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Gural

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[54] **AIR VALVE CARBURETOR**

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[21] Appl. No.: **439,286**

[52] **U.S. Cl.** .... **261/50 A**; 261/52

[51] **Int. Cl.** **F02m 1/02**

[58] **Field of Search** .... 261/50 A, 52

[56] **References Cited**

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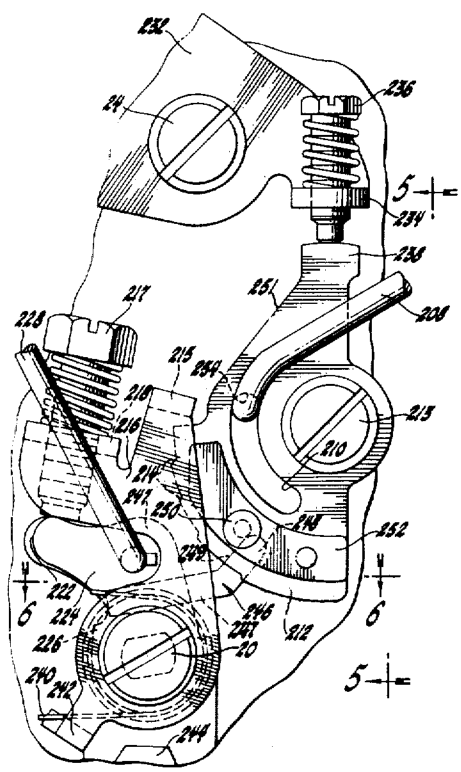
[57] **ABSTRACT**

In an air valve carburetor, an adjustable idle mixture stop operatively connected to the air valve engages an arm extending from the fast idle cam. For cold start enrichment, the arm is moved out from under the idle stop to close the air valve; this increases the fuel metering signal in the metering zone between the air valve and the throttle and thus the fuel flow thereto. To overcome friction between the idle mixture stop and the arm, a canted leaf spring attached to the throttle lever engages a pin extending from the cam. As the throttle is opened, the spring moves the cam to kick the arm out from under the idle mixture stop.

3 Claims, 6 Drawing Figures



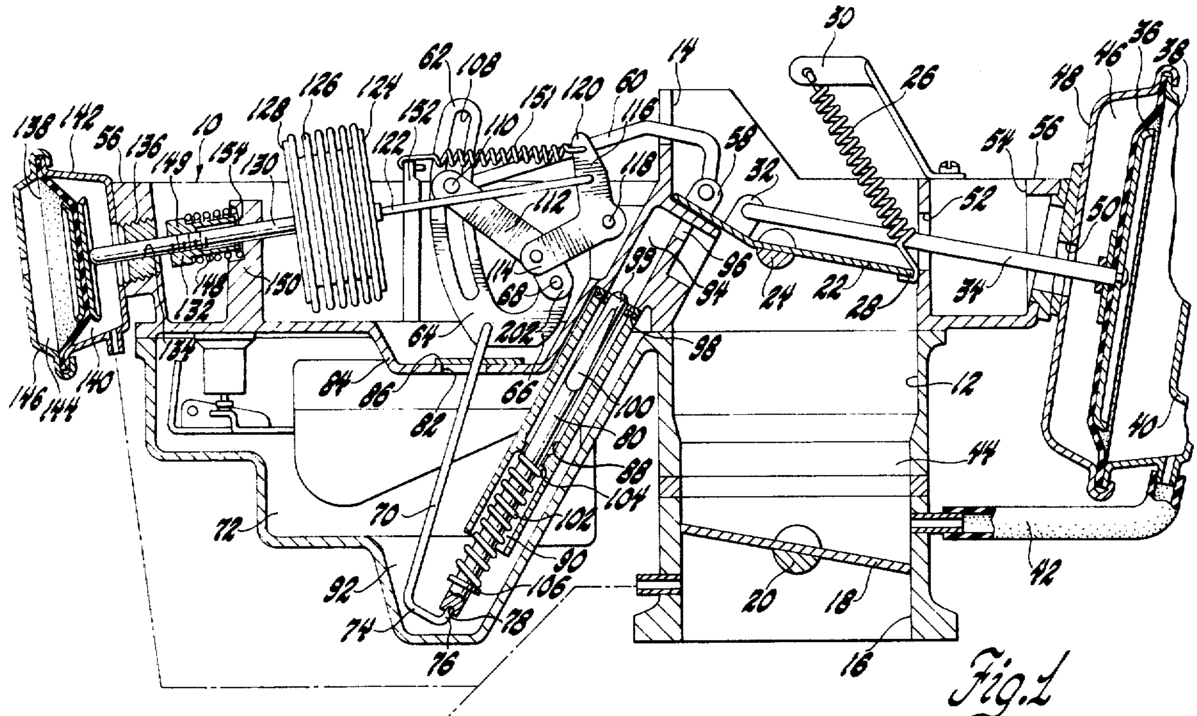


Fig.1

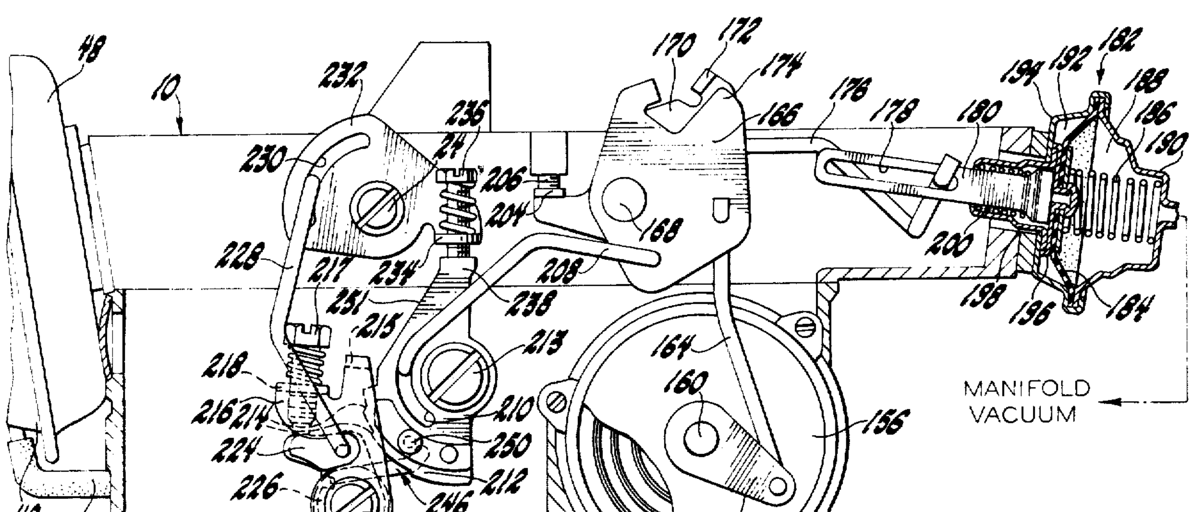


Fig.2

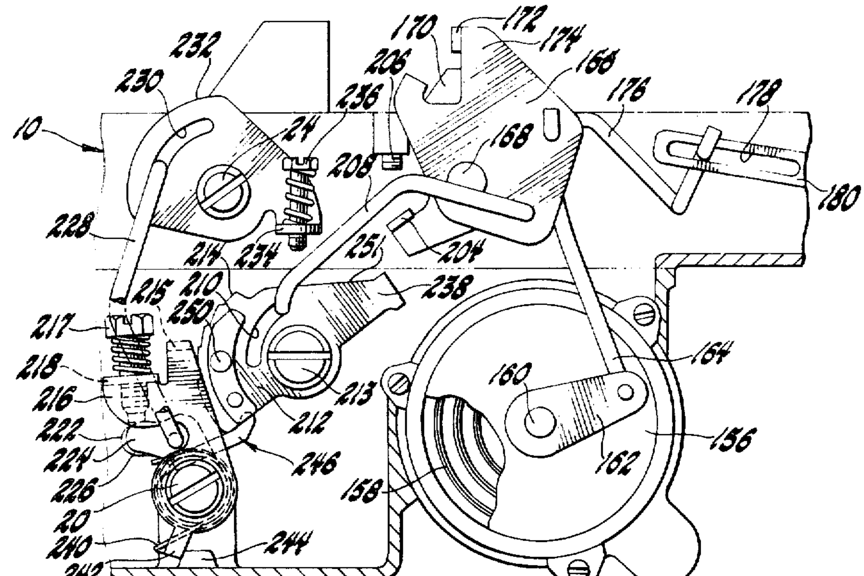


Fig.3

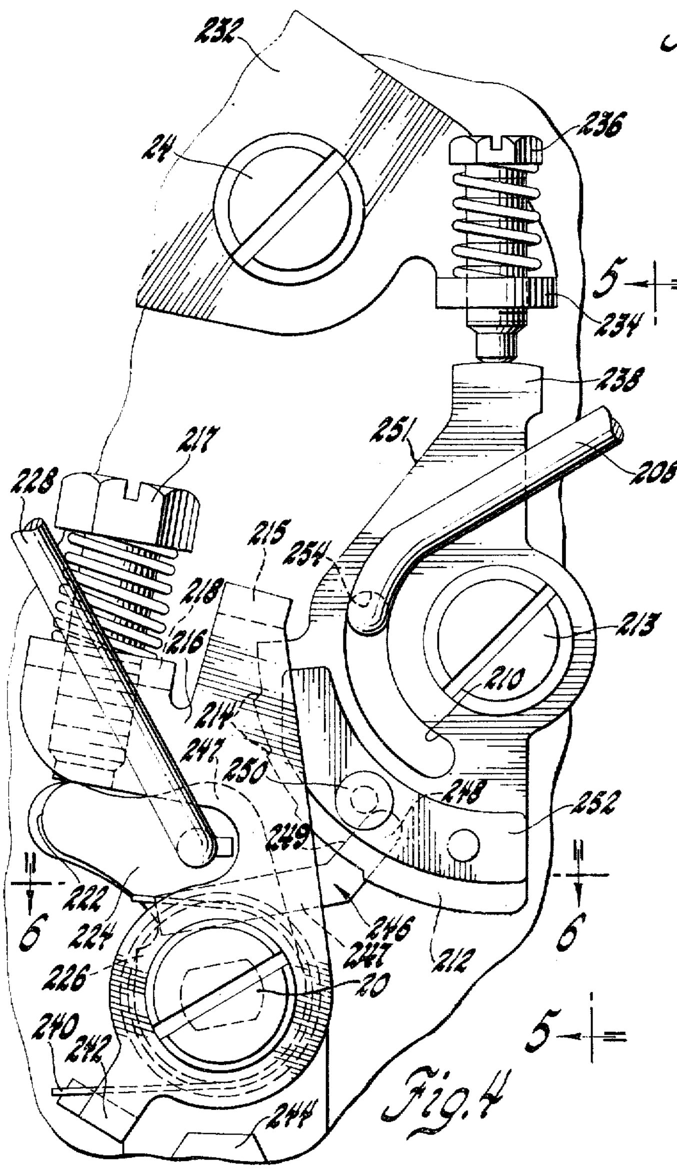


Fig.4

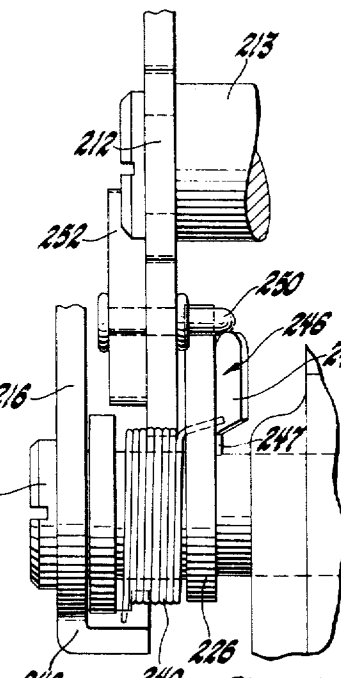


Fig.5

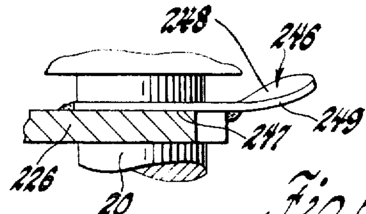


Fig.6

AIR VALVE CARBURETOR

This invention relates to an air valve carburetor for internal combustion engines and, more particularly, to an air valve carburetor having a fast idle cam and an arm extending therefrom which engages an adjustable stop (which holds the air valve open) for controlling the idle mixture. Means are described which disengages the stop from the arm when the throttle is opened to allow the air valve to close for cranking enrichment.

As described in U.S. Pat. No. 3,023,744 Mick, an example of mechanical linkage for positioning the air valve included a fast idle cam which engages a cam follower for limiting throttle closure and positioned by a thermostat responsive to engine temperature, a lever connected to the air valve shaft and having an adjustable idle stop member which engages a contoured portion of the cam, and a spring biasing the air valve closed. When the engine is cold, the cam is repositioned by the thermostat to allow the air valve to be completely closed to provide a maximum metering signal to the fuel supply means, thereby maximizing fuel flow for cold start enrichment.

However, it is possible that mechanical friction between the fast idle cam and the air valve lever and/or between the throttle cam follower and the cam may prevent the air valve from closing as desired. To ensure closure of the air valve for cold starts, the novel linkage set forth in the present invention repositions the fast idle cam when the throttle is opened and the arm supports the adjustable idle stop. This allows the air valve lever, which carries the adjustable idle stop, to disengage the arm and move, thereby closing the air valve to provide cold start enrichment.

In the preferred embodiment a canted, resilient leaf spring has a flat portion at one end which is secured to the auxiliary throttle lever and has a bent portion at the other end which is disposed in the rotative path of the cam and further has a leading edge which engages a pin on the fast idle cam when the throttle is opened and the arm engages the idle stop. In so doing, the leading edge of the spring moves the cam and kicks the arm thereof out from under the air valve lever to allow the air valve to close. However, the construction of the bent portion and the disposition of the leading edge in the rotative path of the pin allows the opposite edge of the spring to slide over the pin when the throttle is closed. Accordingly, this allows the canted spring to engage the pin in a manner henceforth referred to as a unidirectional ratcheting manner during throttle movement. The ratcheting movement ensures that the position of the fast idle cam is not reset as the throttle closes so that the cam may move under the influence of the thermostat during normal warm-up to limit closing of the throttle in a conventional manner.

It is a principal object of the present invention to set forth means for releasing the air valve from the influence of the temperature-controlled cam in order to enrich the cranking mixture in a carburetor having an air valve controlled fuel metering system.

It is a further object of this invention to set forth means for releasing the air valve from under the influence of the temperature controlled cam to allow the air valve to close to increase the metering signal to means for supplying fuel to an air valve carburetor for delivery to an engine in order to obtain cranking enrichment.

Still another object of this invention is to disclose an air valve carburetor having novel means for releasing the air valve idle mixture adjusting screw from under the arm extending from the fast idle cam only when the throttle is opened and the arm supports the screw, in order to close the air valve thereby increasing the metering signal to means for supplying fuel to the carburetor to increase fuel flow to the engine for cranking enrichment.

The details as well as other objects and advantages of this invention are set forth in the remainder of the specification and are shown in the drawings in which:

FIG. 1 is a sectional elevational view of the carburetor showing the basic metering linkage and further showing the controls responsive to ambient air pressure and temperature and manifold vacuum;

FIG. 2 is a side elevational view of the carburetor with parts broken away to illustrate the linkage responsive to engine operating temperatures and showing the linkage in a position as required for a hot start and the spring for releasing the fast idle cam to close the air valve;

FIG. 3 is a view similar to FIG. 2 with the linkage positioned as required for a cold start;

FIG. 4 is a view of the FIG. 2 linkage, enlarged to illustrate further details of the means for releasing the fast idle cam to allow closing of the air valve;

FIG. 5 is an end elevational view of the FIG. 4 linkage taken in the direction indicated by the arrows 5—5 of FIG. 4; and

FIG. 6 is a sectional view taken along line 6—6 of FIG. 4, showing the canted configuration of the fast idle cam release spring.

Referring first to FIG. 1, the carburetor **10** has a mixture conduit **12** including the air inlet **14** and a mixture outlet **16** which discharges to the engine. A throttle **18** is rotatably disposed in mixture outlet **16** on a throttle shaft **20**.

An air valve **22** is rotatably disposed in air inlet **14** on an air valve shaft **24**. A spring **26** is secured to the downstream edge **28** of air valve **22** and extends to a bracket **30** to bias air valve **22** to the closed position shown.

A tab **32** reaches upwardly from air valve **22** and is connected by a link **34** to a diaphragm **36**. A chamber **38**, formed between the right side of diaphragm **36** and a cover member **40**, is connected by a tube **42** to a region **44** of mixture conduit **12** defined between air valve **22** and throttle **18**.

A chamber **46** defined between the left side of diaphragm **36** and a cover member **48** is subjected to substantially atmospheric pressure, present in air inlet **14** and in the air cleaner (not shown) through openings such as **50, 52** and **54**. (The air cleaner seats on a rim **56** disposed about the upper portion of carburetor **10**).

In operation, chamber **38** is subjected to the subatmospheric pressure created in region **44** as throttle **18** is opened, and diaphragm **36** acts through link **34** to pull air valve **22** clockwise toward its open position. Spring **26** is effective to balance the opening force of diaphragm **36**, thereby creating a substantially constant subatmospheric pressure in region **44**. By thus establishing a constant pressure drop across air valve **22**, the area about and thus the rotative position of air valve **22** is determined by and is a measure of the rate of air flow through mixture conduit **12**.

A tab **58** extends upwardly from air valve **22** and is connected through a link **60** to one end **62** of a lever **64**. The opposite end **66** of lever **64** is pivoted about a pivot pin **68.** Intermediate ends **62** and **66,** a hanger **70** descends from lever **64** into a carburetor fuel bowl **72** disposed therebelow. The lower end **74** of hanger **70** has a hook **76** which is received in a recess **78** formed in a metering rod **80.**

It may be noted that hanger **70** extends through an opening **82** in a cover **84** for fuel bowl **72.** Opening **82** is covered by a slider **86** which shifts horizontally during movement of hanger **70.**

Metering rod **80** is disposed in a fuel passage **88** having its lower end **90** disposed to receive fuel from a well **92** formed in the bottom of fuel bowl **72.** The upper end **94** of fuel passage **88** has an opening **96** through which fuel is discharged into region **44** of mixture conduit **12.** It will be appreciated, therefore, that the fuel in fuel bowl **72** is subjected to a substantially constant metering head — from the substantially atmospheric pressure in the upper portion of the fuel bowl to the generally constant subatmospheric pressure in region **44** of carburetor **10.**

A metering jet or orifice plate **98** is disposed in fuel passage **88** around the tip **99** of metering rod **80.** Metering rod **80** has flat tapered surfaces **100** on opposite sides which, upon reciprocation of metering rod **80** in jet **98,** vary the area available for fuel flow through jet **98.**

In operation, as air valve **22** opens by clockwise rotation, link **60** rotates lever **64** in a clockwise direction. Lever **64** then lifts hanger **70** to move the metering rod **80** generally upwardly and rightwardly in fuel passage **88.** Thus as air valve **22** is opened to increase the area available for air flow through air inlet **14,** metering rod **80** is shifted to increase the area available for fuel flow through metering orifice **98.** By this means, a substantially constant air-fuel ratio may be maintained — the precise proportion being controlled by the geometry of tapered surfaces **100** and of the linkage between air valve **22** and metering rod **80.**

A spring **102** extends from an annular ledge **104** formed in fuel passage **88** to the lower end **106** of metering rod **80** to take up any slack in the linkage and to load metering rod **80** against jet **98.**

A slot **108** is formed in the end **62** of lever **64.** Link **60** is connected to lever **64** by having one end **110** disposed in slot **108.** A link **112** extends from end **110** to an arm **114** of a supplementary lever **116** pivoted at a pin **118.** The opposite arm **120** of the lever **116** is connected by a link **122** to one end **124** of an aneroid or bellows **126.** The opposite end **128** of aneroid **126** is connected to a reciprocable plunger **130** threadably received by an adjusting screw **132,** guided in the bore **134** of an adjustable stop **136,** and extending to a diaphragm **138.**

A chamber **140** defined between the right side of diaphragm **138** and a cover member **142** is subjected to the manifold vacuum in mixture outlet **16** downstream of throttle **18,** while a chamber **144** defined between the left side of diaphragm **138** and a cover member **146** is subjected to substantially atmospheric pressure. The resulting rightward bias on diaphragm **138** is resisted by a spring **148** disposed between the head **149** of adjusting screw **132** and a support **150.** The linkage is shown in the position assumed when manifold vacuum is sufficient to overcome the force of spring **148.**

When throttle **18** is opened and manifold vacuum drops to a point indicative of the need for an enriched air-fuel ratio, spring **148** moves adjusting screw **132** leftwardly until head **149** abuts adjustable stop **136.** Plunger **130** is thus moved leftwardly, and a spring **151,** extending between end **120** of supplementary lever **116** and a support **152,** moves supplementary lever **116** counterclockwise to move link **122** and aneroid **126** leftwardly. Link **112** is then pulled downwardly to reposition end **110** of link **60** in slot **108,** thereby resulting in a shorter lever arm defined between end **110** of link **60** and pivot pin **68.** This increases the travel of metering rod **80** through metering jet **98** for equivalent opening movement of air valve **22** to provide an enriched air-fuel mixture.

When manifold vacuum increases to a point indicative of a need for a leaner air-fuel ratio, diaphragm **138** forces link **130** and adjusting screw **132** rightwardly until an end **154** of adjusting screw **132** engages support **150.** This forces aneroid **126** and link **122** rightwardly, resulting in clockwise rotation of lever **116.** Link **112** then raises the end **110** of link **60** in slot **108** to increase the lever arm defined between link end **110** and pivot pin **68.** This reduces the travel of metering rod **80** through metering jet **98** for equivalent opening movement of air valve **22** to provide a leaner air-fuel mixture.

Upon a decrease in ambient air pressure or an increase in ambient air temperature, both indicative of a reduction in air density and consequently a reduction in the mass rate of air flow through air inlet **14** for equivalent volume air flow, aneroid **126** expands, forcing link **122** rightwardly and causing clockwise rotation of lever **116.** Link **122** then raises the end **110** of link **60** in slot **108** to increase the lever arm defined between link end **110** and pivot pin **68.** The increased lever arm reduces the travel of metering rod **80** in metering jet **98** for equivalent movement of air valve **22** to prevent air-fuel mixture enrichment caused by a reduction in air density.

Upon an increase in ambient air pressure or a decrease in ambient air temperature, both indicative of an increase in air density, aneroid **126** contracts. Spring **151** then causes counterclockwise movement of supplementary lever **116,** and link **112** then moves link end **110** downwardly in slot **108** to shorten the lever arm defined between end **110** and pivot pin **68.** The shortened lever arm increases the travel of metering rod **80** in jet **98** for equivalent movement of air valve **22** to prevent leaning of the air-fuel mixture due to an increase in air density.

Referring now to FIGS. **2** and **3,** a housing **156** encloses a thermostat **158** subjected to engine operating temperatures — for example, by passing air in heat exchange relationship with engine exhaust gases and then through housing **156.** Thermostat **158** positions a shaft **160** to which a thermostat lever **162** is secured. A link **164** extends from thermostat lever **162** to an intermediate lever **166** pivotally mounted about a cold enrichment shaft **168.** It is well to point out that thermostat lever **162** is shown in FIG. 2 in a position corresponding to a hot start, with counterclockwise rotation of lever **162** corresponding to cooling of the engine.

A vacuum break lever **170** is secured to cold enrichment shaft **168** and has a tang **172** engaged by an arm **174** of lever **166.** A link **176** extends from vacuum break lever **170** and is received in a slot **178** formed in the plunger **180** of a vacuum break unit **182.**

Vacuum break unit **182** includes a diaphragm **184** biased toward the position shown by a spring **186.** The vacuum chamber **188**, defined between the right side of diaphragm **184** and a cover member **190**, is subjected to the manifold vacuum in mixture outlet **16** downstream of throttle **18**. A chamber **192**, defined between the left side of diaphragm **184** and a cover member **194**, is subjected to atmospheric pressure. As soon as the engine starts, or after a suitable time delay provided by conventional time delay units, diaphragm **184** is pulled rightwardly against the bias of spring **186**. A washer **196**, secured to diaphragm **184**, then pulls a cup member **198** toward the right. This compresses a spring **200** to pull plunger **180** toward the right. Link **176** is thus moved rightwardly to rotate vacuum break lever **170** and cold enrichment shaft **168** in a clockwise direction — the degree of rotation being limited by abutment of tang **172** with arm **174** when the force exerted by spring **200** is balanced by the force exerted by thermostat **158**. The resulting counterclockwise movement of a cold enrichment lever **202**, shown in FIG. **1** and secured to cold enrichment shaft **168**, carries pivot pin **68** extending therefrom and thus moves lever **64** to increase the lever arm defined between link end **110** and pivot pin **68**. This reduces travel of metering rod **80** in jet **98** for equivalent movement of air valve **22** and thus leans the air-fuel mixture after the engine starts.

As thermostat **158** is thereafter warmed during engine operation, thermostat lever **162** is rotated clockwise as viewed in FIG. **3** to the position shown in FIG. **2** corresponding to a warm engine. Lever **162** then acts through link **164** to rotate intermediate lever **166** clockwise as viewed in FIG. **3** to the position shown in FIG. **2**. This permits further clockwise rotation of vacuum break lever **170** and cold enrichment shaft **168** under the force imparted by vacuum break unit **182** which thus imparts counterclockwise rotation to a cold enrichment lever **202** as viewed in FIG. **1**. The resulting counterclockwise movement of pin **68** carried by cold enrichment lever **202** on enrichment shaft **68** moves lever **64** with respect to link **60** and thus increases the lever arm defined between link end **110** and pivot pin **68**. This increase in the lever arm reduces the travel of metering rod **80** in jet **98** for equivalent movement of air valve **22** to lean the air-fuel mixture as the engine warms. This will continue as the engine warms until a tang **204** on vacuum break lever **170** engages an adjustable stop **206** as shown in FIG. **2**.

As thermostat **158** cools after engine operation, thermostat lever **162** is rotated counterclockwise from the position shown in FIG. **2** to that shown in FIG. **3**. Lever **162** then acts through link **164** to rotate intermediate lever **166** counterclockwise as viewed in FIGS. **2–3**. At a selected temperature, arm **174** on lever **166** engages tang **172** on vacuum break lever **170** to move lever **170**, and thus cold enrichment shaft **168**, counterclockwise away from stop **206**. This imparts clockwise rotation to cold enrichment lever **202** as viewed in FIG. **1**, and the resulting clockwise movement of pivot pin **68** shifts lever **64**. As lever **64** is shifted, metering rod **80** is raised to provide increased fuel flow for cold start. In addition, the lever arm defined between link end **110** and pivot pin **68** is decreased to provide increased travel of metering rod **80** in jet **98** for equivalent movement of air valve **22** and thus provide an enriched air-fuel mixture for cold operation.

Referring now to FIGS. **2** through **6**, a link **208** extends from intermediate lever **166** and is received in an arcuate slot **210** of a fast idle cam member **212** pivoted on the carburetor by means of a pin **213**. Fast idle cam member **212** has a series of steps **214** — or alternatively a smoothly contoured surface — abutted by a cam follower tang **215** which extends from a fast idle lever **216** pivoted on throttle shaft **20**.

A fast idle adjusting screw **217** is threadedly carried by a tang **218** of fast idle lever **216**. Screw **217** abuts a rounded end **222** of an abutment arm **224** extending from an auxiliary throttle lever **226** secured to throttle shaft **20**. The function of fast idle adjusting screw **217** is to allow adjustment of the amount of throttle opening during engine idling, in order to limit the idle speed. Adjustment is provided by turning screw **217** which repositions lever **226**, throttle shaft **20** and throttle **18** in relation to the fast idle lever **216** which, through follower tang **215**, engages and is limited by fast idle cam **212**.

A link **228** extends from throttle lever **226** and is received in an arcuate slot **230** of an air valve lever **232** secured to air valve shaft **24**. A tang **234** on air valve lever **232** carries an idle mixture adjusting screw **236** which engages an arm **238** extending from fast idle cam **212**. The function of idle mixture adjusting screw **236** is to allow adjustment of the amount of air valve opening when the throttle is closed and the engine is idling. This determines the vacuum in the metering zone **44** which in turn establishes the amount of fuel flow thereto. Adjustment is provided by turning screw **236** when it engages arm **238** of cam **212**, whereby air valve lever **232**, shaft **24** and air valve **22** are moved in relation thereto. For example, as screw **236** is turned it moves tang **234** from arm **238** and thereby rotates lever **232**, shaft **24** and air valve **22** counterclockwise. This opens the air valve and reduces the vacuum in the metering zone **44** therebelow thereby reducing the amount of fuel flow thereto to lean the idle mixture. Alternatively, if screw **236** is backed off from arm **238** it allows air valve **22** to close thereby increasing the metering signal to increase fuel flow and richen the idle mixture.

Link **228** is provided so that as auxiliary throttle lever **226** is rotated counterclockwise as throttle **18** approaches a wide open throttle position, link **228** is pulled downwardly to provide counterclockwise rotation of air valve lever **232** and air valve shaft **24** to assist in opening air valve **22**. When needed to unload a flooded engine, throttle **18** can be opened completely. This rotates lever **226** counterclockwise and link **228** then opens air valve **22** partially so that little, if any, vacuum is produced in region **44** and fuel flow is minimized thereby.

Auxiliary throttle lever **226** is urged in the clockwise or throttle closing direction by a torsion return spring **240** loosely wound around throttle shaft **20** and engaging both throttle lever **226** and an ear **242** on fast idle lever **216**. Spring **240** imparts counterclockwise torsion to fast idle lever **216** and clockwise torsion to auxiliary throttle lever **226** to ensure that fast idle adjusting screw **217** will engage arm **224** of auxiliary throttle lever **226**.

Stop ear **242** of fast idle lever **216** abuts a fast idle lever stop **244** cast in carburetor **10** to limit the counterclockwise movement of fast idle lever **216**.

As best shown in FIGS. **4** and **5**, a fast idle cam weight **252** is secured by a ratchet pin **250** to fast idle cam **212**. The weight **252** gravitationally biases the fast idle cam **212** counterclockwise to the upright position shown in FIGS. **2** and **4.**

As thermostat **158** is warmed during engine operation, thermostat lever **162** and link **164** pull intermediate lever **166** in a clockwise direction, as viewed in FIGS. **2–3.** This pushes link **208** downwardly and leftwardly to permit counterclockwise movement of fast idle cam member **212,** under the bias of weight **252,** from the FIG. **3** position toward the FIG. **2** position. Cam follower tang **215** may then engage the lower step **214** on fast idle cam member **212,** permitting further movement of lever **216,** auxiliary throttle lever **226,** and throttle shaft **20** to allow throttle **18** to close to reduce engine idle speed.

As shown in FIG. **2,** when the engine is hot thermostat **158** positions thermostat lever **162,** link **164,** intermediate lever **166,** link **208,** and fast idle cam member **212** so that arm **238** on cam **212** is engaged by idle mixture adjusting screw **236.** This limits movement of air valve lever **232** and air valve shaft **24** in the clockwise or air valve closing direction to prevent an overly rich idling air-fuel mixture.

As the engine temperature decreases after the engine stops, thermostat **158** rotates thermostat lever **162** counterclockwise to lift link **164** and rotate intermediate lever **166** counterclockwise. Link **208** is then pulled upwardly and rightwardly to attempt to rotate fast idle cam member **212** clockwise. If this happens cam follower tang **215** on fast idle lever **216** is then received on the high step **214** of fast idle cam **212** to limit clockwise movement in the throttle closing direction of fast idle lever **216,** auxiliary throttle lever **226** and throttle shaft **20.** Also, as cam **212** rotates clockwise to a cold position screw **236** will disengage arm **238** to enrich the cold start idle mixture by allowing the air valve to fully close thereby increasing the metering signal in metering zone **44.** However, mechanical friction may be sufficient to prevent thermostat **158** from resetting the linkage and allowing air valve **22** to close. That is, friction may preclude sliding between arm **238** and idle mixture adjustment screw **236.**

To preclude this so that the air valve may fully close for cold start enrichment a novel means for releasing the arm from under the idle mixture adjusting screw is provided. The release means comprises a canted spring **246** having a flat portion **247** attached to auxiliary throttle lever **226.** The canted configuration of spring **246** is best shown in FIG. **6,** where it can be seen that the spring further has a bent portion **248** obliquely canted from flat portion **247.** Bent portion **248** has a leading edge **249** which is disposed in the rotative path of pin **250** secured to cam **212.** It should be noted that edge **249** is the leading edge when lever **226** moves as the throttle is opened. Pin **250** extends perpendicularly and outwardly from the plane of rotation of fast idle cam **212** and is adapted for registration with bent portion **248** and edge **249** so that the spring and pin coact in a unidirectional ratcheting manner — in the throttle opening direction edge **249** engages pin **250** but in the throttle closing direction bent portion **248** rides or snaps over pin **250.**

In operation, when arm **238** supportingly engages adjustment screw **236** to hold the air valve open thus preventing the desired manner of cold start enrichment, throttle lever **226** may be moved counterclockwise as the throttle is opened to move spring **246** into the rotative path of pin **250.** As spring **246** moves counterclockwise leading edge **249** engages pin **250** as shown in FIG. **4** to move the pin and cam **212** clockwise. This repositions arm **238** from under idle mixture adjusting screw **236** to allow it and tang **234** to drop within a recessed notch portion **251** of arm **238.** Accordingly, air valve lever **232,** shaft **24** and air valve **22** rotate clockwise under the bias of air valve spring **26** thereby closing the air valve for subsequent cold start enrichment.

However, as auxiliary throttle lever **226** is rotated in a clockwise direction as the throttle closes, bent portion **248** of spring **246** slides or snaps over pin **250** in a unidirectional ratcheting manner without resetting the fast idle cam position. This allows cam **212** to be positioned by thermostat **158** in a conventional manner. Thus, it can be seen that the release means do not affect the conventional operation of fast idle cam **212.**

It should be noted that link **208** normally abuts the upper end **254** of arcuate slot **210** in fast idle cam **212** to position the cam. Counterweight **252** rotates cam **212** counterclockwise to the extent permitted by link **208** and slot **210.** Counterweight **252** and link **208** thereby coact to establish the position of the cam. At a selected temperature, arm **238** is positioned under idle mixture adjustment screw **236.** This occurs when cam **212** is near the position shown in FIGS. **2** and **4** and arm **238** is near the zenith of its arc whereby air valve **22** is then held slightly open in order to lean the idling mixture after the engine warms.

It is important to note that as the air valve is allowed to close beyond the idle position established by screw **236** and arm **238,** this repositions metering rod **80** in orifice **98** to restrict fuel flow therethrough, which would in and of itself not achieve the desired effect of cold start enrichment. However, this fuel flow restriction is more than compensated by the greatly reduced (subatmospheric) pressure which is obtained in region **44** as the air valve is allowed to close beyond its idle position. The increased metering signal achieved by closing the air valve predominates in comparison with the restriction of orifice **98** by metering rod **80** to increase fuel flow to the engine for cold start enrichment, which is the desired effect.

I claim:

1. An internal combustion engine carburetor comprising a passage for air flow to the engine, a throttle disposed in said passage and rotatable between closed and open positions for controlling air flow therethrough, an air valve disposed in said passage upstream of said throttle and defining a controlled pressure region in said passage intermediate said air valve and said throttle, said air valve being rotatable between idle and open positions, means controlling said air valve to maintain a substantially constant pressure in said region whereby its rotative position is a measure of the rate of air flow through said passage, means connected to said air valve for supplying fuel to the engine at a rate proportional to the rotative displacement of said air valve from said idle position and inversely proportional to the pressure in said region, a lever secured to said air valve for rotation therewith through a predetermined path, a stop member disposed in said path for limiting closing movement of said air valve to establish said idle position, and means connected to said throttle and engageable with said stop member during movement of said throttle from said closed position for moving said stop member out of said air valve lever path whereby said air valve may be closed beyond said idle position to a closed position to decrease the pressure in said region and thereby increase the rate of fuel flow through said fuel supplying means.

2. A carburetor comprising an air inlet assembly having a metering region defined therein, a throttle valve disposed in said air inlet assembly posterior said metering region, said throttle rotatable between closed and fully open positions, an air valve disposed in said air inlet assembly anterior said metering region, said air valve rotatable between idle and open positions, means connected to said air valve for supplying fuel to said metering region, the rate of fuel flow through said means being inversely proportional to the pressure occurring in said region and further being directly proportional to the rotative position of said air valve; means controlling said air valve to maintain a substantially constant pressure in said region whereby its rotative position is a measure of the rate of air flow through said air inlet, said means including a housing member extending from said carburetor, a cover member adapted for registration with said housing, a diaphragm secured between and partitioning said housing and said cover member into an atmospheric chamber and a vacuum chamber, means exposing said vacuum chamber to the pressure occurring in said metering region and further exposing said atmospheric chamber to atmospheric pressure, and means connecting said diaphragm to said air valve for controlling the position of said air valve in response to pressure occurring in said metering region; cam means rotatably disposed on said carburetor, said cam means having a stop member extending therefrom for rotation through a predetermined path; means responsive to operating temperature and operatively connected to said cam for positioning said cam means; means disposed in the rotative path of said cam means and connected to said throttle for limiting the closure of said throttle; a lever extending from said air valve and disposed in the rotative path of said stop for engaging said stop and holding said air valve open at said idle position; and air valve release means comprising an outwardly extending pin secured to said cam and a canted spring having a flat portion operatively connected to said throttle and further having a bent portion and leading edge associated therewith and disposed in the rotative path of said pin; whereby said spring is adapted for registration with said pin so that as said throttle is closed said bent portion of said spring rides over said pin in a unidirectional ratcheting manner without resetting the position of said cam so that said stop may retain and hold said air valve open at said idle position, and as said throttle is opened said leading edge of said spring engages said pin and rotates said cam to disengage said stop from said air valve lever whereby said air valve may be closed beyond said idle position to a closed position to decrease the pressure in said region and thereby increase the rate of fuel flow through said fuel supplying means for cold start enrichment.

3. For an internal combustion engine, an air valve carburetor comprising an air inlet assembly for providing air flow to the engine, said air inlet assembly having a metering region, a shaft extending through and pivoted in said air inlet assembly posterior said metering region, a throttle valve secured to said shaft and rotatable between closed and fully open positions for controlling air flow through said air inlet, an air valve rotatably disposed in said air inlet assembly anterior said metering region, said air valve rotatable between idle and open positions, means connected to said air valve for supplying fuel to said metering region, the rate of fuel flow through said means being inversely responsive to the pressure in said region and further being directly responsive to the rotative position of said air valve, means controlling said air valve to maintain a substantially constant pressure in said region whereby its rotative position is a measure of the rate of air flow through said air inlet, said means including a housing member extending from said carburetor, a cover member adapted for registration with said housing, a diaphragm secured between and partitioning said housing and said cover member into an atmospheric chamber and a vacuum chamber, means exposing said vacuum chamber to the pressure occurring in said metering region and further exposing said atmospheric chamber to atmospheric pressure, means connecting said diaphragm to said air valve for positioning said air valve; means responsive to operating temperature, a cam member pivoted on said carburetor; means operatively connecting said cam to said temperature responsive means for positioning said cam in response to operating temperature; a fast idle lever secured to said shaft and having a tang portion disposed in the rotative path of said cam for engaging said cam thereby limiting the closure of said throttle; an adjustment screw threadedly carried in said tang portion; an auxiliary throttle lever pivoted on said shaft and having an abutment arm with a rounded end disposed in the path of said adjustment screw, a torsion spring wound around said shaft and engaging said auxiliary throttle and fast idle levers for biasing said abutment arm and said adjustment screw into interengagement; an air valve lever secured to said air valve for positioning said air valve, said air valve lever having a tang portion, an idle mixture adjusting screw threadedly carried in said tang portion, a link connected at one end to said auxiliary throttle lever and having another end disposed in a slot formed in said air valve lever for opening said air valve from said idle position only when said throttle is fully open; a stop member extending outwardly from said cam for engaging said idle mixture adjusting screw when said operating temperature is above a selected value, said stop thereby limiting the closure of said air valve at said idle position; a canted spring having a flat portion secured to said fast idle lever and further having a bent portion extending towards said cam and a leading edge associated therewith; and a pin secured to and extending from said cam and disposed in the rotative path of said leading edge and said bent portion; whereby said spring is adapted for registration with said pin so that as said throttle is closed said bent portion of said spring rides over said pin in a unidirectional ratcheting manner without resetting the position of said cam so that said stop may engage said idle mixture adjusting screw and support said air valve lever thereby holding said air valve open to said idle position, and as said throttle is opened said leading edge of said spring engages said pin and rotates said cam to disengage said arm from said idle mixture adjusting screw so that said air valve may be closed beyond said idle position to a closed position to decrease the pressure in said region and thereby increase the rate of fuel flow through said fuel supplying means for cold start enrichment.

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