stant magnetic field will be applied to the liquid monotectic alloy with the intensity greater than that of the geomagnetic field. During this impact under the conditions of space vehicle, the processes of a marked weakening of the natural thermo-gravitational convection ($g \le 10^{-3}g_0$) and suppression of the convective flows of any nature promoted by the influence of the electromagnetic force in the melt, will be combined. Earlier experiments demonstrated that some kinetic problems hinder the homogenisation of a monotectic melt above temperature of the binodal. Taking into account these factors, we propose to use MHD methods for homogenisation of a single-phase fluid.

To optimise parameters of a given MHD-system for making monotectic alloys with a finely dispersed structure under microgravity, a comprehensive solution will be a combination of the following items:

— performance of mathematical and physical modelling;

— selection of potential variants and conducting experiments on the ground and in space;

— applying the technique of successive complication of the problem.

It is intended to start the research on optimization of a number of features of MHD-technologies from low-temperature «bismuth-gallium» alloy.

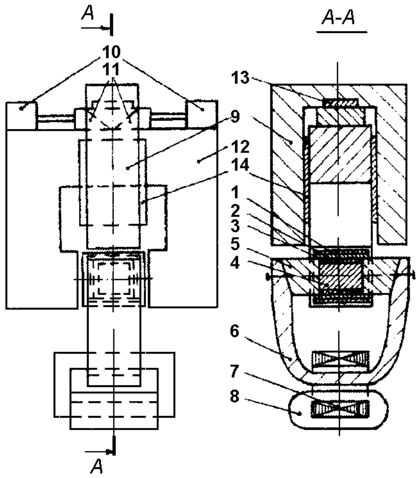

Fig. 3. Schematic of the technological unit (1 — copper capsule; 2 — ceramic cartridge; 3 — elastic heat insulator; 4 — alloy; 5 — copper electrodes; 6 — electrode bus; 7 — transformer core; 8 — transformer winding (primary); 9 — solid aluminium cooler; 10 — manipulator of the magnetic type; 11 — electromechanical cotter pin; 12 — permanent magnet; 13 — ferromagnetic lamina; 14 — slides of the cooler

The schematic of the technological unit is given in Fig. 3.

«MAGELLAN» Experiment

DIGITAL PRECISION SENSOR OF SUPERLOW ACCELERATIONS

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The accelerometer is based on the fiber-optic sensor (FOS) of superlow linear accelerations with time-pulse modulation of optical radiation intensity [1]. For a long time, the FOSs have attracted the attention of designers by their advantages in performance against the traditional (electric) sensors, but the poor metrological parameters of the classical (analogue) FOSs prevent their wide application.

Analysis of this problem has brought us to the following conclusion. To increase the accuracy of measurements using FOS, it is necessary to eliminate analogue modulation of the optical flow and use its discreet modulations, thus adding new, non-optical, parameters to the optical flow, which will serve as recipients of information. It permits preserving all the advantages of the FOSs, since the optical flow remains to be the carrier of information. Furthermore, the problem of measurement accuracy will not be connected with the problem of measurement of low-level intensity of the optical flow. It is transferred from the area of optical measurements into another, non-optical area, where these problems have been properly solved. We have developed a new class of precision FOSs (Fig. 4) with time-discrete (pulsed) modulation of the optical flow intensity. The target signal is the temporal sequence of optical signals. Information parameters of such a sequence are as follows:

— quantity of pulses as such (the process of measurement is reduced to calculation of pulses,

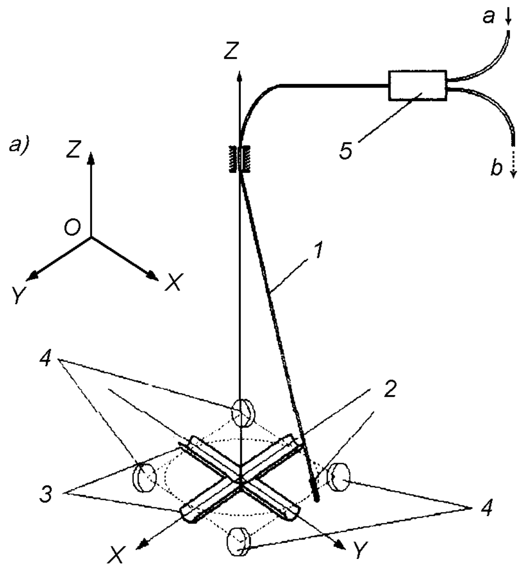

Fig. 4. Structure of pulsing FOS. *a*) Sensitivity axis orientation 1. Elastic element of pendulum suspension — quartz fiber optical gauge. 2. Inert mass — magnetically-soft material. 3. Transverse cylindrical mirrors. 4. Electoromagnets. 5. Fiber-optic splitter. Arrow *a* — Continuos radiation beam from an off-site source of light. Arrow *b* — Output pulse-modulated optical signal.

which can be done accurately);

— frequency of pulses (the process of measurement consists in calculation of the number of pulses per a unit of time; measurement of time intervals can be also done with the necessary accuracy);

— time intervals between pulses following each other in a sequence (the process of measurement consists in determination of the time intervals between the pulses and subsequent processing of the measurement results according to the algorithm accepted for the particular case), etc.

One more factor promoting achievement of a high accuracy of measurements by pulsing FOSs is the independence of their metrological parameters on any instabilities (time, temperature, etc.) of parameters of optical and electric elements. It is explained by fact that the measured (information) parameters in a target signal of pulsing FOSs are not the energy parameters of the optical flow (as in the case of analogue FOS), but the values of time intervals set by optical pulses.

In addition to providing a high accuracy of measurements, the FOSs of this class differ favourably from the usual analogue FOSs by a high threshold sensitivity and wide range of the measured values. Digital processing of a signal is the obvious advantage of pulsing FOS, which promotes higher precision and overall improvement of the quality of measurements. Deployment of digital chip processing permits adjustment of the measurement results, as well as neutralizing both the impact of natural obstacles to precise measurement (non-linear parameters, interference, etc.) and the inaccuracy of FOS manufacturing (non-perpendicular axes of mirrors, unmatched optical and geometrical axes). This ensures performance of precise measurements not in the FOSs but in the module of a signal processing [2]. This way, the technical requirements to FOS manufacturing may be lowered without decreasing the high level of requirements to the measuring accuracy.

Therefore, the higher precision measurements by the pulsing FOSs are ensured by precise measurement of time intervals between optical pulses and quartz super stable oscillating system, which is the sensitive element-modulator of the pulsing FOS.

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