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ANALYSIS OF EFFECTIVENESS OF THE MECHANICAL SHOCK ABSORBER PERFORMANCE

АНАЛИЗ ЭФФЕКТИВНОСТИ РАБОТЫ МЕХАНИЧЕСКОГО АМОРТИЗАТОРА

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Drilling of wells is the initial stage of oil production process in all cases when the vskrysha is provided by rather strong rocks. The modern and high-quality drilling of soil masses and the subsequent operations, and consequently also technical and economic indexes of process of production in general depends on the efficiency of drilling operations [1].

The necessary condition is unification, durability, and also such an index as vibration resistance of drilling technique during the whole process of its maintenance.

One of the most important methods of dynamic loads lowering in technique generally is the application of shock-absorbers of different types.

The following suggestion belongs to the drilling equipment, namely to devices for the radial and axial vibrations' dampening arising in a drilling string at loadings appearing while drilling a well. This device can be used when drilling vertical, horizontal and directional oil and gas wells by any known method.

The mechanical shock-absorber contains the body in the lower part of which there is the shaft forming a gap with a nut which interacts with it through a slit joint. In the lower part of the body there are rows of shock-absorbing rubber elements in the form of full-spheres (for example, rubber full-spheres from oil-resistant rubber 54–24 (9Ta-24-1)) which are separated by metal rings.

At the top of the lower part of the body over shock-absorbing elements the piston toughly connected to the shaft is located.

Over the piston in the annular space between the body and the shaft the compression spring intended for the creation of additional absorption ability is set, thus the toughness of a compression spring is higher than toughness of the shock-absorbing elements executed in the form of full-spheres separated by metal rings. For the connection of the mechanical shock-absorber with elements of drilling configuration from above in the body the connecting thread for the connection, for example with a string of the drill collar is executed, and from below on a shaft the connecting thread for the connection, for example with a bit or the calibrator is executed.

The offered mechanical shock-absorber possesses the sufficient safety in operation because of an exception of the hydraulic chamber from the construction of the device and installation of a compression spring which executes the same functions, as the hydraulic chamber filled with oil, but at the same time excludes depressurization and oil leakage from the hydraulic chamber that can lead to the excessive wear and/or damage of the latter.

Besides, the offered shock-absorber due to the lack of the hydraulic chamber is less demanding to monitoring and maintenance.

The shock-absorber containing the body, located in it the stepped shaft, forming with the body by the bigger step a slit cave and a closed slit cave is known. The smaller step of a shaft forms with the body a cave for the placement of the elastic element executed in the form of rows of the rubber full-spheres located between metal disks. Between a slit cave and a cave for layout of an elastic element the chamber of hydraulic unloading connected with annular space channels is located. Lack of this shock-absorber construction is the existence of the camera of the hydraulic unloading which is filled with the drilling slurry, negatively influencing rubber elements, and blurring an internal cave of the shock-absorber.

The most close by technical entity is the hydro-mechanical shock-absorber (the patent RU 2255197, MPK 7 E21B 17/07, published in bulletin No. 18 of 27.06.2005), containing the body in the lower part of which the shaft forming a gap with a nut which interacts with it through a slit joint, there are rows of shock-absorbing rubber elements in the form of full-spheres separated by metal rings in the lower part of the body, thus at the top of the lower part of the body with shock-absorbing elements the piston forming the hermetic hydraulic camera intended for the creation of additional absorption ability and filled with diesel oil which moves through the hydrochannels located in the upper part of the body with the shaft and the upper part of the body is located.

The disadvantages of this shock-absorber construction are:

- firstly, the existence of the hydraulic camera reduces the reliability of the shock-absorber operation (hydrochannels, sealing elements can lead to a depressurization of the hydraulic camera, and, as a result, excessive loadings on shock-absorbing elements can lead to the excessive wear and/or damage of the latter);
- secondly, the hydraulic camera of the shock-absorber requires the continuous maintenance and monitoring over its state, filling with oil (diesel fuel) and monitoring over its leaks.

The task of the useful model is the reliability augmentation of the shock-absorber operation and also an exception of the constant control and maintenance of the shock-absorber without loss of operation efficiency.

The objective is solved by the mechanical shock-absorber containing the body in the lower part of which there is the shaft forming a gap with a nut which interacts with it through a slit joint, in the lower part of the body the rows of shock-absorbing rubber elements in the form of full-spheres separated by metal rings are located, thus at the top of the lower part of the body over shock-absorbing elements the piston toughly connected to the shaft is located.

The fact that over the piston in the annular space between the body and the shaft there is the compression spring intended for the creation of additional cushioning ability is new, thus the toughness of a compression spring is higher than the toughness of shock-absorbing elements. In fig. 1 the offered mechanical shock-absorber is presented.

The mechanical shock-absorber contains the body 1 the shaft in the lower part *2* forming with a nut *3* which interacts with it through a slit joint *4*, a gap *5*. In the lower part of the body 1there are rows of shock-absorbing rubber elements *6* in the form of full-spheres (for example, rubber full-spheres from oil-resistant rubber 54–24 (9Ta-24-1) separated by metal rings *7*.

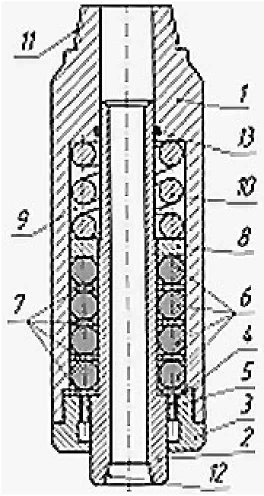

Fig. 1. ***Mechanical shock-absorber***

At the top of the lower part of the body 1 over shock-absorbing elements the piston *8* toughly connected to the shaft *2* is located. Over the piston *8* in the annular space *9* between the body *1* and the shaft *2* the compression spring *10* intended for the creation of additional absorption ability, thus toughness of a compression spring *10* is higher than the toughness of the shock-absorbing elements *6* executed in the form of the full-spheres separated by metal rings *7*.

For the connection of the mechanical shock-absorber with elements of drilling configuration on the top in the body *1* the connecting thread *11* for the connection, for example with a string of the drill collar is executed, and from below on a shaft *2* the connecting thread *12* for the connection, for example with a bit or the calibrator (it is shown on the figure) is executed. Unauthorized overflows of liquid in the operation process are excluded by a sealing element *13*.

The mechanical shock-absorber operates as follows.

The mechanical shock-absorber is included to the composition of the drilling configuration and set over a bit or the calibrator. In the process of drilling the rotation from higher drill collar sections is transmitted through the body 1 and a nut *3* by means of a slit joint *4* on a shaft *2* which also rotates, thus in case of the load on the bit shock-absorbing elements *6* transfer force from higher drill collar sections to a bit, and at the same time perceive a retroactive effect which changes from value of pressure which needs to be created for effective corrupting of rocks.

Shock-absorbing elements 6 permanently in process of load change on the bit different reversal loads are tested. At the same time they can be rolled in this connection there is their uniform wear. The compression spring *10*, in a consequence of that its toughness is higher than toughness of shock-absorbing elements *6*, compensates at some point missing absorption capacity of shock-absorbing elements *6*.

The offered mechanical shock-absorber possesses the sufficient safety in operation for the exception of the hydraulic camera of the device construction and installation of a compression spring which executes the same functions, as the hydraulic camera filled with oil, but at the same time excludes depressurization and oil leakage from the hydraulic camera that can lead to excessive wear and/or damage of the last. Besides, the offered shock-absorber due to the lack of the hydraulic camera is less exacting to monitoring and service.

Thanks to such production characteristics as reliability in maintenance, to an exception of a constant control and maintenance of the shock-absorber without loss of overall performance, and also direct execution of operation – the lowering of vibroloading ensuring maintenance free functioning of a drilling equipment allows to ensure essential economic effect, quality and volumes of the received production according to the tasks delivered by the president and the Government of the Russian Federation.

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