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CARBURETOR THROTTLE CONTROL

Filed July 25, 1940

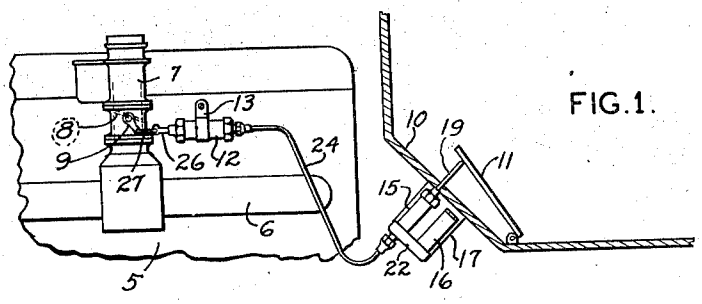

FIG. 1.

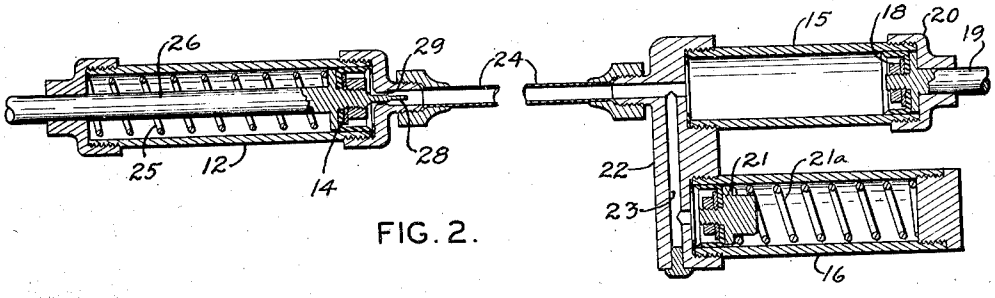

FIG. 2.

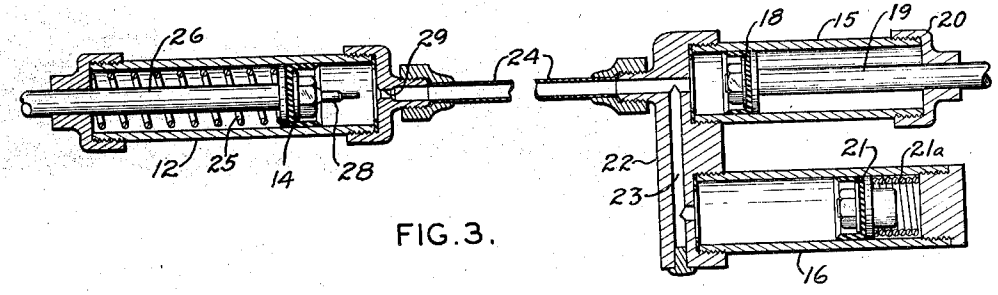

FIG. 3.

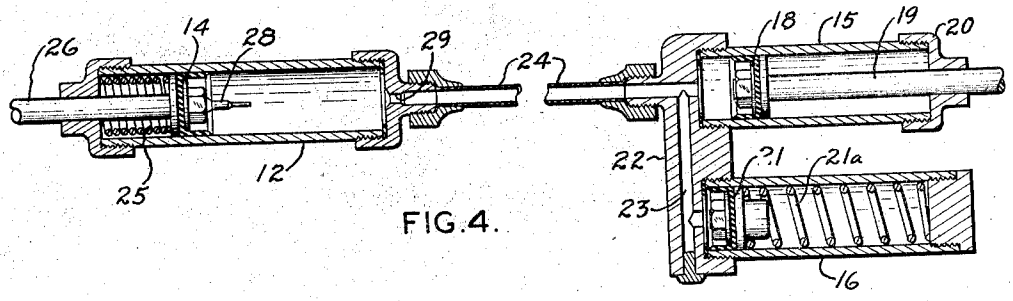

FIG. 4.

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CARBURETOR THROTTLE CONTROL

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Application July 25, 1940, Serial No. 347,416

8 Claims. (Cl. 137—139)

This invention relates to mechanism for actuation of the throttle valve in carburetors for internal combustion engines.

The use of a liquid link to operatively connect the usual carburetor throttle valve and control pedal in an automobile substantially simplifies the control over the usual mechanical linkage. However, it is desirable to vary the rate at which the valve responds to different portions of the pedal movement and, particularly, to provide for a slower actuation of the valve when the vehicle is accelerating from low speeds, than during the latter part of the throttle opening movement when the car is in high gear. Also, it is frequently desirable to retard the latter portion of the closing movement of the throttle so as to prevent stalling of the engine and eliminate the sudden and uncomfortable change of momentum which may occur when the throttle pedal is suddenly released with the car travelling at a fairly rapid rate. So far as I am aware, neither of the above results has been obtained with the hydraulic or liquid link throttle controls heretofore known.

Accordingly, it is an object of the present invention to provide means for varying the rate of actuation of the throttle valve, provided with a hydraulic control, relative to corresponding movement of the control pedal according to the position of the valve.

A more detailed object is to provide an hydraulic control for a carburetor throttle embodying means to retard the first part of the opening movement of the throttle valve, and the last part of the closing movement thereof, relative to the corresponding movements of the throttle pedal.

Certain features of the present invention are shown and claimed in a co-pending application for reissue filed June 8, 1940, Serial No. 339,581, in the name of the present inventor.

In the accompanying drawing which illustrates this invention:

Fig. 1 is a diagrammatic representation of a portion of an automobile engine and carburetor throttle control constructed in accordance with the invention.

Fig. 2 is a sectional view showing the liquid link elements of the throttle control with the valve in the closed throttle position.

Fig. 3 is a view similar to Fig. 2 but showing the parts in the position assumed immediately after the throttle pedal has been depressed rapidly, and

Fig. 4 is a view similar to Figs. 2 and 3 but showing the parts in the positions assumed when the throttle is at rest in its substantially fully open position.

Fig. 1 shows a portion of an automobile engine 5 having an intake manifold 6 and a carburetor 7 mounted thereon. The carburetor has a throttle valve 8 which carries an arm 9 for actuation of the valve. Pivotally mounted on the floor board 10 is a pedal 11 connected to the carburetor throttle by means of a liquid link mechanism, to be described hereafter, whereby depressing of the throttle pedal serves to open the valve in the usual manner.

A cylinder 12 is secured to the engine block adjacent the carburetor by means of a bracket 13 and slidably receives a portion of plunger 14 (Figs. 2, 3 and 4). A second cylinder 15 and a third cylinder 16 are rigidly mounted adjacent the floor board by means of a bracket 17. Cylinder 15 slidably receives a piston plunger 18 having a piston rod 19 slidable through cylinder head 20. Movable in cylinder 16 is a loose or free plunger 21 constantly urged toward the left by a coiled spring 21*a*. Cylinders 15 and 16 are both secured to a base plate 22 projecting from bracket 17 and are connected by a cross passage 23 in the plate. Cylinders 12 and 15 are connected by a tube 24 which also intersects passage 23. Piston 14 is constantly urged to the right by a coiled spring 25 which also serves as a throttle closing spring whereby, when pedal 11 is released, the throttle valve will be automatically returned to its closed position.

Piston 14, which may be termed the driven member of the liquid link, has a piston rod 26 which is connected by means of a link 27 to throttle arm 9. Projecting in the opposite direction from piston 14 is a stepped needle 28 which, when the throttle valve is near its closed position, as in Fig. 2, enters a restriction 29 through which tube 24 communicates with the interior of cylinder 12 so as to restrict the passage of liquid to and from this cylinder.

The mechanism operates as follows:

Cylinder 16, plunger 21 and spring 21*a* form, in effect, a resilient chamber structure in communication with the liquid link whereby a portion of the liquid discharged from cylinder 15 may enter the same instead of passing directly to the driven cylinder 12. When pedal 11 is depressed, rod 19 and piston 18 are forced into cylinder 15 to discharge liquid therefrom into tube 24 and also into passage 23 and cylinder 16, provided sufficient pressure is produced to compress spring 21a. Due to the fact that needle 28 restricts the flow of liquid into cylinder 13 in the early part of the

throttle opening movement, greater back pressure will result in cylinder 15, tube 24, and passage 23 at such time than when the throttle is further opened and needle 28 has been withdrawn from restriction 29. A portion of the liquid discharged from cylinder 15 will enter cylinder 12, moving piston 14 to the left against spring 25 and opening the throttle valve. Obviously, when the throttle has opened far enough to withdraw needle 28 from restriction 29, continued actuation of pedal 11, at the same speed as during the first part of its movement, will produce less pressure in tube 24 and, accordingly, more liquid will enter driven cylinder 12 and less will enter resilient chamber 16. The result of this is that after needle 28 is withdrawn from restriction 29, the throttle valve will respond to depression of pedal 11 at a faster rate than during the first part of the throttle opening movement. This is desirable since such throttle movement ordinarily occurs when the vehicle is being accelerated in a lower or more powerful gear ratio, when a slight opening movement of the throttle greatly increases the speed and power output of the engine. When the throttle has been opened farther and the vehicle is in high gear, the engine does not respond as rapidly to opening movements of the throttle and the valve can be opened faster without discomfort.

In Fig. 3, pedal 11 has been substantially fully depressed and piston 18 moved to its extreme inward position at a rapid rate so as to build up sufficiently high pressure in cross passage 23 to substantially fully compress spring 21*a* so that most of the liquid discharged from cylinder 15 enters the resilient chamber 16 and a relatively small part thereof enters driven cylinder 12 so as to displace piston 14 the relatively small amount shown. After piston 18 comes to rest, spring 21*a*, being stronger than throttle return spring 25, forces liquid from cylinder 16 into cylinder 12 and further opens the throttle. Thus, the rate at which the throttle valve can be opened is limited, a feature which is frequently desirable in order that the valve opening movement be restricted to the rate at which the engine can respond. This feature is claimed in the above-mentioned copending application Serial No. 339,581.

In Fig. 4, spring 21 has again expanded to force all the liquid from cylinder 16 into driven cylinder 12 and to displace piston 14 to its extreme left hand position, in which the throttle valve is fully opened. The throttle valve will be held in its extreme left hand position as long as piston 18 is maintained in its fully open position. When pedal 11 is again released, piston 14 will be forced to the right under the influence of spring 25, ejecting liquid from cylinder 12 into driving cylinder 15. As the throttle approaches its closed position, needle 28 again enters restriction 29 so as to retard the rate of ejection of liquid from cylinder 12 and consequently further closing movement of the throttle valve.

All the above functions occur without noticeable variation in the resistance of pedal movement and thus, automatically, soft and comfortable acceleration through the lower gears is assured by the slow initial opening movement of the throttle valve without conscious variation in the force applied to the throttle pedal by the driver. Moreover, the throttle cannot be opened at a faster rate than that to which the engine can respond. Finally, the last part of the closing movement of the throttle is retarded due to reentry of needle 28 into restriction 29 at the end of tube 24.

The invention may be modified in various respects as will occur to those skilled in the art and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In combination with a carburetor throttle and manual control therefor, a liquid link connecting said members for joint operation thereof, resilient means incorporated with said link for providing yielding response of said throttle to movement of said control, and means to retard the movement of said throttle between selected positions thereof relative to corresponding movement of said control comprising an element actuated with said throttle to restrict said liquid link when said throttle is between said positions.

2. In combination with a carburetor throttle member and a manual control member therefor, a liquid link connecting said members, a resilient chamber device communicating with said fluid link, and means operable with one of said members during at least a portion of the movement thereof to vary the resistance of said link to fluid flow therethrough whereby a varied response of said throttle member is obtained from uniform movement of said control member.

3. In combination with a carburetor throttle member and a manual control member therefor, a liquid link connecting said members, a resilient device in connection with said link permitting movement of said control member at a different rate of speed than the consequent speed of said throttle member, and means operable by one of said members during at least a portion of the normal movement thereof to vary the resistance of said link to fluid flow therethrough.

4. In combination with a carburetor throttle member and a manual control member therefor, a liquid link connecting said members for opening said throttle member, yielding means for closing said throttle member, a yielding device in connection with said liquid link for providing lost motion between said members during opening of said throttle member, and means actuated by said throttle member when near its closed position to increase the effective resistance in said liquid link and thereby retard opening and closing movements of said throttle member when adjacent said position.

5. In combination with a carburetor throttle and a manual control therefor, driving and driven expansible and contractible chamber devices, respectively, connected to said control and said throttle, a passage connecting said devices, a resilient chamber connected to said passage, and means actuated by said driven chamber device to restrict the portion of said passage between the same and said resilient chamber device when said throttle is near its closed position whereby an opening movement of said control at such time produces a relatively slower throttle movement than corresponding movement of said control when said throttle is in other positions.

6. In combinaion with a carburetor throttle member and a manual control member therefor, a liquid link connecting said members including an expansible and contractible chamber device connected to said throttle member, spring means normally urging said throttle member in the closing direction and tending to contract said chamber device, and an element actuated by said chamber device for increasing the resistance to

egress of liquid from said device as said throttle member approaches its closed position so as to retard the last portion of the throttle closing movement.

7. In combination with a carburetor throttle and manual control therefor, driven and driving fluid pressure chamber devices associated respectively with said throttle and said control, said driven chamber device having a movable wall connected to said throttle and said driving chamber device having a movable wall connected to said control, a fluid passage connecting said chamber devices, an additional resilient chamber device communicating with said passage, and means operable with one of said movable walls to vary the effective cross sectional area of said connecting passage during the movement of said last mentioned wall so as to vary the proportions of fluid entering two of said chamber devices during uniform expansion or contraction of said third chamber device.

8. In combination with a carburetor throttle member and a manual control member therefor, a liquid link connecting said members including an expansible and contractible chamber device connected to each of said members and a tube connecting said devices, spring means for closing said throttle member, resilient chamber structure in connection with said link, the chamber device connected to said throttle member having a movable wall, and a projection carried by said movable wall and disposed to enter said tube when said throttle member is near its closed position to restrict the passage of liquid therepast and retard the movement of said movable wall and throttle member relative to the corresponding movement of said control member.

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