AUTOMATED COMPLEX FOR TRIBOTECHNICAL TESTS OF CONSTRUCTIONAL MATERIALS AND LUBRICANT ENVIRONMENTS

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АВТОМАТИЗИРОВАННЫЙ КОМПЛЕКС ДЛЯ ПРОВЕДЕНИЯ ТРИБОТЕХНИЧЕСКИХ ИСПЫТАНИЙ КОНСТРУКЦИОННЫХ МАТЕРИАЛОВ И СМАЗОЧНЫХ СРЕД

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Аннотация. *Свойства и взаимодействие поверхностей твердых тел – одна из самых трудных и малоизученных областей знаний. При проектировании и эксплуатации машин не всегда используются наиболее эффективные средства снижения сил трения и износа, учитывающие конкретные условия работы из-за отсутствия требуемого научно-исследовательского оборудования. Конкретный пример именно такого оборудования представлен в этой статье. Авторы освещают читателю изобретение работников Томского Политехнического Университета, поясняют принцип действия диагностического комплекса и его схему, рассказывают о необходимости создания подобного оборудования. Статья представляет интерес для студентов и специалистов в области машиностроения, приборостроения, трибодиагностики и материаловедения.*

Today the problem of friction and wearing in various machines and mechanisms is not resolved up to the end. One of the tendencies to solve this problem is the aspiration to increase efficiency and reliability of machines. The assessment of such indicators as efficiency and reliability is in turn carried out generally by practical tests. The automated complex for tribotechnical tests of constructional materials and lubricant environments was created exactly for this purpose.

Figure 1. Appearance of the automated complex

Special attention in the work of this complex is paid to three major factors (pressure, speed of sliding and temperature) as their existence leads to frictional warming up which defines conditions of engagement of the rubbing surfaces: the deformation level (elastic, plastic, microcutting) on separate sites of surfaces determining the surface area of the actual contact, durability of adhesive communications, greasing conditions, etc.

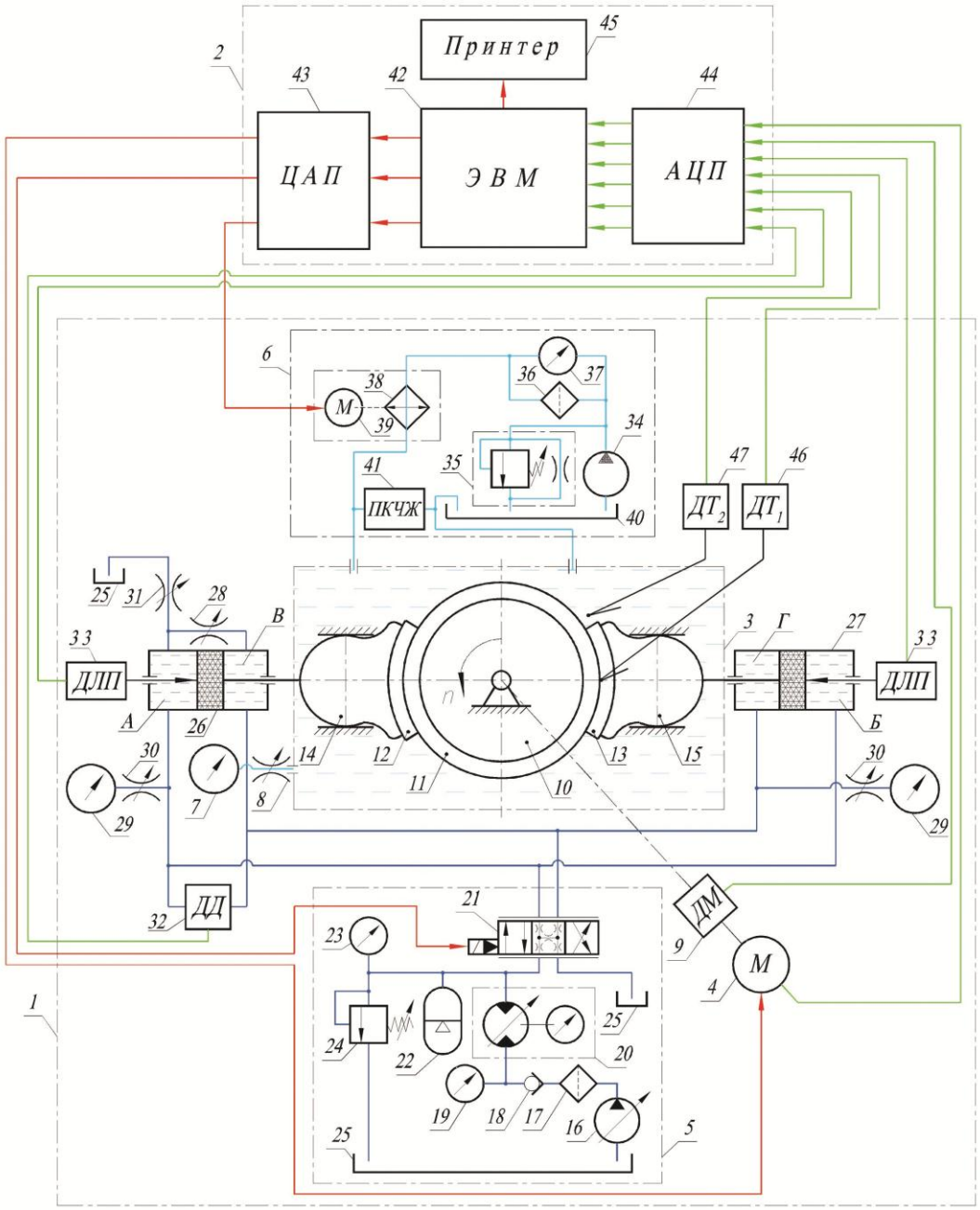

Figure 2. The schematic diagram of the automated complex

In figure 2 the design of the automated complex which consists of two main assembly units is considered: cars of friction 1 and control systems 2. The machine of friction 1 includes: flowing chamber 3; constant direct-current electric motor of the drive of the main movement 4; stressing system 5; the system of circulation, filtration and thermal control 6 of probationer lubricant environments, manometers 7, 19, 23, 29, 37 the damped adjustable throttles 8, 30, 31, the sensor of the torsion torque 9, the roller 10, the contra sample 11, blocks 12

and 13, self-established spherical supports 14 and 15, the axial-piston hydraulic pump 16, the filter 17, the backpressure valve 18, the flow meter 20, the hydro distributor 21, the pneumatic hydraulic accumulator 22, the supporting valve 24, hydro tanks 25, 40, hydraulic cylinders 26 and 27, the sensor of a dynamic pressure difference 32, the contactless sensor of linear movements 33, the unregulated hydraulic gear-pump 34, the safety valve 35, the filter 36, the radiator 38, the cooled electric motor 39, the purity of liquid control device 41, computer 42, the digital-analogous signal converter 43, the analogous-digital signal converter 44, the printer 45 and the sensors of the temperature 46, 47.

The operating principle of diagnostic complex consists of the following: before testing the roller is headed on the output end of a power shaft of bearing knot, the countersample is fixed on the roller and the blocks are set in spherical support and make camera sealing. Then in the control system by means of the computer there are created entry and boundary conditions of carrying out the test: test duration, the law of frequency rotation change of a countersample, the law of pressure change in system of loading, the frequency of speed control of sliding and normal loading, the frequency of a set information from sensors, fluctuation of temperature of the tested lubricant environment, the limit moment of friction of the examinee of a tribological coupling. Start-up of the friction machine is made next. Then the systems of the circulation system inclusion, filtration and thermal control of the probationer lubricant environment are switched on. As a result, the source of circulation gives the probationer lubricant environment on the filtering element under the constant pressure which size is regulated by the safety valve. All the information on the course of the experiment is displayed in a graphical view on the screen of computer display and registers the separate file in its random access memory which in the end of the experiment is processed by the special software product and is issued in the form of tables and schedules on the screen of the display or is printed out on paper. "More detailed description of the principle of installation action is performed in the source [1]".

Loading of the tested tribological coupling can be carried out in two modes: static and dynamic. Static loading of probationer samples is carried out by creation of pressure, constant in size, in cavities of stressing and cavities of a slacking-off. Stressing in the dynamic mode is carried out by means of stressing system. As a result, the created automated complex for carrying out tribotechnical tests of constructional materials and lubricant environments will allow making fail-safe tests and efficiency in the automated operating mode. Unfortunately, the present model of automatic complex needs completion. First of all, it concerns increase in operating speed, the expansion of frequency range of management, the reduction of weight and dimensions of installation, and also, expansions of functionality and a number of the registered parameters.

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