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United States Patent [19]

Farrall

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[54] **CONTROL OF A VEHICLE POWERTRAIN**

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[73] Assignee: **Rover Group Limited**, Birmingham, England

[21] Appl. No.: **443,583**

[22] Filed: **May 17, 1995**

[30] **Foreign Application Priority Data**

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[51] Int. Cl.^{6} **H02P 9/04**

[52] U.S. Cl. **322/40**; 322/9; 322/38; 180/65.2

[58] Field of Search 322/9; 180/65.2, 180/165; 290/16; 60/716, 718

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Attorney, Agent, or Firm—Davis and Bujold

[57] **ABSTRACT**

A controller **20** for a vehicle powertrain, the powertrain comprising an electric motor **16** powered by a battery and an engine **14** powered by fossil fuel. The engine **14** is typically an internal combustion petrol engine. The controller **20** is operative to use maps stored in memory to control the torque contributions from the engine and the motor so as to maintain a desired relationship between the contributions of the electric motor **16** and the engine **14** towards the powering of the vehicle, and the controller is adaptive in that it is arranged to adapt said maps by altering one or more values stored therein to obtain a desired relationship.
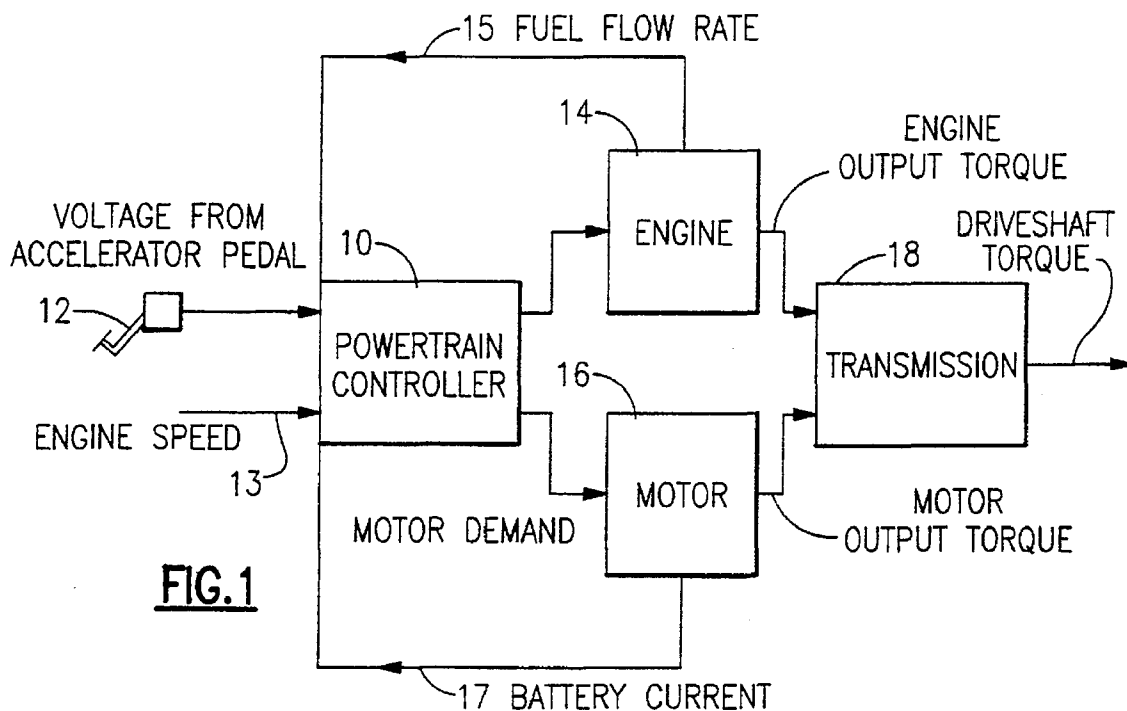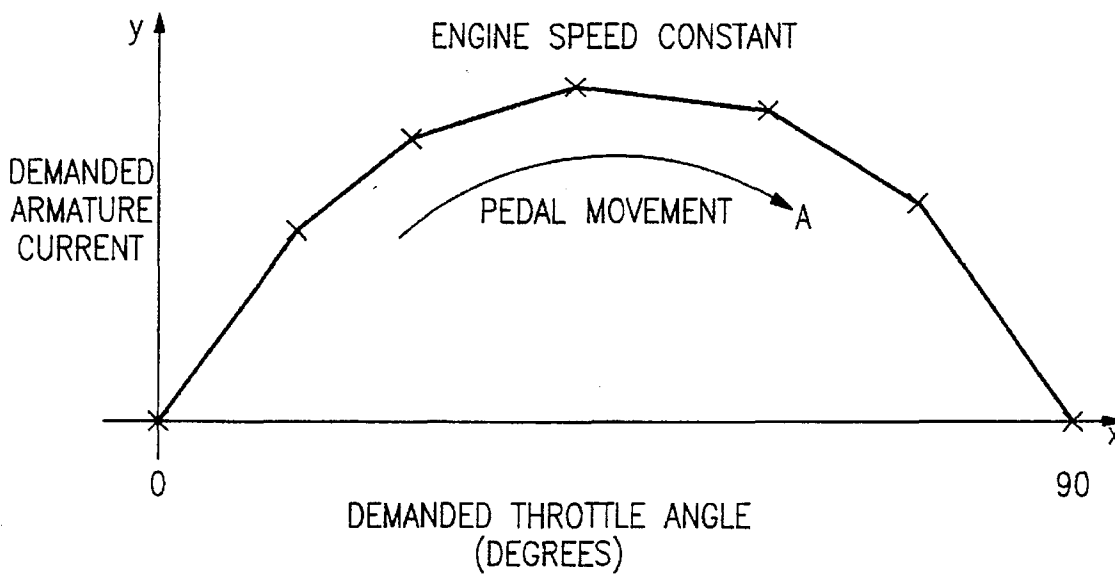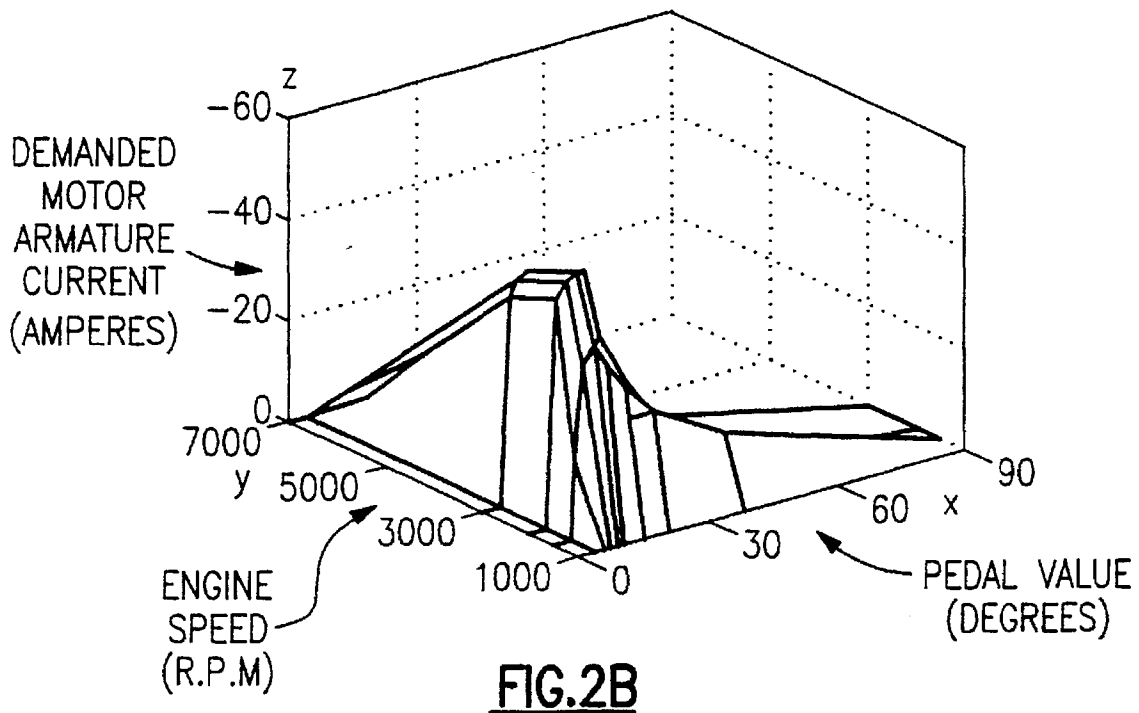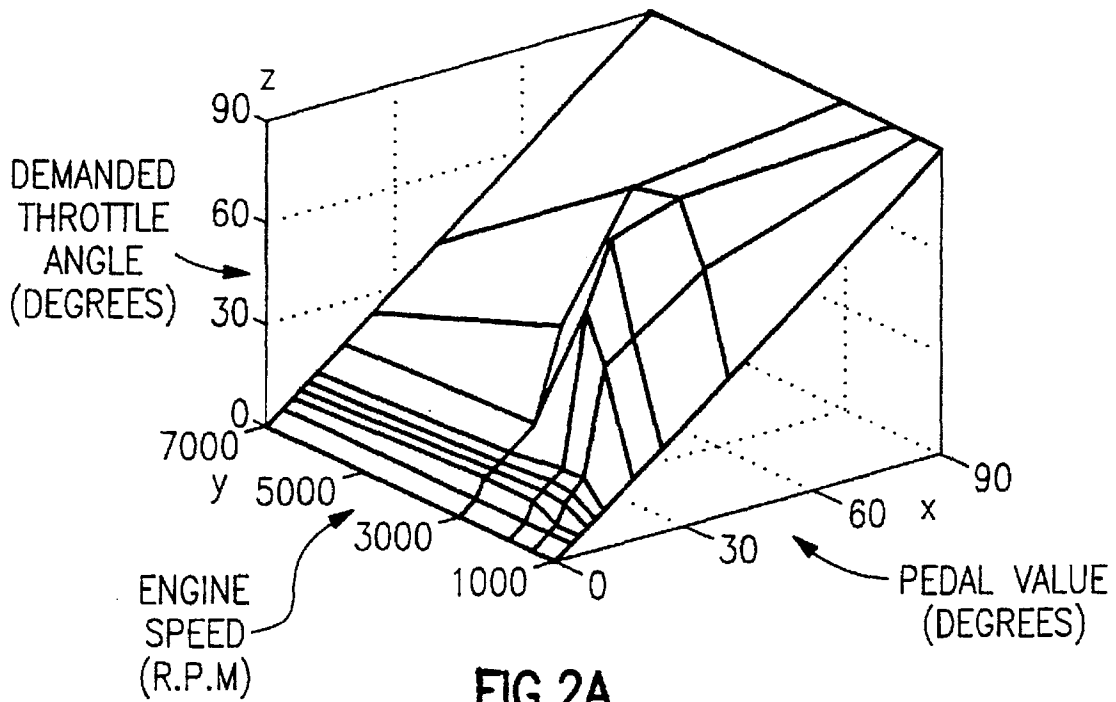
24 Claims, 4 Drawing Sheets

15 FUEL FLOW RATE

14

VOLTAGE FROM
ACCELERATOR PEDAL

ENGINE
OUTPUT TORQUE

ENGINE

DRIVESHAFT
TORQUE

10

18

12

POWERTRAIN
CONTROLLER

TRANSMISSION

ENGINE SPEED

16

13

MOTOR DEMAND

MOTOR

MOTOR
OUTPUT TORQUE

FIG.1

17 BATTERY CURRENT

ENGINE SPEED CONSTANT

y

DEMANDED
ARMATURE
CURRENT

PEDAL MOVEMENT   A

0   90   x

DEMANDED THROTTLE ANGLE
(DEGREES)

FIG.3

FIG.2A

FIG.2B

FIG.4

y

INSTANTANEOUS
PERFORMANCE
MEASURE

FIG.5A

0

−0.2

−0.4

0   200   400   600   800   1000   1200

TIME

y
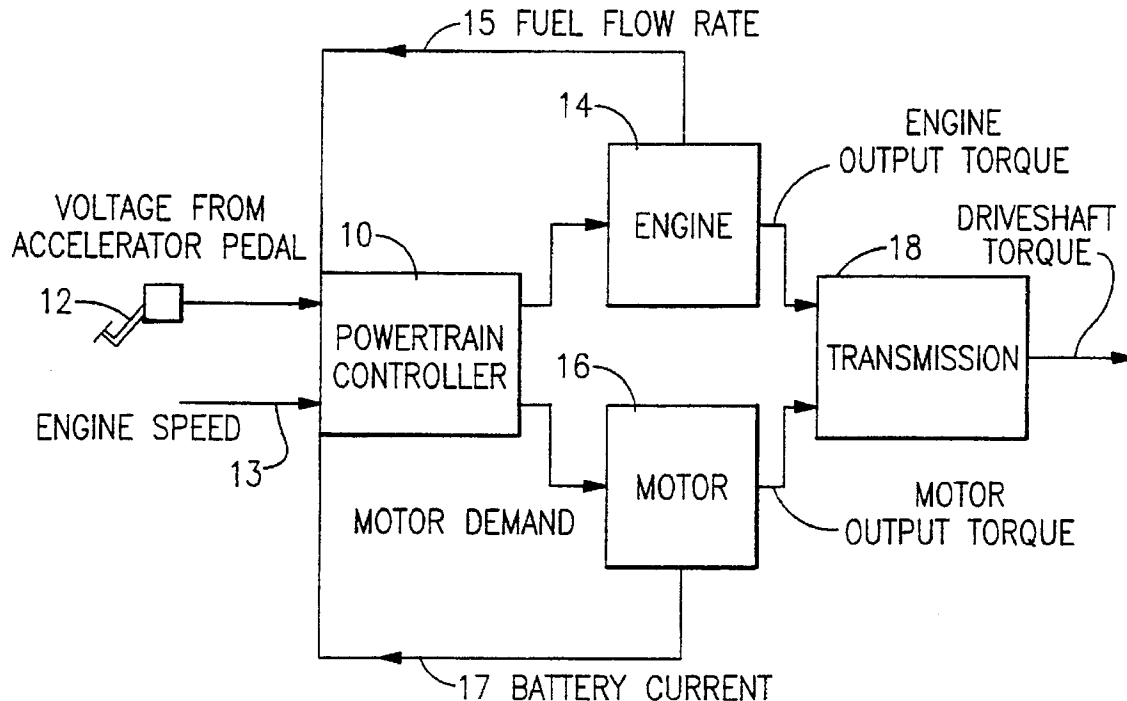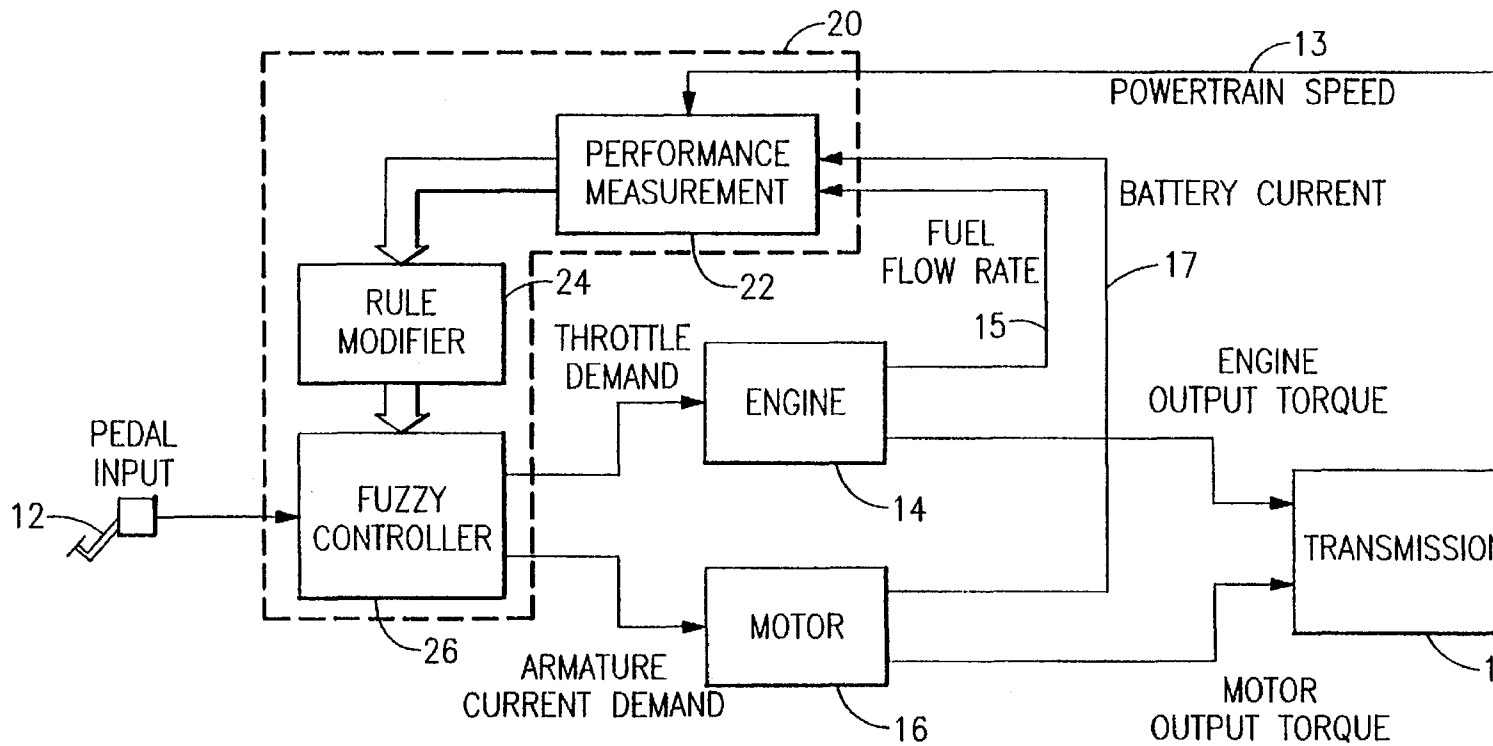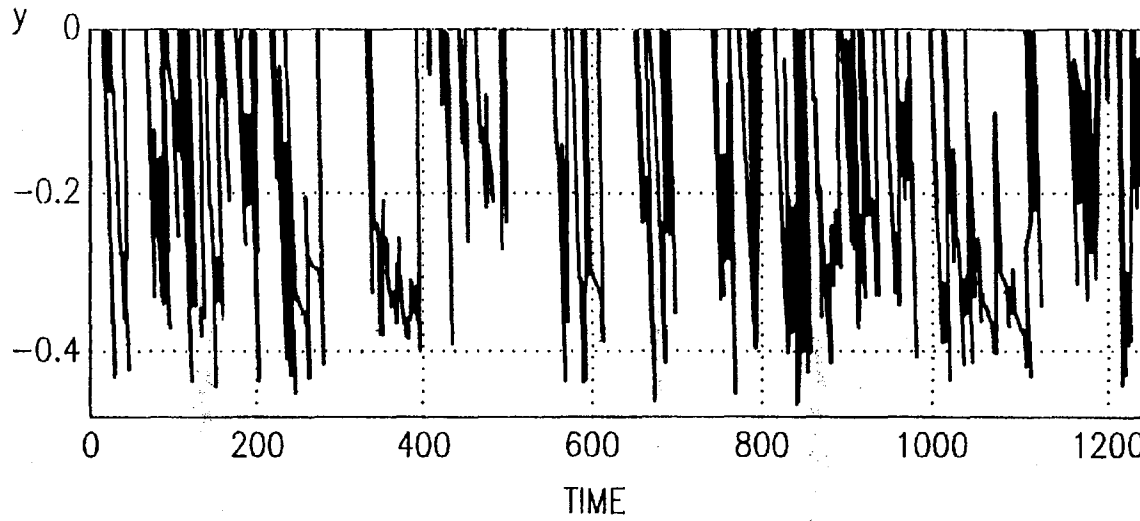
MOVING
AVERAGE OF
INSTANTANEOUS
PERFORMANCE
MEASURE

FIG.5B

0

−0.05

−0.1

−0.15

−0.2

0   200   400   600   800   1000   1200
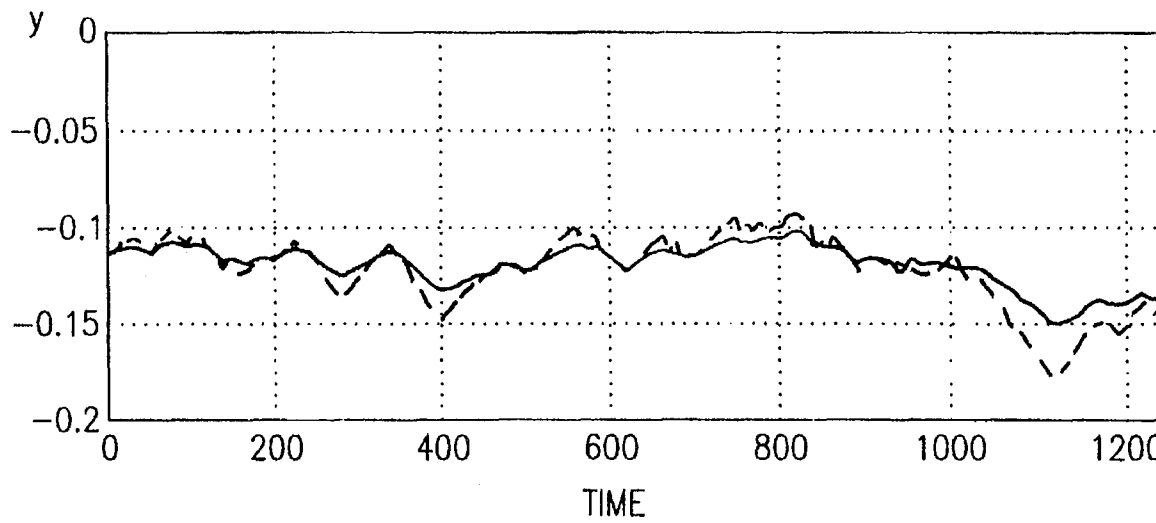
TIME

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