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PRESSURE STABILIZATION IN A HYDRAULIC PRESS

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This article describes a unit which consists of a scouring valve and a system of automatic pumping of the oil, which maintains a constant pressure in the cylinder of a laboratory press for a prolonged period.

The described pressure stabilization system was used on several types of laboratory presses which develop forces of up to 300, 500, 6000, and 10,000 tons and restricted the pressure fluctuations in the press cylinder to a value not exceeding 1 to 1.5 atm. Two alternating actions are made the basis of the stabilization process: slow scouring of the oil excesses from the press cylinder through a valve, and periodic pumping-up of the oil in the cylinder to the initial stipulated pressure. The press feed system with pressure stabilization is shown in Fig. 1. It consists of a feed channel (a hydraulic pump 1, a receiver 2), a scouring channel (the valve 3), and an electronic attachment 4 which operates as a pair with a contact transducer which is mounted in the sample manometer 5. One of the transducer contacts is the tip of the sample-manometer pointer (this contact is first coated with silver), while the second contact sets the magnitude of the pressure and is isolated from the manometer casing (for example, it may be attached to a slider which moves freely along the generant of the manometer casing). Depending on the operating conditions, either the lower or upper value of the working pressure may be chosen as the limiting

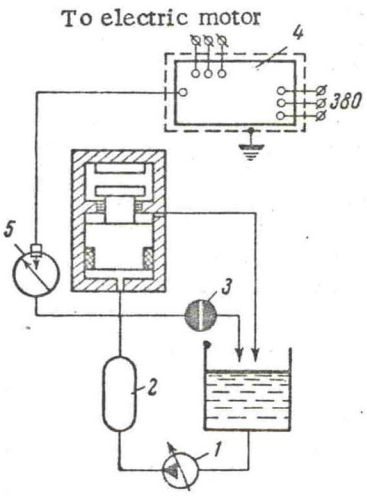

Fig. 1

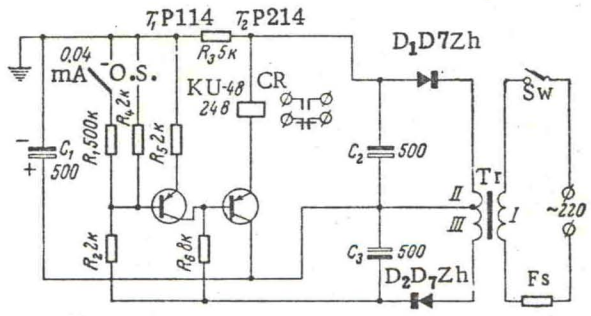

Fig. 2

Fig. 1. Diagram of the hydraulic-press feed. 1) Hydraulic pump; 2) receiver; 3) scouring valve; 4) electronic attachment; 5) sample manometer with contact pressure transducer.

Fig. 2. Schematic of the electronic attachment.

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value. In this case the contact which stipulates the pressure is situated below or above the manometer-pointer contact: the working contact of the KU-48 24-V relay in the circuit of the electronic attachment shown in Fig. 2 are also chosen in accordance with this.

For a normally closed relay circuit the oil is pumped into the press cylinder by the pump after the contacts which are touching at the beginning of operation have separated due to the pressure drop in the press cylinder. In this case the pressure setting contact fixes the upper pressure limit. The lower limit is caused by the inertia of the electronic circuit, and therefore the difference between the limits may be very small. The circuit of the electronic attachment and the automatic connection of the pump allow up to 100-150 turn-ons per minute to be performed. The frequency of pump turn-ons depends on the volume of the cylinder and receiver, the efficiency of the pump, and the rate of oil scouring (the latter may be controlled), and also on the state of the contact surfaces (in the circuit shown in Fig. 2 the current does not exceed 40 μA, and no scorching of the surface occurs). For example, on the press which develops a force of 300 tons the pumping turn-on period was at least 10 min.

The described device for pressure stabilization is convenient in operation and recommended itself well during continuous operation at the Institute of High-Pressure Physics over a period of five years.

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