May 24, 1966 H. H. DIETRICH ETAL 3,252,450

MECHANISM FOR REDUCING UNBURNED HYDROCARBON EMISSION

Filed Oct. 18, 1963 3 Sheets-Sheet 1

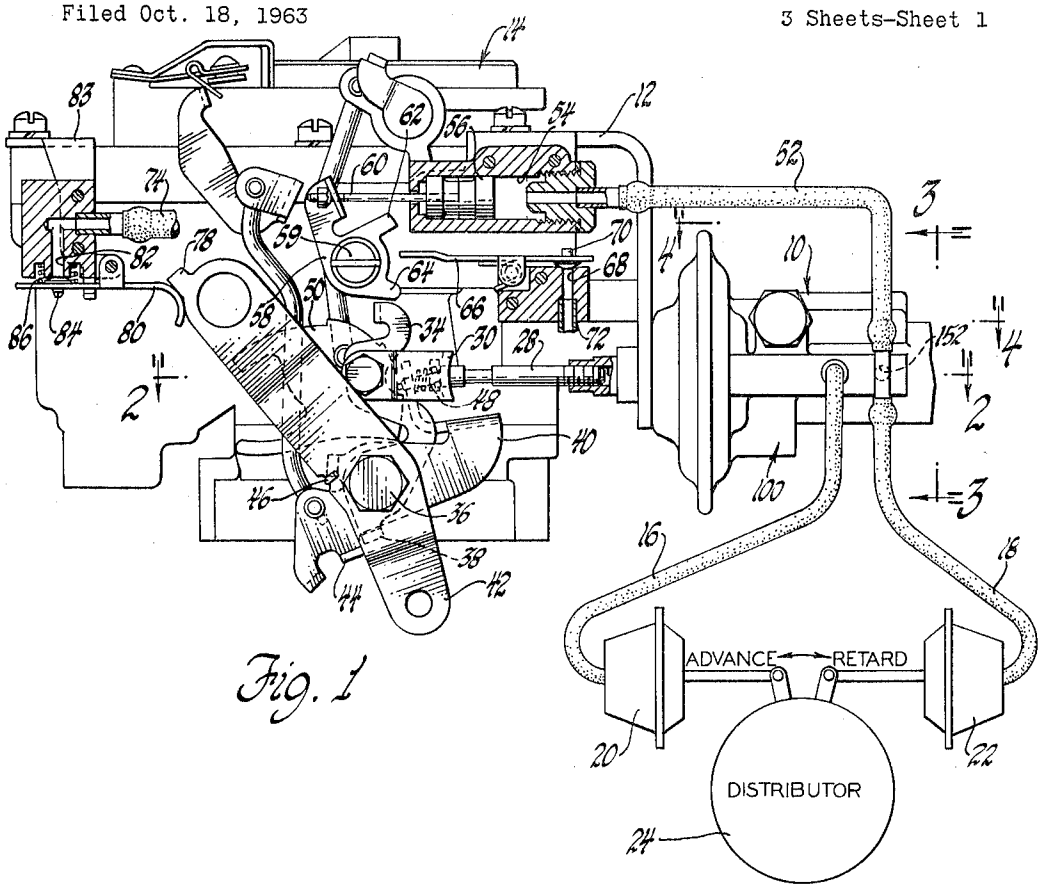


Fig. 1

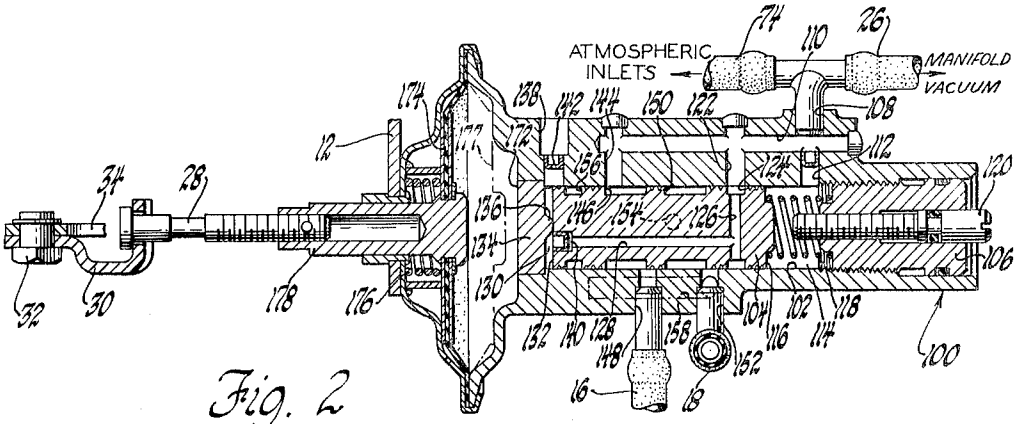


Fig. 2

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MECHANISM FOR REDUCING UNBURNED HYDROCARBON EMISSION

Filed Oct. 18, 1963 3 Sheets-Sheet 2

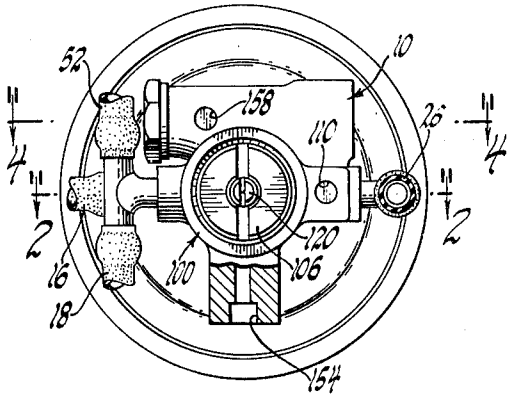


Fig. 3

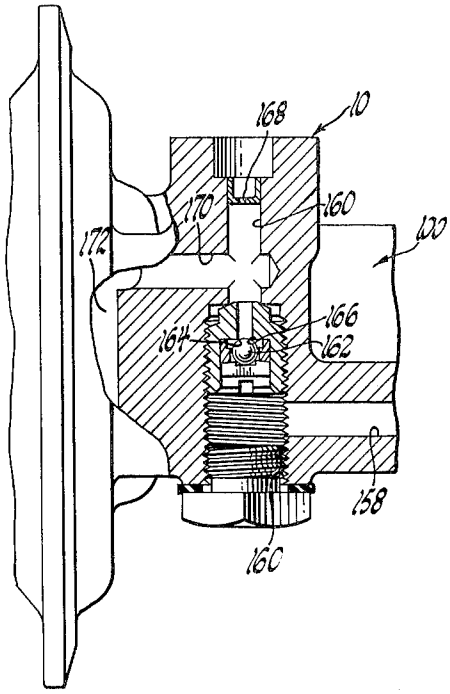


Fig. 4

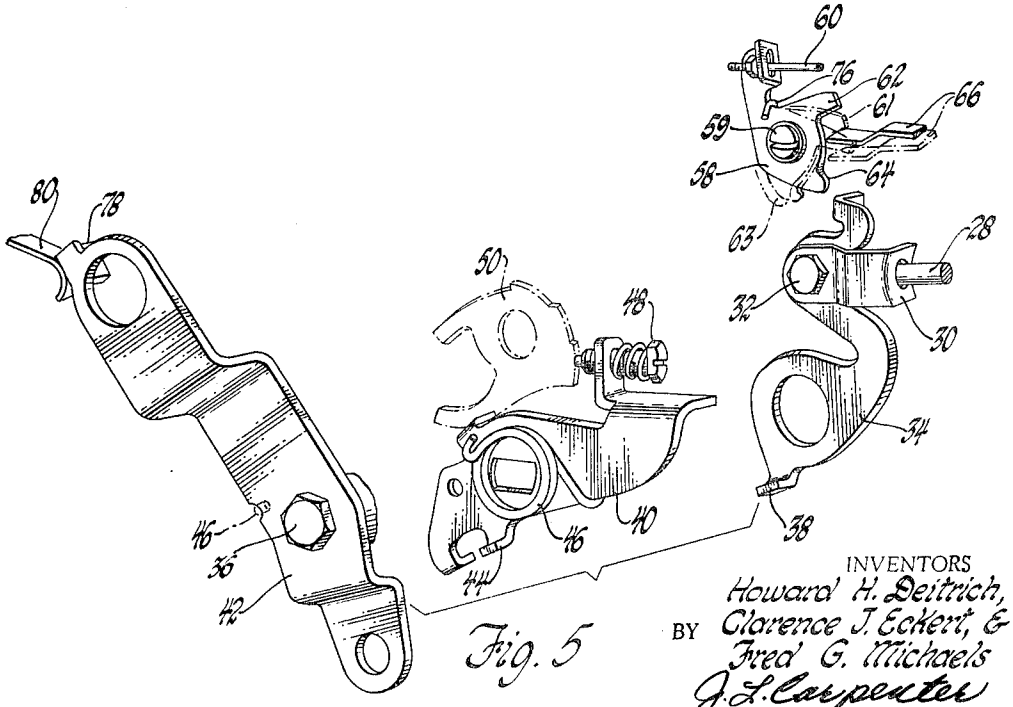


Fig. 5

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MECHANISM FOR REDUCING UNBURNED HYDROCARBON EMISSION

Filed Oct. 18, 1963 3 Sheets-Sheet 3

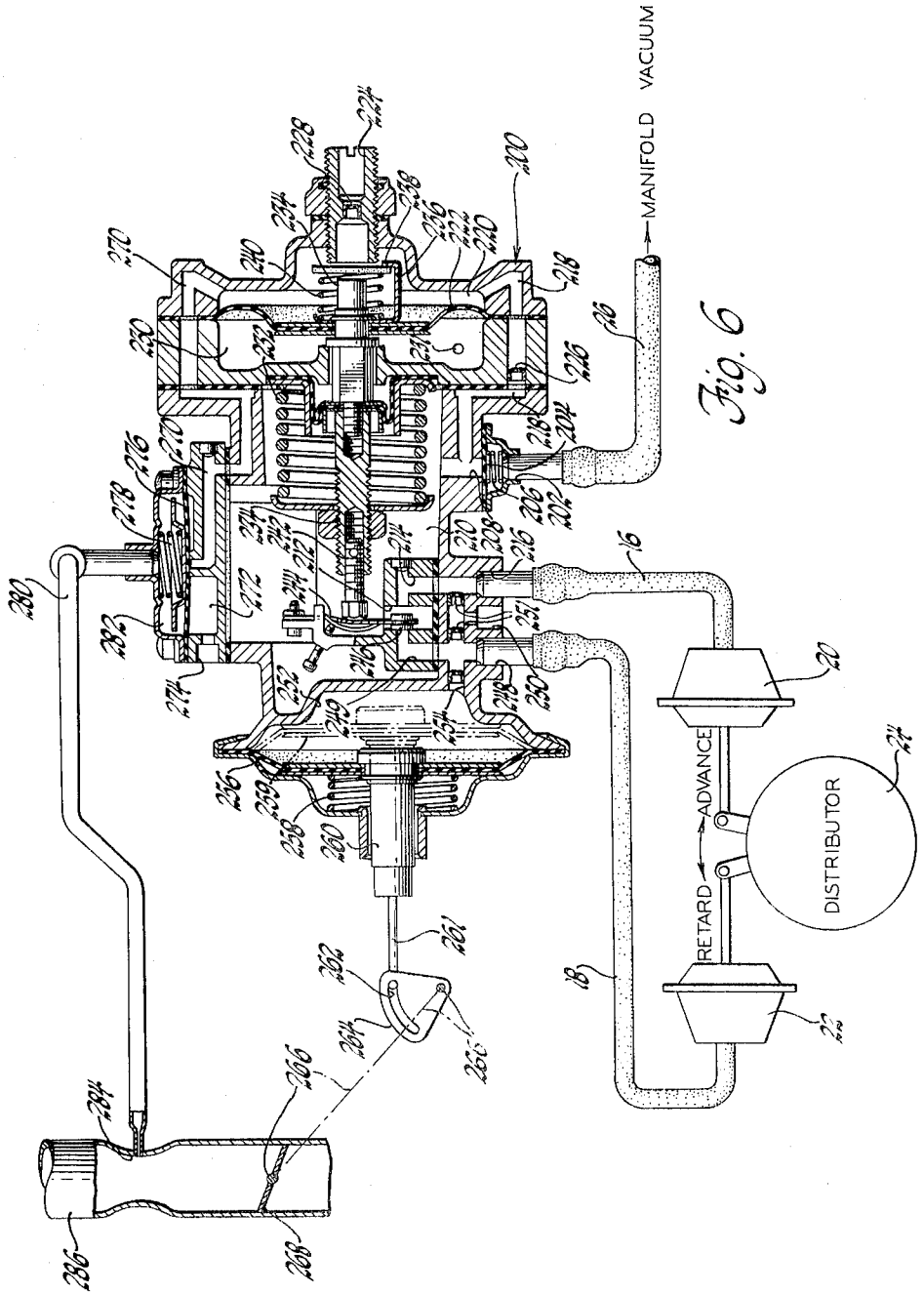


Fig. 6

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MECHANISM FOR REDUCING UNBURNED HYDROCARBON EMISSION

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4 Claims. (Cl. 123—117)

The present invention relates to a mechanism for reducing the amount of unburned hydrocarbon presently emitted from internal combustion spark ignition engines and is sepecifically directed to a mechanism which opens the throttle valve slightly to provide a more combustible fuel mixture during deceleration of the engine. Since a high percentage of the unburned hydrocarbons emitted from such an engine are emitted during deceleration, the present invention accomplishes a considerable reduction in unburned hydrocarbon emission.

The present invention constitutes an improvement over the disclosure of United States Patent No. 3,027,884 issued in the names of M. E. Bale, Jr., and D. G. Guetersloh. The Bale and Guetersloh patent discloses a mechanism adapted to open the throttle valve and retard the spark in response to the high vacuum created during deceleration in the intake manifold of the engine. A more combustible fuel mixture is thereby provided during deceleration without transferring more power to the drive shaft. The several improvements of the present invention provide a mechanism more suitable for use in an automotive vehicle.

One of the difficulties encountered with the mechanisms previously available is their tendency to actuate in response to the high manifold vacuum created during low speed, light load engine operation, particularly in an automobile traveling slightly downhill. Such actuation is undesirable since the distributor, instead of increasing engine power through spark advance, causes power absorption through spark retard. The present invention prevents such importune actuation by providing means to admit atmosphere to the vacuum operated mechanism whenever the throttle valve is held open by the normal foot pedal control. The admission of atmosphere prevents the vacuum from rising to the value at which the mechanism would actuate.

Another of the difficulties encountered with the mechanisms previously available is their tendency to cycle in response to its effect on the the combustion process. That is, the mechanism, in response to high manifold vacuum, opens the throttle valve, thereby providing a more combustible fuel mixture, but also reducing the manifold vacuum. The mechanism then, in response to reduction of the manifold vaccum, closes the throttle valve, causing the manifold vacuum to increase. When the manifold vacuum reaches the value at which the mechanism actuates, the throttle valve is again opened, starting another cycle. The present invention prevents such cycling by providing means to admit atmosphere to the vacuum operated mechanism in response to closure of the throttle valve by the mechanism. The admission of atmosphere prevents the vacuum from increasing to the value at which the mechanism actuates, thereby preventing the mechanism from starting a second cycle.

A further difficulty encountered with the mechanisms previously available is their tendency to close the throttle valve very suddenly. A sudden closing of the throttle valve often causes stalling of an engine which is connected to an automatic transmission. The present invention incorporates in the mechanism a ball check valve which causes a gradual closing of the throttle valve.

The details as well as other objects and advantages of the present invention will be apparent from the accompanying description and the drawings in which:

FIGURE 1 is a view, partially in section with parts broken away, showing the mechanism mounted on a carburetor and schematically illustrating the connection to a distributor;

FIGURE 2 is an enlarged sectional view of the valve mechanism, taken along lines 2—2 of FIGURES 1 and 3;

FIGURE 3 is an enlarged view of the valve mechanism, partially in section with parts broken away, taken along line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged view partially in section with part broken away, showing the ball check valve included in the valve mechanism, taken along the lines 4—4 of FIGURES 1 and 3;

FIGURE 5 is an exploded view of the lever arrangement show in FIGURE 1; and

FIGURE 6 is a sectional view of an alternative embodiment of the valve mechanism shown in FIGURE 2, schematically illustrating the connections to a throttle valve and distributor.

Referring first to FIGURE 1, the valve mechanism **10** is mounted on the carburetor **14** by a bracket **12**. Hoses **16** and **18** connect valve mechanism **10** to servo mechanisms **20** and **22** which control the distributor **24**.

The construction of distributor **24** may be that disclosed in the aforementioned Bale and Guetersloh patent. Generally speaking, valve mechanism **10** is designed to supply vacuum from the intake manifold of the engine (not shown) to either hose **16** or **18**. When manifold vacuum is supplied through hose **16** to servo mechanism **20**, distributor **24** advances the spark. When manifold vacuum is supplied through hose **18** to servo mechanism **22**, distributor **24** retards the spark.

The construction of valve mechanism **10** is shown in FIGURE 2. A housing **100** has a bore **102** in which a piston **104** is contained. Bore **102** is closed at one end by a threaded plug **106**. A hose **26** provides an air flow conduit from a port **108** in housing **100** to the intake manifold. Passages **110** and **112** provide an air flow conduit between port **108** and a chamber **114** formed by more **102**, the end of plug **106**, and the face **116** of piston **104**.

Manifold vacuum passes through port **108** and passages **110** and **112**, enters chamber **114** and acts on face **116** of piston **104** against the force of a spring **118**. When the force of spring **118** is overcome, piston **104** moves to the right. The force of spring **118** can be regulated by axial movement of threaded plug **106** in bore **102**. Overtravel of piston **104** can be prevented by axial movement of a stud **120** threaded through plug **106**.

While piston **104** remains in the position shown, passages **122** and **110** provide an air flow conduit to port **108** from an annular chamber **124** formed between piston **104** and bore **102**. Passages **126** and **128** provide an air flow conduit through piston **104** to annular chamber **124** from a chamber **130** formed by bore **102**, the face **132** of piston **104**, and a plug **134** closing the end of bore **102**. A projection **136** on plug **134** spaces face **132** of piston **104** from plug **134**. A vent **138** admits atmosphere to chamber **130**.

Manifold vacuum passes through port **108**, passages **110** and **122**, annular chamber **124**, and passages **126** and **128**, enters chamber **130** and combines with the atmosphere entering through vent **138** to produce a subatmospheric pressure in chamber **130**. The value of the subatmospheric pressure may be regulated by the relative sizes of restrictions **140** and **142** located in passage **128** and vent **138**, respectively. The subatmospheric pressure acts on face **132** of piston **104**, complementing the force of spring

of spring **118** and resisting the movement of piston **104** toward the right.

When the manifold vacuum becomes sufficiently high to overcome the force of the subatmospheric pressure in chamber **130** and the force of spring **118**, piston **104** moves to the right and interrupts the air flow from annular chamber **124** to passage **122**. Therefore, air can no longer flow from chamber **130**, and the pressure therein becomes atmospheric. Atmospheric pressure in chamber **130** provides less resistance to movement of piston **104** toward the right and, conversely, more resistance to movement of piston **104** toward the left. Thus, the manifold vacuum required to move piston **104** to the right being greater than that existing when piston **104** returns to the position shown by a predetermined increment, a differential pressure piston is provided which operates as a valve as described below.

While piston **104** remains in the position shown, passages **144** and **110** provide an air flow conduit to port **108** from an annular chamber **146** formed between piston **104** and bore **102**. A port **148** in housing **100** provides an air flow conduit between annular chamber **146** and hose **16**. Manifold vacuum passes through port **108**, passages **110** and **144**, annular chamber **146**, port **148**, and hose **16** and enters servo mechanism **20** which then causes distributor **24** to advance the spark.

Also, while piston **104** remains in the position shown, a vent **154** admits atmosphere to an annular chamber **150** formed between piston **104** and bore **102**. A port **152** in housing **100** provides an air flow conduit between annular chamber **150** and hose **18**. Atmosphere passes through vent **154**, annular chamber **150**, port **152**, and hose **18** and enters servo mechanism **22** which then causes distributor **24** to advance the spark.

When high manifold vacuum moves piston **104** to the right, the flow of atmosphere into chamber **150** is interrupted. Instead, passages **122** and **110** provide an air flow conduit to port **108** from annular chamber **150**. Manifold vacuum passes through port **108**, passages **110** and **122**, annular chamber **150**, port **152**, and hose **18** and enters servo mechanism **22** which then causes distributor **24** to retard the spark.

Also, when high manifold vacuum moves piston **104** to the right, air flow from annular chamber **146** to passage **144** is interrupted. Instead, vent **154** admits atmosphere to annular chamber **146**. Atmosphere passes through vent **154**, annular chamber **146**, port **148**, and hose **16** and enters servo mechanism **20** which then causes distributor **24** to retard the spark.

Piston **104** thus operates as a valve, supplying manifold vacuum to servo mechanism **20** and atmosphere to servo mechanism **22** and advancing the spark when manifold vacuum is low and supplying vacuum to servo mechanism **22** and atmosphere to servo mechanism **20** and retarding the spark when manifold vacuum is high.

Also, when high manifold vacuum moves piston **104** to the right, an annular chamber **156**, formed between piston **104** and bore **122**, slides adjacent passage **144** to prevent the manifold vacuum present in passage **144** from causing piston **104** to bind in bore **102**.

Referring to FIGURE 4, passages **158**, **160**, and **170** provide an air flow conduit between annular chamber **150** and a chamber **172**. Located in passage **160** is a ball check valve **162**, the seat **164** of which is nicked, as at **166**. Air flow "downward" through valve **162** is unimpeded, whereas air flow "upward" through valve **162** is restricted to pass through nick **166** in seat **164**.

Passage **160** is open at one end to the atmosphere. The flow of atmosphere through passages **160** and **170** into chamber **172** is limited by a restriction **168** located in the end of passage **160**.

Referring again to FIGURE 2, chamber **172** is formed by clamping a flexible diaphragm **174** over the end of housing **100**. A spring **176** biases diaphragm **174** toward the right, against the force of the throttle return spring (not shown).

When high manifold vacuum moves piston **104** to the right, manifold vacuum passes through port **108**, passages **110** and **122**, annular chamber **150**, and passages **158**, **160**, and **170**, enters chamber **172** and combines with the atmosphere entering through passages **160** and **170** to produce a subatmospheric pressure, pulling diaphragm **174** toward the right to the position indicated by outline **177**.

When the manifold vacuum reduces and piston **104** returns to the position shown, atmosphere enters chamber **172** both through the open end of passage **160** and passage **170** and through vent **154**, annular chamber **150**, and passages **158**, **160**, and **170**. The flow of atmosphere "upward" through passage **160**, it will be remembered, is restricted to pass through nick **166** in seat **164** of ball check valve **162**. The flow of atmosphere into chamber **172** is slowed, therefore, by valve **162** and restriction **168**, and diaphragm **174** will return gradually to the position shown.

Secured to diaphragm **174** is a plunger **178** in which is threadedly received a stud **28**. As shown in FIGURE 5, stud **28** is slidably received through a hole in a bracket **30** which is rotatably connected by a pin **32** to a lever **34**. Lever **34** is rotatably mounted on the throttle valve shaft **36**. When diaphragm **174** is pulled by high manifold vacuum toward the right, stud **28** and bracket **30** move with it, rotating lever **34** clockwise about shaft **36**. A tang **38** on lever **34** engages a lever **40**, secured to shaft **36**, and causes lever **40** and shaft **36** to also rotate clockwise. The clockwise rotation of shaft **36** opens the throttle valve (not shown). The throttle valve is thus opened in response to high manifold vacuum.

The throttle valve may also be opened by the normal foot pedal control (not shown) acting through a rod (not shown) to cause clockwise rotation of a throttle lever **42**. Throttle lever **42** then engages a tang **44** on lever **40** and causes a clockwise rotation of lever **40** and shaft **36**, thus opening the throttle valve.

When the foot pedal control causes counterclockwise rotation of throttle lever **42** away from tang **44** of lever **40**, lever **40** and shaft **36** are rotated counterclockwise by a spring **46**, and the throttle valve closes. Similarly, as diaphragm **174**, plunger **178**, and stud **28** move toward the left, the pressure brought by lever **34** through tang **38** against lever **40** is relieved, and spring **46** rotates lever **40** and shaft **36** counterclockwise, closing the throttle valve. Inasmuch as the movement of diaphragm **174** toward the left is gradual, the throttle valve is closed gradually.

Lever **40** is provided with a stud **48** which may bear against a fast idle cam **50** and hold the throttle valve open. Fast idle cam **50** is controlled in the usual manner.

Referring again to FIGURE 1, a hose **52** provides an air flow conduit between port **152** in housing **100** of valve mechanism **10** and a cylinder **54** mounted on bracket **12**. A pressure responsive piston **56** is located within cylinder **54**. When high manifold vacuum moves piston **104** to the right, manifold vacuum passes through port **108**, passages **110** and **122**, annular chamber **150**, port **152**, and hose **52** to cylinder **54**. Piston **56** is pulled toward the right and cocks a cam **58**, rotatably mounted on bracket **12** by a pin **59** and riding loosely on a rod **60** secured to piston **56**, into the position indicated by outline **61** in FIGURE 5.

When the manifold vacuum reduces and diaphragm **174** moves toward the left, spring **46** rotates levers **40** and **34** counterclockwise. Lever **34** engages a tang **64** on cam **58** in its cocked position **61** and rotates cam **58** further clockwise into the position indicated by outline **63**.

In position **63**, a tang **62** on cam **58** depresses a lever arm **66** of an inlet **68** mounted on bracket **12** as shown in FIGURE 1, thereby opening a stopper valve **70** to permit atmosphere to pass through inlet **68** and a hose

connection 72. Hose connection 72 connects with a hose 74 (not shown completely for the sake of clarity).

Hose 74 is connected to hose 26 leading from the intake manifold. Atmosphere present in hose 74 therefore flows to the intake manifold and to chamber 114 in valve mechanism 10 and causes a reduction in the value of the manifold vacuum. Inasmuch as the atmosphere enters hose 74 concurrently with the closing of the throttle valve, the manifold vacuum is prevented from increasing as the throttle valve closes. Valve mechanism 10 is thereby prevented from cycling and reopening the throttle valve.

When the foot pedal control rotates throttle lever 42 clockwise, lever 40 is rotated from tank 38 on lever 34, and the pressure of lever 34 against cam 58 is relieved. A spring 76 engaging cam 58 rotates cam 58 in the counterclockwise direction. Cam 58 slips away from lever 34, returning to the position shown.

When the foot pedal control rotates throttle lever 42 counterclockwise, a tang 78 on throttle lever 42 engages a lever arm 80 of an inlet 82 mounted by a bracket 83 on carburetor 14, as shown in FIGURE 1. Lever arm 80 closes a stopper valve 84, preventing atmosphere from passing through inlet 82 into hose 74 and permitting manifold vacuum to build up. When the foot pedal control rotates throttle lever 42 clockwise, and tang 78 does not bear against lever arm 80, stopper valve 84 is opened by a spring 86, admitting atmosphere through inlet 82 to hose 74 and reducing the manifold vacuum conveyed to chamber 114 in mechanism 10. Thus, as long as the throttle valve is opened by the foot pedal control through throttle lever 42, valve mechanism 10 is prevented from actuating. The importune actuation of valve mechanism 10 during low speed, light load engine operation is thereby prevented.

The construction of the alternative embodiment of valve mechanism 10 is shown in FIGURE 6. A housing 200 has a port 202. Hose 26 provides an air flow conduit between port 202 and the intake manifold of the engine.

Passages 208 and 218 provide an air flow conduit between port 202 and a chamber 220 formed between housing 200 and a flexible diaphragm 222. A vent 224 admits atmosphere to chamber 220.

Manifold vacuum passes through port 202 and passages 208 and 218, enters chamber 220 and combines with the atmosphere entering through vent 224 to produce a subatmospheric pressure in chamber 220. The value of the subatmospheric pressure in chamber 220 may be regulated by the relative sizes of restrictions 226 and 228 located in passage 218 and vent 224, respectively.

A vent 231 maintains the chamber 230 behind diaphragm 222 at atmospheric pressure. The difference in pressure on the two sides of diaphragm 222, atmospheric pressure in chamber 230 and subatmospheric pressure in chamber 220, tends to pull diaphragm 222 to the right against the force of a spring 232 acting through a plunger 234 secured to diaphragm 222.

A bracket 236 secured to diaphragm 222 supports a gasket 238. A spring 240 biases gasket 238 away from the end of plunger 234. When the manifold vacuum becomes sufficiently high to overcome the force of spring 232, diaphragm 222 moves toward the right. Plunger 234 and spring 240 push gasket 238 over vent 224 and close vent 224. Therefore, atmosphere can no longer enter chamber 220 and the pressure therein reduces to manifold vacuum. This value of manifold vacuum in chamber 220 provides less resistance to movement of diaphragm 222 to the right, and conversely, more resistance to movement of diaphragm 222 toward the left. Thus, the manifold vacuum existing when diaphragm 222 moves to the left being lower than that required to move diaphragm 222 to the right by a predetermined increment, a differential pressure diaphragm is provided which operates a valve as described below.

Threadedly received in the other end of plunger 234 is a stud 242 which bears against a spring 244. Spring 244 controls a valve 246 located within a passage 212.

Valve 246 is adapted to alternatively open either passage 214 or 249 to passage 212. A port 216 provides an air flow conduit between passage 214 and hose 16. A port 248 provides an air flow conduit between passage 249 and hose 18.

A vent 250 admits atmosphere to passages 214 and 249 through restrictions 251.

While diaphragm 222 and valve 246 remain in the position shown, manifold vacuum passes through port 202, passage 208, a chamber 210 formed by the interior of housing 200, passages 212 and 214, port 216, and hose 16, enters servo mechanism 20 and combines with the atmosphere entering through vent 250, passage 214, port 216, and hose 16 to create a subatmospheric pressure in servo mechanism 20. Servo mechanism 20 then causes distributor 24 to advance the spark.

Also, while diaphragm 222 and valve 246 remain in the position shown, atmosphere passes through vent 250, passage 249, port 248, and hose 18 and enters servo mechanism 22 which then causes distributor 24 to advance the spark.

When high manifold vacuum causes diaphragm 222 to move to the right, stud 242 moves to the right and releases spring 244. Spring 244 forces valve 246 to the right, closing passage 214 and opening passage 249. Manifold vacuum passes through port 202, passage 208, chamber 210, passages 212 and 249, port 248 and hose 18, enters servo mechanism 22 and combines with the atmosphere entering through vent 250, passage 249, port 248, and hose 18 to create a subatmospheric pressure in servo mechanism 22. Servo mechanism 22 then causes distributor 24 to retard the spark. Also, atmosphere passes through vent 250, passage 214, port 216, and hose 16 and enters servo mechanism 20 which then causes distributor 24 to retard the spark.

A valve mechanism is thus provided which supplies vacuum to servo mechanism 20 and atmosphere to servo mechanism 22 and advances the spark when manifold vacuum is low and which supplies vacuum to servo mechanism 22 and atmosphere to servo mechanism 20 and retards the spark when manifold vacuum is high.

It will be appreciated that valve 246 and spring 244 might be replaced by other devices, such as a slide valve suitably connected to plunger 234, which would alternatively open either passage 214 or 249.

When valve 246 moves to the right, an air flow conduit is provided between a chamber 252 and port 202 through passages 254, 249, and 212, chamber 210, and passage 208. Chamber 252 is formed by clamping a flexible diaphragm 256 over the end of housing 200. A spring 258 biases diaphragm 256 toward the right, against the force of the throttle return spring (not shown).

Secured to diaphragm 256 is a plunger 260 in which is threadedly received a member 261. When diaphragm 256 is pulled by high manifold vacuum toward the right to the position indicated by outline 259, member 261 moves with it.

As illustrated in FIGURE 6, member 261 is slidably received through a slot 262 in a lever 264 fixed on a shaft 266 which controls the throttle valve 268. When member 261 moves toward the right, lever 264 and shaft 266 are rotated clockwise, and throttle valve 268 opens. Slot 262 in lever 264 permits rotation of lever 264 by the normal foot pedal control (not shown) without interference from member 261.

It will be appreciated that the alternative embodiment of the differential pressure valve mechanism shown in FIGURE 6 and described above performs the same function as the valve mechanism disclosed in the aforementioned Bale patent. It will be further appreciated that the ball check valve, lever arrangement, and inlet mechanisms described above are easily connected to this

alternative embodiment and provide the same improvements with respect thereto.

Also disclosed in FIGURE 6 are means for preventing the valve mechanism from actuating in response to the high manifold vacuum created during a slight deceleration from high engine speeds. A passage **270**, a chamber **272** and a vent **274** provide a conduit to admit atmosphere to chamber **220**. Air flow between chamber **272** and passage **270** is normally interrupted by a diaphragm **276** biased by a spring **278** to seat across the opening of passage **270**.

A hose **280**, connected to the chamber **282** formed between housing **200** and diaphragm **276** and connected to the venturi nozzle **284** in an induction tube **286** of the carburetor **14**, permits the application of venturi vacuum against diahpragm **276**. At high speeds, when the venturi vacuum is high, diaphragm **276** will be moved "upward" from its seat across the opening of passage **270**, thereby allowing atmosphere to pass from chamber **272** through passage **270**. The admission of atmosphere into chamber **220** prevents the subatmospheric pressure therein from reaching the value at which the valve mechanism would actuate.

A valve **204** closed by a spring **206** is located in port **202** of housing **200**, as shown in FIGURE 6. Valve **204** provides a substitute means of reducing cycling of the valve mechanism.

The operation of valve **204** is such that when the pressure differential across valve **204** is sufficient to overcome the force of spring **206**, valve **204** opens and permits free air flow through port **202**. When that pressure differential is not sufficient to overcome spring **206**, valve **204** closes and acts as a restriction in port **202**, permitting only limited air flow therethrough. Thus, when high manifold vacuum is created, valve **204** opens and permits air flow through port **202**, diaphragm **222** is pulled to the right, valve **246** opens passage **249**, diaphragm **256** is pulled to the right, and throttle valve **268** is opened. The opening of throttle valve **268** reduces the manifold vacuum. Valve **204** then closes, thereby preventing rapid reduction of the vacuum within chambers **220** and **252**. Air flow into these chambers is restricted to flow about valve **204** and flow through restriction **251**. Such a flow delays the return of diaphragm **256** to the position shown and thereby delays the closure of throttle valve **268**. The manifold vacuum is thus kept at a low value, and the cycling tendency is reduced.

It will be appreciated that although valve **204** sacrifices some efficiency in that it can only reduce cycling whereas inlet **68** and the associated mechanism almost completely prevent cycling, valve **204** is a low cost device in comparison with inlet **68** and its required mechanism.

We claim:

1. A mechanism adapted to reduce emission of unburned hydrocarbons from a decelerating engine which has a rotatable distributor and a throttle valve secured upon a rotatable shaft, said mechanism comprising a first pressure responsive member, servo means, means to supply pressure to said member and servo means including valve means operable to regulate the pressure, said member being connectable to said throttle valve so as to open said throttle valve in response to a decrease in the pressure, said servo means being connectable to said distributor so as to retard the timing of said distributor in response to a decrease in the pressure, a second pressure responsive member to which manifold vacuum is supplied, said second member being connected to said valve means so as to operate said valve means to reduce the pressure supplied said first member and servo means in a predetermined range of manifold vacuum, inlet means adapted to supply atmosphere to said second member, stopper valve means closing said inlet means, and throttle lever means positioned about said shaft and adapted to drive said shaft in a throttle-opening direction, said throttle lever means being adapted to operatively contact said stopper valve means upon closure of said throttle valve whereby atmosphere is supplied to said second member to reduce the vacuum and prevent said second member from cycling and otherwise importunely operating said valve means.

2. A mechanism adapted to reduce emission of unburned hydrocarbons from a decelerating engine which has a rotatable distributor and a throttle valve secured upon a rotatable shaft, said mechanism comprising a first pressure responsive member, servo means, means to supply pressure to said member and servo means including valve means operable to regulate the pressure, said member being connectable to said throttle valve so as to open said throttle valve in response to a decrease in the pressure, said servo means being connectable to said distributor so as to retard the timing of said distributor in response to a decrease in the pressure, a second pressure responsive member to which manifold vacuum is supplied, said second member being connected to said valve means so as to operate said valve means to reduce the pressure supplied said first member and servo means in a predetermined range of manifold vacuum, inlet means adapted to supply atmosphere to said second member, stopper valve means closing said inlet means, a throttle lever adapted to rotate said throttle valve, and a throttle lever positioned about said shaft and adapted to drive said shaft in a throttle-opening direction, said throttle lever being connected to said stopper valve means so as to open said stopper valve means upon opening of said throttle valve by said throttle lever whereby atmosphere is supplied to said member to reduce the vacuum and prevent said member from importunely operating said valve means.

3. A mechanism adapted to reduce emissions of unburned hydrocarbons from a decelerating engine which has a rotatable distributor and a throttle valve secured upon rotatable shaft, said mechanism comprising a first pressure responsive member, servo means, means to supply pressure to said member and servo means including valve means operable to regulate the pressure, said member being connectable to said throttle valve so as to open said throttle valve in response to a decrease in the pressure, said servo means being connectable to said distributor so as to retard the timing of said distributor in response to a decrease in the pressure, a second pressure responsive member to which manifold vacuum is supplied, said second member being connected to said valve means so as to operate said valve means to reduce the pressure supplied said first member and servo means in a predetermined range of manifold vacuum, inlet means adapted to supply atmosphere to said second member, stopper valve means closing said inlet means, a throttle lever positioned about said shaft and adapted to drive said shaft in a throttle-opening direction, and means movable into the path of said lever to open said stopper valve means upon closure of said throttle valve by said first member whereby atmosphere is supplied to said second member to reduce the vacuum and prevent said second member from cycling.

4. A mechanism adapted to reduce emission of unburned hydrocarbons from a decelerating engine which has a rotatable throttle valve and distributor, said mechanism comprising a pressure responsive diaphragm, servo mechanisms, means to supply air to said diaphragm and servo mechanisms including a first valve operable to regulate the air pressure, said diaphragm being connectable to said throttle valve so as to rotate said valve in response to a change in the air pressure, said servo mechanisms being connectable to said distributor so as to rotate said distributor in response to a change in the air pressure, a ball check valve adapted to regulate the rate of change of the air pressure supplied to said diaphragm whereby a sudden closure of said throttle valve by said diaphragm is prevented, a piston to which manifold vacuum is supplied, said piston being connected to said first valve so as to operate said valve in response to changes in manifold vacuum, an inlet adapted to supply atmosphere to said

piston, a stopper valve closing said inlet, a lever arm controlling said stopper valve, a throttle lever adapted to rotate said throttle valve, a tang extending from said throttle lever, said tang adapted to engage said lever arm so as to open said stopper valve upon opening of said throttle valve by said throttle lever whereby atmosphere is supplied to said piston to reduce the vacuum and prevent said piston from importunely operating said valve, a second inlet adapted to supply atmosphere to said piston, a second stopper valve closing said second inlet, a second lever arm controlling said second stopper valve, a cam, and a lever connected to said diaphragm and adapted to engage said cam and cause said cam to engage said second

lever arm so as to open said second stopper valve upon closure of said throttle valve by said diaphragm whereby atmosphere is supplied to said piston to reduce the vacuum and prevent said piston from cycling.

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