

[54] **SPEED CONTROL APPARATUS FOR MOTORCAR ENGINE**[72] Inventor: **Takaya Senzaki**, Omiya, Japan[73] Assignee: **Honda Giken Kogyo Kabushiki Kaisha**, Tokyo, Japan[22] Filed: **July 7, 1970**[21] Appl. No.: **52,928**[30] **Foreign Application Priority Data**

July 7, 1969 Japan.....44/53078

[52] U.S. Cl.318/297, 318/305, 123/102

[51] Int. Cl.H02p 1/40

[58] Field of Search318/297, 319, 327, 305; 123/102

[56] **References Cited****UNITED STATES PATENTS**

3,476,205	11/1969	Kato	123/102
3,207,255	9/1965	Hahlganss.....	123/102
3,172,497	3/1965	Stoner	123/102

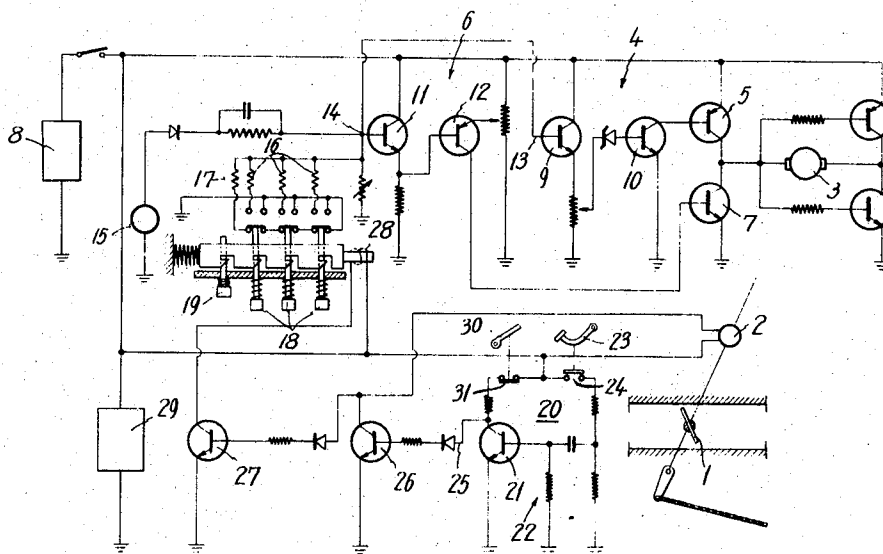
3,249,175	5/1966	Baxter	123/102
3,344,880	10/1967	Iwashita.....	123/102
3,425,401	2/1969	Lang.....	123/102
3,533,383	10/1970	Schultz	318/297

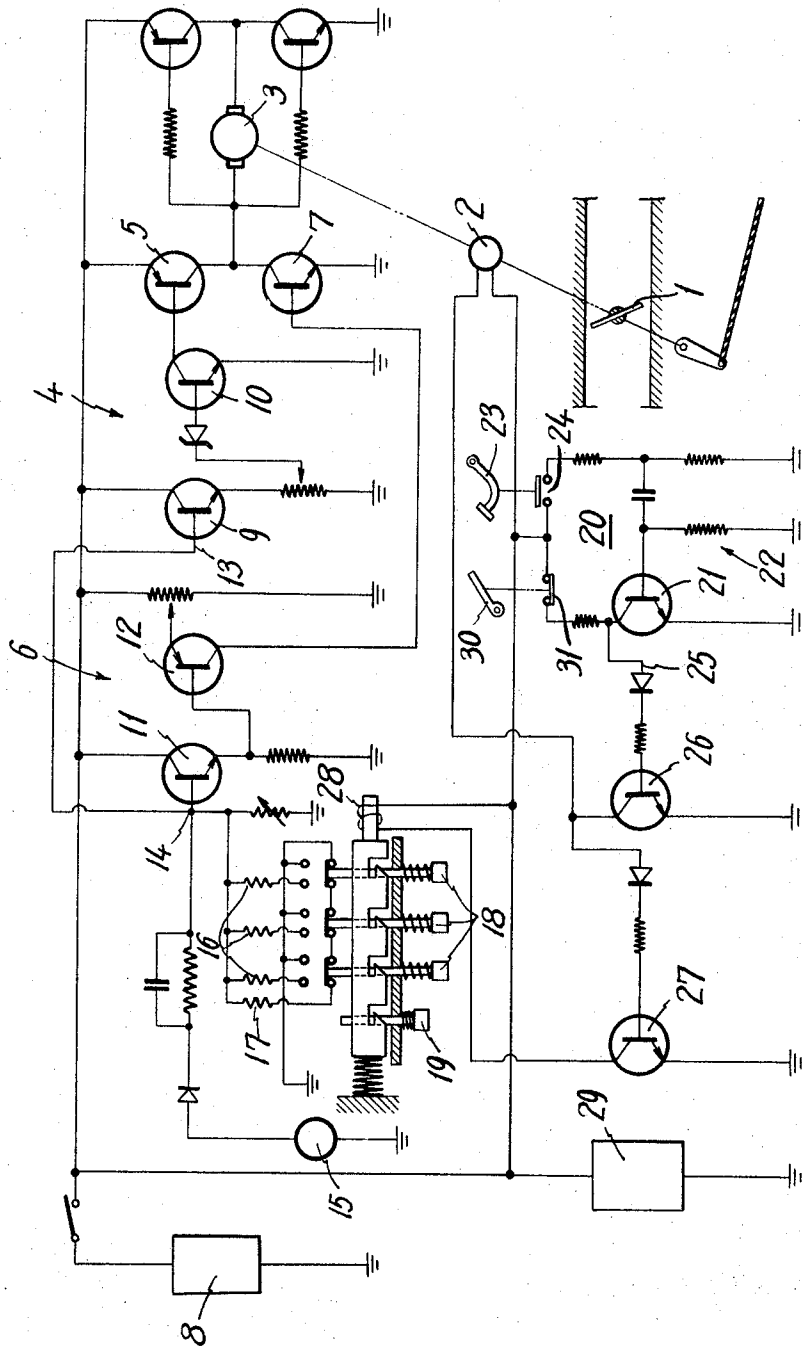
Primary Examiner—Bernard A. Gilheany*Assistant Examiner*—Thomas Langer*Attorney*—Waters, Roditi, Schwartz & Nissen

[57]

ABSTRACT

An internal combustion engine of a vehicle is controlled in its speed of operation by an electric motor which is coupled to the throttle valve of the engine via an electromagnetic clutch. Speed selector devices regulate the introduction of corresponding resistances into the motor supply circuit to control the degree of opening of the throttle valve, and upper and lower limit detection circuits effect operation of the motor to regulate engine speed within prescribed limits at a selected speed. A release circuit is operated by the vehicle brake to return the speed setting to engine idle while the clutch is temporarily opened and the release circuit is operated by the accelerator pedal to open the clutch and permit manual control of the engine speed.

3 Claims, 1 Drawing Figure



SPEED CONTROL APPARATUS FOR MOTORCAR ENGINE

BRIEF SUMMARY OF THE INVENTION

This invention relates to control apparatus for automatically setting the engine speed of a vehicle to a predetermined idling speed, and is characterized in that a vehicle driven by an internal combustion engine is provided with an electric motor connected to a throttle valve of the engine and is arranged so that when the speed of the engine reaches an upper limit or a lower limit of a previously set idling speed, the electric motor is operated in one or the other direction for correspondingly controlling the throttle valve to move in the closing or opening direction.

A clutch is interposed between the electric motor and the throttle valve so that upon manual operation of the throttle valve the clutch is automatically opened. By such arrangement, the throttle valve, upon manual operation thereof, can be released from its connection with the electric motor so as to be operable at will.

Additionally, the foregoing apparatus can be so modified that, instead of idling speed, any desired cruising speed may be pre-set. By this modification, the speed of the engine can be automatically maintained to a previously set cruising speed.

BRIEF DESCRIPTION OF THE DRAWING

The sole FIGURE of the drawing is a schematic illustration of the speed control apparatus according to the invention.

DETAILED DESCRIPTION

Referring to the drawing, numeral 1 denotes a conventional throttle valve interposed in a suction air passage of an internal combustion engine for driving a motorcar, and an electric motor 3 is connected to the throttle valve 1 through an electromagnetic clutch 2 and is electrically connected to an electric source 8 in a reverse direction through a first transistor 5 which is brought into an "ON" condition at the time of operation of an upper limit detecting circuit 4 and in a regular direction through a second transistor 7 which is brought into an "ON" condition at the time of operation of a lower limit detecting circuit 6.

The upper limit detecting circuit 4 and the lower limit detecting circuit 6 comprise respective front and rear stage transistors 9, 10 and 11, 12, and the front stage transistors 9, 11 are connected at their input terminals 13, 14 to an output terminal of an electric generator 15 driven by the engine so that an electric voltage corresponding to engine speed acts thereon. Additionally there are provided several selectively operated grounding resistors so that this voltage may be properly reduced within a predetermined voltage range.

In the illustrated embodiment, the grounding resistors comprise three resistors 16, corresponding to three predetermined cruising speeds and a single resistor 17 corresponding to a predetermined idling speed, and there are provided three cruising speed setting pushbuttons 18 corresponding to the three resistors 16, and a set releasing pushbutton 19 corresponding to the resistor 17. If, accordingly, any one of the three pushbuttons 18, is selectively pushed, a corresponding one of the three resistors 16, is selected and thereby the output of the generator 15 undergoes a voltage drop corresponding thereto and is set within a predetermined voltage to act on the input terminals 13, 14. Then, by pushing the pushbutton 19 or by the action of a release coil 28, which will be explained in more detail hereinafter, the selected pushbutton 18 is released from the depressed condition and as a result the resistor 17 is selected and thereby the output of the generator 15 similarly undergoes a voltage drop corresponding thereto and is set within the predetermined voltage range to act on the input terminals 13, 14. Thus, any desired cruising speed is set if the pushbuttons 18, are selectively pushed, and an idling speed is set if the pushbuttons 18, are released. Accordingly, if under any desired set condition the engine speed reaches the upper limit and the lower limit of a set speed, the respective detect-

ing circuits, 4, 6 are operated to energize the transistors 5, 7 and thereby the electric motor 3 is connected to the electric source 8 in reverse direction or in normal direction, so that the throttle valve 1 is driven thereby to rotate either in the direction of closing or in the direction of opening and thus the engine speed can be automatically regulated to keep the pre-set speed.

Numeral 20 denotes a release signal generating circuit comprising a transistor 21 and an RC time constant circuit 22, and a switch 24 (which is closed when a brake pedal 23 is pressed) is interposed therein, so that if the switch 24 is closed a release signal (a voltage drop) is obtained at its output terminal 25 for a predetermined constant period of time defined by the RC circuit 22. This signal switches another transistor 26 to "OFF" condition and a further transistor 27 to "ON" condition. The transistor 26 is interposed in a circuit for connecting the foregoing electromagnetic clutch 2 with the electric source 8, and the transistor 27 is interposed in a circuit for connecting the release coil 28 for the pushbuttons 18, with the electric source 8. Accordingly, by the foregoing "OFF" and "ON" conditions, the electromagnetic clutch 2 is cut off from current flow to release the throttle valve 1 from the electric motor 3 allowing the valve 1 to return to its closed position by the action of its own return spring, that is, to its idling position, while the release coil 28 is energized to bring the pushbuttons 18, into their release positions, that is into the idling speed setting condition. The electromagnetic clutch 2 is thereafter returned automatically to its closed condition, so that thereafter the engine speed can be automatically controlled to be kept at the pre-set idling speed.

Referring to the drawing, numeral 29 denotes an engine ignition circuit, numeral 30 denotes an accelerator pedal for manual operation of the throttle valve 1, numeral 31 is a switch which is opened when the pedal 30 is pushed down, and switch 31 is interposed in the release signal generating circuit 20 so that substantially the same operation as in the case of closing of the switch 24 can also be obtained by the opening of the switch 31. Namely, if the switch 31 is opened, the transistor 26 is brought into the "OFF" condition to open the electromagnetic clutch 2 so that the throttle valve 1 is released from the electric motor 3 for being allowed to be manually operated, while the transistor 27 is brought into the "ON" condition for operating the release coil 28 so that the pushbuttons 18 are returned to their released positions.

The operation of this apparatus is as follows:

If, under the condition that all the pushbuttons 18 are released and not pushed and an idling speed is set, as engine speed reaches the upper and the lower limits thereof, the respective detecting circuits 4, 6 are operated to connect the electric motor 3 to the electric source 8 in the reverse direction and the normal direction, so that the throttle valve 1 is driven thereby respectively in closing direction or opening direction and thus the engine speed is automatically stabilized to maintain the pre-set idling speed. If, from this condition, with a view to manual operation of the throttle valve 1, the accelerator pedal 30 is pushed down, the electromagnetic clutch 2 is opened by the release signal, so that the throttle valve 1 is released from its connection with the electric motor 3 to be brought into a freely operable condition. If, subsequently the pedal 30 is released the throttle valve 1 is again connected to the electric motor 3 for undergoing automatic control by the electric motor 3. If, additionally, any one of the pushbuttons 18 is pushed, a cruising speed corresponding thereto is set instead of the foregoing idling speed, and almost the same operation as in the foregoing case can be obtained at this set value. Namely, if the engine speed reaches an upper limit or a lower limit thereof, the respective detecting circuits 4, 6 are operated, so that the electric motor 3 operates the throttle valve 1 to move towards closing or opening and thus the engine speed can be automatically maintained at the pre-set cruising speed.

Thus, according to this invention, it is possible to automatically set engine speed to a pre-determined idling speed, and it

is also possible that the engine speed can be set to any desired cruising speed, instead of the idling speed. Additionally, upon manual operation of the throttle valve, the connection between the valve and the electric motor is automatically interrupted.

What is claimed is:

1. Speed control apparatus for an internal combustion engine which drives a vehicle, the vehicle having a brake, said apparatus comprising an electric motor, an engine throttle valve, means coupling the motor and throttle valve such that when the engine speed reaches an upper limit or a lower limit of a pre-set speed, the electric motor is operated in normal or reverse direction for controlling the throttle valve to move respectively in closing direction or opening direction to maintain the pre-set speed, the latter means including a clutch means between the motor and throttle valve, a source of electrical energy, upper and lower limit detecting circuits between the source and motor to selectively energize the motor in a particular direction to maintain the engine speed within the pre-set range, and speed selection means between said source and motor and connected to said detecting circuits, said speed selection means including an idle speed selector, at least one

cruising speed selector and corresponding voltage adjustment means operated by said selectors for regulating the voltage supplied to said motor, means automatically activating the voltage adjustment means associated with the idle speed selector when the cruising speed selector is inactivated, and means for disconnecting the voltage adjustment means associated with the cruising speed selector from the motor supply circuit and setting the voltage adjustment means associated with the idle speed selector while also decoupling the clutch means when the brake pedal is operated, said throttle valve thereafter returning to its idle position under the control of the motor as determined by the voltage adjustment means associated with the idle speed selector when the brake pedal is released.

2. Speed control apparatus as claimed in claim 1 comprising means controlling the clutch means to open the same when the throttle valve is manually operated.

3. Speed control apparatus as claimed in claim 1 wherein said voltage adjustment means comprise resistances coupled with respective selectors.

* * * * *

25

30

35

40

45

50

55

60

65

70

75