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VACUUM CONTROLLED DAMPENING DEVICE FOR SECONDARY THROTTLES

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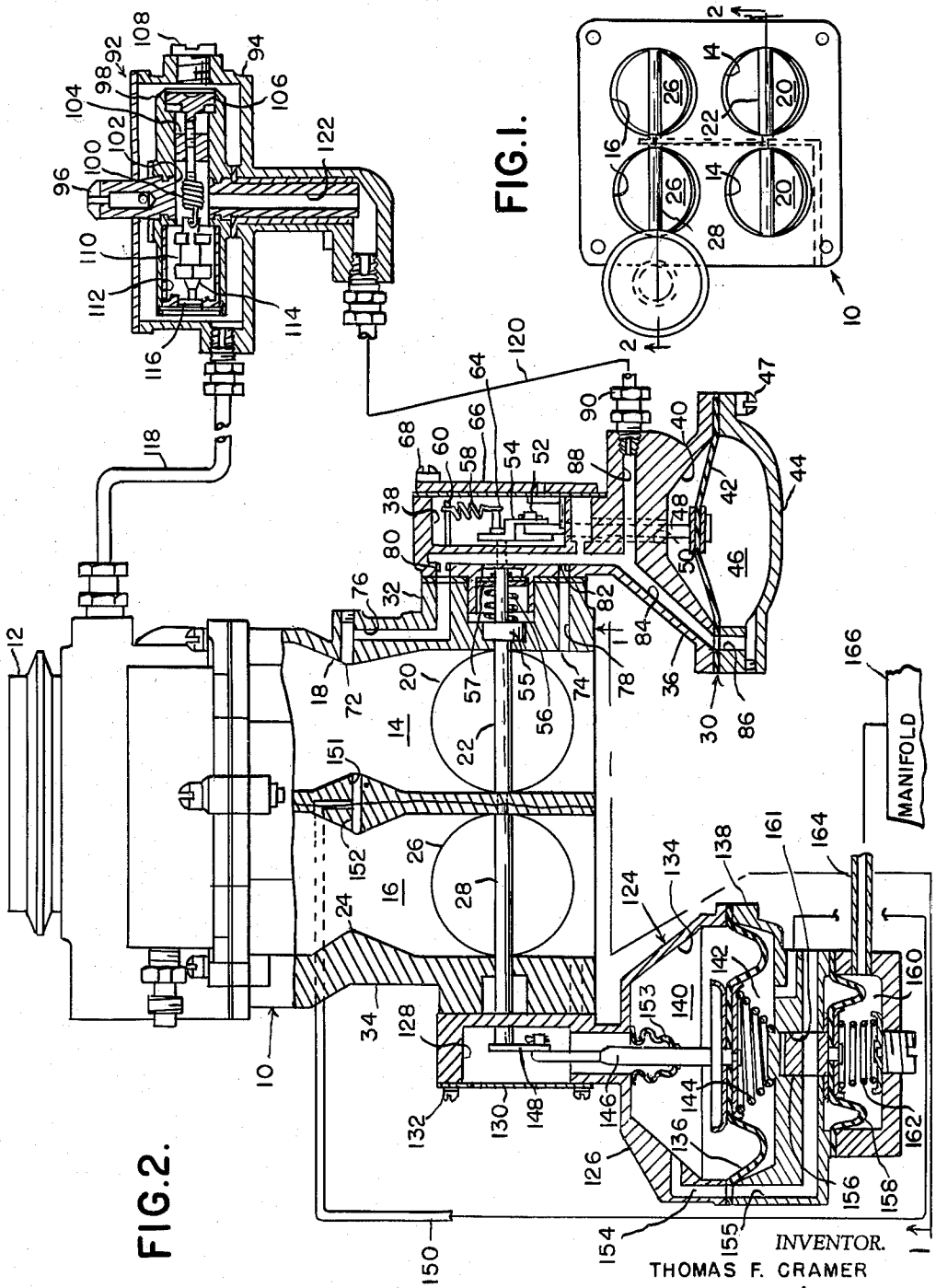


FIG. 1.

FIG. 2.

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VACUUM CONTROLLED DAMPENING DEVICE FOR SECONDARY THROTTLES

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The present invention relates to a dampening device in a multiple stage carburetion system effective to dampen or retard response of a secondary throttle under selected conditions.

A multiple stage carburetion system comprises an operator-controlled primary throttle plate assembly and a primary venturi vacuum controlled secondary throttle plate assembly which is operable to supply additional air flow to the combustion chambers at high speeds.

In engines having governing systems wherein at governed speed the primary throttle plate is automatically adjusted to restrict the fuel mixture to the combustion chambers, the subsequent movement of venturi-operated secondary plate is delayed and very quick, causing a compensating opening of the primary plate. The secondary plate in turn opens slightly due to the increased air flow through the primary venturi and repeated alternate adjustments or hunting of the primary and secondary plates result. This invention successfully prevents hunting by applying a dampening or resisting movement to the secondary plate so that its initial closing after governing is modified and resultant changing of the primary throttle plate is substantially eliminated.

In general terms the dampening action is the result of connecting the secondary throttle actuator to a member constituting one wall of a chamber, substantially but not completely sealing the chamber with its interior at ambient pressure so that movement of said member in either direction is opposed by a yieldable force. A controlled leakage to the chamber permits response at a controlled rate.

It is therefore an object of the present invention to provide in a governed, multiple-stage carburetion system means for eliminating the hunting which occurs at governed speeds.

It is a further object of the present invention to provide the secondary throttle plate assembly with means opposing exceptionally quick movement and subsequent hunting of the secondary throttle plate upon governed movement of the primary throttle plate.

It is a further object of the present invention to oppose exceptionally quick movement of the secondary throttle plate by connection thereof to a member constituting a movable wall of a pressure chamber, substantially sealing the chamber with fluid pressure therein at ambient pressure, and providing a controlled leak to determine the rapidity of response of said secondary throttle plate.

It is a feature of the present invention to provide a chamber having a movable wall, a passage connecting said chamber to atmosphere, a valve controlling said passage, means responsive to primary venturi vacuum to control movement of a secondary throttle plate, means connecting said movable wall to the secondary throttle plate, means responsive to engine manifold vacuum controlling said valve, and means providing a controlled leak between said chamber and atmosphere.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawing, illustrating a preferred embodiment of the invention, wherein:

FIGURE 1 is a schematic partial bottom plan view of a four-barrel carburetor provided with a governor and secondary dampening device, looking in the direction of the arrows 1—1, FIGURE 2.

FIGURE 2 is a sectional view on the line 2—2, FIGURE 1.

Referring now to the Figures, FIGURE 2 shows a four-barrel carburetor **10** having an air intake **12**, sectioned as shown in FIGURE 1 to expose one of the primary barrels **14** and one of the secondary barrels **16**. The primary barrels are provided with venturis **18** and include conventionally operated throttle plates **20** mounted on a shaft **22** extending across both primary barrels. The secondary barrels are provided with venturis **24** and throttle plates **26** mounted on shaft **28** which extends across both secondary barrels **16**.

While a particular four-barrel carburetor is shown for purposes of illustration, it will be apparent that the invention is equally applicable to two-barrel or other multi-stage carburetors.

A vacuum device **30**, commonly referred to as a governor diaphragm assembly, is mounted on the boss **32** extending from the carburetor throttle body **34**. The assembly **30** includes a body **36** formed to provide recesses **38** and **40**. The recess **40** is covered by a flexible diaphragm **42** which is secured to the body **36** by a cover member **44** formed to provide an air-tight chamber **46** of which the flexible diaphragm **42** forms a movable wall. The cover member may be secured by any suitable means such as screws **47**.

As shown in FIGURE 2, the diaphragm **42** has secured to the center thereof a rod **48** passing through opening **50** in the body **36** and having a laterally extending end **52** pivotally secured to a lever **54** which is rigidly secured to the end of the primary throttle shaft **22** extending into the chamber **38**. The shaft **22** is mounted in an anti-friction bearing **55**, and a spring **56** is disposed between the bearing **55** and washers **57** to provide a seal. A tension spring **58** attached between an adjustable pin **60** and a fixed pin **64**, secured to the lever **54**, tends to hold the primary throttle plate **20** in the open position. An atmospherically vented cover plate **66** may be secured by screws **68** to housing **36**, thereby protecting the mechanism within chamber **38**.

Means are provided for connecting the interior of chamber **46** to variable pressures. An orifice **72** in the throat of primary venturi **18** and an orifice **74** below the primary throttle plate **20** are connected by passages **76** and **78** having fixed restrictions **80** and **82** respectively with passage **84** in the body member and passage **86** in the cover member **44** leading to chamber **46**. A passage **88** connects passage **84** to a fitting **90**.

Located at any desired position on the engine is a governor valve assembly **92** comprising a stationary housing **94** adapted to be mounted on the engine and containing a shaft **96** driven in any suitable manner in proportion to engine or vehicle speed. Mounted for rotation with the shaft **96** is a laterally extending sleeve **98** having a spring **100** mounted within the axial passage **102** in the sleeve by attachment at one end to the internally threaded member **104**, which is keyed in passage **102**. Spring **100** is adjustable axially of sleeve **98** by turning the adjustment screw **106** which is reached by removing the access screw **108**. The other end of the spring **100** is secured to the governor weight **110** movable radially of shaft **96** within the chamber **112** against the spring **100** and having at the free end thereof a valve **114** adapted to close the orifice **116** when the weight **110** is forced outwardly due to the rotation of the shaft **96** and the sleeve **98** in accordance with engine speed. The engine or vehicle speed at which the orifice **116** will be closed

is dependent, of course, upon the adjustment of the spring **100**. It is apparent, also, that some other governor valve structure may be employed.

A vacuum balancing air bleed is provided through assembly **92** to chamber **46** when orifice **116** is uncovered. Conduit **118** between the air intake **12** of the carburetor **10** and the housing **94** and conduit **120** between the housing **94** and the passage **88** in the body **36** are provided so that when the engine or vehicle is operating at a speed insufficient to close the orifice **116**, engine vacuum will draw clean air through the conduit **118**, into the housing **94**, through the orifice **116** and into the chamber **112**, through the passage **102** and an axial passage **122** in the shaft **96** and thence through the conduit **120** to the governor diaphragm assembly **30**. When the engine reaches governed speed, the orifice **116** is closed and the air bleed through conduits **120** is cut off. When this occurs, vacuum in the chamber **46** urges the diaphragm **42** downwardly, as in FIGURE 2, against the spring **58** to close the primary throttle plates **20**.

A secondary throttle diaphragm assembly **124** is mounted at the opposite side of the throttle body **34**. This assembly comprises a body **126** having a recess **128** vented to the atmosphere through a plate **130** secured by screw **132** and a recess **134** closed by a flexible diaphragm **136** which is secured to the body **126** by means of a cover **138** formed to provide oppositely disposed chambers **140** and **142** between which the flexible diaphragm **136** forms a movable wall. The chamber **142** contains a compression spring **144** positioned between the cover **138** and diaphragm **136**. A rod **146** is secured to the center of the diaphragm **136** so that the spring **144** urges the rod **146** upwardly to rotate a lever **148** secured rigidly to the secondary throttle shaft **28** in a direction to close the secondary throttle plates **26**. A conduit **150** extending between the chamber **142** and the vacuum passages **151** and **152** opening into the throats of the primary and secondary venturis enables venturi vacuum to evacuate the chamber **142** and displace the diaphragm **136** downwardly, as in FIGURE 2, against the spring **144** to open the secondary throttle **26**. The force of the spring **144** is selected so that the secondary throttle plate **26** will be open at any predetermined venturi vacuum.

The structure described above, or its equivalents, is well known in the art, and proper governing action depends upon the particular closing of the throttle plates **20** and **26** when the engine or vehicle has reached a predetermined governing speed so as to diministh or cut off the flow of motive fluid to the engine. However, in the case of dual carburetion as described above, the automatic closing of the secondary throttle plates **26** lags behind that of the primary throttle plates **20**, particularly at governed engine speeds at which the secondary plates **26** are not fully open so that linkage (not shown) usually effective to positively close the secondary plates **26** with the primary plates **20** does not come into operation. While this is tolerable in the normal function of the dual carburetor, e.g., during acceleration, it is highly objectionable for the purposes of governing. This causes hunting, since the primary throttle plates have to first close farther than would otherwise be required to compensate for the open secondary plates and then open when the secondary plates finally close.

In order to remedy this, means are provided to retard response of the secondary throttle plates under selected engine conditions. For this purpose chamber **140** is sealed by a flexible boot **153**, and provided with a passage **154**. The cover **138** is provided with a passage **155** connected with the passage **154** and leading to atmosphere. If desired, passage **155** may, like passage **118**, be connected to the interior of the air flow passage of the carburetor below the air cleaner usually provided. Passage **155** is controlled by a valve **156** connected to flexible diaphragm **158** forming a chamber **160** with a recess in the cover **138**. The valve **156** is not held tightly in guide **161** so that, when the opening therethrough is moved out of axial alignment with the passage **155**, a restricted flow is permitted around the valve, thus performing a metering function. In some instances it might be of advantage to have an adjustable restriction bypassing the valve **156** so that the restricting action of both can complement each other. A compression spring **162** in the chamber biases valve **156** toward open position. A conduit **164** connects the interior of chamber **160** to a variable source of vacuum dependent on engine conditions. A desirable operation results when the conduit **164** is connected to the engine manifold, a portion of which is diagrammatically indicated at **166**.

With the foregoing construction, when a predetermined speed below governed speed is reached, the primary venturi vacuum overcomes spring **144** and opens the secondary throttle plate **26**. At this time, manifold vacuum is not sufficiently great to close valve **156**. Accordingly, air within the chamber **140** is not trapped and offers no resistance to movement of the diaphragm **136** in either direction.

However, when the speed increases to governed speed, bleed valve **114** closes and the combination of primary venturi and engine manifold vacuum move the primary throttle plate **20** toward closed position. This reduces primary venturi vacuum and increases engine manifold vacuum. The increase in engine manifold vacuum moves valve **156** toward closed position, thereby restricting the flow of air through passage **155**. Thus, abrupt movement of diaphragm **136** in neither direction is opposed and the force opposing movement of the diaphragm is yieldable and increases in magnitude in accordance with the amount of displacement. At the same time, air flow past the valve **156** permits a retarded movement of diaphragm **136**.

As will be apparent from an inspection of FIGURE 2, the boot **153** may be omitted if the chambers **128** and **140** are sealed from atmosphere by blocking the vent provided in the plate **130**.

In its broadest aspect, the dampening device disclosed herein is operable to provide a force opposing abrupt movement of a movable member from any intermediate position, the force being yieldable and of a magnitude which increases upon displacement of the member but which decreases with time.

The drawing and the foregoing specification constitute a description of the improved vacuum controlled dampening device for secondary throttles in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. In an engine carburetor having a throttle plate, means responsive to an engine condition comprising a movable wall connected to said throttle plate to adjust its position, said responsive means being dependent on engine load and speed, a dampening device including a chamber partly formed by said movable wall, means providing a passage from said chamber to atmosphere, valve means operable to establish and interrupt substantially free communication between said chamber and atmosphere, and means responsive to an engine vacuum condition controlling said valve means.

2. In an engine carburetor having a throttle plate, means responsive to an engine condition comprising a movable wall connected to said throttle plate to adjust its position, said responsive means being dependent on engine load and speed, a dampening device including a chamber partly formed by said movable wall, means providing a passage from said chamber to atmosphere, valve means operable to establish and interrupt substantially free communication between said chamber and atmosphere, and means responsive to engine manifold vacuum controlling said valve means.

3. A multi-stage carburetor having primary and sec-

ondary passages including respectively primary and secondary venturis and throttle plates therein, a speed responsive governor in control of said primary throttle, means responsive to venturi vacuum comprising a movable wall connected to said secondary throttle plate to adjust its position, a dampening device including a chamber partly formed by said movable wall, and a restricted passage connecting the interior of said chamber to atmosphere.

4. A multi-stage carburetor having primary and secondary passages including respectively primary and secondary venturis and throttle plates therein, a speed responsive governor in control of said primary throttle, means responsive to venturi vacuum comprising a movable wall connected to said secondary throttle plate to adjust its position, a dampening device including a chamber partly formed by said movable wall, a passage connecting the interior of said chamber to atmosphere, and valve means operable to establish and interrupt substantially free communication between said chamber and atmosphere.

5. A multi-stage carburetor having primary and secondary passages including respectively primary and secondary venturis and throttle plates therein, a speed responsive governor in control of said primary throttle, means responsive to venturi vacuum comprising a movable wall connected to said secondary throttle plate to adjust its position, a dampening device including a chamber partly formed by said movable wall, a passage connecting the interior of said chamber to atmosphere, valve means operable to establish and interrupt substantially free communication between said chamber and atmosphere, and means responsive to engine manifold vacuum connected to said valve means to control said valve means.

6. A multi-stage carburetor comprising primary and secondary barrels having respectively primary and secondary venturis and throttle plates therein, a governor connected to said primary throttle plate, a chamber having a movable wall connected to said secondary throttle, a passage connecting said chamber to venturi vacuum, means enclosing said movable wall to form therewith a second chamber, and a restricted passage connecting said second chamber to atmosphere.

7. A multi-stage carburetor comprising primary and secondary barrels having respectively primary and secondary venturis and throttle plates therein, a governor connected to said primary throttle plate, a chamber having a movable wall connected to said secondary throttle, a passage connecting said chamber to venturi vacuum, means enclosing said movable wall to form therewith a second chamber, a passage connecting said second chamber to atmosphere, and valve means selectively operable to establish and interrupt communication between the interior of said second chamber and atmosphere.

8. A multi-stage carburetor comprising primary and secondary barrels having respectively primary and secondary venturis and throttle plates therein, a governor connected to said primary throttle plate, a chamber having a movable wall connected to said secondary throttle, a passage connecting said chamber to venturi vacuum, means enclosing said movable wall to form therewith a second chamber, a passage connecting said second chamber to atmosphere, valve means selectively operable to establish and interrupt communication between the interior of said second chamber and atmosphere, and means responsive to engine manifold vacuum connected to said valve means.

9. A multi-stage carburetor comprising primary and secondary barrels having respectively primary and secondary venturis and throttle plates therein, a governor connected to said primary throttle plate, a chamber having a movable wall connected to said secondary throttle, a passage connecting said chamber to venturi vacuum,

means enclosing said movable wall to form therewith a second chamber, a passage connecting said second chamber to atmosphere, valve means selectively operable to establish and interrupt communication between the interior of said second chamber and atmosphere, and means responsive to engine manifold vacuum connected to said valve means and effective to close said valve means upon an increase in manifold vacuum following movement of said primary throttle plate toward closed position by operation of said governor.

10. In an engine having a movable throttle control member, actuating means for controlling the position of said control member, said actuating means being responsive to an engine condition which is a function of engine load and speed and including a chamber having a movable wall connected to said control member, means providing a slow leakage of air between the interior of said chamber and atmosphere, and valve means responsive to variations in engine vacuum for regulating the movement of said wall in response to changes in venturi vacuum in the throttle closing direction.

11. A multi-stage carburetor for an internal combustion engine, comprising a body, primary and secondary induction passages formed through said body, primary and secondary venturis formed respectively within said induction passages, primary and secondary throttle valves located respectively within said induction passages and adapted to control the flow of combustible mixtures therefrom to the intake manifold of said engine, means for manually controlling the position of said primary throttle valve, vacuum responsive means for controlling the position of said secondary throttle, said vacuum responsive means comprising a housing, a movable wall within said housing forming a first and second chamber therein, first conduit means communicating between said first chamber and a source of primary venturi vacuum, second conduit means communicating between said second chamber and a source of atmospheric pressure, and valve means responsive to variations in engine vacuum for regulating the degree of communication between said second chamber and said source of atmospheric pressure as afforded by said second conduit means.

12. A multi-stage carburetor for an internal combustion engine, comprising a body with primary and secondary induction passages therethrough and having respectively primary and secondary throttle valves therein controlling the flow of combustible mixtures to said engine, a venturi formed within said primary induction passage, means for manually controlling the position of said primary throttle valve, vacuum responsive means for controlling the position of said secondary throttle valve, said vacuum responsive means comprising a housing having a movable wall therein operatively connected to said secondary throttle valve and adapted to form at least one chamber, conduit means communicating between a source of venturi vacuum and said chamber, and valve means responsive to variations in engine vacuum for regulating the rate of movement of said wall in response to changes in venturi vacuum in the throttle closing direction.

13. In an engine carburetor having a throttle plate, means responsive to an engine condition comprising a movable wall connected to said throttle plate to adjust its position, said responsive means being dependent on engine load and speed, a dampening device including a chamber partly formed by said movable wall, means providing a restricted passage from said chamber to atmosphere, valve means operable to establish and interrupt substantially free communication between said chamber and atmosphere, and means responsive to an engine vacuum condition for controlling said valve means.

14. A multi-stage carburetor for an internal combustion engine, comprising a body, primary and secondary induction passages formed through said body, primary

and secondary venturis formed respectively within said induction passages, primary and secondary throttle valves located respectively within said induction passages and adapted to control the flow of combustible mixtures therefrom to the intake manifold of said engine, means for manually controlling the position of said primary throttle valve, vacuum responsive means for controlling the position of said secondary throttle valve, said vacuum responsive means comprising a housing, a movable wall within said housing forming a first and second chamber therein, conduit means communicating between said first chamber and a source of primary venturi vacuum, means providing a restricted passage from said second chamber to the atmosphere, and valve means operable to establish and interrupt substantially free communication between said second chamber and atmosphere, and means responsive to an engine vacuum condition for controlling said valve means.

15. A multi-stage carburetor defined in claim 14 wherein said last-named means is responsive to engine manifold vacuum for controlling said valve means.

16. A multi-stage carburetor defined in claim 14 wherein resilient means is provided in said first chamber for urging said movable wall in a direction to close the secondary throttle valve.

17. A multi-stage carburetor defined in claim 14 wherein said valve means includes a valve member having a passage therein, said valve member being connected to a flexible wall.

18. A multi-stage carburetor defined in claim 14 wherein said valve means includes a valve member connected to a diaphragm, said valve member having a valve passage therein, and resilient means biasing said diaphragm and valve member in a direction so as to move said valve passage to a position which permits unrestricted communication between the second chamber and atmosphere.

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