

THE HYDRAULIC SYSTEM WITH  
AUXILIARY TOUCH SUPPORTING HYDROCYLINDER

Hydraulic system in which reliability for raise of the power hydrocylinder, the auxiliary supporting hydrocylinder is in addition installed.

**Key words:** hydrocylinder, hydraulic system, reliability, support.

Auxiliary touch supporting hydrocylinder is intended for hydraulic systems of machine drive working under conditions of considerable loads to working equipment and having hydraulic cylinders of increased dimensions [1-5].

Hydraulic system driving main hydraulic cylinder from the state of operational longitudinal and lateral loading to steadiness state offers [6-8]:

- smaller rod and casing bending strains;
- smaller transverse and contact stresses;
- smaller reaction in piston-casing and rod-bushing alignments;
- smaller friction forces and higher hydraulic cylinder efficiency;
- improvement of temperature mode of piston and bushing packing;
- smaller piston and bushing wear, and in general increase of main hydrocylinder reliability and its durability.

Hydraulic system includes main and auxiliary touch supporting cylinders, safety and pressure valves. Main cylinder piston and rod chambers are connected through a distributor to power source and discharge. The auxiliary cylinder is made single-chambered. Its rod is connected to main cylinder casing by joints. Its chamber is joined up to safety valve out let connected to main cylinder piston chamber and to pressure valve inlets [6].

Hydraulic control chamber of the latter is connected to main cylinder rod chamber.

Besides hydraulic system is fitted with diversely directed and unidirectional valves – they are connected in parallel – mounted before main cylinder piston and its rod chambers. In this case the pressure valve connects the auxiliary cylinder chamber with the piston chamber of the main one. Among other things pressure and safety valves are set for operating pressure, less than that one similar for delivery valves.

The essence of the invention is explained in drawings, where:

- figure 1 represents hydraulic system with auxiliary hydraulic cylinder supporting the main one from below with reference to gravitation surface;
- figure 2 shows hydraulic system with auxiliary hydraulic cylinder supporting the main one from above with reference to gravitation surface.

Hydraulic system (figures 1, 2) includes main 1 and auxiliary touch supporting 2 cylinders, safety

valve 3 and pressure valve 4. Cylinder 1 piston and rod chambers are connected through a distributor 5 to power source 6 and discharge 7. Auxiliary cylinder 2 is made single-chambered, its rod being connected to main cylinder 1 casing by joints. Its chamber is connected to safety valve 3 out-let which in its turn is connected by its inlet with main cylinder 1 piston chamber and to pressure valve 4 inlet. The hydraulic control chamber of the latter is connected to main cylinder 1 rod chamber, valve 4 outlet being connected to its piston chamber. Before the piston chamber delivery 8 and unidirectional 9 valves diversely directed are set in parallels. Before the main cylinder 1 rod chamber are mounted connected in parallels diversely directed delivery 10 and unidirectional valves 11 [6].

The applied hydraulic system works as follows.

The pumping of fluid into piston chamber of the main hydraulic cylinder 1 results in its lateral add longitudinal loading and causes peak lateral bending strains dued to operation pressure difference of safety 3 and delivery 8 valves. The former opening puts into operation auxiliary hydrocylinder 2, acting as a sensor at the load main cylinder 1 support. Valve 3 operation pressure chosen from condition of transforming cylinder 1 into stable state by cylinder 2 [6].

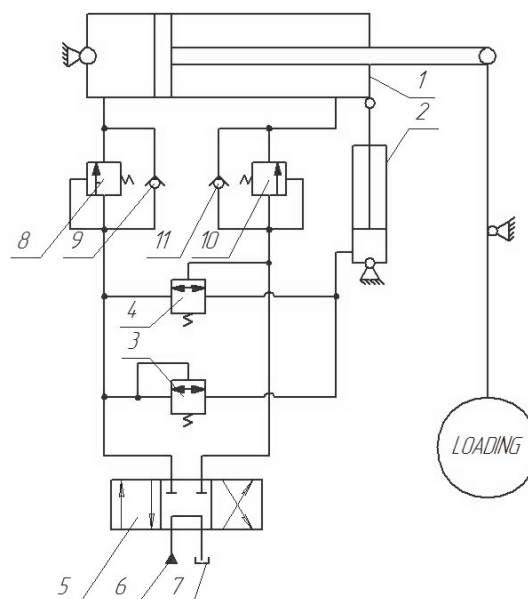
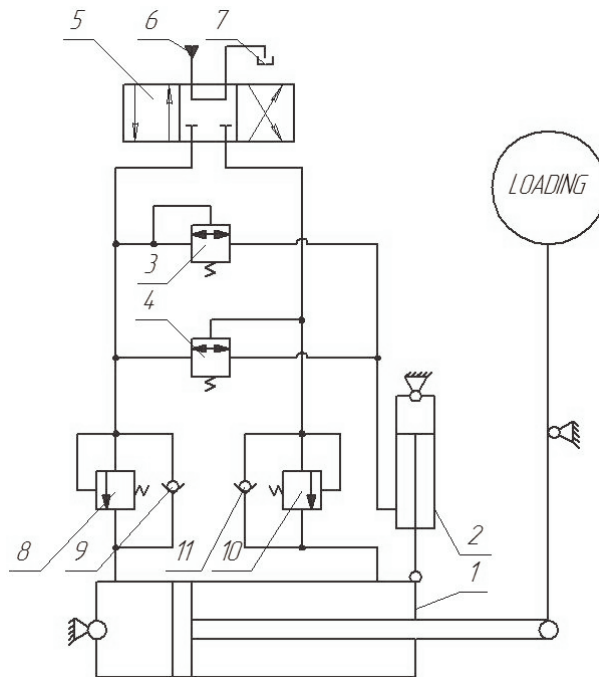


Figure 1. Hydraulic system with auxiliary touch hydrocylinder supporting the main one

from below with reference to gravitation surface.

All this makes it possible to compensate all possible and accumulated lateral bending strains during the idle - time of hydraulic cylinder 1, including those of inner overflow of working fluid through hydraulic cylinder 2 seals [6].



**Figure 2. Hydraulic system with auxiliary touch hydrocylinder supporting the main one from above with reference to gravitation surface.**

Subsequently delivery valve 8 opens bringing into operation main cylinder 1, the latter being in a stable state due to cylinder 2 operation. Fluid displaced by moving piston from cylinder 1 rod chamber through unidirectional valve 11 comes through distributor 5 to discharge 7. Load operational variations on hydraulic cylinder 1 rod through fluid pressure in its piston and auxiliary cylinder 2 chambers connected to the former 2 influences the amount of pushing (fig. 1), pulling (fig. 2) supporting efforts on its rod due to which

hydraulic cylinder 2 action as a loading sensor is achieved [6].

When working fluid is supplied through distributor 5 into hydraulic cylinder 1 rod chamber there is no necessity to support the latter by auxiliary cylinder 2 due to its tension. At first valve 4 opens due to operation pressure difference of pressure valve 4 and delivery valve 10 connecting cylinder 2 chamber with discharge 7 then valve 10 opens putting into operation hydraulic cylinder 1 free from unwanted action of auxiliary 2 one. Fluid expelled by moving piston out of main cylinder 1 piston chamber through unidirectional valve 9 comes further to discharge 7 through distributor 5.

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