

[54] OPTIMUM SHIFT POSITION INDICATION USING SUCCESSIVE TWO-DIMENSIONAL DATA MAPS

[75] Inventors: Nobuo Habu; Kouichi Osawa; Yuuichi Kato; Michio Furuhashi; Taiyo Kawai; Junichi Saiki; Toshio Ito, all of Susono; Tsutomu Nakamura, Kariya, all of Japan

[73] Assignees: Nippondenso Co., Ltd., Kariya; Toyota Jidosha Kabushiki Kaisha, Toyota, both of Japan

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[52] U.S. Cl. 364/424.1; 340/52 D; 364/442; 434/71

[58] Field of Search 364/424.1, 442; 434/71; 340/52 R, 52 D, 52 F

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Primary Examiner—Felix D. Gruber
Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] ABSTRACT

A shift indication apparatus having an engine rotation sensor, a throttle valve sensor, and a shift position sensor, a microcomputer having a ROM and RAM for storing data corresponding to the engine speed, throttle valve openings, and the shift positions therein, and an indicator for indicating preferable shift positions to be performed by a driver in which a torque data map and a fuel consumption rate data map have been stored in the ROM for calculating various torque and fuel consumption rates so as to obtain preferable shift positions relating to optimum fuel consumption rate in accordance with said data detected. With this construction, it becomes possible for a driver to run his car in accordance with the indications of the shift operation on the indicator so as to enable the economical running of the car to be realized.

12 Claims, 4 Drawing Figures

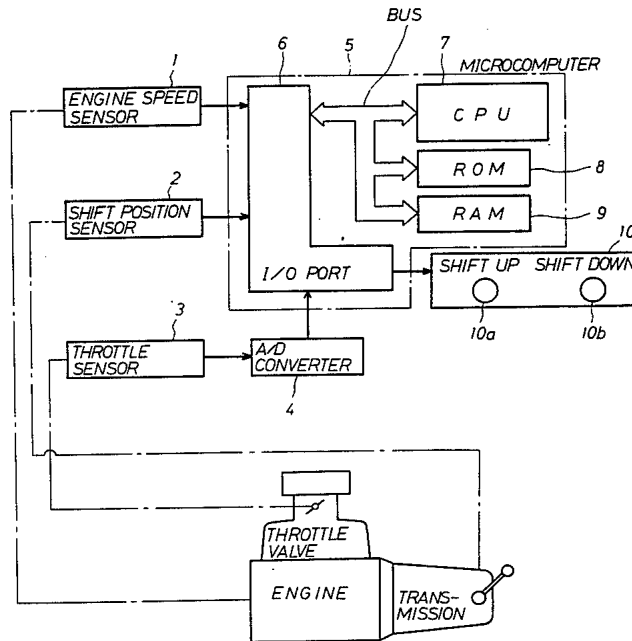


FIG. 1

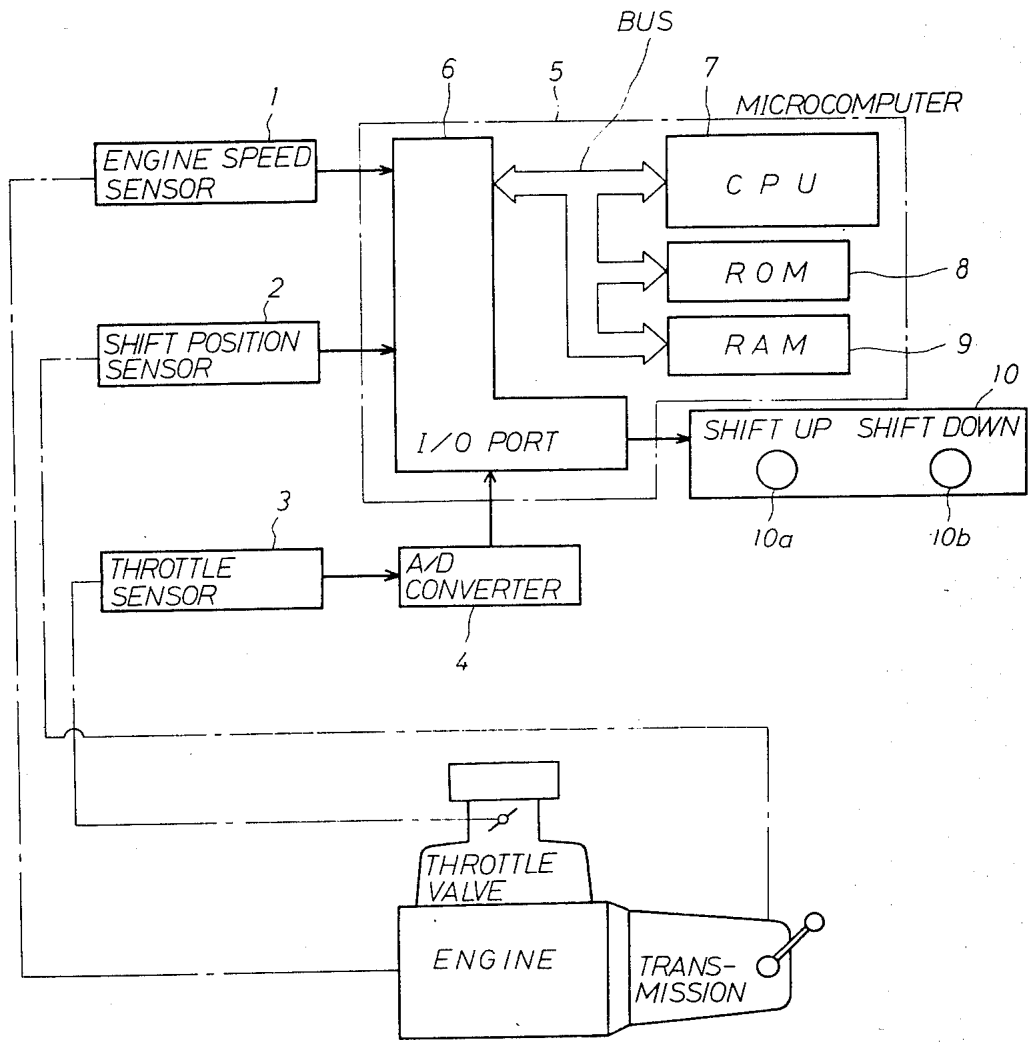


FIG. 2

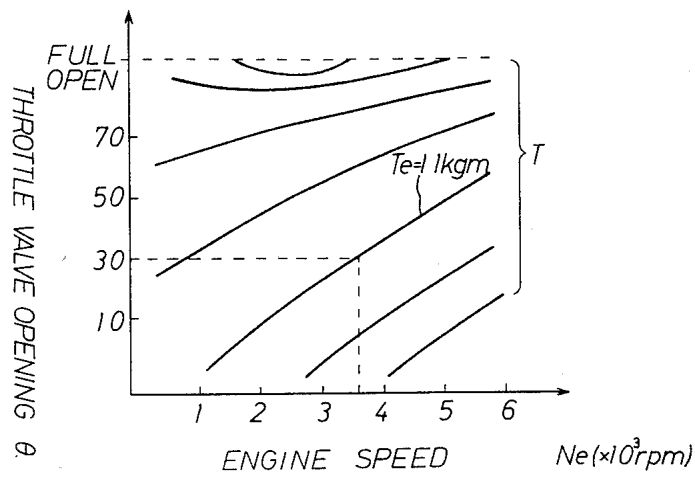
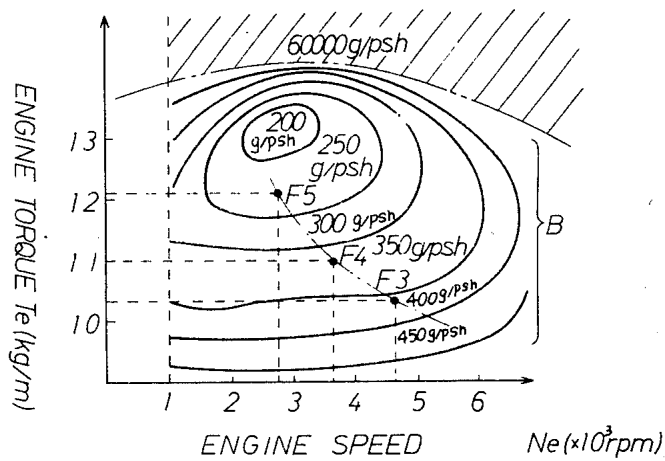


FIG. 3



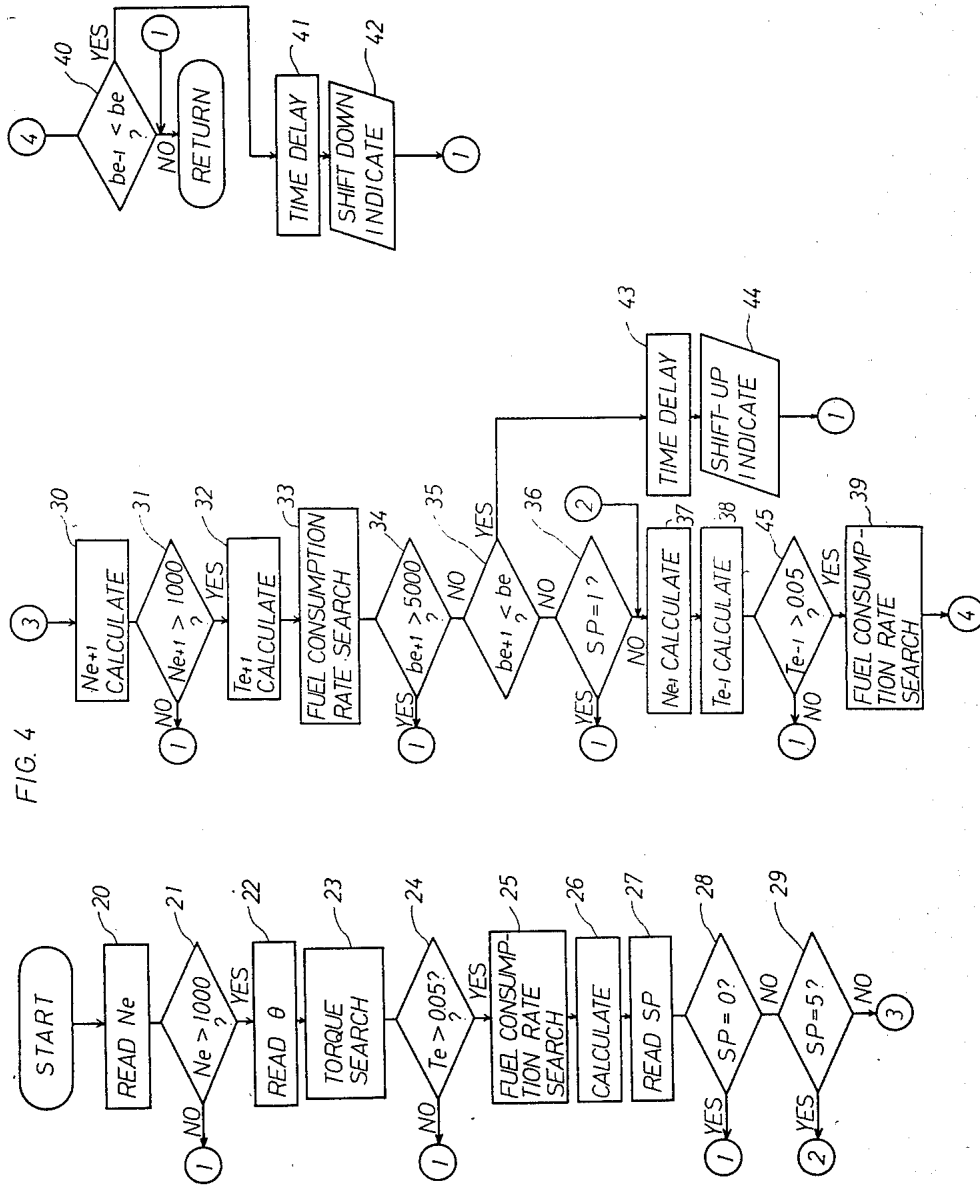


FIG. 4

OPTIMUM SHIFT POSITION INDICATION USING SUCCESSIVE TWO-DIMENSIONAL DATA MAPS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a shift indication unit which can be used for an automotive vehicle having a manual transmission and for indicating to a driver change-speed operations to be performed relating to preferable shift position with respect to optimum fuel consumption, and a method of performing the optimum speed change operation so as to reduce fuel cost.

2. Description of the Prior Art

Recently, the situation and circumstances surrounding supply of oils have deteriorated, and various research and development activities have been made in response in an attempt to improve efficient utilization of energy in each technical field in industry. The situation is the same in the automobile industry, where various research and development for improving engines to have better thermal efficiencies and for pursuing better methods for performing effective combustion of fuel for vehicles with less fuel consumption rate have been undertaken. However, there is a problem that unless operations including acceleration operation and shift operation are included, it is not possible for driving operation to sufficiently demonstrate the improved fuel consumption performance thus reached.

SUMMARY OF THE INVENTION

It is therefore a main object of the present invention to provide a shift indication apparatus which is capable of performing optimum running with a good fuel consumption rate by indicating to a driver preferable shift positions for the optimum fuel consumption during the running of the automotive vehicle.

It is another object of the present invention to provide a shift indication apparatus having a microcomputer including a speed change instruction indicator and a ROM in which predetermined torque and fuel consumption maps are stored so as to calculate and indicate on the indicator preferable shift positions corresponding to the optimum fuel consumption rate.

It is still another object of the present invention to provide a speed change operation and indication unit having a microcomputer comprising a ROM and a RAM into which data corresponding to the current engine speed and current shift position as well as throttle valve opening are stored and expected torque and fuel consumption rates are calculated from the data read from the RAM together with the predetermined maps.

According to one feature of the present invention, the shift indication apparatus is characterized in that the unit comprises sensors for detecting the engine speed and the opening of a throttle valve, means for calculating an expected or assumed fuel consumption rate in order to generate the same driving horsepower as that in the current car running conditions at a certain shift position adjacent to the particular shift position of the transmission at that time, means for comparing the current fuel consumption rate with the assumed fuel consumption rate so as to select a preferable shift position with the optimum fuel consumption rate, and means for indicating to the driver shift operation instructions to the preferable shift position.

These and other objects and advantages of the present invention will become more apparent from the following detailed description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall construction of one embodiment of the shift indication apparatus according to the present invention,

FIG. 2 is one example of the characteristic curves of a torque data map stored in the ROM in the microcomputer in FIG. 1 and

FIG. 3 is one example of the characteristics of a fuel consumption data map stored in the ROM in the microcomputer in FIG. 1.

FIG. 4 is a programmed flow chart of the speed change operation indicating unit of FIG. 1 for the purpose of explaining the operation of the unit according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the shift indication apparatus with a manual transmission according to the present invention comprises an engine speed sensor 1 for detecting the engine speed and for producing pulse signals of a frequency proportional to the engine speed, a shift position sensor 2 for detecting the shift positions of the transmission, a throttle sensor 3 for detecting the opening degree of the throttle valve by means of, for instance, a potentiometer, an A/D converter 4 for converting analog signals from the throttle valve sensor 3 into digital signals, a microcomputer 5 for performing various calculations in accordance with the different signals from the sensors, and an indicator 10 for indicating the result of the calculations.

The microcomputer 5 further comprises an input/output port (I/O port) 6, a central processing unit (CPU) 7, a read only memory (ROM) 8, and a random access memory (RAM) 9. In the microcomputer 5, there is provided a bus BUS which communicates the I/O port 6 and the CPU 7, ROM 8, and RAM 9.

The engine speed sensor 1 is mounted in a distributor (not shown) and the output of the sensor is connected to the input of the I/O port 6 so as to transmit the output pulses to the microcomputer 5 through the I/O port 6 and to store the data corresponding to the engine speed into the RAM 9. The output of the shift sensor 2 is connected to the input of the I/O port 6 so as to transmit the output signals thereof to the microcomputer 5 through the I/O port 6 and to store the data from the shift sensor 2 into the RAM 9. Similarly, the output of the throttle sensor 3 is connected through the A/D converter 4 to the input of the I/O port 6 so as to transmit the output signals thereof to the microcomputer 5 through the A/D converter 4 and to store the data corresponding to the throttle value opening into the RAM 9 after converting from the analog signals into the digital signals. The input of the indicator 10 is connected to the output of the I/O port 6 so as to indicate each preferable shift position corresponding to the optimum fuel consumption rate in accordance with various parameters calculated.

The indicator 10 includes a shift-up indicating lamp 10a and a shift-down indicating lamp 10b.

The indicator 10 may be assembled by light emitting diodes (LED) so as to perform shift-up and shift-down indications by up and down directed arrow marks. Al-

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