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# United States Patent [19] Hollis

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[54] **SYSTEM FOR CONTROLLING THE STATE OF A FLOW CONTROL VALVE**

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### Related U.S. Application Data

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[51] Int. Cl.<sup>6</sup> ..... **F01P 7/14**  
[52] U.S. Cl. .... **123/41.1; 123/41.29; 123/41.31; 123/196 AB**  
[58] Field of Search ..... **123/41.1, 41.31, 123/196 AB, 41.08, 41.09, 41.29**

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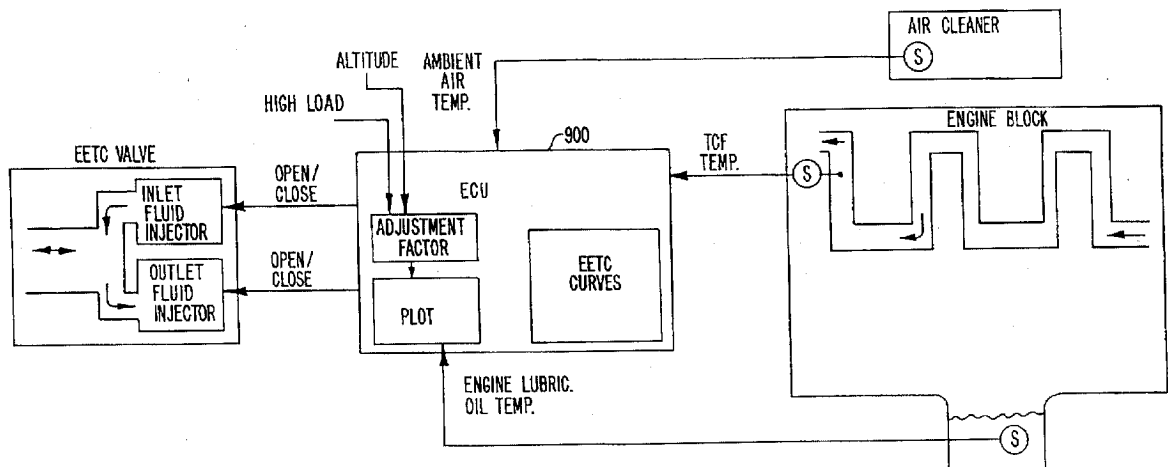
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### [57] ABSTRACT

A temperature control system, in a liquid cooled internal combustion engine equipped with a radiator, controls the state of a flow control valve for controlling flow of a temperature control fluid through a passageway leading to the radiator. Sensors detect the engine operation temperature, the temperature of the temperature control fluid,  $t_1$ , and the ambient air temperature,  $t_2$ . An engine computer receives signals from the sensors, produces control signals based on both of the sensor signals, and sends the control signals to the flow control valve to control the state of the valve. The values  $t_1$  and  $t_2$  define a plurality of mathematical functions of  $t_1=f(t_2)$  which form a plurality of two-dimensional curves on an orthogonal coordinate system having axes  $t_1$  and  $t_2$ . Each of the curves divide the coordinate system into two regions, one on either side of the curve. The engine computer control signals prevent flow through the valve when coordinate pairs of  $t_1$  and  $t_2$  lie on a first region of the coordinate system and allow the flow when coordinate pairs of  $t_1$  and  $t_2$  lie on a second region of the coordinate system. The engine computer receives a measurement of the actual engine operational temperature, compares it to an optimum engine operation temperature, and selects an appropriate curve based on the comparison.

85 Claims, 52 Drawing Sheets



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