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CHARGE CONTROL VALVE MECHANISM FOR
INTERNAL-COMBUSTION ENGINES

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5 Claims. (Cl. 123-103)

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This invention relates to a charge control valve mechanism for an internal combustion engine.

It is desirable in an internal combustion engine to provide a carburetor and fuel mixture intake passageway of sufficient size or cross-section so that the engine can breathe freely and maintain a desired high compression in the cylinders at high engine speeds. With such an intake passageway there is a tendency for the engine to overcharge and knock or detonate at low engine speeds.

This invention contemplates a charge control valve for such an intake passageway which will control the charge, particularly at low engine speeds, so that the engine will not be overcharged and therefore will not knock. In other words, this invention contemplates a charge control valve mechanism which will control the charge taken in by the engine at all speeds to maintain approximately the same high compression at all engine speeds without knocking.

In the drawing:

Fig. 1 is a vertical cross section through a carburetor showing my charge control valve mechanism.

Fig. 2 is a vertical cross section through a carburetor showing a modified form of my charge control valve mechanism.

Referring more particularly to the drawing, the various elements are referenced as follows: carburetor housing 1 having an intake passageway 2 through which all the fuel mixture flows into the engine, intake passageway inlet 3 and outlet to the engine 4, venturi 5, carburetor fuel nozzle 6 connected into the float bowl (not shown) of the carburetor, balanced throttle valve 7 mounted on throttle shaft 8 journaled in carburetor housing 1, crank arm 9 fixed on throttle shaft 8 without the housing 1, throttle rod 10 of the push and pull type provided with an elongate slot 11 at one end, pin 12 fixed on crank 9 and extending into slot 11 so that slot 11 and pin 12 provide a lost motion connection between throttle rod 10 and crank 9, suction device or servo-motor 13 comprising a flexible diaphragm 14, suction chamber 15, compression spring 16, rod 17 pivotally connecting diaphragm 14 with crank 9 as at 18, orifice 19 in intake passageway 2 on the engine side of valve 7, orifice 20 in venturi 5, conduit 21 connecting orifices 19 and 20, branch conduit 22 connecting conduit 21 to suction chamber 15, valve 23 having a screw fit in conduit 21 by means of which communication between orifice 19 and suction chamber 15 can be adjusted.

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If valve 23 is turned in, then communication between orifice 19 and suction chamber 15 through conduit 21 is restricted. If valve 23 is screwed outwardly, then the restriction in conduit 21 is decreased.

Although it is preferred to locate orifice 20 in the venturi, this orifice 20 can be located in intake passageway 2 anywhere on the atmosphere side of throttle valve 7 so long as all of the fluid flowing through intake passageway 2 passes by orifice 20. If desired, orifice 20 can be omitted, but in such case it is imperative that orifice 19 be located in the intake passageway on the engine side of throttle valve 7 where all of the air or fuel mixture flowing into the engine passes and when orifice 19 alone is used, then it is preferred to locate this orifice on the engine side of valve 7 in the plane of valve shaft 8 (Fig. 2) because valve shaft 8 acts as a restriction in intake passageway 2 and increases the velocity of the air flowing by this shaft.

The operation of my device is as follows: As shown in Fig. 1, throttle rod 10 and throttle valve 7 are in idle position. At this time pin 12 is at the left hand end of slot 11. Compression spring 16 tends at all times to close valve 7. If throttle rod 10 is now moved to the left to wide open position, then pin 12 will be at the right hand end of slot 11 but spring 16 will tend to hold valve 7 closed due to the lost motion connection between throttle rod 10 and crank 9. The vacuum at orifice 19 will tend to establish itself in suction chamber 15 (as bled down by orifice 20) and cause diaphragm 14 to move toward the right and thereby move throttle valve 7 toward open position against compression spring 16. When valve 7 is closed orifice 20 tends to act as an air bleed to orifice 19 so that the full manifold vacuum is not established in chamber 15. The speed of the engine will increase and consequently the suction at orifice 20 will increase thereby moving diaphragm 14 toward the right and moving valve 7 further toward open position. Thus, valve 5 will open gradually instead of suddenly and thereby prevent the engine from being overcharged at low speed which would result in spark knocks or detonation. At high engine speeds the Venturi suction at orifice 20 will be higher than the suction on the engine side of throttle valve 7 and this Venturi suction, acting through suction device 13, will hold throttle valve 7 wide open.

The tension of spring 16 can be decreased by turning threaded nipple 24 outwardly against which the right hand end of spring 16 abuts. If I omit orifice 20, then spring 16 is adjusted

so that a low vacuum of about two inches of mercury (the intake passageway vacuum at high engine speeds) acting on diaphragm 14 will hold valve 7 wide open. When it is desired to move throttle valve 7 toward closed position, then throttle rod 10 is moved toward the right so that the throttle rod 10 will engage pin 12 at the left hand end of slot 11 and thereby swing valve 7 toward closed or idle position.

Regardless of whether both orifices 19 and 20 are used or orifice 19 alone is used, the spring tension is adjusted so that approximately 2" of vacuum will hold the throttle valve wide open, meaning that the breathing of the engine will never be greatly restricted but enough to prevent detonation or pre-ignition at the low end. In any engine extremely high compression can be used when the speed of the engine is high but, if extremely high compression is used, the engine will overcharge at low speeds and cause detonation. With my invention the charge is regulated so the engine receives a full charge at high speeds and a restricted charge at low speeds.

Another advantage is that, when the throttle is not all the way open at low speed, there will be considerable manifold depression which assists in maintaining an atomized mixture whereas, if the throttle is wide open at low engine speeds, the mixture falls into the manifold, which is almost atmospheric pressure, and condenses on the walls causing rough engine operation.

I do not wish to be limited to using the device as part of the carburetor. It will function satisfactorily by using an auxiliary valve and placing it between the carburetor throttle and the engine.

I claim:

1. In combination with the intake passageway for an internal combustion engine through which the motive fluid for the engine flows, a throttle shaft rotatably mounted in said passageway, a throttle valve supported on said shaft in the intake passageway, a push and pull throttle rod having a lost motion connection with said throttle valve shaft so that movement of the throttle rod in one direction will positively close said valve and movement of the throttle rod in the opposite direction will free said valve for opening movement, an orifice positioned in the intake passageway on the engine side of said throttle valve in a plane which passes through the throttle shaft and which is perpendicular to the flow of motive fluid and in that portion of the intake passageway through which all of the motive fluid for the engine flows, a suction device, a connection between the suction device and the throttle valve, resilient means tending to move said throttle valve toward closed position, and a conduit connecting the suction chamber of said suction device with said orifice whereby when said throttle rod is moved in a throttle opening direction the intake passageway vacuum acts through said suction device to move said throttle valve gradually to open position and thereby avoid overcharging the engine.

2. In combination with the intake passageway for an internal combustion engine through which the motive fluid for the engine flows, a throttle valve in the intake passageway, a push and pull throttle rod having a lost motion connection with said throttle valve so that movement of the throttle rod in one direction will positively close said valve and movement of the throttle rod in the opposite direction will free said valve for opening movement, an orifice positioned in the intake passageway on the engine side of said throttle

valve and in that portion of the intake passageway through which all of the motive fluid for the engine flows, a suction device, a connection between the suction device and the throttle valve, resilient means tending to move said throttle valve toward closed position, and a conduit connecting the suction chamber of said suction device with said orifice whereby when said throttle rod is moved in a throttle opening direction the intake passageway vacuum acts through said suction device to move said throttle valve gradually to open position and thereby avoid overcharging the engine, a second orifice in the intake passageway on the atmosphere side of said throttle valve, and a conduit connecting said second orifice into the suction chamber of said suction device.

3. The combination as set forth in claim 2 including a venturi in the intake passageway on the atmosphere side of said throttle valve and the second mentioned orifice being positioned in said venturi.

4. The combination as set forth in claim 3 including an adjustable valve in the conduit between the orifice on the engine side of the throttle valve and the suction device for adjusting communication between said orifice and the suction device.

5. In combination with the intake passageway for an internal combustion engine through which the motive fluid for the engine flows, a balanced throttle valve in the intake passageway, a push and pull throttle rod having a lost motion connection with said throttle valve so that movement of the throttle rod in one direction will positively close said valve and movement of the throttle rod in the opposite direction will free said valve for opening movement, an orifice positioned in the intake passageway on the engine side of said throttle valve, a suction device, a connection between the suction device and the throttle valve, resilient means tending to move said throttle valve toward closed position, and a conduit connecting the suction chamber of said suction device with said orifice, a second orifice in the intake passageway on the atmosphere side of said throttle valve, and a conduit connecting said second orifice into the suction chamber of said suction device whereby when said throttle rod is moved from idle toward throttle opening position the suction on the engine side of the throttle valve will act through said suction device and will initiate opening movement of said throttle valve producing an increased flow of motive fluid through the intake passageway whereupon at higher engine speeds the suction produced by the velocity of the motive fluid by the second orifice on the atmosphere side of the throttle valve will act through said suction device to hold the throttle valve open.

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