United States Patent

[11] 3,534,721

[72] Inventor **Jack B. King**
Royal Oak, Michigan

[21] Appl. No. **755,959**
[22] Filed **Aug. 28, 1968**
[45] Patented **Oct. 20, 1970**

[73] Assignee **General Motors Corporation**
Detroit, Michigan
a corporation of Delaware

[54] **CARBURETOR FUEL BOWL SUPPLY AND DRAIN SYSTEM**
2 Claims, 1 Drawing Fig.

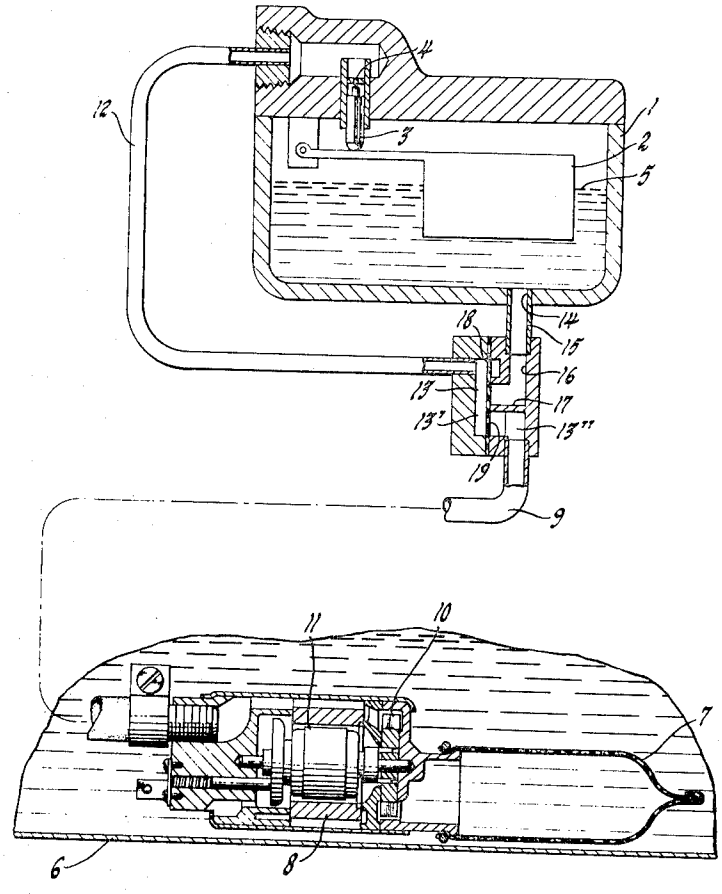
[52] **U.S. Cl.** **123/136,** 123/139
[51] **Int. Cl.** **F02m 37/10**
[50] **Field of Search** 123/136, 139, 139.16; 137/414, 461

[56] **References Cited**
UNITED STATES PATENTS

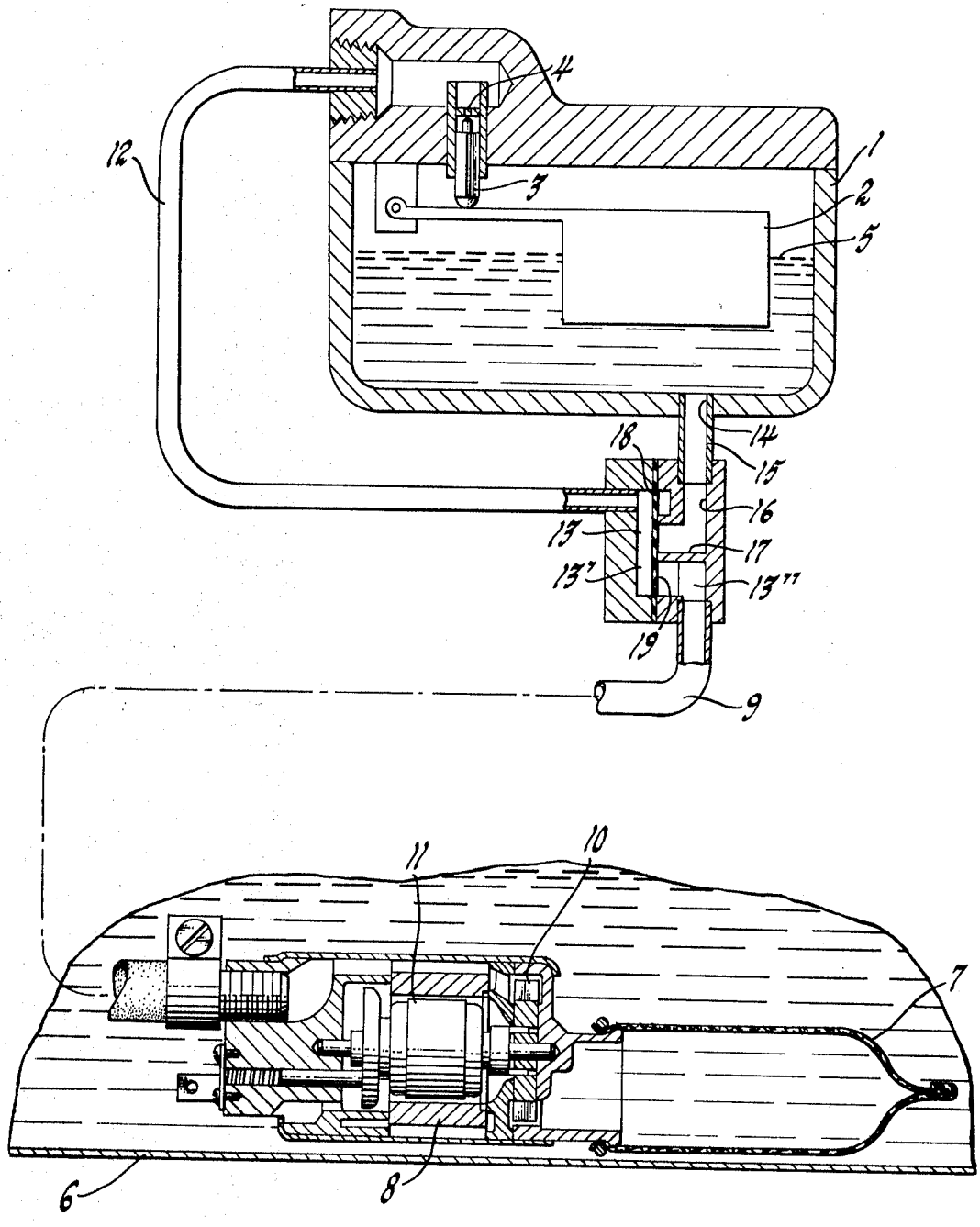
2,293,884	8/1942	Boyce	123/139
2,855,949	10/1958	Sterner et al.	137/414
3,385,316	5/1968	Couffer	137/414

Primary Examiner—Laurence M. Goodridge
Attorneys—Charles K. Veenstra and Jean L. Carpenter

ABSTRACT: A carburetor float bowl has a float-controlled inlet and a bottom opening both connected through a flow-control chamber to a centrifugal type pump located in a fuel supply tank below the bowl, the chamber having a pressure-responsive diaphragm permitting rapid filling of the bowl through the bottom opening when the pump is operating and drainage of the bowl when the pump is inoperative.



Patented Oct. 20, 1970 3,534,721



INVENTOR.
Jack B. King
BY
L. C. Thorpe
ATTORNEY

CARBURETOR FUEL BOWL SUPPLY AND DRAIN SYSTEM

BACKGROUND OF THE INVENTION

1.Field of the Invention

This invention relates to fuel supply supply systems for engines and the like, and particularly to the filling of a carburetor float bowl from a fuel tank located at a lower level and drainage of the fuel back to the tank when the supply pump is inoperative. Such emptying of the float bowl is especially desirable immediately after an engine shutdown in order to avoid the high evaporation of fuel therein which might otherwise accompany increased heat absorption from the engine.

2.Description of the Prior Art

While it is old in the prior art to provide for drainage of the fuel remaining in the carburetor float bowl when the engine is shutdown, my invention is believed to have advantages over such prior arrangements in that it enables minimizing both the size of the float bowl and the capacity of the supply pump. Thus there are such prior systems as shown in U.S. Pat. Nos. 2,965,086 and 3,048,157 to Gregory et al., for example, wherein return flow from the bowl back to the tank occurs continuously during pump operation. Although they effect the desired emptying of the bowl when the engine and pump are inoperative, the pump must be provided with the additional delivery capacity to make up for the return flow and it affords no reduction from the usual float bowl capacity.

Another scheme which has been proposed for emptying of the float bowl is shown, for example, in U.S. Pat. Nos. 3,256,870 to Walker and 3,277,877 to Rosenberg wherein a separate diaphragm type or plunger-type pump is employed to withdraw the fuel into a storage reservoir upon engine shutdown. Still another alternative is represented by U.S. Pat. No. 2,293,884 to Boyce in which emptying of the bowl is accommodated by a drain passage under the control of a check valve which is normally held closed by supply pump pressure when the engine is operating.

SUMMARY OF THE INVENTION

My invention provides for the desired draining of the float bowl upon engine shutdown in a very simple and inexpensive manner through the use of a flow-control valve which is inserted between the pump and the inlet and bottom drain openings of the float bowl. The arrangement is such that the float-controlled inlet valve in the bowl acts only to provide a pressure signal to the control valve which, in turn, allows flow to the bowl through the bottom opening for rapid filling thereof during pump operation, as well as drainage of the bowl through the same bottom opening when the pump is inoperative as during an engine shutdown. As a result, rapid filling of the bowl upon engine startup is not dependent upon the flow capacity of the float controlled inlet, and hence both the size of the float bowl and its float-controlled valve may be made much smaller than is conventional. Also, by using a centrifugal or other nonregenerative type supply pump which accommodates reverse flow therethrough when the pump is inoperative, the required capacity of the supply pump is less than that for other such systems which require either a separate bypass around the pump, continuous return flow from the float bowl, or filling of the float bowl only through the float-controlled inlet.

Other objects and advantages of the invention will be apparent from the following description of the preferred embodiment thereof, having reference to the drawing which schematically shows portions of a carburetor float bowl, fuel supply tank and pump and the flow-control valve connected between the float bowl and the pump.

Description of the Preferred Embodiment

A carburetor float bowl is indicated at **1**, having therein the usual pivoted float **2** arranged to raise an inlet valve **3** upwardly from its position shown to close the inlet **4** to the bowl when the level **5** of the fuel therein reaches a predetermined height. It will be understood that fuel is withdrawn from the float bowl via one or more passages not shown as required by the operation of the engine with which the carburetor is associated. Located at a level below the float bowl **1** is a fuel supply tank **6** containing fuel to be transferred to the float bowl as necessary to maintain the predetermined level therein as established by the float **2**. Within the tank is shown a strainer or filter **7** through which the fuel passes to a pump **8** which serves to transfer the fuel to the float bowl **1**. The particular pump **8** illustrated is arranged within the tank **6**, although it will be appreciated that the pump may be located externally of the tank at a suitable point in the delivery conduit **9**, provided, of course, that the pump be sufficiently self-priming to insure adequate delivery of fuel from the tank to the conduit **9**. Also, the particular pump **8** illustrated is of the centrifugal type comprising a rotary impeller **10** driven by an electric motor **11**. Such pump has advantageous employment in my invention by reason of the fact that the impeller **10** accommodates reverse flow of fuel back to the tank when the pump is not operating. Other nonregenerative-type pumps may be used with similar advantage, and alternatively a diaphragm or plunger-type pump of greater capacity might be substituted therefor incorporating a suitable bypass around the pump element to accommodate such reverse flow during shutdown.

Fuel flow to the float bowl inlet **4** is continued through a conduit **12** which is connected to the upper end of the conduit **9** by a flow-control chamber **13**. This chamber is also connected with a bottom opening **14** in the float bowl by a short conduit **15**, and this conduit communicates with a passage **16** terminating with a port **17** within the chamber **13**. Normally closing the port **17** and partitioning the chamber **13** into portions **13'** and **13''** is a valve in the form of a flexible diaphragm **18**. This diaphragm may be made of soft synthetic rubber or other elastic material and a bypass is provided laterally of the port **17** in the form of one or more apertures in the diaphragm, of which one such aperture is shown at **19**. A spring (not shown) may be added to bias the diaphragm toward the port, but it should not be required if the diaphragm is installed under slight tension so as to utilize its own resilience in biasing itself to the position shown.

During operation of the pump **8** fuel is delivered from the tank through the conduit **9** to the chamber portion **13''** from which it flows through the aperture or apertures **19** into the chamber portion **13'**. If the pump has commenced operation while the float-controlled inlet valve **3** is in open position (as shown) fuel from the chamber **13'** thence flows through the conduit **12** and bowl inlet **4** into the float bowl **1**, and continues to so flow until the inlet valve **3** closes under the action of the float **2** in response to the rising level of fuel in the bowl. During such period of operation a pressure drop occurs in the fuel passing through the aperture **19** due to its flow capacity being less than that delivered by the pump to the chamber **13**, with the result that the greater pressure existing in the chamber portion **13''** acts to move the diaphragm **18** to the left of its position shown, uncovering the port **17** and allowing rapid filling of the float bowl via the passage **16**, conduit **15** and bottom opening **14** in the bowl. The capacity for this latter flow is greater than that accommodated by the bowl inlet **4** and, in fact, the inlet **4** may be made relatively small since the rate of filling of the bowl is not dependent thereon but is dependent upon the greater flow capacity of the passage means **14—17**. Upon the inlet valve **3** closing the inlet **4** when the desired predetermined level of the fuel in the bowl has been reached, further flow through the aperture **19** ceases with the result that pressures in the chamber portions **13'** and **13''** are then equalized. The area of diaphragm **18** exposed to chamber **13'** is greater than the area exposed to chamber **13''** with the result that a greater force is exerted on diaphragm **18** by the pressure present in chamber **13'**. Diaphragm **18** is thus returned to the position shown, closing the port **17** and blocking further supply of fluid to the float bowl. As fuel is withdrawn from the bowl in supplying the engine with which it

is associated and opening of the inlet valve **3** again occurs, the flow resumes via conduit **12** and passage means **14—15** to maintain the required fuel level in the bowl.

Upon stopping the operation of the fuel pump, as during an engine shutdown, the fuel pressure in the passage **16** acts against the diaphragm **18** to uncover the port **17**, allowing the fuel to drain back to the tank via the passage means **14 —17**, chamber **13**, conduit **9** and pump impeller **10**.

It will be appreciated that minor changes in the parts and their arrangement may be made without departing from the spirit and scope of my invention as defined in the following claims.

I claim:

1. The combination of a carburetor fuel bowl having an inlet and a bottom opening, a fuel tank located at a level below said bottom opening, a fuel pump operative to transfer fuel from said tank to said bowl, means defining a flow-control chamber having a port opening centrally therefrom and an annular portion surrounding said port and a further portion, a delivery conduit connecting said annular portion of said chamber and said pump, a fuel conduit connecting said further portion of said chamber and said inlet of said fuel bowl, a fuel passage connecting said port and said bottom opening of said fuel bowl, a flexible pressure responsive diaphragm partitioning said chamber to separate said annular portion from said further portion and overlying said port to control fuel flow between said annular portion and said fuel passage, said diaphragm having an aperture connecting said annular portion of said chamber and said further portion of said chamber, said aperture having less capacity for fuel flow than said pump and delivery conduit whereby a pressure differential is created across said diaphragm to move said diaphragm away from said port and permit fuel flow from said annular portion of said chamber through said port to said bottom opening of said bowl when said pump is operative and said inlet is open, an inlet valve controlling said inlet, and a fuel level responsive float in said bowl connected to said valve and causing said valve to close said inlet when the fuel in said bowl rises to a predetermined level whereby the pressure in said further portion of said chamber is increased to cause said diaphragm to move toward said port and prevent fuel flow from said annular portion of said chamber through said port to said bowl then when said pump is operative and said inlet is closed, said pump accommodating reverse flow of fuel from said annular portion of said chamber to said tank when inoperative whereby a pressure differential is created across said diaphragm by the static head of fuel in said bowl above said bottom opening to cause said diaphragm to move away from said port and permit fuel flow from said bottom opening of said bowl through said port to said annular chamber when said pump is inoperative.

2. The invention of claim **1** wherein said port, said fuel passage, and said bottom opening of said bowl have a greater capacity for fuel flow than said fuel conduit and said inlet of said bowl.