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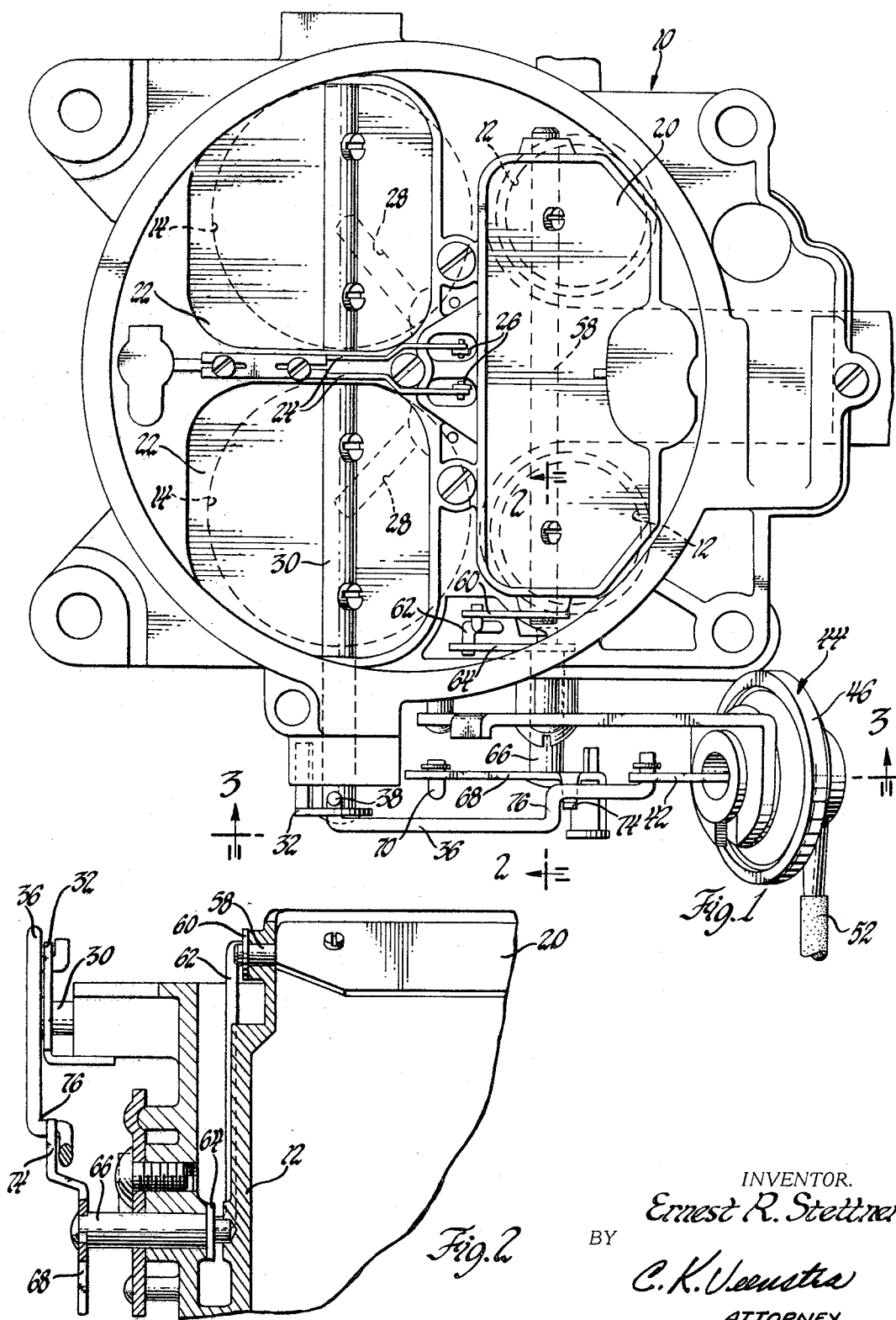
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3,396,948

CARBURETOR AIR VALVE VACUUM DAMPER

Filed Oct. 14, 1966

2 Sheets-Sheet 1



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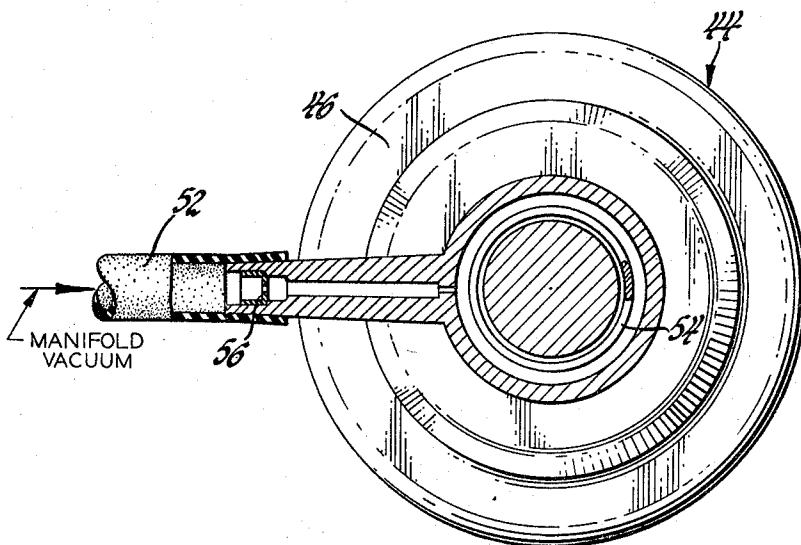
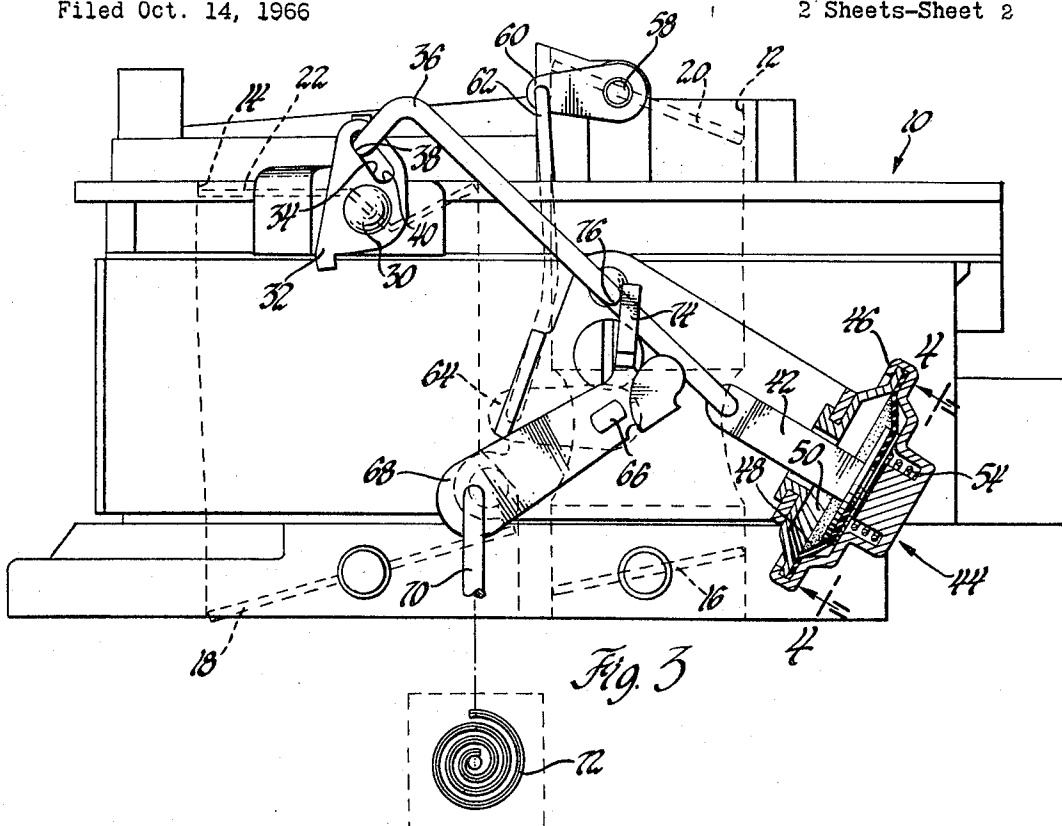


Fig. 4

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CARBURETOR AIR VALVE VACUUM DAMPER
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ABSTRACT OF THE DISCLOSURE

A four-barrel, multiple-stage carburetor has a pair of plain tube primary mixture conduits and a pair of air valve secondary mixture conduits. A single unit provides vacuum break of the choke in the primary mixture conduits and vacuum damping of air valve opening movement.

In a carburetor in which fuel is metered past a metering rod positioned by an air flow responsive air valve, it has been found desirable and occasionally even necessary to damp opening movement of the air valve so that a sudden inrush of air, which has less inertia than liquid fuel, does not cause leaning of the mixture and a sag in acceleration. While such arrangements are common in air valve carburetors, it has not been suggested heretofore that the already available vacuum control for the automatic choke might be readily adapted to provide a damping arrangement. Consequently, the air valve damping arrangements known heretofore require separate apparatus, increasing the cost of the carburetor.

This invention provides a carburetor air valve damping arrangement combined with the carburetor choke valve vacuum break unit.

The details as well as other objects and advantages of this invention are disclosed in the following description of a preferred embodiment as shown in the drawings in which:

FIGURE 1 is a top plan view of a four-barrel, two-stage carburetor having a choke valve controlled primary stage and an air valve type secondary stage;

FIGURE 2 is a sectional view along line 2—2 of FIGURE 1 illustrating the choke valve linkage;

FIGURE 3 is a side elevation view, partially in section taken along line 3—3 of FIGURE 1, showing the vacuum control unit and linkage for controlling both the choke valve and the air valve; and

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 3 illustrating the restriction to change in pressure in the vacuum servo unit.

Referring to the drawings, a carburetor 10 includes a pair of primary mixture conduits 12 and a pair of secondary mixture conduits 14. Primary and secondary throttles 16 and 18 (shown in FIGURE 3) are provided in primary and secondary mixture conduits 12 and 14 respectively, and appropriate linkage is provided for sequentially opening throttles 16 and 18. A choke valve 20 is disposed in the inlet to primary mixture conduit 12 to restrict air flow therethrough and provide an enriched mixture for starting and warm-up operation.

Air valves 22 are provided in the inlets to secondary mixture conduits 14 and, as shown in FIGURES 1 and 3, are unbalanced to open in response to air flow through the secondary mixture conduits 14. A complete description of the operation and control of the carburetor fuel metering is contained in copending application Ser. No. 504,961, filed Oct. 24, 1965, in the names of E. A. Kehoe and D. D. Stoltman, and assigned to the assignee of this application; the description of the construction of the carburetor is therefore limited to that required for an understanding of the invention.

Air valves 22 are controlled so that their rotative posi-

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tion is responsive to and a measure of air flow through secondary mixture conduits 14. A metering rod carrier 24 is associated with air valves 22 and positions metering rods 26 in accordance with the position of the air valves 22. Metering rods 26 control fuel flow through nozzles 28 into the secondary mixture conduits 14. A mixture of air and fuel in appropriate ratio is thus formed in secondary mixture conduits 14.

However, when air valves 22 first open and air rushes through secondary mixture conduits 14, a temporary leaning of the mixture may occur due to the relatively greater inertia of the fuel. This may cause a sag in acceleration. The linkage arrangement described below is adapted to damp opening movement of the air valves to allow the inertia of the fuel to be overcome and avoid a lean mixture.

Air valves 22 are secured on a shaft 30 which extends exteriorly of the carburetor 10. A lever 32, secured on the end of shaft 30, has a slot 34 in which a link 36 is received. Link 36 has a shoulder 38 adapted to cooperate with the end 40 of slot 34.

Link 36 is secured at its other end to a plunger 42 of a vacuum control unit 44. Vacuum control unit 44 includes a housing 46 closed by flexible pressure responsive diaphragm 48 to form an expansible chamber 50. Plunger 42 is secured to diaphragm 48. A conduit 52 extends from housing 46 to the intake manifold or one of the mixture conduits downstream of the throttle valve to thereby subject diaphragm 48 to the manifold or induction pressure. A spring 54 biases diaphragm 48 against the induction vacuum.

A restriction 56 (shown in FIGURE 4) is provided in conduit 52 so that diaphragm 48 is not immediately responsive to a change in induction pressure but rather its motion is damped so that it slowly moves outwardly under the force of spring 54 upon an increase in induction pressure.

Choke valve 20 is secured to a shaft 58 which also extends exteriorly of the carburetor. A lever 60, secured on the end of a shaft 58, has an operating link 62 secured thereto. Operating link 62 is secured at its other end to a lever 64 which is secured to the inner end of an intermediate shaft 66. A lever 68 is secured to the other end of shaft 66. A link 70 extends from lever 68 to a temperature responsive thermostat 72 whereby the choke may be positioned in accordance with temperature conditions. As the temperature increases, thermostat 72 will permit upward movement of link 70; clockwise movement of lever 68, shaft 66, and lever 64; upward movement of link 62; and clockwise movement of lever 60, shaft 58, and choke valve 20.

Before the engine is started, a tang 74 on lever 68 is contacted by a shoulder 76 on link 36. When the engine is started, the manifold vacuum draws diaphragm 48 back and plunger 42 and shoulder 76 of link 36 rotate tang 74 and lever 68 clockwise to open the choke valve 20 a predetermined amount. Tang 74 and shoulder 76 provide a lost motion connection permitting further opening movement of choke valve 20 under control of thermostat 72. This motion of link 36 is lost as its shoulder 38 is drawn to the end 40 of slot 34. When throttle valves 18 are subsequently opened to allow additional air flow to the engine, air valves 22 will attempt to open but will be retarded by the shoulder 38 of link 36. At the same time, the induction pressure will increase and restriction 56 in conduit 52 will permit a gradual increase in the pressure applied against diaphragm 48, thus allowing a slow movement of diaphragm 48, plunger 42, and link 36 to the left as viewed in FIGURE 3. Air valves 22 are thus permitted to open only slowly.

When throttle valves 16 and 18 are closed to decelerate the engine, a sudden increase in manifold vacuum occurs.

This increase will pull diaphragm 48 to the right as viewed in FIGURE 3, closing air valves 22. This arrangement thereby assists in positively reducing air flow to the engine when such is desired.

It will be appreciated that this construction provides a simple and economical arrangement for damping opening movement of a carburetor air valve to prevent the formation of lean mixtures which may cause a sag in acceleration. It will be noted that the vacuum break control of choke valve 20 is not required at the low vacuums when air valves 22 are opening since air flow through mixture conduits 12 is great enough to open the choke valve. The combination provided by this invention therefore achieves its simplicity of construction and operation without adversely affecting the desired functions of the carburetor.

I claim:

1. An internal combustion engine carburetor comprising a primary mixture conduit, a choke shaft in said primary mixture conduit, a choke valve secured on said choke shaft and rotatably disposed in said primary mixture conduit, a rotatable choke lever operably connected to said choke shaft, a secondary mixture conduit, an air valve shaft in said secondary mixture conduit, an air valve secured on said air valve shaft and rotatably disposed in said secondary mixture conduit, a rotatable air valve lever operably connected to said air valve shaft, means for supplying fuel to said mixture conduits in accordance with the position of said choke valve and said air valve, means for positioning said choke valve to limit air flow through said primary mixture conduit and provide an enriched air-fuel mixture, means for controlling said air valve whereby its position is responsive to and is a measure of the rate of air flow through said secondary mixture conduit, throttle valve means disposed in said mixture conduits to control flow therethrough, control means responsive to the induction pressure in said mixture conduits downstream of said throttle valve means, and a substantially linearly movable link connected to said control means and extending adjacent said levers, said link including a first shoulder portion engageable with said choke lever to open said

choke valve and including a second shoulder portion engageable with said air valve lever to prevent opening of said air valve, said control means being responsive to a decrease in induction pressure indicative of self-sufficient operation of the engine after starting to move said link and open said choke valve a predetermined amount to provide a leaned air-fuel mixture, said link and said air valve lever having a lost motion connection permitting opening of said choke valve the predetermined amount provided by said control means, said link and said choke lever having a lost motion connection permitting opening of said choke valve beyond the predetermined amount provided by said control means, said control means including means providing a damped response to an increase in induction pressure indicative of an opening of said throttle valve means to retard movement of said link and damp the rate of opening movement of said air valve to prevent leaning of the air-fuel mixture.

2. The carburetor of claim 1 wherein said control means comprises a housing, a flexible pressure responsive diaphragm enclosing said housing to form an expansible chamber, a plunger connecting said link to said diaphragm, said diaphragm being responsive to an increase in pressure in said chamber to permit opening movement of said air valve, and a conduit connecting said expansible chamber to said mixture conduits downstream of said throttle valve means whereby said diaphragm is subjected to the induction pressure therein, said conduit including a restriction to damp the response of said diaphragm to an increase in the induction pressure and thereby retard opening movement of said air valve.

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