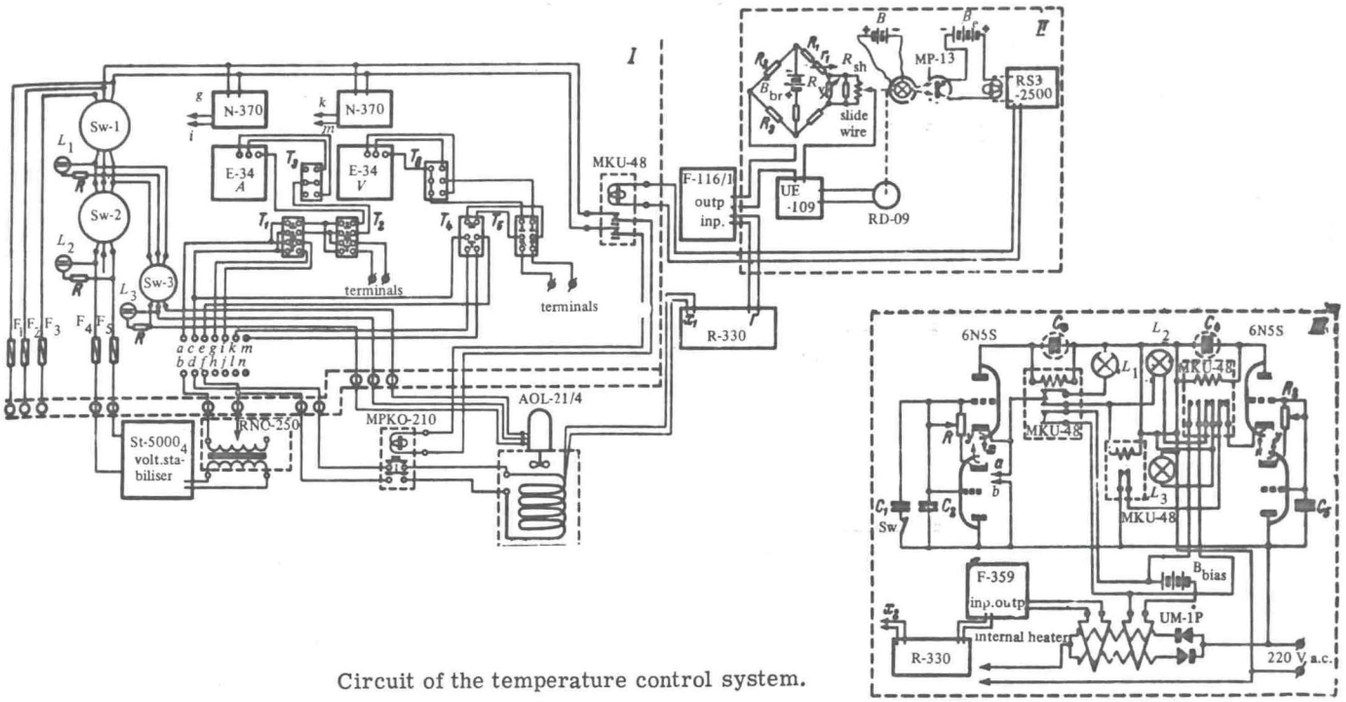

Circuit of the temperature control system.

their thermal diffusivity, S is the area of the outer surface of the thermostat, and τ the time.

Under regular conditions, the temperature changes according to the law

$$T = C_1 \exp\left(-\frac{\lambda S}{ch}\tau\right) a \cos \omega\tau + b \sin \omega\tau,$$

$$a = -P / c[1 + (\lambda S / ch)^2]; \quad b = P\lambda S / c^2 h[1 + (\lambda S / ch)^2]; \qquad (2)$$

when $\tau \to \infty$, the first term may be neglected. The period during which the heater must be switched on to give minimum temperature variation in the thermostat can be readily found from Eqn. (2). In the present case for $\lambda = 0.013$ kcal m^{-1} deg^{-1} min^{-1}, $c = 0.3$ kcal kg^{-1} deg^{-1} (liquid polyethylsiloxan), $S/h = 10.32$ m, and a mixture weighing 56 kg, the period is 4 min.

The circuit presented in the Figure was used for temperature control. The signal from the thermocouple was transmitted to an R-330 potentiometer, the deviations from the specified value being amplified by an F-116/1 photoamplifier. The amplifier has several ranges, which make it possible to amplify the error signal with any accuracy. The amplified signal is transmitted simultaneously to a potentiometric bridge and an amplifier of type UE-109. The UE-109 amplifier incorporates a synchronous motor of type RD-09, which moves the sliding contact of the potentiometric bridge slide wire compensating the error signal. A small lamp mounted on the sliding contact triggers off a photo-relay at the instant of compensation of the error signal, and the photo-relay switches on the thermostat heater. The precision of temperature control is ±0.025 deg. The circuit of an EPP-09 potentiometer may be used in the construction of the regulator (block II in the Figure). To improve the precision of temperature control, it is possible to employ a low-power internal heater located directly on the high-pressure vessel. The internal heater must be switched on at the instant when the negative half-period of the thermal wave reaches the surface of the high-pressure vessel. Since the parameters and dimensions of the thermostat are constant, the period between the instant of switching on the thermostat heater and the arrival of the negative thermal wave can be readily determined with the aid of an additional thermocouple. The author suggests that the internal heater be switched on with the aid of a time relay (III in the Figure) based on two 6N5S valves. At the instant when the external heater is switched on, the contacts a and b of the time relay are closed and the time count is begun. After the required period, the relay switches on the internal heater, the duration of the operation of which is limited by the second half of the time relay. Thus the decrease of temperature on the surface of the high-pressure vessel is compensated by the required (as regards duration and magnitude) power output of the internal heater. The precision of the temperature control of the high-pressure vessel can reach ±0.01 deg.

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Institute of Crystallography, USSR Academy of Sciences, Moscow

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