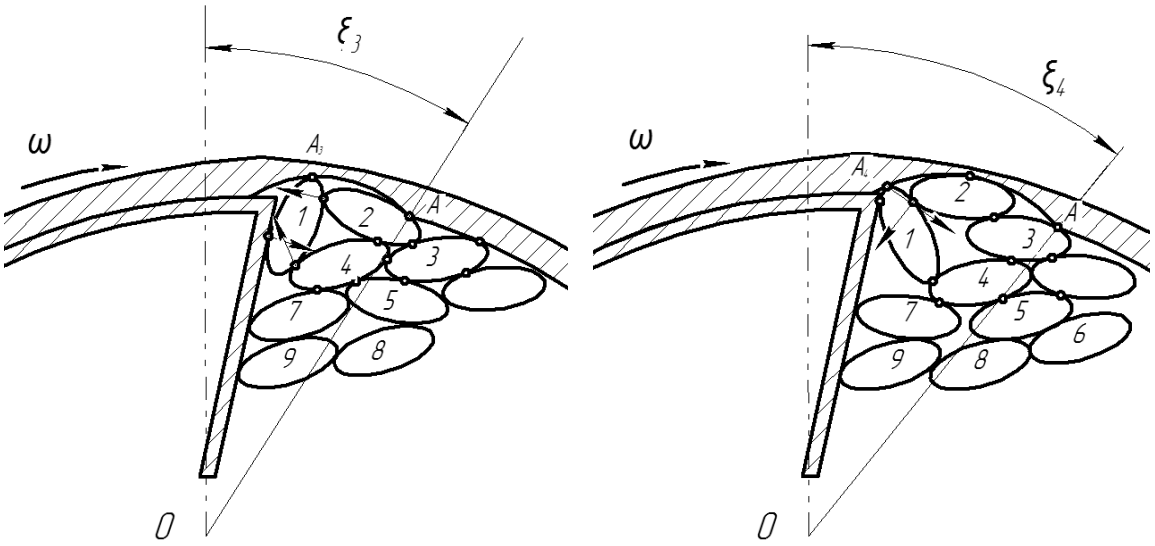

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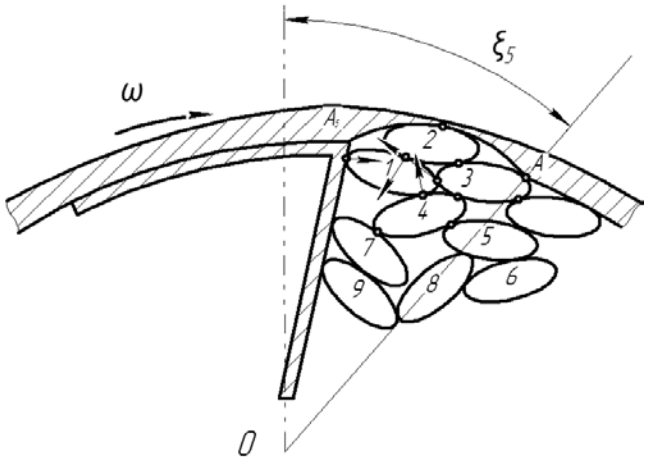

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Fig. 4. Scheme processseed entering its rotation in closet sowing item placed on its inner surface1 - seed element; 2 - bunker; 3 - seed; 4 - closet.

This circular movement due to peripheral layer and its departure from the bunker wall, between them there is a temporary space free of seeds and seed as №4, (rys.4h) presses on one end of the seed №1, №2 and seed presses the second end is, it, sliding it on the basis of end closet, finally pushed beyond its limits, and its place is a seed №2.

The third option entering seed in the closet of her turning back and forth is a combination of the first two options [11].

The process of this entry, consider the example of sowing element with vertical rotation axis, whose closet located on the lower basis (rys.1v).

As with previous versions of the process of entering seed conventionally divide into five phases and display the schematic in Figure 5, while applying similar designation. He is as follows.

Phase 1. When you turn the seed item 1 (Figure 5) clockwise extreme right point A closet 2 out of the bunker and the overlap zone is moved relative to its wall 3 distance l1.

Thus far right end of the seed №1 by the forces P2 and P4 will go into the closet and be in point B.

As the largest power P2 is greater than the force P4, the seeds when you log in closet provides counterclockwise rotation about the point K and returns to the angle φ1.

This provision seed will be the beginning of its occurrence in closet 2.

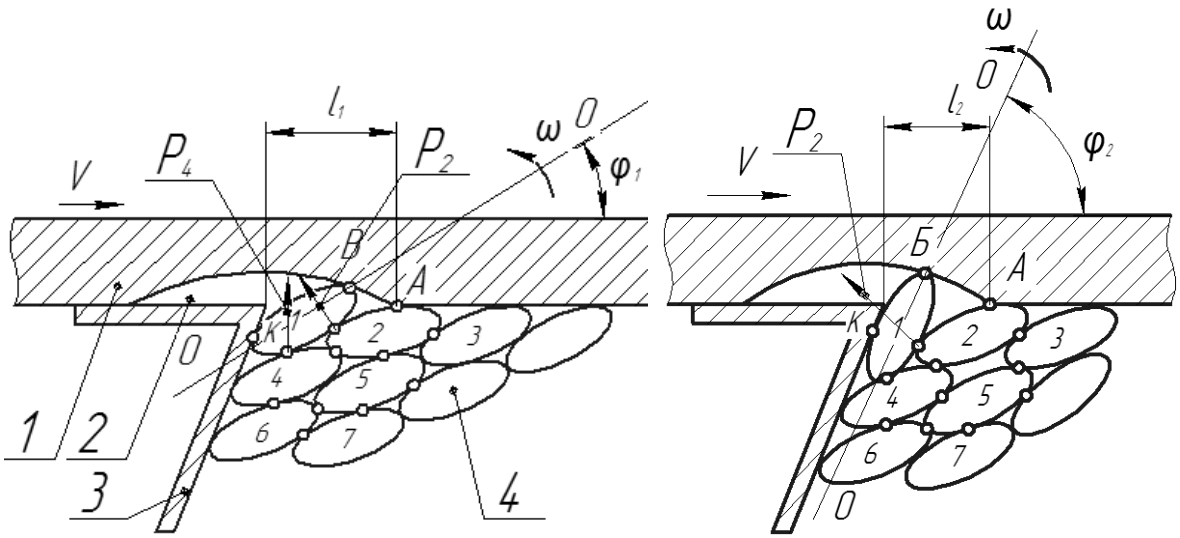
Phase 11 (fig.5b) is in turn further sowing element and simultaneously move the right-most point A closet 2 relative to the hopper wall 3 distance l2.

The upper part 1 seed, based on sliding closet under the influence of pressure P2 peripheral layer back counter-clockwise around the point

K on the angle φ2 and take position B.

The next time you turn the seed element (rys.5v) comes a phase in which 111 entry in the closet is increased to a value l3.

The upper end of the seed under the influence of pressure P2 peripheral layer will move farther on the basis closet counterclockwise while turning around the point K. seed will come back until you return to the angle φ3 = φmah not take a position B, which determines most open closet depth hmax.



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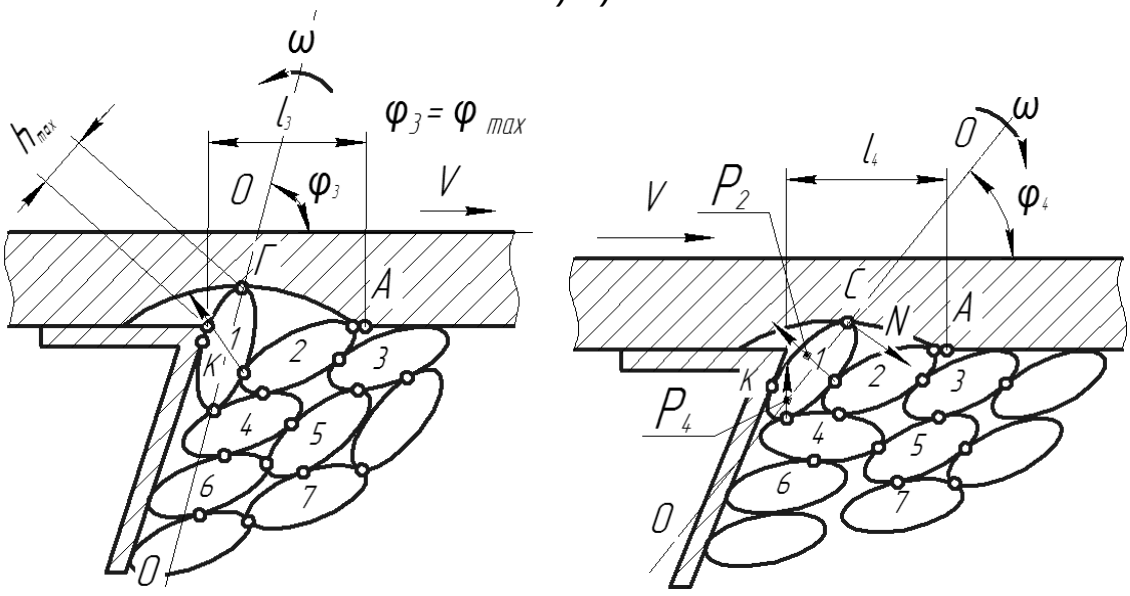

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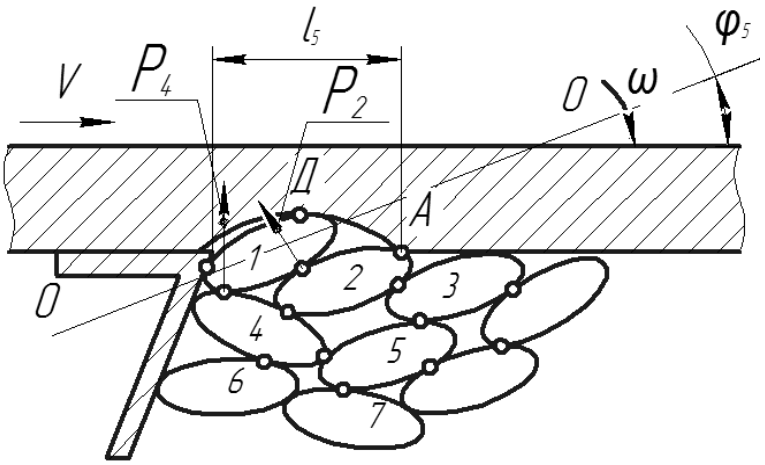

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Fig. 5. Scheme accession process in closet seed sowing element with its rotating back and forth: 1 - seed element; 2 - bunker; 3 - seed; 4 - closet.

This phase ends and 111 1U comes a phase in which the seed №1 back in the opposite direction. This is due to the fact that as seed №1 on the left side relative to its longitudinal axis rests at point C (Fig. 5g) into the hopper 3, and below it a point of contact with the seed №4 the force caused by the pressure P4 neighboring seeds, the with a further turn of the sowing depth h element relative to the edge of the bunker closet will decrease. So the power of N normal pressure basics closet on the upper end of the seed grow №1 and under the influence of this force will gradually seed back in the opposite direction, ie clockwise and angle φ4 <φ3 = φmah. Upon further turning of the sowing element (rys.5d) occurs in the phase in which the entrance to the closet opened almost its entire length and is l5. Since the seed №1 bottom all the time the force caused by the pressure P4 neighboring seeds, it will return and continue clockwise until fully enter into the closet. This angle φ5 will decrease until it reaches the value - φmin = 0º

The analysis of the likely entry process in closet seed sowing element shows that its occurrence is independent of the type of sowing device and orientation axis of rotation in space. It can be implemented by zashtovhuvannya seed in the closet under pressure grain layer in a bunker under one of the three options simultaneously: prytyskuvannyam seed closet to the base; with simultaneous rotating and pushing beyond the closet and zashtovhuvannyam first seed in its place nearby; rotated back and forth seed. The most rational option of entering in the closet seed sowing element is the first option because zashtovhuvannya seed while it prytyskuvannyam closet to the base does not cause either significant rise or abrupt change in location of the seeds in the peripheral layer, which creates favorable conditions to secure seed after login in the closet.

However, this option is only available when placing seeds in perfect peripheral layer. If we assume that the probability of realization of any of the three options of entering seed in closet interchangeable and can not exceed 33.3%, we can assume that the fullness of filling the closet does not depend on the primary importance of either option of entering seed, and of it is firmly seated in the closet after login.

Conclusions

1. The process of entry into the closet seed sowing element rotates in a continuous grain layer does not depend neither on the type of sowing device or the orientation of its axis of rotation in space.

2. The process of joining the closet seed can be implemented by its zashtovhuvannya under pressure grain layer in a bunker under one of the three options simultaneously: prytyskuvannyam seed closet to the base; with simultaneous rotating and pushing beyond the closet and zashtovhuvannyam first seed in its place nearby; rotated back and forth seed.

3. Completeness filling closet is independent of the first-priority implementation of a variant of entering seed, and from her firmly locked in the closet after login.

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In this article are presented vhozhdenyya Semen analysis process in cell vыsevayuscheho element, kotorыy realyzuetsya putem ego zatalkyvanyya Under pressure action grain layer in a bunker IZ Trejo varyantov with odnovremennым: pryzhatyem Semen basis for the cell; with rotation and odnovremennым vытalkyvanyem for predelы cell pervogo Semen and zatalkyvanyem on ego mesto sosedneh; Semen with turning back and forth.

Vыsevnoy element, kamorka, bunker semya, layer of, pressure of, force, torque, zatalkyvanyya, turn.

In paper an analysis over of process of including of pip is brought in the closet of sowing element which will be realized by her pushing under the action of pressure of grain-growing layer in a bunker after one of three variants with simultaneous: pinning of pip against basis of closet; with a rotation and simultaneous extrusion outside the closet of the first pip and pushing into her place of nearby; with the turn of pip back forward.

Seed element chamber, hopper, seed layer, pressure, force, torque, zashtovhuvannya, turn.

631,372 UDC: 62-843

EQUATION Machine Dynamics-TRAKTORNOHO Units

GA Holub, PhD
VV Chub, applicant

The equation of motion dynamics machine-tractor unit when running on biodiesel on the performance of manufacturing operations.

Dynamics, machine-tractor unit, diesel biofuel.

Problem. Assessment of the feasibility of power means the power to the machines and tractor unit (AIT) in various operating conditions in the application of appropriate agricultural machines and the type of fuel remains a major operational issue.

Energy performance MTA in the interaction workspaces vary within wide limits, which in turn is reflected in the technical and economic performance, especially fuel consumption and runtime manufacturing