Passive Vaporizing Heat Sink

Lyndon B. Johnson Space Center, Houston, Texas

A passive vaporizing heat sink has been developed as a relatively lightweight, compact alternative to related prior heat sinks based, variously, on evaporation of sprayed liquids or on sublimation of solids. This heat sink is designed for short-term dissipation of a large amount of heat and was originally intended for use in regulating the temperature of spacecraft equipment during launch or re-entry. It could also be useful in a terrestrial setting in which there is a require-

ment for a lightweight, compact means of short-term cooling. This heat sink includes a hermetic package closed with a pressure-relief valve and containing an expendable and rechargeable coolant liquid (e.g., water) and a conductive carbon-fiber wick. The vapor of the liquid escapes when the temperature exceeds the boiling point corresponding to the vapor pressure determined by the setting of the pressure-relief valve. The great advantage of this heat sink over a melting-paraffin

or similar phase-change heat sink of equal capacity is that by virtue of the ≈10× greater latent heat of vaporization, a coolant-liquid volume equal to ≈1/10 of the paraffin volume can suffice.

This work was done by Timothy R. Knowles, Victor A. Ashford, Michael G. Carpenter, and Thomas M. Bier of Energy Science Laboratories, Inc., for Johnson Space Center. For further information, contact the Johnson Commercial Technology Office at (281) 483-3809. MSC-23414-1

Remote Sensing and Quantization of Analog Sensors

This technique has applications in automotive ride and steering sensors, and in industrial vibration and process monitors.

NASA's Jet Propulsion Laboratory, Pasadena, California

This method enables sensing and quantization of analog strain gauges. By manufacturing a piezoelectric sensor stack in parallel (physical) with a piezoelectric actuator stack, the capacitance of the sensor stack varies in exact proportion to the exertion applied by the actuator stack. This, in turn, varies the output frequency of the local sensor oscillator. The output, F_{out}, is fed to a phase detector, which is driven by a stable reference, F_{ref}.

The output of the phase detector is a square waveform, D_{out}, whose duty cycle, t_W, varies in exact proportion according to whether F_{out} is higher or lower than F_{ref}. In this design, should F_{out} be precisely equal to F_{ref}, then the waveform has an exact 50/50 duty cycle.

The waveform, D_{out}, is of generally very low frequency suitable for safe transmission over long distances without corruption. The active portion of the waveform, t_W, gates a remotely located counter, which is driven by a stable oscillator (source) of such frequency as to give sufficient digitization of t_W to the resolution required by the application.

The advantage to this scheme is that it negates the most-common, present method of sending either very low level signals (viz. direct output from the sensors) across great distances (anything over one-half meter) or the need to transmit widely varying higher frequencies over significant distances thereby eliminating interference [both in terms of beat frequency generation and *in-situ* EMI (elec-

tromagnetic interference)] caused by ineffective shielding. It also results in a significant reduction in shielding mass.

This work was done by Karl F. Strauss of Caltech for NASA's Jet Propulsion Laboratory.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Phase Retrieval for Radio Telescope and Antenna Control

Goddard Space Flight Center, Greenbelt, Maryland

Phase-retrieval is a general term used in optics to describe the estimation of optical imperfections or "aberrations." The purpose of this innovation is to develop the application of phase retrieval to radio telescope and antenna control

in the millimeter wave band.

Earlier techniques do not approximate the incoherent subtraction process as a coherent propagation. This approximation reduces the noise in the data and allows a straightforward application

of conventional phase retrieval techniques for radio telescope and antenna control.

The application of iterative-transform phase retrieval to radio telescope and antenna control is made by approximating