Jan. 16, 1962 R. R. GRIFFEN 3,017,167

ACCELERATING PUMP CHANNEL VAPOR PURGING SYSTEM

Filed Sept. 21, 1959 2 Sheets-Sheet 1

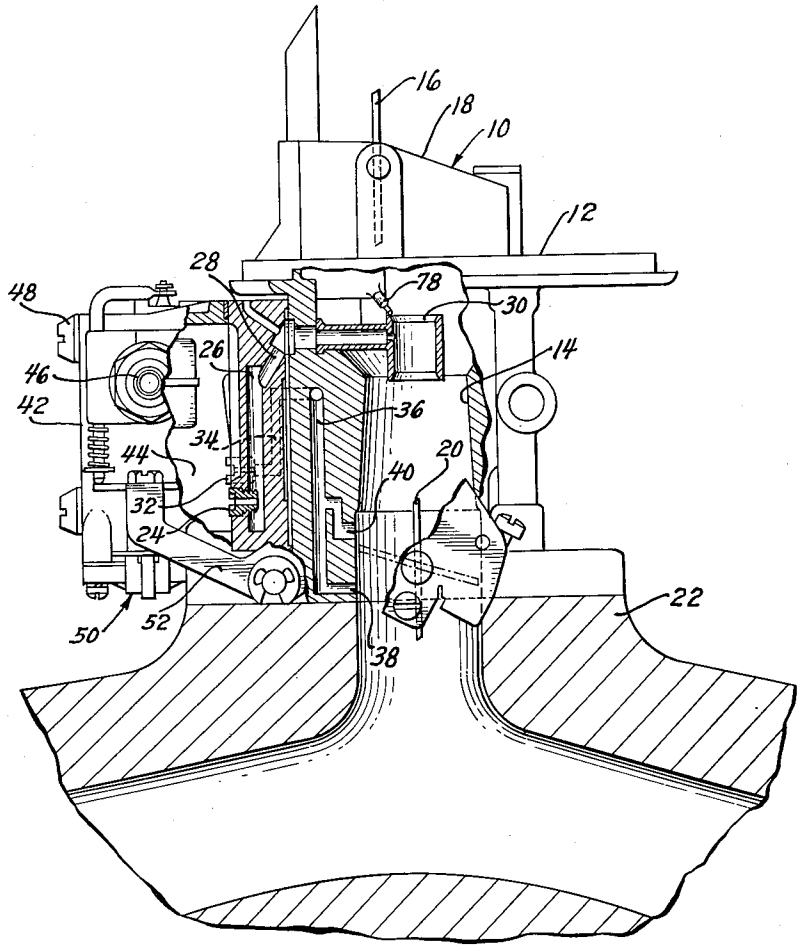


Fig. 1

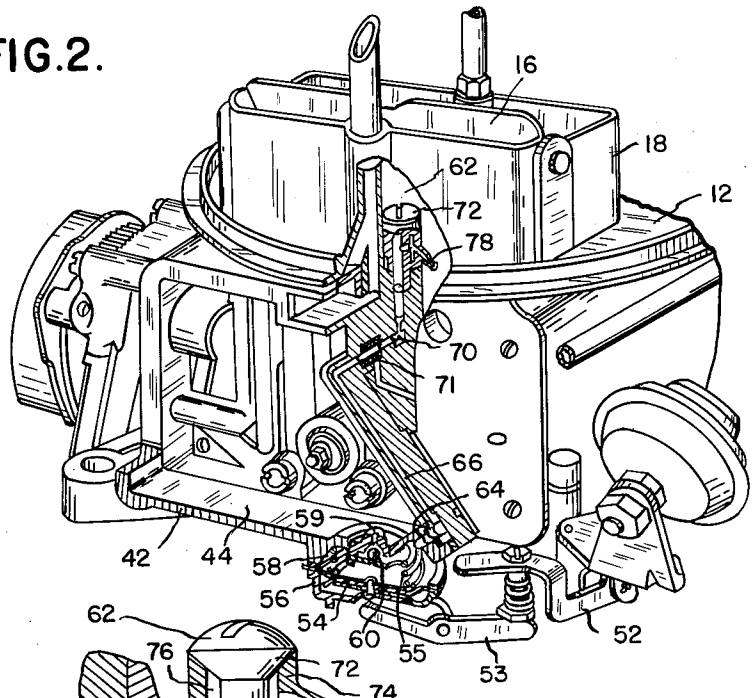
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FIG.2.



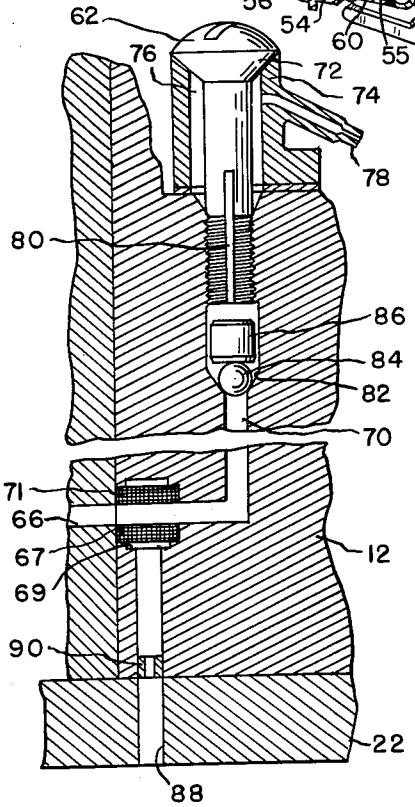


FIG.3.

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ACCELERATING PUMP CHANNEL VAPOR PURGING SYSTEM

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This invention relates generally to pumps and more particularly to accelerating pumps used in carburetors for internal combustion engines.

This invention further relates to porous means placed in series in an accelerating pump circuit to permit vaporous fuel to be purged from the pump channels, thereby permitting the channels to fill with liquid fuel. Such a circuit provides a pump channel vapor or gas purging system which is highly desirable where excessive heating of the engine causes the fuel to vaporize.

When an internal combustion engine is called upon to accelerate rapidly, the air flow through the carburetor responds almost immediately to the increased throttle opening; however, the fuel which is heavier than air, lags a substantial amount behind the increased air flow, thereby causing a leaning out of the fuel-air ratio. The accelerating pump is mechanically operated through the throttle linkage and is designed to correct this condition by supplying liquid fuel until the other fuel metering systems once again are providing the proper mixture.

The performance of accelerating pumps, in general, has been seriously impaired by fuel vapors trapped within the accelerating pump system. The presence of these vapors is attributed to those situations where an excessive amount of heat is created within the engine compartment, whether by a hot shut-down or prolonged idling of the engine. When vapor is trapped in the system, it displaces the volume therein which liquid fuel would normally occupy and therefore, when the accelerating pump is called upon to supply additional fuel under pressure into the mixing chamber of the carburetor, none will be supplied because of the absence of liquid fuel.

An object of this invention is to provide means for removing the fuel vapor located within the accelerating pump system.

A further object of this invention is to provide a porous element in series in the accelerating pump circuit at a point of high manifold vacuum to provide a large differential pressure between the inside and outside of the porous element to cause the vapor to pass through the pores of the element and retain the liquid fuel in the pores.

Another object of this invention is to overcome "vapor lock" which occurs in an internal combustion engine by utilizing porous means in series in the accelerating pump system which provides a pressure differential which purges the channels of vapor and permits the channels to fill with liquid fuel.

Still another object of the invention is to provide a simple, economical and efficient way to eliminate vapor lock in an internal combustion engine by incorporating a porous filter in series in the accelerating pump circuit at a point of high manifold vacuum to permit the vapor to pass through the pores which retain the liquid fuel.

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

FIGURE 1 is a side elevational view, with portions thereof cut away and in cross-section, of a carburetor embodying the invention.

FIGURE 2 is a perspective view of the carburetor, again with portions thereof cut away and in cross-section, and having the fuel bowl removed with the exception of the accelerating pump and associated linkage.

FIGURE 3 is an enlarged view of the accelerating pump nozzle and the porous filter element in cross-section, taken on a plane substantially through the center of the carburetor body and pump nozzle.

Referring now in greater detail to the drawings, FIGURE 1 illustrates a carburetor **10** having a body **12** with an induction passage **14** extending therethrough. The carburetor **10** is provided with the usual choke valve **16** controlling the entrance of the air intake **18** and throttle valve **20** controlling the flow of combustible mixture to the engine intake manifold **22**.

A main fuel system is defined by metering restriction **24**, conduits **26** and **28**, and nozzle **30**, which discharge as required within the induction passage **14**. An idle system having a minimum idle and a transfer portion is schematically comprised of restriction **32**, conduits **34** and **36**, and port **38** and slot **40** which discharge selectively below the throttle valve **20**. A fuel bowl **42**, defining a chamber **44** and having an inlet **46**, is secured as by screws **48** to the body **12** in such a manner to supply all the fuel systems with a source of fuel. An accelerating pump **50** is attached to the bottom of the fuel bowl **42** and is adapted to be actuated in a well known manner by levers **52** and **53** (shown in FIGURE 2) when the throttle **20** is opened. The accelerating pump **50** supplies the additional fuel for fast acceleration when the throttle valve **20** is suddenly opened.

FIGURE 2 illustrates the accelerating pump **50** as being comprised of a reinforced diaphragm **54** secured to the bottom of the fuel bowl **42** by a member **56** and thereby creating a chamber **58**. The diaphragm **54** is acted on by a return spring **55**. The chamber **58** communicates with chamber **44** of the fuel bowl **42** by means of passage **59** having a gravity actuated ball check valve **60**. Chamber **58** also communicates with the pump nozzle assembly **62** by means of conduits **64**, **66** and **70**.

A passage **88** having a restriction **90** therein leads from the engine intake manifold **22** to passage **66**. The passage **88** has an annular chamber **67** in which is located a porous filter element **71**, as is best shown in FIGURE 3. Another chamber, identified as numeral **69**, provides an annular space around the porous filter element **71** in which the vacuum from the engine intake manifold **22** or from another source of vacuum acts to provide large differential pressure between the inside and outside of the filter element **71** to permit vapor to pass from the channels or passages through the pores and to prevent passage of the liquid fuel, as will be explained in more detail later.

The porous element **71** may be made of any porous material which will provide a proper differential pressure. As an example, a powdered metal or a plastic material may be used. If a cylindrical powdered metal bushing or filter is used, the filter may be constructed of a relatively small size. As an example, the powdered metal filter could have an inside diameter of .127", an outside diameter of .253", and an overall length of .375". Element **71**, as illustrated, is annular and substantially fills the annular chamber **67**, as previously explained.

A screw **72** and housing **74** cooperatively defining a chamber **76** constitute the basic nozzle assembly. A nozzle **78**, which may either be formed as part of housing **74** or secured thereto, communicates with chamber **76** and is directed towards the induction passage **14**. The screw **72** is threadedly received by the body **12**, and a passage **80** formed in screw **72** is provided as a means of communication between chamber **76** and conduit **70**. A seat **82** is provided within conduit **70** and a ball **84** and weight **86** are placed between the seat and chamber **76**.

In operation when the throttle 20 is opened, the pump linkages 52 and 53 force the pump diaphragm 54 upwardly. As the diaphragm 54 moves up, the pressure forces the pump inlet ball check valve 60 closed, thereby preventing fuel from flowing back into the chamber 44. The fuel within chamber 58 flows from there through passages or channels 64, 66 and 70 where it causes the ball 84 and weight 86 to raise, thereby discharging the fuel from chamber 76 through nozzle 78 into the induction passage 14.

As the throttle 20 is moved toward the closed position, the linkages 52 and 53 return to their normal positions, and the diaphragm 54 is forced downwardly by spring 55. As the diaphragm 54 returns to its original position the pump inlet ball check valve 60 is opened and chamber 58 is again filled with fuel from the fuel bowl 42.

The invention relates to improvements in pump channel vapor or gas purging systems. The invention is particularly valuable when hot internal combustion engines vaporize fuel in the channels or passages which due to increased volume and pressure causes poor acceleration. This condition is worse on hot days after a car has been shut off and not used for fifteen minutes to thirty minutes. On starting up and upon "light tip ins" of the accelerator pedal the automobile without such a vapor purging system shows a jerky hesitation because the channels and passages are vapor locked due to the ball weight 84 at the top of the channel 70.

The specific improvement contemplated by the invention is the incorporation of the porous filter 71 in the annular chamber 67 of channel or passage 88 and connecting the inside periphery of the hollow cylindrical filter 71 to the passage 66 at a point of high manifold vacuum to provide a large differential pressure between the inside and outside of the filter 71 to cause the vapor in the channels or passages 64, 66 and 70 to pass through the pores of the filter 71 into the passage 88. By utilizing such an arrangement it is possible to obtain a pressure differential of approximately 10 pounds per square inch to purge the passages of vapor and thereby permit the channels to fill with liquid fuel.

When the engine is started on which the carburetor 10 is mounted and become self-sustaining, manifold vacuum will be applied to passage 88 to create a pressure differential between it and the passages 64, 66 and 70. This will cause the vapors which are present in the system to be forced out through the pores in the filter element 71 into the passage 88 and subsequently to the engine. Since a vacuum is constantly applied to the system during engine operation, no vapors will collect even during excessively long periods of idle operations.

While the form of the embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

The drawings and the foregoing specification constitute a description of the improved accelerating pump channel vapor purging system 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. An accelerating pump system comprising: a carburetor having a mixing chamber; an accelerating pump having a fuel chamber therein for supplying additional fuel to the mixing chamber; a first passage connecting said fuel chamber to said mixing chamber; a second passage leading from a source of vacuum to said first passage; and a porous filter element at the intersection between said first and second passages to provide free fuel flow along said first passage and to intercept fuel flow from said first to said second passages, said filter element having pores of such size as to provide purging of the vapor in said first passage through the pores in said element and to prevent the passage of liquid fuel through the pores of the element.

2. An accelerating pump system comprising: a carburetor having a mixing chamber; an accelerating pump having a fuel chamber therein for supplying additional fuel to the mixing chamber; a first passage connecting said fuel chamber to said mixing chamber; valve means in said first passage for controlling fuel flow from said fuel chamber to said mixing chamber; a second passage leading from a source of vacuum to said first passage; and a porous filter element at the intersection between said first and second passages to provide free fuel flow along said first passage and to intercept fuel flow from said first to said second passages, said filter element having pores of such size as to provide purging of the vapor in said first passage through the pores in said element and to prevent the passage of liquid fuel through the pores of the element.

3. An accelerating pump system comprising: a carburetor; a mixing chamber in said carburetor and having a discharge nozzle therein; an accelerating pump having a fuel chamber therein for supplying additional fuel to the mixing chamber; a discharge passage connecting said fuel chamber to said mixing chamber through said nozzle; valve means for controlling fuel flow from said fuel chamber to said mixing chamber; a vacuum passage extending from an engine operated vacuum source to said discharge passage; and a porous filter element at the intersection between said discharge and vacuum passages in position to provide free fuel flow along said discharge passage and to intercept flow from said discharge passage to said vacuum passage, said filter element having pores of such a size to provide purging of the vapor in said discharge passage through the pores in said element and to prevent passing of fuel through the pores.

4. An accelerating pump system comprising: a carburetor; a mixing chamber in said carburetor; a discharge nozzle extending into said mixing chamber for delivering a small quantity of fuel required for fast acceleration; an accelerating pump provided with a fuel chamber; a first passage connecting said fuel chamber to said mixing chamber through said nozzle; a second passage leading from a source of engine operated vacuum to said discharge passage; and a porous filter element at the intersection between said first and second passages to provide free fuel flow along said first passage and to intercept fuel flow from said first to said second passages, said element having pores of such a size whereby a differential pressure between the inside and outside of said filter element is effective to purge the vapor in said first passage through the pores, said element preventing the fuel from passing into said second passage.

5. An accelerating pump system comprising: a carburetor; a mixing chamber in said carburetor; a discharge nozzle extending into said mixing chamber for delivering a small quantity of fuel required for fast acceleration; an accelerating pump provided with a fuel chamber; a liquid fuel passage connecting said fuel chamber to said mixing chamber through said nozzle; valve means in said fuel passage for controlling fuel flow from said fuel chamber to said mixing chamber; a vacuum passage extending from a source of engine generated vacuum to said liquid fuel passage; and a porous filter element located in said vacuum passage at the place where said passages intersect, said element having pores of such a size whereby a differential pressure between the inside and outside of said filter element is established to purge the vapor in said fuel passage through the pores in said filter element, said element preventing the fuel from passing through the pores.

6. An accelerating pump system comprising: a carburetor; a mixing chamber in said carburetor; a discharge nozzle extending into said mixing chamber for delivering a small quantity of fuel required for fast acceleration; an accelerating pump provided with a fuel chamber; a fuel passage connecting said fuel chamber to said mixing chamber through said nozzle; check valve means for con-

trolling fluid flow in said passage to said mixing chamber; a vacuum passage extending from a source of engine operated vacuum to said fuel passage; and a porous filter element at the intersection between said fuel and vacuum passages in position to provide free fuel flow along said fuel passage and to intercept fuel from said fuel passage to said vacuum passage, said element having pores of such a size whereby a relatively high differential pressure created between the inside and outside of said filter element permits the vapor in said fuel passage to be purged from said fuel passage through the pores in said element, said element preventing fuel from passing through said pores.

7. An accelerating pump system comprising: a carburetor having a mixing chamber; a throttle valve movably mounted in said mixing chamber; a fuel chamber; a discharge passage connecting said fuel chamber to said mixing chamber; a diaphragm movable in said fuel chamber for delivering additional fuel to said mixing chamber when the throttle valve is suddenly opened; a vacuum passage extending from the engine manifold to said discharge passage; and a porous filter element at the intersection between said discharge and vacuum passages in position to provide free fuel flow along said discharge passage and to intercept flow from said discharge passage to said vacuum passage, said element having pores of such size to provide purging of the vapor in said discharge passage outwardly through the pores in said filter element into said vacuum passage, said filter element preventing the liquid fuel from passing through the pores.

8. An accelerating pump system comprising: a carburetor having a mixing chamber; a throttle valve movably mounted in said carburetor; a fuel chamber; a fuel bowl; an inlet valve connecting said fuel bowl to said fuel chamber; a first passage connecting said fuel chamber to said mixing chamber; an outlet valve for controlling fuel flow in said first passage between said chambers; a diaphragm movable in said fuel chamber for delivering additional fuel to said mixing chamber when said throttle valve is suddenly opened; a second passage connected to the engine manifold and to said first passage; and porous filter means at the intersection between said first and second passages, said filter means having pores of such size to purge vaporous gases in said first passage through the pores in said filter means, said filter means preventing the liquid fuel from passing through the pores but permitting the fuel from the fuel chamber to travel in said first passage unimpeded between said fuel chamber and said mixing chamber.

9. An accelerating pump system comprising: a carburetor having a mixing chamber; a throttle valve movably mounted in said carburetor; a fuel chamber; a fuel bowl; an inlet valve connecting said fuel bowl to said fuel chamber; a first passage connecting said fuel chamber to said mixing chamber; an outlet valve for controlling fuel flow in said first passage between said chambers; a diaphragm movable in said fuel chamber for delivering additional fuel to said mixing chamber when said throttle valve is suddenly opened; a second passage connected to the engine manifold and to said first passage; an annular chamber at the place where said second passage joins said first passage; a porous filter element located in said annular chamber; means forming an annular space around said element to provide vacuum around the outer periphery of said element; said element having pores of such size to provide purging of the vapor in said first passage through the pores and to prevent fuel from passing through the pores.

10. An accelerating pump system comprising: a carburetor having a mixing chamber; a throttle valve movably mounted in said mixing chamber; a fuel chamber; a discharge passage connecting said fuel chamber to said mixing chamber; a diaphragm movable in said fuel chamber for delivering additional fuel to said mixing chamber when the throttle valve is suddenly opened; a vacuum passage extending from the engine manifold to said discharge passage; an annular chamber at the end of said vacuum passage extending to said discharge passage; a porous filter element located in said chamber; means forming an annular space around said element to provide vacuum on the outer periphery of said element; said element having pores of such a size to purge the vapor in said discharge passage through the pores and to prevent the fuel from passing through the pores.

11. An accelerating pump system comprising: a carburetor; a mixing chamber in said carburetor and having a discharge nozzle therein; an accelerating pump having a fuel chamber therein for supplying additional fuel to the mixing chamber; a discharge passage connecting said fuel chamber to said mixing chamber through said nozzle; valve means for controlling fluid flow from said fuel chamber to said mixing chamber; a vacuum passage extending from an engine operated vacuum source to said discharge passage; an annular chamber at the end of said vacuum passage extending to said discharge passage; a porous filter element located in said chamber; means forming an annular space around said element to provide vacuum on the outer periphery of said element; said element having pores of such a size to purge the vapor in said discharge passage through the pores and to prevent the fuel from passing through the pores.

12. An accelerating pump system comprising: a carburetor having a mixing chamber; an accelerating pump having a fuel chamber therein for supplying additional fuel to the mixing chamber; a first passage connecting said fuel chamber to said mixing chamber; a second passage leading from a source of vacuum to said first passage; an annular chamber at the place where said second passage joins said first passage; an annular porous filter element located in said annular chamber; means forming an annular space around said element to provide vacuum around the outer periphery of said element; said element having pores of such size to provide purging of the vapor in said first passage through the pores and to prevent fuel from passing through the pores.

13. An accelerating pump system comprising: a carburetor having a mixing chamber; an accelerating pump having a fuel chamber therein for supplying fuel to the mixing chamber; a first passage connecting said fuel chamber to said mixing chamber; a second passage leading from a source of engine manifold vacuum to said first passage; and porous filter means at the intersection between said first and second passages to provide free fuel flow along said first passage and to intercept fuel flow from said first to said second passages, said filter means having pores of such a size to purge the vapor in said first passage through the pores and to prevent fuel from passing through the pores.

14. An accelerating pump system comprising: a carburetor having a mixing chamber; an accelerating pump having a fuel chamber therein for supplying fuel to the mixing chamber; a first passage connecting said fuel chamber to said mixing chamber; a second passage leading from a source of engine vacuum to said first passage; means forming a chamber at the place where said second passage joins said first passage; porous filter means located in said chamber in position to provide free fuel flow along said first passage and to intercept fuel flow from said first to said second passages; and means forming a space around said filter means to provide vacuum around the outer periphery of said filter means; said filter means having pores of such a size to purge the vapor in said first passage through the pores and to prevent the fuel from passing through the pores.

15. An accelerating pump system comprising: a carburetor having a mixing chamber; an accelerating pump having a fuel chamber therein for supplying additional fuel to the mixing chamber; a first passage connecting

said fuel chamber to said mixing chamber; said first passage having an annular chamber surrounding an intermediate portion thereof; a tubular filter in said annular chamber having its outer surface spaced inwardly from the outer surface of said annular chamber to define therewith an annular space and having an opening therethrough in alignment with said first passage to provide substantially unrestricted fuel flow along said first passage; a second passage leading from a source of vacuum to the annular space surrounding said filter, said filter having pores of such size to provide purging of the vapor in said first passage through the pores and to prevent fuel from passing through the pores.

References Cited in the file of this patent

UNITED STATES PATENTS

1,316,876	Cardwell	Sept. 23, 1919
2,403,578	Carpenter	July 9, 1946
2,578,568	Mayer et al.	Dec. 11, 1951
2,658,733	Boller	Nov. 10, 1953
2,901,031	Powell et al.	Aug. 25, 1959