FLAT-SURFACED SOLID TEMPERATURE MEASURING DEVICE

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1. Introduction

Temperature Measurements have been done since hundreds of years ago but up until now, there's still no device available that can measure flat-surfaced solids' temperatures with high accuracy. The current liquid-based thermometers have highly unsuitable physical structures for measuring flat-surfaced solids' temperatures due to their inability to make a good thermal contact with flat-surfaced solids. Thermocouples' inconveniences lie in its physical structure and reference junction system. Infrared thermometers also possess problems due to their dependency on infrared radiations which could be affected by numerous factors. These problems lead up to the purpose of this research, which is to make a device that has a physical structure suitable for thermal conductions with flat-surfaced solids.

2. Research Methods

My device utilizes multiple chromel-alumel thermocouples as they are cheap and have a wide temperature range. The conventional thermocouples use only one thermocouple which can only provide narrow temperature measuring ranges at low temperatures due to the small voltage that they produce. My device also has a physical structure suitable for thermal contacts with flat-surfaced solids as well as a thermally regulated environment between the thermocouples by the use of thermal paste.

The reference junction system consists of a thermoelectric cooler and a heatsink that regulate the temperature of the other side of the thermocouples at a certain temperature. A temperature sensor is used to detect whether the temperature of the other side of the thermocouples is at a certain temperature. The temperature sensor, which is an LM35, can measure liquid temperatures accurately and due to the presence of thermal paste around the reference junction and the temperature sensor, the temperature sensor can bring out accurate temperature readings of the reference junction.

Microcontrollers are used to convert the voltage outputs into temperature readings, as well as to regulate my reference junction's temperature depending on the measured resistance from the thermistor.

Heat insulating materials are implemented as the cover of the device, this is done so that the thermocouples can only be affected by the measured object's temperature.

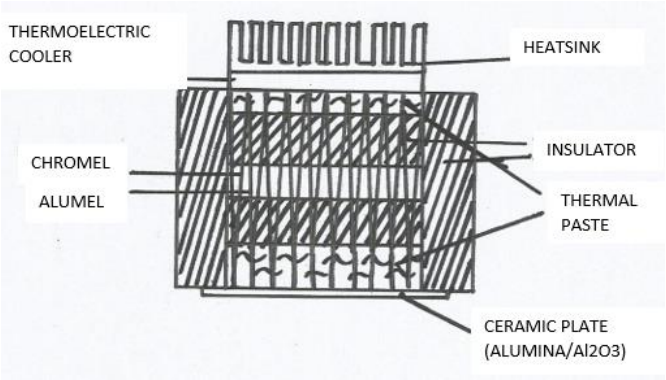

Fig.1, Device Diagram.

3. Results

The improved reference junction system is able to regulate the other side of the thermocouples' temperature at a set temperature by only using a compact device, this leads up to this device having a relatively small size which adds up its convenience.

Data of the improved reference junction system's performance and the device's voltage output at different measured temperatures were obtained.

4. Conclusion

This device possesses a physical structure that is suitable for measuring flat-surfaced solids' temperatures, has an improved reference junction system, consists of a thermally regulated environment between the thermocouples and provides a high voltage output. These aspects lead up to this device being able to provide higher precision temperature measurements for flat-surfaced solids, as well as a wider temperature measuring range compared to the conventional thermocouples, thermometers and infrared thermometers.

5. References

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[2] Lundh, Joel. *Simulation and Evaluation of Two Different Skin Thermocouples A Comparison Made with Respect to Measured Temperature*. Department of Management and Engineering., 2007.