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Dual fuel supply system

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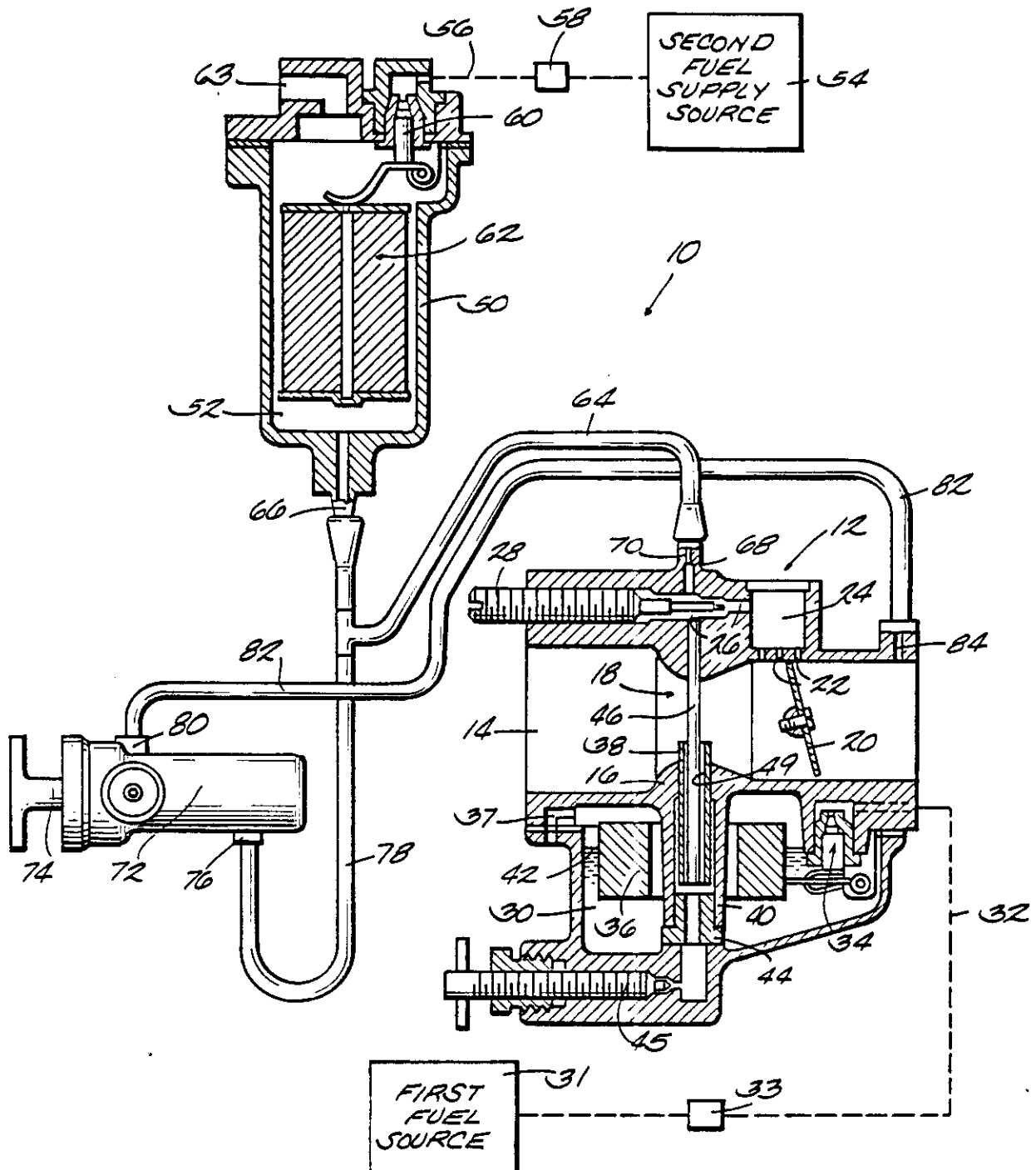
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"Dual Fuel Supply System"

This invention relates to fuel supply systems for internal combustion engines and, more particularly, to dual fuel systems operable to supply two different  
5 fuels to an internal combustion engine.

It is known to provide dual fuel supply systems capable of selectively supplying a more expensive fuel, such as gasoline, to an internal combustion engine during starting, idle and low speed operations and a less expensive fuel, such as kerosene, during low and normal speed  
10 operations.

The invention provides a fuel supply system comprising a carburetor including a fuel/air induction passage having means defining a low pressure zone, a secondary orifice and a cavity communicating with the induction passage through the secondary orifice, first fuel supply means having a source of first fuel and means operable to simultaneously supply the first fuel to the low pressure zone and to the cavity, and second fuel supply means including a source of a second fuel and means operable to supply the second fuel to the cavity simultaneously with the first fuel, whereby the first and second fuels are blended together in the cavity prior to introduction into the induction passage.

In one embodiment, the first fuel supply means includes a first float bowl communicable with the low pressure zone and with the cavity and a first float controlled valve communicable with the first fuel source and operable to control the supply of the first fuel to the first float bowl, and the second fuel supply means includes a second float bowl communicable with the cavity and a second float controlled valve communicable with the second fuel source and operable to control supply of the second fuel to the second float bowl. First fuel can be supplied to the low pressure zone through a fuel nozzle communicating between the first float bowl and the low pressure zone. First fuel can be supplied to the cavity through a conduit connecting the first float bowl in communication with the cavity.

In another embodiment, the fuel supply system includes a primer pump having an inlet \_\_\_\_\_

connected in communication with the second float bowl and an outlet connected in communication with a priming fuel port opening into the induction passage for selectively introducing a  
5 quantity of the second fuel into the induction passage.

One of the principal features of the invention is the provision of a dual fuel supply system for an internal combustion engine having  
10 the capability of reducing the amount of the more expensive fuel required for operating the engine at idle and part throttle.

Another of the principal features of the invention is the provision of such a dual  
15 fuel supply system which is arranged to supply a blend of less expensive primary fuel and more expensive secondary fuel to the engine at idle and part throttle operations, as well as at full throttle operation.

20 Other features, aspects and advantages of the invention will become apparent to those skilled in the art upon reviewing the following detailed description, the drawing and the appended claims.

25 BRIEF DESCRIPTION OF THE DRAWING

The single figure is a schematic view of a dual fuel supply system embodying various of the features of the invention.

30 Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components

set forth in the following description or illustrated in the drawing. The invention is capable of other embodiments and of being practiced and carried out in various ways.

5 Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 Illustrated in the drawing is a fuel supply system 10 for an internal combustion engine (not shown) included in an outboard motor or the like. The fuel supply system 10 is arranged to permit engine operation with two  
15 different fuels, for example, an inexpensive first or primary fuel, such as kerosene, and a more expensive second or secondary fuel, such as gasoline. The system is arranged so that the two fuels are blended and supplied to the engine  
20 during idling, as well as during low and normal speed operations. The system is also arranged so that the secondary fuel can be used to prime the engine to facilitate starting.

The fuel supply system 10 includes a  
25 carburetor 12 having a fuel/air induction passage 14 communicating with the engine fuel intake (not shown). The fuel/air induction passage 14 includes a venturi 16 having a throat defining a low pressure zone 18. Mounted  
30 downstream of the venturi 16 is a throttle valve 20 which is movable between open and closed positions to control the flow of fuel and air through the fuel/air induction passage 14 and thus engine speed.

Located in the wall of the fuel/air induction passage 14 adjacent the periphery of the throttle valve 20 is one or more secondary orifices 22, each of which communicates with a fuel cavity or well 24 in the carburetor 12. The carburetor 12 includes a fuel duct or passage 26 through which fuel is supplied to the fuel well 24. The flow of fuel through the fuel passage 26 to the fuel well 24 is controlled by a needle valve 28.

The carburetor 12 includes a first or primary fuel chamber or float bowl 30. A primary fuel, such as kerosene, is supplied to the float bowl 30 from a source 31 of the primary fuel via an inlet hose or conduit 32 and a fuel pump 33 or other suitable means.

Flow of the primary fuel to the float bowl 30 is controlled by a valve 34 which is connected to a float 36 and opens and closed in response to movement of the float 36. Thus, the valve 34 and float 36 serve to maintain a predetermined level of the primary fuel in the float bowl 30.

The carburetor 12 includes a vent 37 through which the float bowl 30 is vented to the atmosphere.

Primary fuel is supplied from the float bowl 30 to the low pressure zone 18 through a fuel nozzle 38 extending between the float bowl 30 and the low pressure zone 18. More specifically, the carburetor 12 includes a depending hollow boss 40 which extends into the float bowl 30 with the lower end below the normal fuel level 42. The lower end of the boss

40 is closed by an orifice plug 44 and the fuel nozzle 38 extends into the boss 40 above the orifice plug 44. The carburetor 12 also includes a needle valve 45 for adjusting fuel flow from the float bowl 30 to the fuel nozzle 38.

Primary fuel is supplied from the float bowl 30 to the fuel passage 26 by a pick-up conduit or tube 46 which extends between the float bowl 30 and the fuel passage 26. While other arrangements can be used, in the specific construction illustrated, the pick-up tube 46 is located inside the fuel nozzle 38 and an annular flow passage 49 is defined therebetween.

The fuel supply system also includes a housing 50 defining a secondary fuel chamber or float bowl 52. A secondary fuel, such as gasoline, is supplied to the float bowl 52 from a source 54 of the secondary fuel via an inlet hose or conduit 56 and a fuel pump 58 or other suitable means. Flow of the secondary fuel into the float bowl 52 is controlled by a valve 60 which is connected to a float 62 and opens and closed in response to movement of the float 62. Thus, the valve 60 and the float 62 serve to maintain a predetermined level of the secondary fuel in the float bowl 52.

The top portion of the housing 50 includes a vent 63 through which the float bowl 52 is vented to the atmosphere.

Secondary fuel is supplied from the float bowl 52 to the fuel passage 26 via a tube or conduit 64 connected to and extending between an outlet 66 in the housing 50 and a fuel inlet



port 68 on the carburetor 12 communicating with the fuel passage 26. An orifice 70 in the fuel inlet port 68 restricts flow of the secondary fuel into the fuel passage 26.

5           The fuel supply system 10 can also include a conventional plunger-operated primer pump 72 for supplying a small amount of the secondary fuel into the fuel/air induction passage to facilitate engine starting. The  
10       primer pump 72 includes an external stem 74, an inlet 76 connected in communication with the housing outlet 66 via a tube or conduit 78, and an outlet 80 connected in communication with the fuel/air induction passage 14 via a tube or  
15       conduit 82. While the priming fuel can be introduced into the fuel/air induction passage 14 at various locations, in the specific construction illustrated, a priming fuel port 84 communicating with the fuel/air induction  
20       passage 14 is provided downstream of the throttle valve 20 and the conduit 82 is connected to the priming fuel port 84.

          Assuming that kerosene and gasoline are used as the primary and secondary fuels,  
25       respectively, the engine can be primed to facilitate starting by depressing the stem 74 on the primer pump 72. This will supply a flow of gasoline from the float chamber 52 into the fuel/air induction passage 18 through the  
30       priming fuel port 84.

          As the engine cranks, during starting or normal operations, a flow of gasoline is induced from the float bowl 52, through the fuel passage 26 into the fuel well 24, and from the

fuel well 24 through the secondary orifices 22 into the fuel/air induction passage 18. At the same time, a flow of kerosene is induced from the float bowl 30, through the pick-up tube 46 and the fuel passage 26 into the fuel well 24, from the fuel well 24 (after mixing or blending with the gasoline), through the secondary orifices 22 and into the fuel/air induction passage 18. Also at the same time, a flow of kerosene is induced from the float chamber 30 through the annular passage 46 between the pick-up tube 46 and the fuel nozzle 38 and into the low pressure zone 18. Thus, once the engine is started, a blend of the primary fuel (kerosene) and the secondary fuel (gasoline) is provided during idle, part throttle and full throttle operations.

This blending allows the engine to operate on a lesser amount of the more expensive secondary fuel and, therefore, reduces cost of operation as compared to prior dual fuel systems which employ only the secondary fuel for the starting and/or idling operation. The mixture ratio of the blended fuel in the fuel well depends on the flow resistance in the primary and secondary fuel systems between the fuel well and the respective float chambers.

Various of the features of the invention are set forth in the following claims:

CLAIMS

1. A fuel supply system comprising a carburetor including a fuel/air induction passage having means defining a low pressure zone, a secondary orifice and a cavity communicating with said induction passage through said secondary orifice, first fuel supply means including a source of a first fuel and means operable to simultaneously supply the first fuel to said low pressure zone and to said cavity, and second fuel supply means including a source of a second fuel and means operable to supply the second fuel to said cavity simultaneously with said first fuel, whereby said first and second fuels are blended together in said cavity prior to introduction into said induction passage.
2. A fuel supply system according to claim 1, wherein said first fuel supply means includes a first float bowl communicable with said low pressure zone and with said cavity and a first float controlled valve communicable with the first fuel source and operable to control the supply of the first fuel to said first float bowl, and wherein said second fuel supply includes a second float bowl communicable with said cavity and a second float controlled valve communicable with the second fuel source and operable to control the supply of the second fuel to said second float bowl.

3. A fuel supply system according to  
Claim 2 including a fuel nozzle communicating  
between said first float bowl and said low  
pressure zone and a conduit connecting said  
5 first float bowl in communication with said  
cavity.

4. A fuel supply system according to  
Claim 1 wherein said carburetor includes a  
throttle valve located downstream of said low  
10 pressure zone and a priming fuel port located  
downstream of said throttle valve and  
communicating with said induction passage.

5. A fuel supply system according to  
Claim 4 including a primer pump having an inlet  
15 connected in communication with said second fuel  
source and an outlet connected in communication  
with said priming fuel port for selectively  
introducing a quantity of the second fuel into  
said induction passage through said priming fuel  
20 port.

6. A fuel supply system comprising a carburetor including a fuel/air induction passage having means defining a low pressure zone and a secondary orifice and further including a cavity communicating with  
5 said induction passage through said secondary orifice, first fuel supply means including a first fuel bowl connected to a source of a first fuel, a first float controlled valve operable to control the supply of the first fuel to said first float bowl, a fuel nozzle  
10 communicating between said first float bowl and said low pressure zone, and a conduit connecting said first float bowl in communication with said cavity such that said first fuel is simultaneously supplied to said low pressure zone and to said cavity, and second fuel  
15 supply means including a second float bowl communicable with said cavity and connected to a source of a second fuel, and a second float controlled valve operable to control the supply of the second fuel to said second float bowl and hence to control supply of the second  
20 fuel to the cavity simultaneously with the supply of the first fuel, whereby said first and second fuels are blended together in said cavity prior to introduction into said induction passage.

7. A fuel supply system according to Claim 6 wherein said carburetor includes a throttle valve located downstream of said low pressure zone and a priming fuel port located downstream of said throttle valve and communicating with said induction passage, and wherein said system further includes a primer pump having an inlet connected in communication with said second float bowl and an outlet connected in communication with said priming fuel port for selectively introducing a quantity of the second fuel into said induction passage through said priming fuel port.

8. A fuel supply system substantially as hereinbefore described with reference to the accompanying drawing.

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