АНАЛИЗ ОГНЕОПАСНЫХ РАБОЧИХ ЧАСТЕЙ КАРТОФЕЛЬКОУБОРОЧНЫХ МАШИН

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Аннотация. В настоящее время вопросами возделывания и уборки картофеля занимаются ряд ученых в Узбекистане и за рубежом. Однако до настоящего времени вопрос механизации уборки картофеля в условиях пониженной влажности почвы не решен в полной мере. В данной статье дается подробный анализ рабочих органов картофелеуборочных машин.

Ключевые слова. *картофелекопалка, комбайн, агрегат, прибыльный, ресурс, почва, измельчитесь, элеватор, гидравлическая система, сито.*

ANALYSIS OF THE WORKING PARTS OF POTATO DEEPING MACHINES

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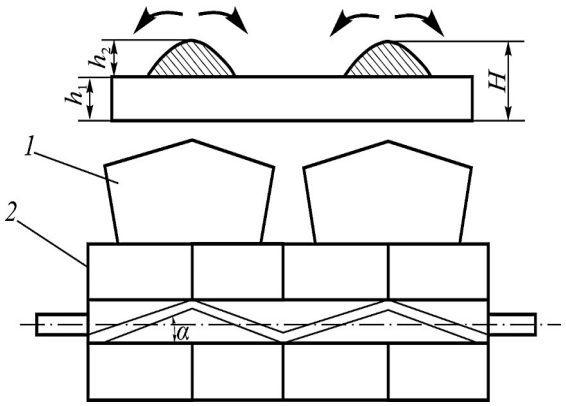
Annotation. Currently, a number of scientists in Uzbekistan and abroad are engaged in the issue of potato cultivation and harvesting. However, to date, the issue of mechanization of potato harvesting in conditions of low soil moisture has not been fully resolved. This article provides a detailed analysis of the working parts of potato harvesting machines.

Keywords: *potato digger, combine, aggregate, profitable, resource, soil, chopper, elevator, hydraulic system, sieve.*

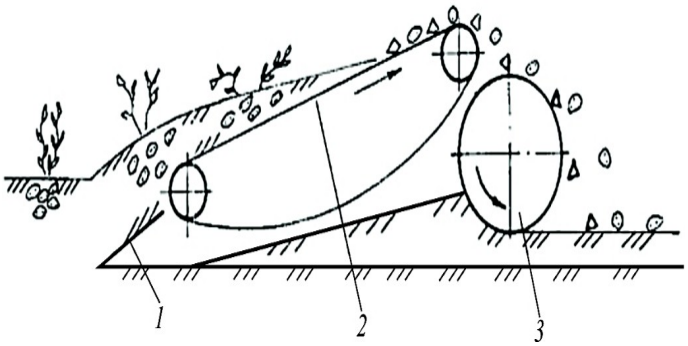
The scheme of the potato digger created by scientists from the Ryazan State University of Agrotechnology is shown in Figure 1.1 [5]. Its main working part is the share (1), which is made in the shape of a trapezoid. A device (2) is installed at the beginning of the elevator to accelerate the excavated mass. Also, another potato digger elevator (Figure 1.2) has a support wheel with a rubber surface mounted behind it, which also serves to quickly crush the soil [6].



1-trapezoidal coulters; 2-accelerating device

Figure 1.1.

Potato digger diagram



1-scythe; 2-elevator; rubber wheel.

Figure 1.2.

Potato digger diagram

A lot of research work has been carried out on the process of sifting the soil-potato mass and the creation of a sifting working body [7; 185-p., 8; 218-p., 9; 168-p., 10; 145-p., 11; 186-p., 12; 140-141-p., 13; 75-80-p., 14; 76-81-p.].

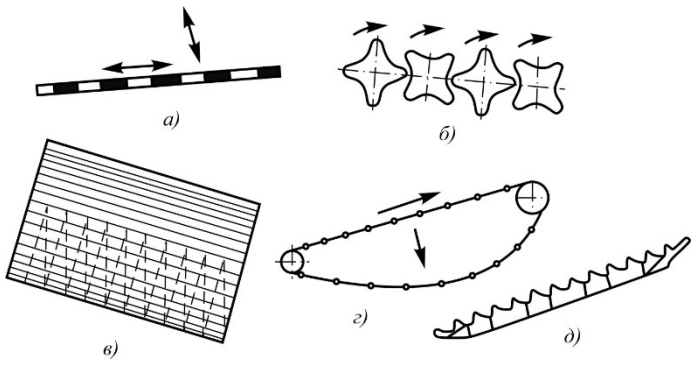
The sifting and sorting working parts of potato diggers are divided into two main parts depending on the place of installation in the technological schemes of potato diggers and combines:

- primary sorting working parts;
- secondary sorting working parts.

The primary sorting section separates 60–70% of the potatoes from the soil, while the secondary sorting section separates the remaining potatoes from the soil.

The following main requirements are imposed on working bodies of this type: high productivity of the main screening working bodies (150 kg/h), minimal loss and damage of nodules (2–3%), high operational reliability and simplicity of design, simultaneous sifting of the soil and upward transfer of the mass, ensuring greater separation of nodules from the soil (70–80%)

The main types of primary screening working parts of potato diggers are shown in Figure 1.3.



a – with a bar;
b – with a ear;
c – with a drum;
d – with a finger;
d – with a key

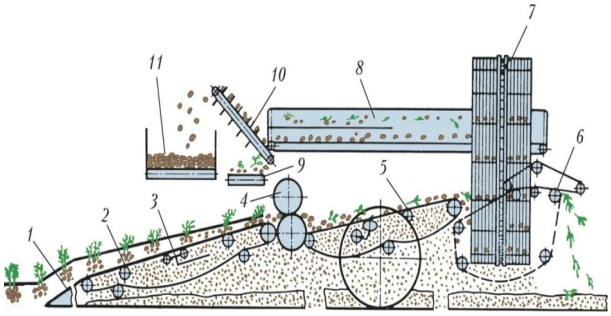
Figure 1.3.
Types of primary screening working parts of potato diggers

The screw elevator (Fig. 1.3, a) has been the main working unit of potato harvesters in the world for more than a century, although it was invented. The main reason for its widespread use is its simplicity of design and the ability to simultaneously sift and transport the layer upwards at an angle of inclination of 20° [15; p. 62].

Along with these good features, slatted elevators also have disadvantages: friction occurs on a large surface, which accelerates the wear of parts and leads to a large expenditure of energy to move the elevator slats. This is because the slatted surface accounts for 40% of the total surface area; the relative surface area is small (less than 70%); when working in fields with wet soil, soil can get stuck between the slats, etc. The advantage of vibrating grate shakers (Fig. 1.3, a) is that they can easily maintain the distance between the bars within the required range (10-20 mm) by periodically changing the grate [15; p. 145].

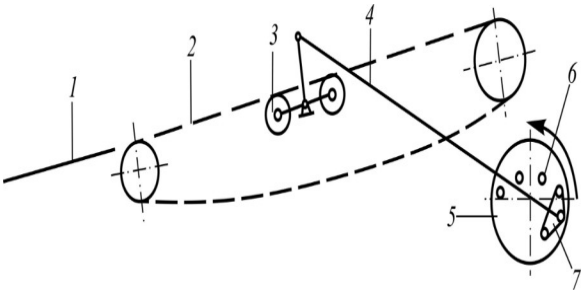
Separators equipped with a vibrating mechanism with a hopper constitute a large group (Fig. 1.3, b). Their advantage is the absence of inertial forces and friction, good separation of soil particles and plant residues. The disadvantage is the high damage to the nodules. In the past, potato diggers in many cases used drum-type vibrating elevators (Fig. 1.3, v). Their advantages are mainly reliability, non-slip properties and the ability to lift the soil mass upwards. However, clogging of the drum with plant residues and wet soil sharply reduces the threshing capacity.

According to Sorokin A.A., potato harvesters with a tine elevator, when high agrotechnical conditions are applied to the field and the optimum humidity is 18–20%, can separate 85% of the soil. Therefore, the above-mentioned tine elevators and separators are of great importance in potato harvesting, and their operation leads to high-quality secondary threshing, cleanliness in the threshing unit, lack of damage, and low losses [16; p. 78].



1 – plowshare; 2 – roller; 3 – shaking mechanism; 4 – pneumatic chopper drum; 5 – drive shaft; 6 – shaft driving the stem separator; 7 – lifting drum; 8 – sorting table; 9 – conveyor for loading the separated mass; 10 – conveyor; 11 – hopper

Figure 1.4. Technological scheme of the "KKU-2A" combine harvester



1 – plowshare; 2 – main elevator; 3 – rollers; 4 – connecting rod; 5 – disc; 6 – holes; 7 – plank

Figure 1.5. Scheme of the shaking mechanism of the KKU-2A combine

The two-row "KKU" combine harvester generation, developed jointly by the Russian Research Institute of Agricultural Machinery (VISKHOM) and the Ryazan GSKB, is the most mass-produced potato harvesting equipment, and the one currently in use is the KKU-2A combine harvester (Figure 1.4). Its main screening device is the shaking mechanism (Figure 1.4) consisting of a pair of rollers 3 mounted at the end of a two-arm lever driven by a connecting rod 4 mounted on the combine elevator. It should be noted that the KKU-2 A combine has a number of disadvantages: low technological reliability, excessive weight of the machine, and frequent damage to the nodes. The main elevator of the AVR "Spirit-4100" and

"Grimme" DR-1500 potato harvesters uses a vibrating mechanism of the elevator cloth to accelerate the sifting process (Figures 1.6 and 1.7). The disadvantage of mechanical vibrating mechanisms is that they cannot generate sufficient vibrations in the low frequency range required for crushing large pieces [17].

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