Thermoelectric Variable Temperature Steering Wheel (VTSW)

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ABSTRACT

The thermoelectric Variable Temperature Steering Wheel, (VTSW), is a new development in vehicle occupant comfort enhancement. Anyone who has parked a car in bright sunlight has experienced how hot a steering wheel grip can get, along with seat sitting surfaces, instrument panel, and other vehicle interior surfaces.

Likewise, in winter, vehicle interior surfaces become cold after soaking in cold weather.

INTRODUCTION

This paper will describe the design and functioning of the thermoelectric Variable Temperature Steering Wheel, and will compare it with some other approaches to solving the problem. The VTSW addresses the issues of both hot and cold steering wheels as cost-effectively as possible, with minimum system weight and volume, and maximum reliability and safety. Efficiency is considered secondary to the other variables in importance, primarily because efficiency has a profound effect upon system cost, weight, and volume. Although the VTSW may be operated continuously, it is optimized for intermittent use. It can easily be designed to automatically shut off once the temperature controlled hand grips reach a comfortable temperature, either in hot weather or in cold weather.

Photographs of prototypes and color thermographs are included to illustrate both the structure of and the functioning of the VTSW in both cooling mode and heating mode.

BACKGROUND

Peltier thermoelectric devices are not very efficient, but in applications requiring compact, lightweight, very reliable results at low power levels, they may offer the best set of compromises. For example, other techniques ruled out for this project were:

1- Miniature Rankine Cycle: Too complicated, bulky, and expensive. Reversibility for heating mode adds even more complexity, bulk, and cost. Compressor vibration, and refrigerant environmental considerations. Pressurized system safety concerns.

2- Stirling Cycle, including Pulse Tubes: Similar to Rankine Cycle, though not as complicated, without refrigerant based environmental considerations. Heating mode a serious complication. No appropriate machines in production, expensive.

3- Ranque-Hilsch tubes: Far too inefficient. Noisy. Compressor vibration a possible concern. Heating mode a serious complication.

Fig. 1