



US005655506A

# United States Patent [19]

[11] Patent Number: **5,655,506**

Hollis

[45] Date of Patent: **Aug. 12, 1997**

[54] **SYSTEM FOR PREHEATING INTAKE AIR FOR AN INTERNAL COMBUSTION ENGINE**

5,415,147 5/1995 Nagle et al. .  
5,482,013 1/1996 Andrews et al. .... 123/556

[76] Inventor: **Thomas J. Hollis**, 5 Roxbury Dr.,  
Medford, N.J. 08055

### FOREIGN PATENT DOCUMENTS

34 35 833 4/1986 Germany .  
35 16 502 11/1986 Germany .  
40 33 261 4/1992 Germany .

[21] Appl. No.: **533,471**

[22] Filed: **Sep. 25, 1995**

### OTHER PUBLICATIONS

[51] Int. Cl.<sup>6</sup> ..... **F02G 5/00; F02M 15/00;**  
F02M 23/14

Sensor Technology Review, *Automotive Engineering*, Sept. 1995, p. 45.

[52] U.S. Cl. .... **123/556**

*Primary Examiner*—Marguerite McMahon  
*Attorney, Agent, or Firm*—Seidel, Gonda, Lavorgna & Monaco, PC

[58] Field of Search ..... 123/556, 41.31,  
123/542

### [56] References Cited

### [57] ABSTRACT

#### U.S. PATENT DOCUMENTS

3,397,684	8/1968	Scherenberg .	
3,450,109	6/1969	Gratzmuller .	
4,079,715	3/1978	Masaki et al. .	
4,212,270	7/1980	Nakanishi et al. .	
4,258,676	3/1981	Lamm .....	123/556
4,286,551	9/1981	Blitz .	
4,338,891	7/1982	Blitz .	
4,348,991	9/1982	Stang et al. .	
4,399,774	8/1983	Tsutsumi .	
4,565,175	1/1986	Kaye .	
4,625,910	12/1986	Kawamura .....	123/556
4,944,260	7/1990	Shea et al. ....	123/556
5,094,198	3/1992	Trotta et al. ....	123/556
5,138,987	8/1992	Schmid et al. ....	123/556
5,170,755	12/1992	Kano et al. .	
5,213,086	5/1993	Sims .....	123/556
5,307,780	5/1994	Dodge .....	123/556
5,347,966	9/1994	Mahon et al. ....	123/556

A temperature control system in an internal combustion engine includes a heating arrangement which channels a flow of temperature control fluid from an engine to and from a heat exchanger used to preheat intake air flowing to an engine intake manifold when the ambient air temperature is relatively cold (e.g., below 20° F.). In one embodiment, the heat exchanger is mounted upstream from a throttle body. The heat exchanger consists of a panel of high capacity heat transferring fins, which are heated by heat conductive tubes wrapped around the periphery of the panel. Flow of temperature control fluid to and from the heat exchanger is regulated by a control valve which is controlled by an engine computer unit in accordance with a set of predetermined values which define a curve that is a function of engine oil temperature and ambient air temperature.

**13 Claims, 3 Drawing Sheets**

