Sept. 29, 1959 E. P. SODER, JR 2,906,251

FUEL ECONOMIZING SPEED CONTROL FOR ENGINES

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Fig. 1

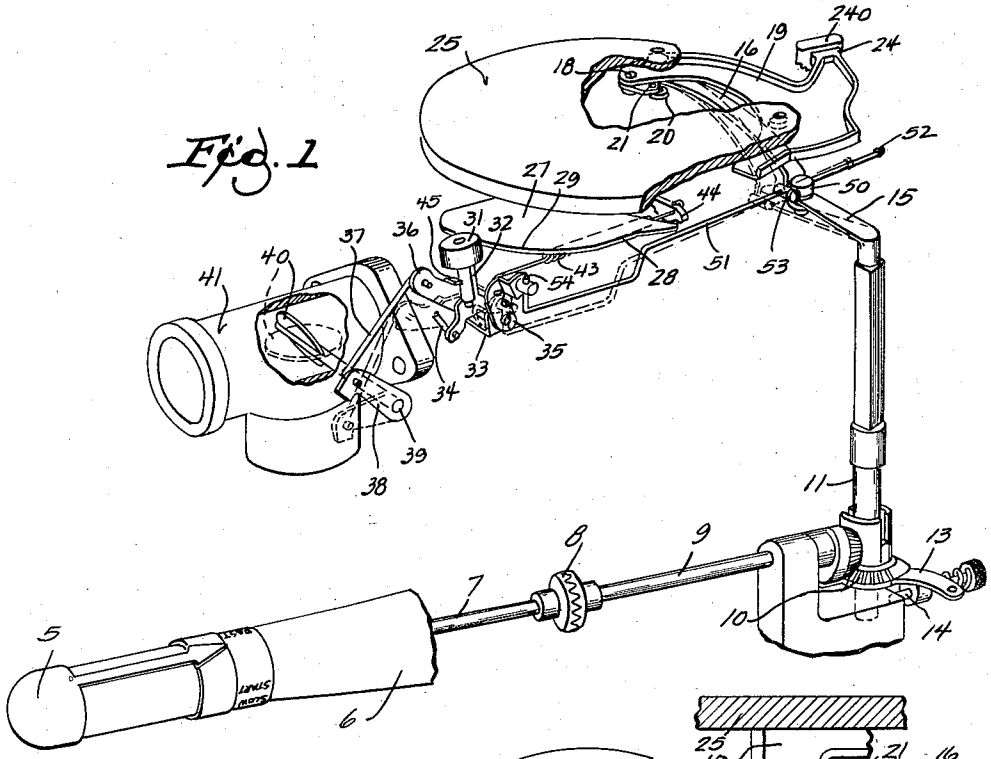

Fig. 2

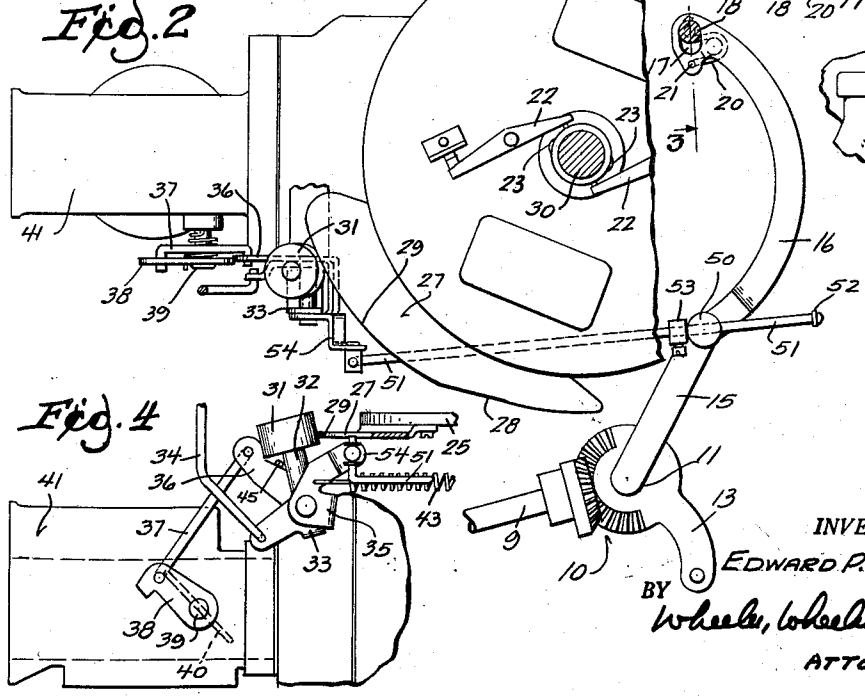

Fig. 3

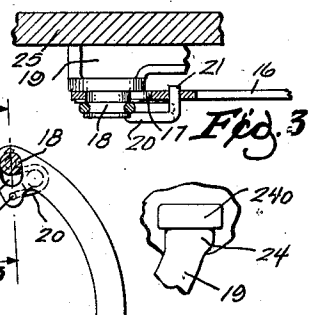

Fig. 4

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FUEL ECONOMIZING SPEED CONTROL FOR ENGINES

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8 Claims. (Cl. 123—99)

This invention relates to a fuel economizing speed control for engines. As diagrammatically illustrated, the control governs the throttle valve in an organization peculiarly adapted for use with the two-cycle engine of an outboard motor.

It is true of all engines, and particularly of two-cycle engines, that speed control is effected in part by the timing and in part by the throttle valve opening. United States Patent 2,723,655, issued November 15, 1955 is one of the most recent of a number of patents disclosing connection between the timer plate and the throttle valve for the concurrent or inter-related operation of these two different speed controlling devices. The present device is similar in several respects to the mechanism disclosed in that patent.

In the present device, as in that of the above identified patent, a manually controlled part advances the spark by rotation of the timer plate and, through a cam and cam follower also oscillates the throttle valve from its closed position toward its open position. As in the device of the above identified patent, the lever connected with the throttle valve is capable of overrun respecting the cam follower so that the throttle valve may be opened independently of the cam follower. The present invention adds a separate linkage from the manually operated control aforesaid, with a further lost motion connection from the part which operates the timer plate, in an organization such that after the timer plate has reached its fully advanced position and the throttle valve is opened as wide as it can be opened by the cam and cam follower, continued oscillation of the manual control will bring about a further opening of the throttle valve. This additional movement is opposed by relatively strong spring pressure tending to restore the throttle valve toward the normal opening to which it was brought by the cam and cam follower. Consequently, the extreme open position is used only for rapid acceleration or top speed and there is a constant tendency for the linkage to retract the throttle valve from its extreme position to a more normal position representing a cruising speed, at which the engine will operate at a considerable saving in fuel.

In the drawings:

Fig. 1 is a view in perspective diagrammatically illustrating component parts required for the practice of the invention.

Fig. 2 is a view in plan of some of the parts shown in Fig. 1, these being illustrated on a somewhat enlarged scale and portions thereof being broken away.

Fig. 3 is a detail view taken in section on the lines 3—3 of Fig. 2.

Fig. 4 is a fragmentary side elevation on a further enlarged scale showing some of the throttle valve operating linkage.

It will be understood that reference to conventional outboard motor parts is strictly by way of exemplification and without any intent to limit the invention to that field of use.

The hand grip 5 is mounted at the end of an outboard motor tiller fragmentarily illustrated at 6. Connected to the hand grip and extending along the tiller is an oscillatory shaft 7 having a type of universal joint at 8 connected to shaft section 9. Bevel gears at 10 transmit motion from shaft section 9 to the upright rock shaft 11. The driven bevel gear includes an arm 13 which engages a manually adjustable stop 14, shown in position of minimum throttle opening. For acceleration, the rock shaft 11 turns counterclockwise as viewed in Figs. 1 and 4.

The rocker arm 15 at the upper end of shaft 11 is pivotally connected with a link 16 having its remote ends provided with a lost motion slot 17 engaged over a stud 18 depending from a plate 19 bolted to timer plate 25 shown in Fig. 1. The torsion spring 20 has one end anchored at 21 and its other end hooked about the lower end of stud 18 and acting on said stud in such a way as to maintain it normally at the remote end of slot 17 as shown in Fig. 2. Accordingly, the link 16, when moved rearwardly from the position of Fig. 2 by the counterclockwise oscillation of rock shaft 15 on the upper end of shaft 11 will initially push rearwardly on stud 18. Since stud 18 is fixed to plate 19 mounted on the timer plate 25, the described counterclockwise thrust on stud 18 will oscillate the timer plate assembly in a direction to advance the cam followers 22 toward cams 23 on crank shaft 30, thus advancing the spark and accelerating engine operation. This will continue until arm 24 of plate 19 strikes the fixed stop 240 as shown in Figs. 1 and 2, this engagement representing the extreme speed possible to achieve through movement of the timer plate.

Connected with the timer plate 25 to partake of the counterclockwise oscillation thereof in a spark advancing direction is cam 27 having a portion 28 of rapidly increasing radius and a portion 29 which is nearly concentric with the axis of crankshaft 30. These portions successively engage the cam follower roller 31 mounted on the rocker arm 32 of an inner lever yoke 33 which may have a link 34 connected to it for the operation of a starter lock such as that disclosed in the above identified patent.

Pivoted coaxially with the inner lever yoke 33 is an outer yoke-shaped lever 35 which has an arm 36 connected by link 37 with the rocker arm 38 with the rock shaft 39 on which the throttle valve 40 is mounted. Fig. 1 and Fig. 4 show this throttle valve in an intermediate position within the carburetor 41, which position is intended to represent the partially open position at which the engine will operate at normal or cruising speed. Fig. 1 shows in dotted lines the wide open position of the throttle valve, at which the engine will develop maximum speed.

Opening of the throttle valve to its wide open position is opposed by a tension spring 43 having a fixed anchor at 44. This spring oscillates lever 35 clockwise to the extent permitted by engagement of lug 45 on the yoke arm 36 with the arm 32 of the inner yoke lever 33. Accordingly, through the operation of the cam 27 and the cam follower roller 31, the inner yoke lever 33 may be oscillated counterclockwise to displace the inner yoke lever 33 by engagement of arm 32 with lug 45, thereby opening the throttle valve to the extent shown in Fig. 1. Beyond this, the throttle valve cannot be manipulated by routine angular adjustment of the timer plate.

However, separate means of throttle valve adjustment is provided. The pintle pin 50 which pivotally connects rocker arm 15 with link 16 to oscillate the timer plate is provided with a transverse bore through which the end of link 51 is reciprocable to the limited extent permitted by a stop ring 52 at the outer end thereof and an adjustable collar 53 spaced from the stop ring. During the described oscillation of rock shaft 15, the link 51 remains stationary while the pin 50 is moved from the outer stop

member 52 to the stop collar 53. At this point, the pin 59 picks up stop collar 53 so that any further movement of rock shaft 15 is transmitted to the link. At its forward end, the link is connected with arm 54 on yoke lever 35 so that this forward movement of the link is directly communicated through the yoke lever 35 and link 37 to the rocker arm 38 of the throttle valve rock shaft 39, whereby the throttle is moved to its wide open position as shown in dotted lines in Fig. 1.

Since this occurs when the pintle pin 50 of rocker arm 15 is very close to dead center, relatively little motion will be communicated to link 16. To the extent that link 16 receives further outward thrust to which pin 18 cannot respond, the timer plate being unable to move by reason of engagement with its arm 24 with stop 240, lost motion is accommodated by continued movement of link 16 respecting stud 18 against the bias of spring 20, the link continuing to move respecting the stud to the extent permitted by the lost motion slot 17.

Because this spring offers substantial resistance to such movement, it takes considerable torque on the hand grip 5 to maintain the throttle in its wide open position. In all other positions of the hand grip 5, the hand grip tends to remain static. Consequently, as soon as the operator relaxes his manual torque on the hand grip 5, the grip will spring back from the extremely high speed position to which it has been forced and will thereupon maintain the intermediate cruising speed position in which the parts are illustrated in full lines. This cruising speed position will continue to be maintained unless and until the hand grip is either moved to the full speed position against the torque of spring 20 or toward the fully retarded position in which the rock shaft 15 will be oscillated clockwise to draw the timer plate 25 and cam 27 clockwise thereby retarding the spark and closing the throttle valve.

Thus I have two means of throttle valve adjustment, both operated from the same manually operable part, one of which is correlated with spark advance and the other of which becomes effective only when the spark is fully advanced and is used only to achieve an unusually wide throttle opening. The latter operation is resisted by relatively high spring pressure so that on release of the manually operable part, the throttle is automatically returned to the range of movement effected in coordination with the timer plate in relation to this part. While the preferred embodiment of the invention receives both movements through manipulation of a single manually operable part, I do not wish to be limited to employment of a single part for this purpose. In fact, even with the mechanism as shown, it is possible for the operator to manipulate the linkage independently of hand grip 5, by actuating the mechanism at some intermediate point, to achieve manual movement of the throttle valve to its wide open position without moving the timer plate.

I claim:

1. A device for actuating a throttle valve and timer, said device including manually operable means, first control means operated by said manually operated means through a first range of control for fully advancing the timer and partially opening the throttle valve to a predetermined running position, and second control means operable by said manually operable means for opening the throttle valve beyond said position, said last means including parts separate from the first means and including a spring opposing such further opening movement of the throttle valve.

2. The combination with an engine timer plate and throttle valve, of manually operable means for the concurrent actuation of the timer plate and throttle valve in a direction to advance the spark and open the throttle valve to a predetermined running position, separately operative motion transmitting means for actuating the throttle valve and with which said manually operable means has a lost motion connection for actuating said separately operative means only after the throttle valve reaches said predetermined running position, and spring means biasing said separate connection in opposition to further opening movement of the throttle valve.

3. A device for operating a timer plate and throttle valve of an engine, said device including the combination with a manually operable control part, of motion transmitting connections leading from said part to the timer plate, motion transmitting connections leading from the timer plate to the throttle valve for transmitting timer plate movement to the throttle valve to open the valve as the timer plate is advanced, said connections being effective only to an intermediate throttle valve position, additional motion transmitting connections which are at least in part separate from the motion transmitting connections aforesaid and have lost motion means in which the lost motion is substantially taken up at said intermediate throttle position for transmitting movement from said manually operable part to said throttle valve to effect further opening thereof.

4. The combination with an engine having a timer plate movable between spark advancing and spark retracting positions and a throttle valve movable between closed and open positions, and a manually operable speed control part, of motion transmitting means from said part to said timer plate for actuating the plate in a spark advancing and spark retracting direction, a motion transmitting connection for transmitting movement from said plate to said throttle valve for effecting corresponding movement of the throttle valve in an opening and closing direction, means limiting the movement of said timer plate and the means for transmitting motion therefrom to the throttle valve, and means whereby the further movement of said part is transmitted independently of said timer plate to said throttle valve for effecting additional opening movement thereof.

5. The combination with a manually operable part for controlling engine speed, of a rock shaft connected therewith, a timer plate, a link connected with the rocker arm and having a lost motion connection with the timer plate, a spring opposing lost motion of the link respecting the timer plate, a stop limiting timer plate movement, the timer plate having an arm adapted to abut the stop at a predetermined point, further movement of the link being possible through said lost motion connection in opposition to the bias of said spring, a throttle valve, means operable with said plate and subject to said stop for transmitting motion to the throttle valve, and a separate motion transmitting connection from said link to said throttle valve independently of the timer plate and effective following the stopping of the timer plate to bring about continued opening movement of the throttle valve in opposition to the bias of said spring.

6. In a device of the character described, the combination with a throttle valve movable between closed and opened positions and having an intermediate position of normal opening, of a timer plate movable between spark advanced and spark retarded positions, a manually operable speed control part, motion transmitting connections from the speed control part to the timer plate, a second set of motion transmitting connections including a cam connected with the timer plate and a cam follower connected with the throttle valve for opening the throttle valve toward said intermediate position in the course of movement of the timer plate to its spark advanced position, the connection of the cam-follower with the throttle valve including lost motion means for the independent further advance of the throttle valve, and a separate link from the first mentioned motion transmitting connections through the lost motion means for the further opening of the throttle valve to effect throttle valve movement beyond said intermediate position independently of the timer plate and after the timer plate reaches its spark advanced position.

7. The combination with a timer plate having a throttle controlling cam, of a throttle valve having an actuating lever, a cam follower having spring means holding it to the cam and having means for transmitting motion to said lever, the cam and cam follower being capable of effecting only a partial opening movement of the valve, a manually operable speed control part comprising a rocker arm having link connection with the timer plate for the actuation thereof, a link having a lost motion connection with said arm, said link being connected with said lever, and stop means on said link engaged by said arm at substantially the maximum advanced position of the timer plate for effecting transmission of motion to the last mentioned link to said lever for the continued opening movement of the throttle valve independently of the timer plate.

8. The device of claim 7 in which the first mentioned link and timer plate have a lost motion connection and

a spring has its bias opposed to the yielding of said lost motion connection whereby said spring acts through the first mentioned link upon said arm in a direction to restore the throttle valve to the position to which it is operated through the timer plate and said cam and cam follower.

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