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DEVELOPMENT OF THE DESIGN OF THE BENCH FOR THE LIFE-TIME TESTS OF HYDRAULIC FRICTION DAMPERS OF ELECTRICROLLING STOCK

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ABSTRACT

The article proposes a new design of a stand for tests of hydraulic and hydro-friction vibration dampers for electric rolling stock.

Objective monitoring of the operability of hydraulic vibration dampers of electric trains is carried out on specialized stands by the method of harmonic oscillations with chart recording. According to the diagram, the resistance parameter is determined and compared with the standard value; resistance forces; their symmetry on compression-stretching strokes and maximum values in valve mode; possible defects of the damper [1,2].

Hydraulic vibration dampers are tested on stands reproducing the harmonic motion of the piston relative to the cylinder $x = \alpha \sin \omega t$, where α is the amplitude of the oscillations, $\omega = 2$ ππ is the circular frequency, n is the frequency of oscillations from 1 to 4 *Hz*.

Based on our analysis of patent research on promising designs of diagnostic methods, as well as new designs of stands for testing hydraulic vibration dampers according to IPC classes B 61 G 9/10, B 61 G 11/14, F 15 F 15/023, F 15 F 15/067, F 16 F 3/087, F 16 F 5/00, F 16 F 1/40, etc. F16F9/14, F16F5/00, F16F 9/516, F16J15/56, we propose a new design of the stand for resource testing hydraulic and hydro friction vibration dampers of electric rolling stock.

The schematic diagram of the simulator is shown in Fig. 1. The test bench drive consists of the motor-reducer 1, which

output shaft, through the sleeve-and-bolt coupling 2, is connected to the crankshaft 3, on which the bottom eyes of rods 4 are dressed. The upper ends of the connecting rods 4 connected to the sliders 5, which are mounted on the stands 6 lower clamping device 7 the bottom eyelet tested hydro damper 6. The upper eye of the hydro damper 8 is clamped by the upper clamping device 9, which is mounted on the free end of the force-measuring device 10, which is rigidly attached to the frame of the stand. At the output end of the crankshaft 3 the position sensor for the crankshaft 11 is installed.

This test bench works in the following way. With the help of the PC keyboard the hydraulic damper testing process is started, which firstly switches on (if necessary) the electric motors of the stand tilt drive (not conditionally shown). After the tilt of the test bench at the preset angle - the position is determined by the tilt angle sensor (not shown in the scheme) - the tilt drive stops, the inclined part of the test bench is fixed by an adjustable screw support, and the electric motor of the power drive is switched on [3].

The power drive drives the lower part of the tested hydro dampers 8 with a certain frequency and amplitude. Position of the crankshaft is fixed by the crankshaft position sensor 11, and resistance forces of the hydro dampers 8 are transmitted to the force-measuring devices 10. Information from the crankshaft position sensor 11 and deformation of the force-measuring devices 10 is converted into electric signals which are fed to the corresponding inputs of the microcontroller module 12. After appropriate transformations on the monitor 13 information on the results of the hydro dampers 8 tests is displayed. After the tests the adjustable screw support is released, the electric motor of the tilt drive is switched on and the bench returns to the vertical position (defined by the sensor), if the angle of the bench tilt differs from the value of 90 degrees.

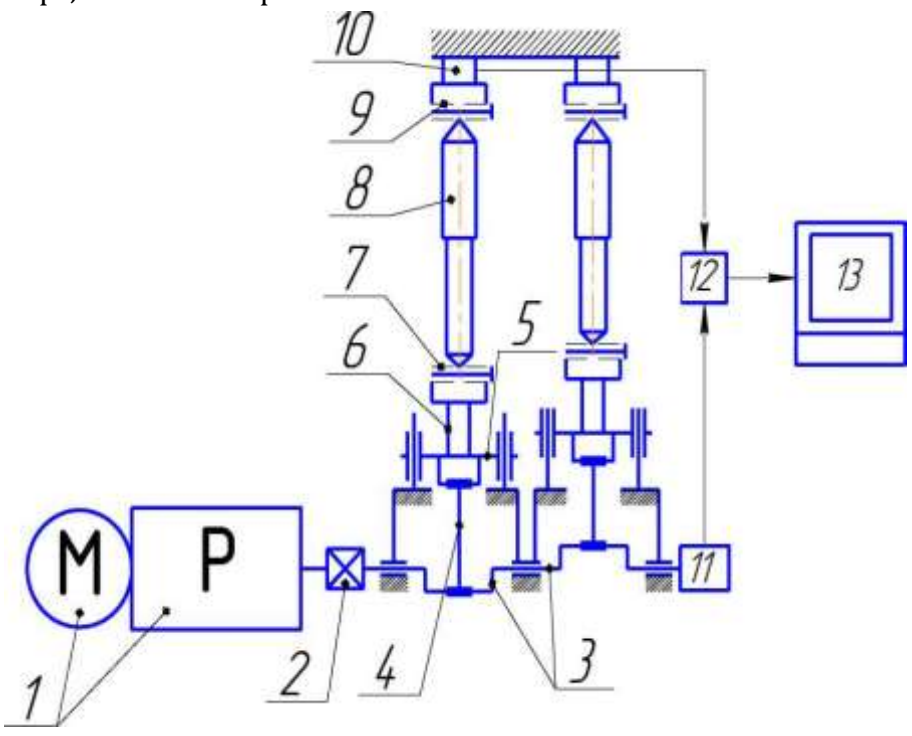

Figure1. - Schematic diagram of the bench for the resource tests of hydraulic and hydraulic friction dampers of electric rolling stock.

The process of resource tests of the hydraulic vibration dampener on the test bench is as follows.

1. The setting of the tilt angle of the test bench is checked; in case the angle differs from 90° the drive of the tilt angle of the test bench is switched on. When the set angle is reached, the tilt angle reducer will switch off.

2. The braking mechanism which additionally fixes the turning part of the test bench will be actuated.

3. The motor reducer of the power drive is switched on: the hydraulic vibration damper (GGK) is pumped.

4. The test process is synchronized by the position sensor.

5. A certain number of cycles of the hydro dampener test is carried out. The graph (working diagram) and damper parameters are displayed on the monitor screen.

6. The gear motor of the power drive is switched off; the locking mechanism of the bench is unlocked.

7. The bench returns to the vertical position.

8. On the screen of the monitor the working diagram of the hydraulic damper in coordinates P-S (force-movement) on throttle and a valve mode is displayed.

9. Testing by the family of working diagrams.

Selection of the type of the output graph in the test report is performed by selecting the corresponding tab. It should be taken into account that the velocity characteristic of the shock absorber is built according to the family of working diagrams.

Test stands for hydraulic vibration dampers allow determining the good condition of hydraulic vibration dampers, as well as hydraulic dampers and their performance characteristics [4,5].

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