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United States Patent [19]

Onari et al.

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[54] ELECTRONIC ENGINE CONTROL APPARATUS

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[21] Appl. No.: **622,217**

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Related U.S. Application Data

[63] Continuation of Ser. No. 233,209, Aug. 17, 1988, abandoned, which is a continuation-in-part of Ser. No. 46,388, May 6, 1987, Pat. No. 4,853,720.

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[5] **G06F 15/20**; F02D 41/00; B60K 41/00

[52] **U.S. Cl.** **364/431.04**; 364/431.03; 364/148; 123/480; 395/905

[58] **Field of Search** 364/431.01, 431.03, 364/431.04, 431.05, 424.01, 148, 150, 151, 152, 154; 123/480, 350; 395/905

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,058,796	11/1977	Oishi et al.	340/679
4,346,776	8/1982	Taplin	123/342
4,439,824	3/1984	Mayer	364/424.01
4,597,049	6/1986	Murakami	364/431.07
4,727,838	3/1988	Oshiage et al.	123/399
4,729,356	3/1988	Kaneko et al.	123/399
4,747,055	5/1988	Eto et al.	364/424.01
4,763,745	8/1988	Eto et al.	364/174
4,773,010	9/1988	Suzuki et al.	364/424.05
4,773,012	9/1988	Ito et al.	364/424.01
4,829,434	5/1989	Karmel et al.	364/424.1
4,853,720	8/1989	Onari et al.	364/431.07

FOREIGN PATENT DOCUMENTS

0059586	2/1982	European Pat. Off. .
0144608	6/1985	European Pat. Off. .
3715423	11/1987	Fed. Rep. of Germany .
2047361	11/1980	United Kingdom .
2151049	7/1985	United Kingdom .

OTHER PUBLICATIONS

U.S. Ser. No. 55,530, filed May 29, 1987.
U.S. Ser. No. 155,391, filed Feb. 12, 1988.

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[57] **ABSTRACT**

An electronic engine control apparatus includes: a plurality of first sensors for detecting the driving action taken in accordance with a driver's intent; a plurality of second sensors for detecting the operating conditions of a vehicle and an engine; a plurality of actuators for controlling the engine; a unit for discriminating the driver's intent of how to drive the vehicle based on output signals from the first and second sensors; and a unit for controlling the engine to match the driver's intent by selectively adjusting at least one of the actuators, in accordance with the discriminated driver's intent.

59 Claims, 17 Drawing Sheets

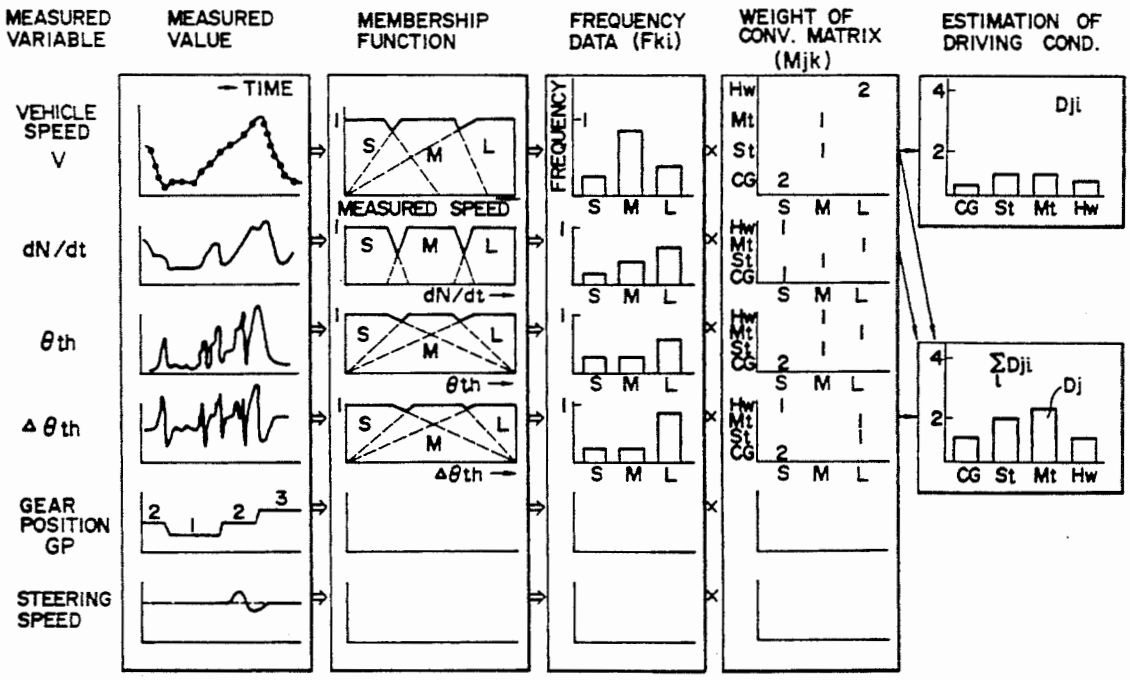


FIG. 1A

CHARACTERISTIC DRIVINGACTIONS DEPENDENT ON DRIVER'S PREFERENCES & DRIVING ENVIRONMENT

	DRIVER'S PREFERENCE			DRIVING ENVIRONMENT			
	GENTLE (Ge)	NORMAL (No)	SPORTY (Sp)	CONGESTED (CG)	URBAN STREET (St)	MOUNTAIN ROAD (Mt)	HIGHWAY (Hw)
THROTTLE VALVE OPENING DEGREE θth	◎ SMALL AS A WHOLE	MIDDLE WITH SLIGHT FLUCTUATION	◎ LARGE AS A WHOLE	○ SMALL	MIDDLE AS A WHOLE	LARGE AS A WHOLE	MIDDLE AS A WHOLE
$\Delta\theta$th	◎ SMALL	MIDDLE	◎ LARGE	○ SMALL	LARGE	LARGE	SMALL
VEHICLE SPEED v				◎ LOW	MIDDLE	LOW ~ MIDDLE	◎ HIGH
ENGINE SPEED N	LOW	MIDDLE	HIGH	LOW	LOW ~ MIDDLE	MIDDLE ~ HIGH	MIDDLE ~ HIGH
G, $(\frac{dN}{dt})$	○ SMALL	○ MIDDLE	○ LARGE	SMALL	MIDDLE	LARGE	SMALL
GEAR POSITION (GP)	HIGH SPEED SIDE	MIDDLE SPEED SIDE	LOW SPEED SIDE	○ LOW SPEED	MIDDLE SPEED SIDE	LOW SPEED SIDE	○ HIGH SPEED

FIG. 1B

		DRIVER'S PREFERENCE			DRIVING ENVIRONMENT			
		GENTLE (Ge)	NORMAL (No)	SPORTY (Sp)	CONGESTED (CG)	URBAN STREET (St)	MOUNTAIN ROAD (Mt)	HIGHWAY (Hw)
SHIFT ACTION	FREQUENCY	HIGH	LOW	MIDDLE	HIGH	MIDDLE	HIGH	○ LOW
	TIMING	QUICK SHIFT-UP SLOW SHIFT-DOWN	MIDDLE	SLOW SHIFT-UP QUICK SHIFT-DOWN			SLOW SHIFT-UP QUICK SHIFT-DOWN	
	TIME MAINTAINED AT NEUTRAL POSITION	LONG	MIDDLE	SHORT			SHORT	
SPEED FLUCTUATION		SMALL	MIDDLE	LARGE	LARGE	MIDDLE	LARGE	◎ SMALL
STEERING ROTARY SPEED		LOW	MIDDLE	HIGH	LOW		○ HIGH	○ LOW
BRAKE FREQUENCY		LOW	MIDDLE	HIGH	○ HIGH		○ HIGH	○ LOW

◎ VERY LIKELY

○ SLIGHTLY LIKELY

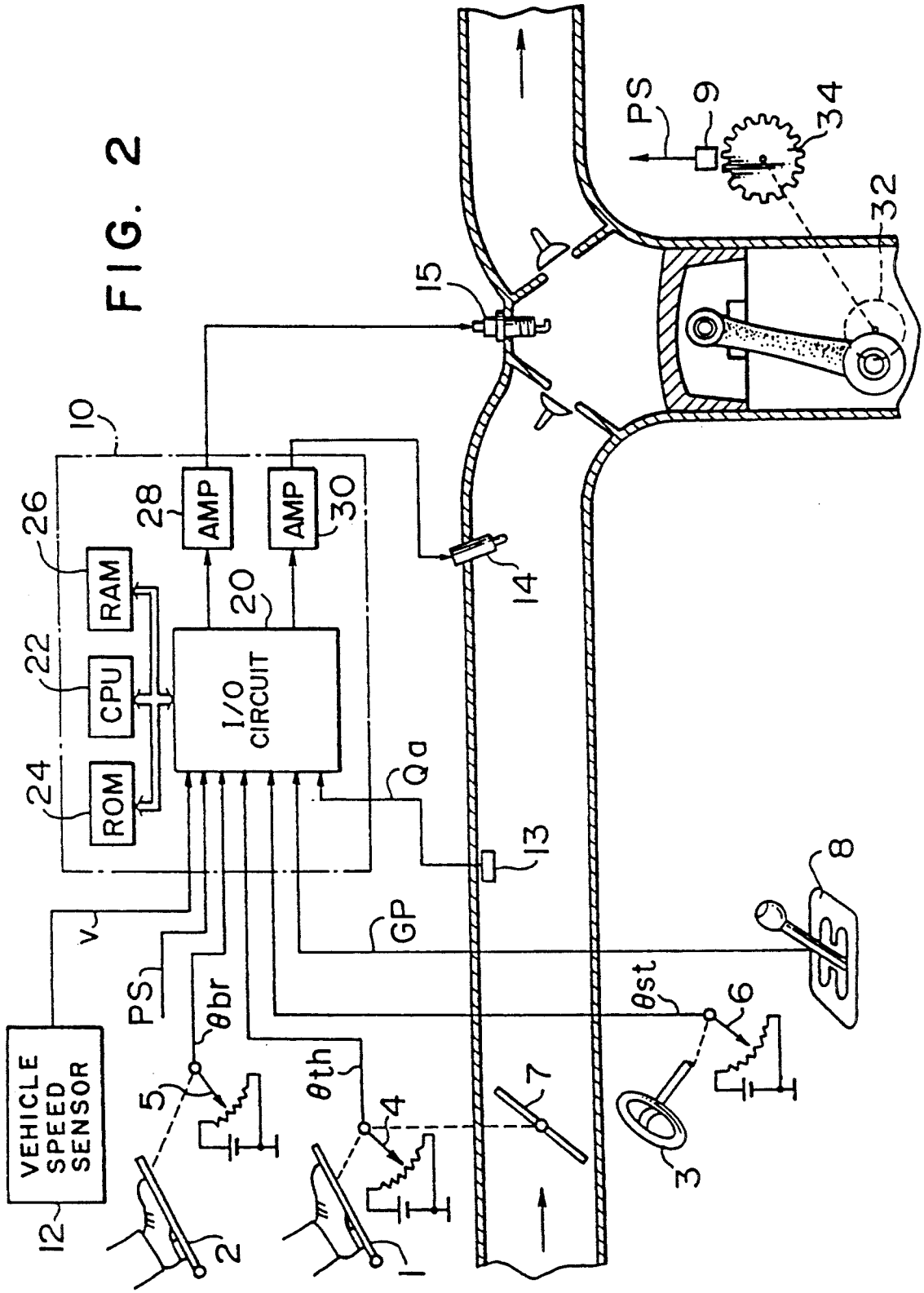
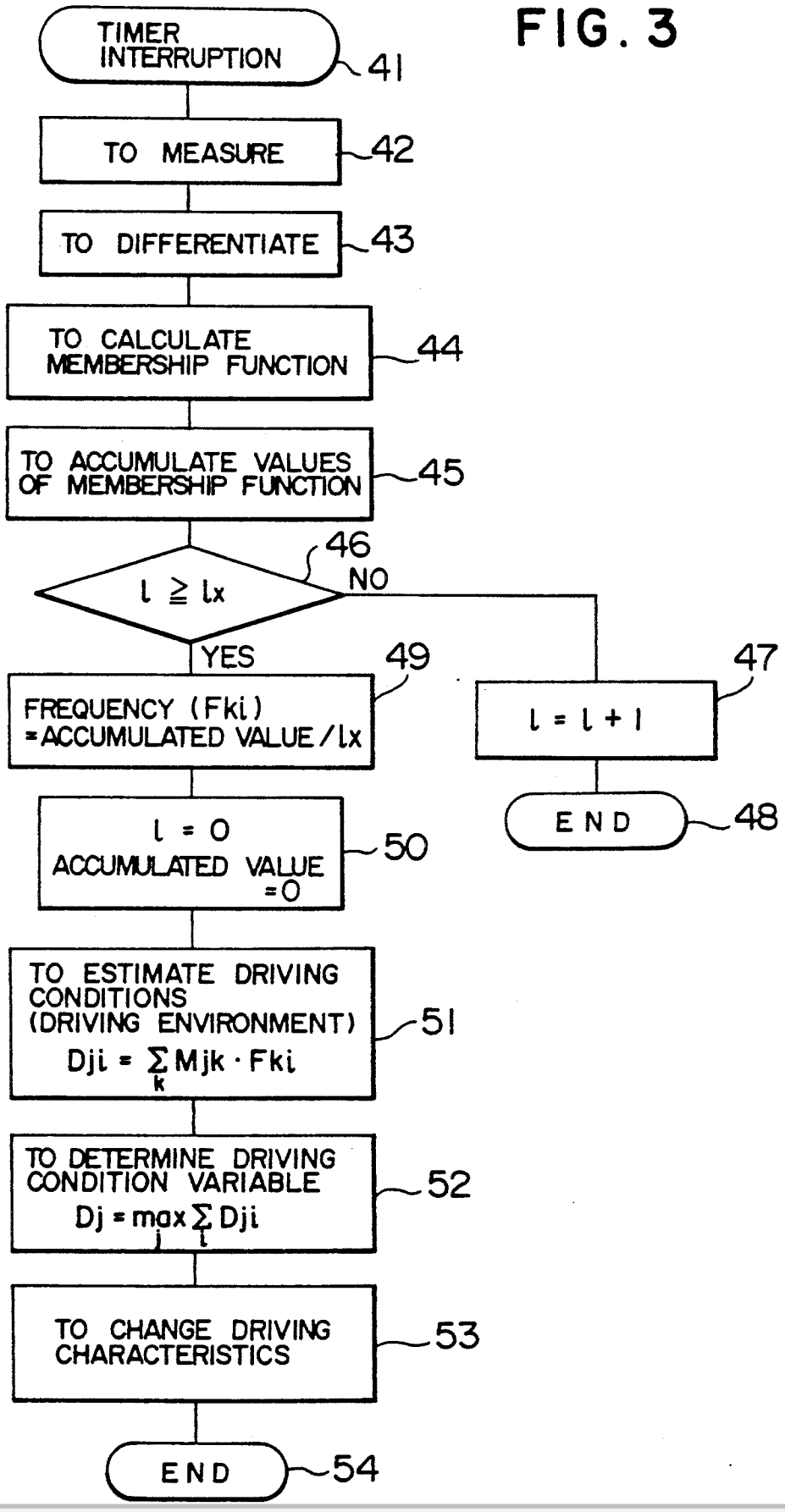


FIG. 2

FIG. 3



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