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# United States Patent [19]

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Onari et al.

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- [54] **ELECTRONIC ENGINE CONTROL APPARATUS**
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- [73] Assignee: **Hitachi, Ltd., Tokyo, Japan**
- [21] Appl. No.: **622,217**
- [22] Filed: **Dec. 3, 1990**

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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.

### Foreign Application Priority Data

Aug. 19, 1987	[JP]	Japan	62-204006
Oct. 28, 1987	[JP]	Japan	62-270202

- [51] Int. Cl.<sup>5</sup> ..... **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**

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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

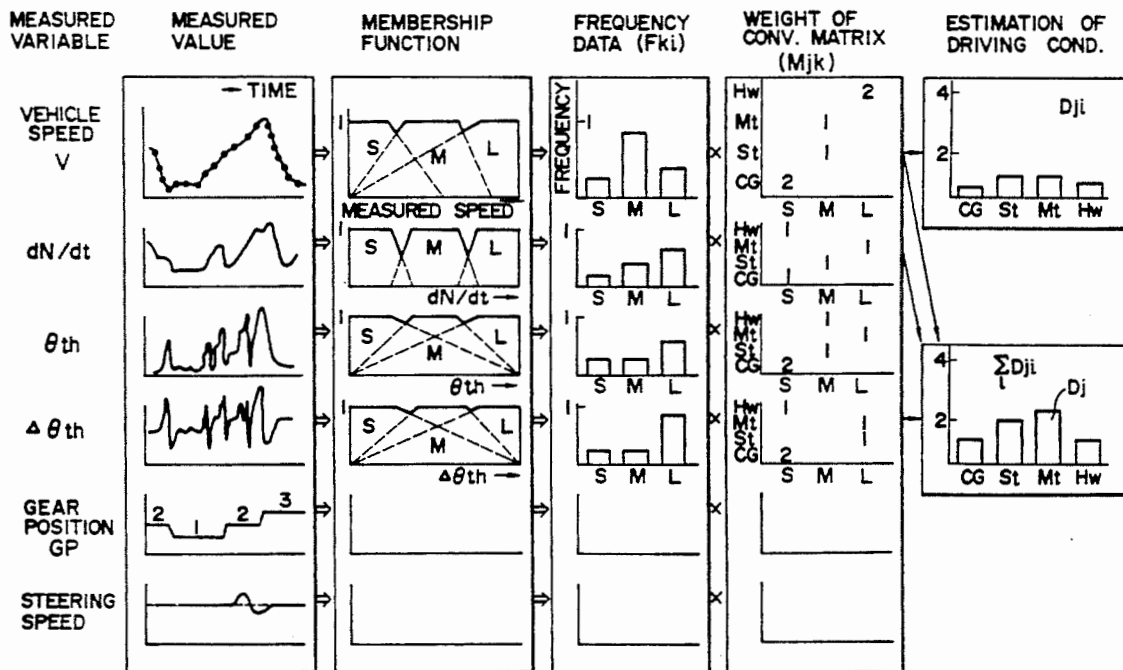


FIG. 1A

CHARACTERISTIC DRIVING ACTIONS 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 $\theta$ th	⊙ SMALL AS A WHOLE	MIDDLE WITH SLIGHT FLUCTUATION AS A WHOLE	⊙ 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

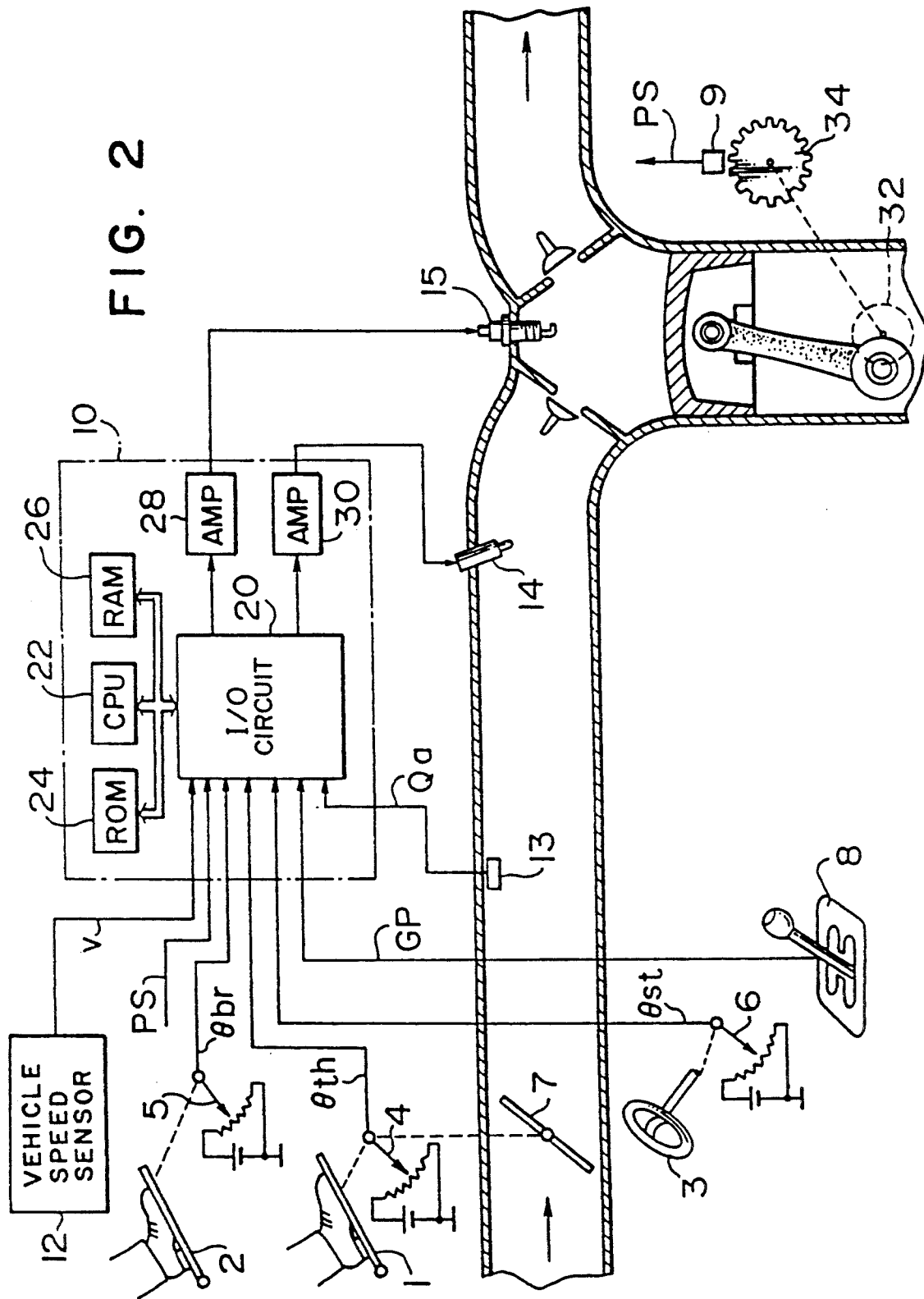
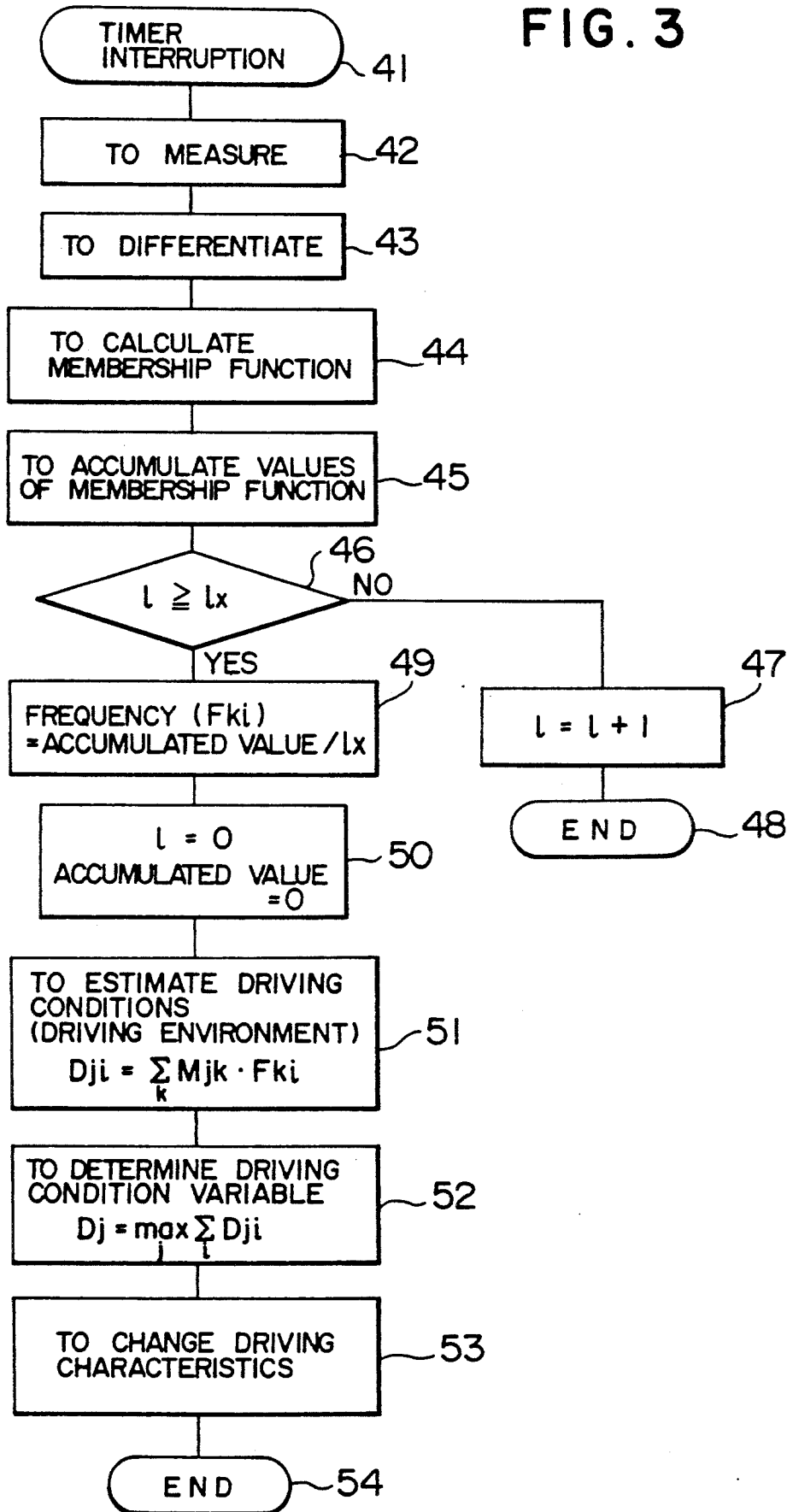


FIG. 3



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