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Multifunctional hydraulic excavator

ANNOTATION

The volume of excavation in road construction now requires the development and implementation of new technologies. Along with road construction, machine building, production of road construction materials, and the production of new machinery and equipment are developing. It is an increase in the efficiency of hydraulic excavators by modernizing the working equipment-the introduction of an additional working organ-cutting discs.

Keywords: hydraulic excavator, handle, ladle, hydraulic cylinder, lever.

Excavators are important geological for the development of soil, for extraction of soft, hard, hard rocks in the quarry, excavation of excavations, etc. To date, the production of hydraulic excavators involved in many foreign companies, for example, f. Komatsu, Hitachi, Volvo, etc., which are focused on the production of quality components and technologies for enterprises. The principles of application of innovative technical and technological solutions greatly simplify the control system, and also produce excavators of the highest productivity and reliability. In this regard, the study of the working bodies of hydraulic excavators, which not only increase the productivity but also expand the technological capabilities of these excavators is relevant. The volume of excavation in road construction now requires the development and implementation of new technologies. Along with road construction, machine building, production of road construction materials, and the production of new machinery and equipment are developing.

Working equipment of a hydraulic excavator including a handle, a bucket, connected by a turning mechanism consisting of a hydraulic cylinder, a lever and a pull rod, an additional working member pivotally mounted on the handle with articulated rods fixed thereto, characterized in that the additional operating element, made in the form of a T- frame, is equipped with two disc knives with a serrated cutting edge mounted freely rotatable at a distance greater than the width of the bucket, and by means of the free ends of the hinge connects with turning mechanism.

The invention relates to earth-moving equipment, namely to working equipment of hydraulic excavators. An additional working element is mounted on the hinged handle of the hinge, on the T-frame, there are two disc knives with serrated cutting edges at a distance from each other exceeding the width of the bucket. In this case, the bucket rotation mechanism is connected to the additional operating element by means of two articulated links. The energy intensity of destruction of asphalt concrete pavements decreases and the drive structure of the working bodies is simplified.

The invention relates to the field of earth-moving machines, in particular to the working equipment of single-bucket hydraulic excavators intended for breaking up asphalt-concrete coatings in the repair of underground communications.

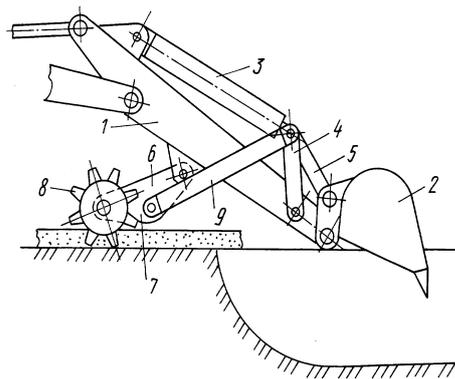
The working equipment of a hydraulic excavator is known, including a handle with a bucket, on the axis with which rippers and hydraulic cylinders for turning the bucket and rippers are installed.

The disadvantages of such equipment are the complexity of the design of the drive of working bodies and the high energy intensity of the development of asphalt pavement because of its destruction along the entire width of the trench by the teeth of the rippers.

The closest to the proposed invention is the excavator operating equipment including a handle, a ladle, a bucket rotation hydraulic cylinder and an additional working member in the form of grippers mounted on the same axis as the bucket on the handle. In this case, the rippers are connected to the bucket by means of pivot links, a double-armed lever and additional traction. This ensures the drive of the rippers and bucket from one hydraulic cylinder, which simplifies the construction of the equipment, but requires the introduction of a two-arm lever into the bucket.

The aim of the invention is to reduce the energy intensity of destruction of asphalt concrete pavements and to simplify the design of the actuator drive.

This goal is achieved in that in the working equipment of a hydraulic excavator including a handle, a bucket, connected by a turning mechanism consisting of a hydraulic cylinder, a lever, and a pull rod, an additional operating member hinged mounted on the handle with the articulated links secured thereto, form of a T-frame, is equipped with two disc knives with a serrated cutting edge, which are freely rotatable at a distance greater than the bucket width, and by means of a free end articulated rods connected to the turning mechanism.



In Fig. 1 - position of the working equipment in the production of incisions.

The working equipment of the hydraulic excavator (Figure 1) consists of a handle 1, a bucket 2, its turning mechanism consisting of a hydraulic cylinder 3, a lever 4 and a link 5 pivotally connected to each other and an additional working element 6, the T-shaped frame 7 of which is hinged is fastened to the handle 1. Two disk blades 8 equipped with toothed cutting edges at a distance from each other exceeding the width of the bucket 2.

The equipment works as follows. When the bucket 2 is pulled out by means of the lever 4 and the link 5, and the additional working member 6, under the action of the rods 9, rotating relative to the corresponding hinges on the handle 1, move towards each other, pinching the developed layer of asphalt concrete. In this case, the circular knives 7, being inserted into the asphalt concrete by the jagged cutting edges, come into the rotation and produce its notching, thereby facilitating the process of destruction of the coating by the bucket 2. Depending on the thickness of the crumbled coating, it can be pre-incised by rolling the discs 8 along the surface of the asphalt concrete when turning handle 1 or when the excavator moves by its own motion, as shown in Fig. 1. The fragment

of the initial pit in the development of the trench by the bucket 2 can also be accompanied by the creation of a preliminary incision on the surface of the coating.

The advantage of the proposed equipment design is that it can be mounted on the basis of standard backhoe equipment of a single bucket hydraulic excavator with minimal costs for its modernization.

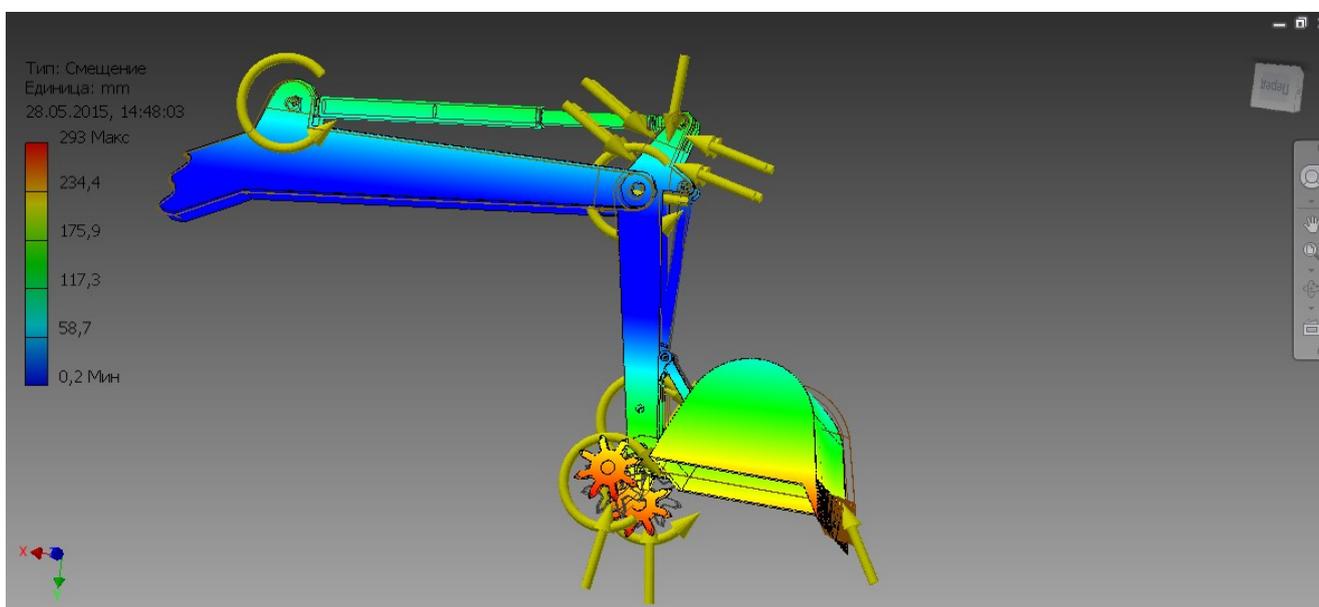
The solution of the problem consists of two main stages:

At the first stage, the hydraulic excavator working structure is calculated with the initial set of parameters in order to create a command file describing the calculation of the parametric model of the construction (analysis file).

At the second stage, this command file is transferred to the probabilistic analysis module, where probability density distributions are assigned for input random parameters, then the program performs a series of calculations based on the algorithm described in this command file. As a result, the probability density distribution of the output parameters is determined (in this example, one output parameter is used) and their dependence on one or other input parameters.

Calculation of the stressed-deformed proposed hydraulic excavator working equipment, which deals with methods and methods of geometric modeling, which consist in the interactive creation by the user of a 3D model of the working organ of a hydraulic excavator consisting of structural elements: bucket, hilt, boom, cutting discs and hydraulic cylinders. Synchronous geometric modeling is based on the complex application of methods of boundary representation of volume bodies, variational parametrization.

The geometric model clearly defines the structure of the entire working body, contains important information resources, necessary for the whole process of creating the product, which is created by the completion of new data.



The main operations of motion for geometric modeling were: extrusion operations, cross-section construction.

To create a geometric model of the working body, the numerical values of the parameters used in the models of primitives were used. In the process of the dialog construction of the geometric model of the working body, exact conjugations were obtained using conjugations of primitives with each other "bindings". "Bindings" include the characteristic points of vector Card In

geometric objects (ends, midpoints, the center of a circle, intersection points, etc.).

The availability of information software in the form of libraries and databases containing ready-made standard geometric elements allowed to construct an object of hydraulic excavator equipment in 3 D. In the modeling process, the determination functions, the relationship between the boom and boom parameters were taken into account.

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