THEORETICAL SUBSTANTIATION OF THE UNIFORMITY OF THE DEPTH OF THE RIPPER STROKE OF THE MACHINE FOR PRE-SOWING TREATMENT OF RIDGES

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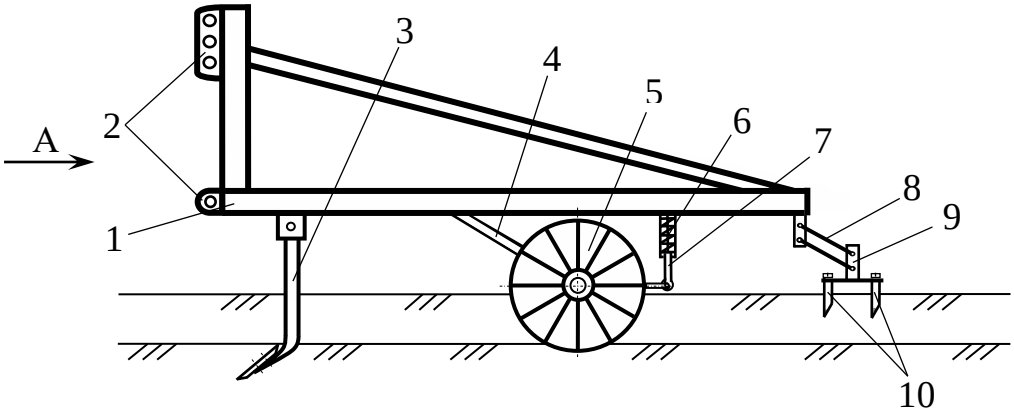
Annotation: The article presents the results of research on the justification of the angle of inclination to the horizon of the longitudinal links of the mechanism for mounting the ripper of the machine for pre-sowing treatment of ridges in order to ensure uniform loosening of their tops.

Key words: machine for seedbed treatment of ridges, frame, hitch, loosening arm, slatted conical roller, ripper, hitch mechanism, longitudinal link of the hitch mechanism, its location relative to the horizontal.

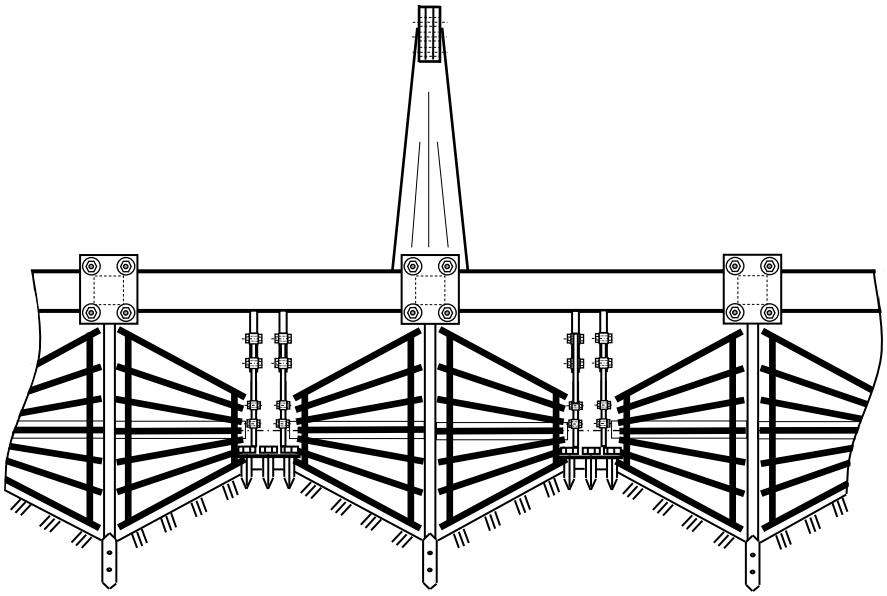
The main task of agricultural production is to provide the population of the republic with food and raw materials for the processing industry by increasing the efficiency of all its branches. A special place in solving these problems is given to the cultivation of agricultural crops based on advanced technologies and the use of high-performance equipment [1-10].
In the Republic of Uzbekistan every year the technology of growing cotton on ridges is gaining more and more recognition.
Increased soil temperature on the ridges, better aeration, as well as optimal soil density create favorable conditions for early and friendly shoots, as well as plant growth and development.
As a rule, the ridges for cotton cultivation are formed in autumn, and in the spring, pre-sowing treatment is first carried out, and then cotton seeds are sown on their top.
The tests carried out showed that the existing machines and tools for pre-sowing treatment of ridges do not ensure their processing throughout the profile. As a result, complete destruction of weeds and soil crust is not achieved. With this in mind, we have developed a new machine for processing them before sowing. It consists (Fig. 1) of a frame 1 with a hitch 2, loosening paws 3, slatted conical rollers 5 installed behind them, guides 6 with pressure springs 7 and rippers 9 placed between the slatted conical rollers, equipped with teeth 10. Ripper paws 3 to the frame are rigidly attached, and the conical slatted rollers 5 and rippers 9 are hinged, respectively, by means of rods 4 and parallelogram mechanisms 8 [11-13].
In the course of work, the ripping paws loosen the bottom of the furrows between the ridges, the slatted conical rollers and rippers process the slopes and tops of the ridges, respectively, copying their irregularities. This ensures that the ridges are processed along the entire profile without flaws.
This article presents the results of research on the study of the uniformity of the depth of the rippers of the developed device.
Using the scheme shown in Fig. 2, we determine the force Q, under the action of which the ripper is deepened into the soil

$$Q = R_z = \left[0{,}5\left(m_í + m_â\right) + m_ð\right] g \mp R_x tg\varphi, \quad (1)$$

where Rx is the resistance force of the soil to the movement of the ripper teeth;
Rz - vertical reaction of the soil to the cultivator;
$m_н$, $m_в$ - mass, respectively, of the lower and upper longitudinal links of the ripper hitch mechanism;
m_p is the mass of the ripper;



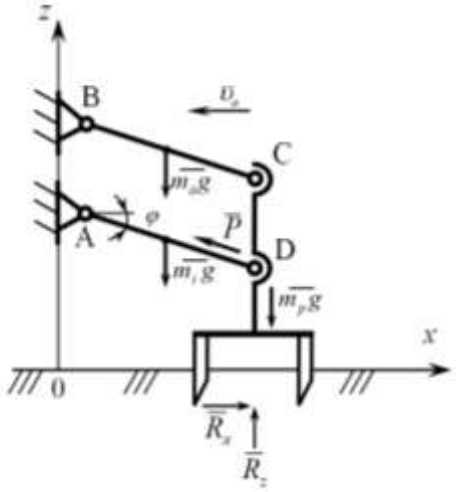
View A



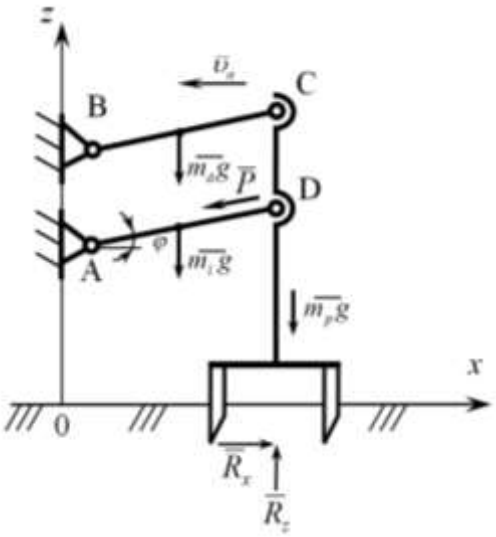
1-frame; 2-mounted device; 3-ripping paw; 4-thrust; 5-slatted conical roller; 6-pressure spring; 7-director; 8-hanging mechanism; 9-ripper; 10 teeth
Rice. 1. Scheme of the machine for pre-sowing treatment of ridges

φ - the angle of inclination to the horizon of the longitudinal links of the ripper hitch mechanism.
In expression (1), the upper sign before $R_x tg\varphi$ corresponds to the inclination of the longitudinal links of the ripper hitch mechanism downwards (Fig. 2, a), and the lower one corresponds to their upward inclination (Fig. 2, b).

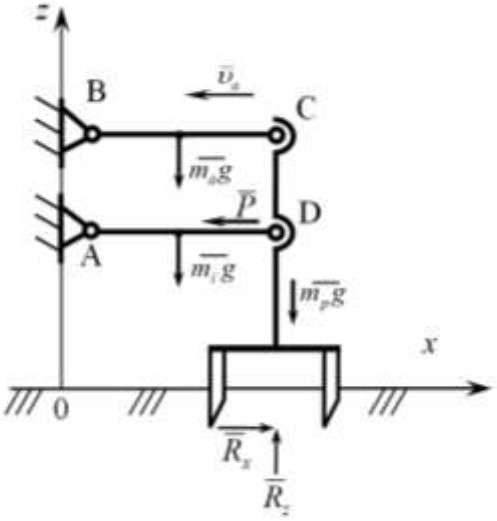
From the analysis of expression (1) it follows that with the location (during operation) of the longitudinal links of the ripper attachment mechanism to the horizon with



а)



б)



в)

Fig.2. Forces acting on the device ripper

slope both downward and upward, the burrowing force Q becomes a function of the force R_x soil resistance. With the arrangement of the longitudinal links of the hinge mechanism with a downward inclination, the force R_x contributes to the deepening of the working bodies, and with an upward slope - deepening. The larger the angle φ, the greater the influence of force R_x on the Q and vice versa. Due to the variability of the physical and mechanical properties of the soil and the existing irregularities at the top of the ridge, the value of the force R_x constantly changing, as a result, the force also changes Q, which leads to a change in the depth of the ripper teeth, and consequently, to a deterioration in the uniformity of the depth of loosening of the top of the ridge.

As is well known in the process of work, the force Rx also varies depending on the speed of the unit. Therefore, when the longitudinal links of the parallelogram mechanism are located with an inclination down or up, a change in the speed of movement also leads to a change in the depth of loosening of the ridge top. It should be assumed that when installing the longitudinal links with a downward slope, with an increase in the speed of movement, the depth of loosening of the top of the ridge will decrease, and when installed with an upward slope, it will increase.

At $\varphi=0$, those. if during operation the longitudinal links of the ripper of the parallelogram mechanism are located horizontally (Fig. 2, c)

$$Q = \left[0{,}5\left(m_{\text{і}} + m_{\text{â}}\right) + m_{\text{ð}}\right] g \qquad (2)$$

and strength R_x does not affect the depth of the teeth. Therefore, in this case, i.e. at $\varphi=0$ the influence of the variability of the physical and mechanical properties of the soil, unevenness, speed of movement and other factors on the uniformity of the depth of the ripper stroke will be minimal.

Thus, to ensure uniform loosening of the tops of the ridges during the operation of the device, the longitudinal links of the linkage mechanism of its rippers must be horizontal or close to this position.

References

1. Типовые технологические карты по возделыванию основных сельскохозяйственных культур на 2011-2015 годы. Ташкент: Hilol Media, 2011. 80 с.
2. Tukhtakuziev, A., & Mansurov, M. T. (2015). Research of resistance on the tractor equipped with implements at front and backside lift hitch contrarily the sidewise skidding. *Europaische Fachhochschule*, (6), 76-77.
3. Тухтакузиев, А., Мансуров, М., Расулжонов, А., & Каримова, Д. Научные основы обеспечения равномерности глубины работы почвообраба-тывающих машин. *Ташкент: Издательство TURON-IQBOL.–2020*
4. Мансуров М.Т. Научно-технические решения агрегатирования почвообработывающих машин, состоящих из рабочих частей, навешиваемых спереди и сзади на колесные тракторы. Автореферат дисс. ... доктора техн. наук (DSc). – Ташкент, 2018. – 54 с.
5. Мансуров, М. Т., & Расулов, А. Д. (2016). Теоретическое обоснование параметров выравнивателя-уплотнителя комбинированной машины по системе push-pull для предпосевной обработки почвы. *Молодой ученый*, (8), 256-259.
6. Тухтакузиев, А., & Мансуров, М. Т. (2015). Исследование устойчивости трактора с орудиями передней и задней навески против бокового заноса. *Тракторы и сельхозмашины*, (9), 34-35.
7. Тухтакузиев, А., Мансуров, М. Т., & Тошпулатов, Б. У. (2019). Исследование равномерности глубины обработки почвы почвообраба-тывающими машинами. In *ВКЛАД УНИВЕРСИТЕТСКОЙ АГРАРНОЙ НАУКИ В ИННОВАЦИОННОЕ РАЗВИТИЕ АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА* (pp. 382-387).
8. MT Mansurov, BU Toshpulatov, ON Toshpulatov. RESULTS OF A STUDY OF THE EFFECT OF PLOW PARAMETERS ON PERFORMANCE ON THE FRONT AND REAR OF A TRACTOR / Academicia Globe: Inderscience Research 2 (08), 1-4. (2021).
9. A Tukhtakuziev, MT Mansurov, ON Toshpulatov, JA Yigitaliyev. Justification of the parameters of the leveling-sealing working body of the combined machine according to the “push-pusl” system / ACADEMICIA: An International Multidisciplinary Research Journal 11 (6), 611-614. (2021).
10. MT Mansurov, ON Toshpulatov. INVESTIGATE A SMOOTH RIDE OF THE FRONT PART OF THE PLOW, CONSISTING OF WORKING PARTS HANGING FROM THE FRONT AND BACK OF THE TRACTOR, ALONG THE DRIVING DEPTH / Innovative Technologica: Methodical Research Journal 2 (08), 7-14. (2021).
11. Устройство для обработки гребней и борозд между ними: пат. № FAP 00753 РУз., МПК 8 A01B 21/00 / А.Тухтакузиев, Х.Г.Абдулхаев. № 20120051; заявл. 03.05.2012; опубл. 28.09.2012, Бюл. № 9. С. 48.
12. Кленин Н.И., Сакун В.А. Сельскохозяйственные и мелиоративные машины. Москва: Колос, 1980. 671 с.
13. Синеоков Г.Н., Панов И.М. Теория и расчет почвообрабатывающих машин. Москва: Машиностроение, 1977. 328 с.