INCREASING PRODUCTIVITY OF A DIGGING MACHINE ON CONNECTED SOILS

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Abstract: *this article presents the results of a review and analysis of patent-technical material on existing designs of bucket excavators for various earthworks. Their use on cohesive soils for cleaning irrigation canals has drawbacks that the stems of vegetation falling into the interdental space are not cut off and remain in the channel of irrigation systems. These disadvantages are eliminated in the proposed bucket with rollers, which showed more effective test results.*
Keywords: *canal cleaning, plant stem, roller, bucket excavator, working body, bucket tooth, canal, rear wall, work.*

ПОВЫШЕНИЕ ПРОИЗВОДИТЕЛЬНОСТИ КОВША ЗЕМЛЕРОЙНОЙ МАШИНЫ НА СВЯЗНЫХ ГРУНТАХ

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Аннотация: *в данной статье приводятся результаты обзора и анализа патентно-технического материала по существующим конструкциям одноковшовых экскаваторов для выполнения различных земляных работ. Использование их на связных грунтах по очистке оросительных каналов имеет недостатки, что стебли растительности, попадая в межзубное пространство, не срезаются и остаются в русле оросительных систем. Эти недостатки устранены в предлагаемом ковше с роликами, который показал более эффективные результаты при испытании.*
Ключевые слова: *очистка каналов, стебель растений, ролик, одноковшовый экскаватор, рабочий орган, зуб ковша, канал, задняя стенка, работа.*

The exploitation of drainage channels in the earthen channel is associated with the inevitable loss of the original design form. Basically, there is a decrease in the cross-sectional area of the channel caused by sediment and silt deposition, deformation of slopes and channels, overgrowth of shrubbery and grassy vegetation, as a result of which its throughput decreases.

In irrigation canals under normal operating conditions, the amount of sediment deposited during the year is usually 0,4 ... 0,5 m, in some cases this value may be 2,3 times greater. The living cross-sectional area of drainage channels is usually less than that of irrigation canals; moreover, it decreases annually by 5,8%. In this state of reclamation systems, irrigation canals require annual cleaning, while drainage canals need to be cleaned once every 3-5 years [1].

Currently, excavators are mainly used for cleaning reclamation canals, equipped with cleaning or leveling buckets.

In existing designs of the working body of excavators [2], such as a bucket with teeth (of various shapes), with a solid cutting edge and with spherical rotating walls mounted at an angle to the axis of the bucket are known.

The disadvantage of this bucket when used in cleaning irrigation canals is that the stalks of vegetation entering the interdental space are not cut and remain

in line with irrigation systems.

Known working body of one bucket excavator [3], including a handle pivotally connected to the handle using a multi-link bucket, consisting of a movable rear wall with sockets and side walls with locks.

However, such a device is complex in design, the presence of significant efforts to resist the movement of soil in the bucket during unloading, occurring

when the rear wall is rotated, and the low reliability of the fixing device.

The most interesting is the design of the working body of the excavator with forced unloading of the bucket [4]. Forced cleaning of the excavator bucket when working on sticky soils helps to increase the productivity of the earthmoving machine, and reduce the energy intensity of the processes.

The disadvantages of the considered buckets [3, 4] are the relatively small working width and low quality of work when cleaning the channels from plant stems. When using standard buckets, when cleaning canals from plant stems to completely remove them, they often have to dig the bucket, as a result of which the channel profile is destroyed and the excavator's productivity is reduced.

Improving the productivity and quality of the excavator during land reclamation can be achieved by improving the cutting system of the bucket.

To this end, we propose the design of the working body of a single-bucket excavator, in which the bucket teeth have grooves, the rollers are mounted via an axis, the rollers can rotate around its axis and act as rotating knives. The roller sharpening angle is set to 30°.

When cleaning the canals from plants, their stems, falling between the teeth in the rollers, are either cut off or squeezed between the two rollers, thus eliminating their pressing into the ground. Then the cut stems fall into the bucket of the excavator.

This working body of the excavator is designed to perform various earthworks on soils with low bearing capacity (associated wetlands, waterlogged areas, etc.).

The proposed bucket consists of side walls, rear wall, bottom and teeth, in the grooves of which on the vertical axes, rollers are installed. The diameter of the rollers is chosen so that when they are installed in the grooves of the teeth, the gap between them does not exceed 3 mm.

This bucket works as follows. When moving forward, the rollers under the action of the soil entering the bucket begin to rotate in the direction of the

arrows and are pulled into the gap between themselves in the plant stem.

Due to the fact that the gap between the rollers is much smaller than the diameter of the plant stems, the latter are separated from their root parts, after which they together enter the bucket.

The test results of the model of the proposed bucket at the physical modeling bench in the laboratory complex of the Tashkent Institute for Planning, Construction and Operation showed that productivity compared to the traditional bucket increased by 1,2 times.

In addition, according to preliminary estimates, approximately 9,6 million sums (UZS) per year per excavator with a capacity of V = 1,0 m^3 has a positive economic effect.

References / Список литературы

1. Ochistka meliorativnyh kanalov ot nanosov, zailenij i rastitel'nosti [Cleaning of reclamation channels from sediment, siltation and vegetation] // Tehnika i tehnologii APK: Vestnik [Technique and technologies of agroindustrial complex: Bulletin], 2016. № 5. P. 13–16 [in Russian].
2. *Harac E.A., Klimshin A.V.* Kovsh zemlerojnoj mashiny [Digging bucket] // Patent Rossii [Russian patent] № RU 12150 U1. Zajavleno [Stated]: 22.06.1999.06: opubl. [publ.] 16.12.1999 [in Russian].
3. *Repin S.V.* Jekskavatornyj kovsh s prinuditel'noj razgruzkoj [Excavator bucket with forced unloading] // Patent Rossii [Russian Patent] № RU 90809 U1. Zajavleno [Stated]: 07.07.2009: opubl. [publ.] 20.01.2010 [in Russian].

4. *Harac E.A.* Kovsh jekskavatora // Patent Rossii №RU 2186908 S1. Zajavleno [Stated]: 12.04.2000: opubl. [publ.] 10.08.2002 [in Russian].