Nov. 22, 1966 — A. B. GELLMAN — 3,286,741

FUEL VALVE

Filed June 24, 1963 — 2 Sheets-Sheet 1

Fig. 1

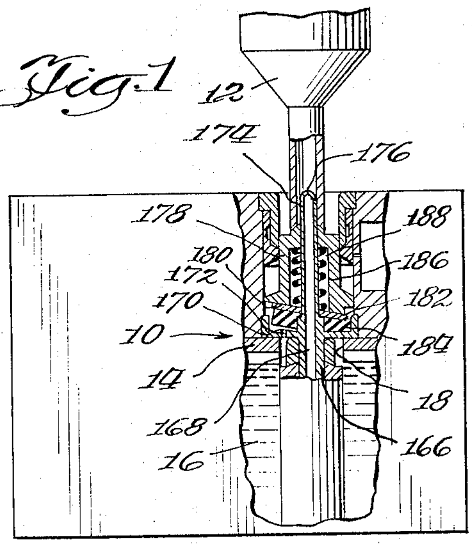
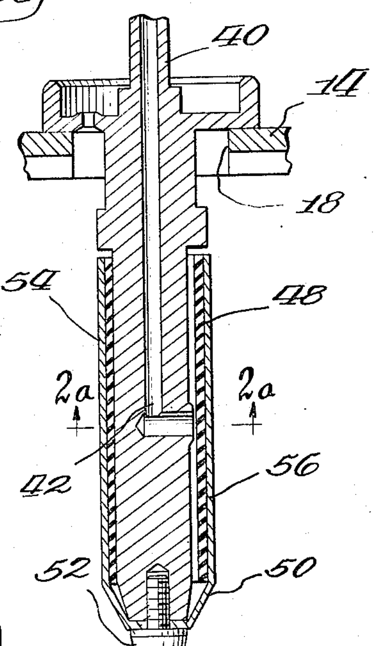


Fig. 2



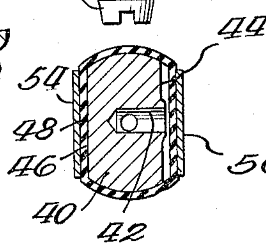
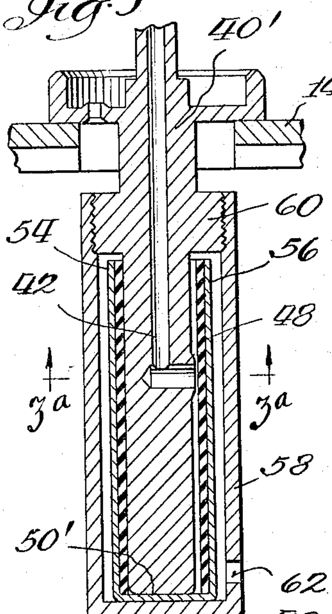


Fig. 2a

Fig. 3



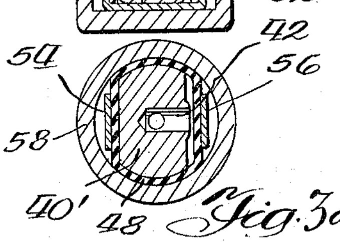


Fig. 3a

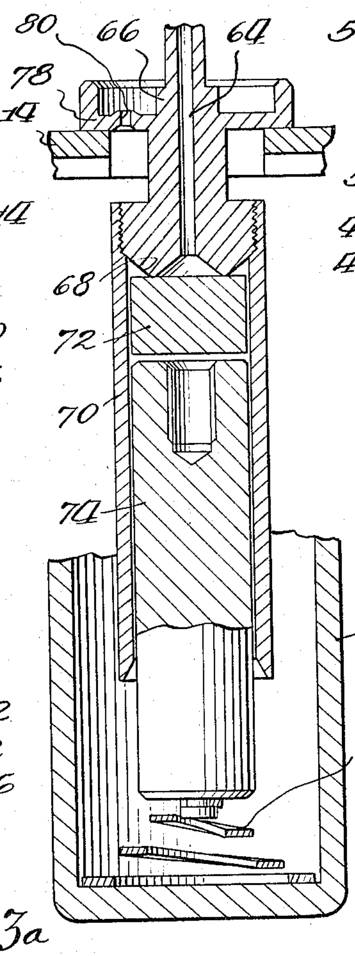


Fig. 4

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FUEL VALVE

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Fig. 6

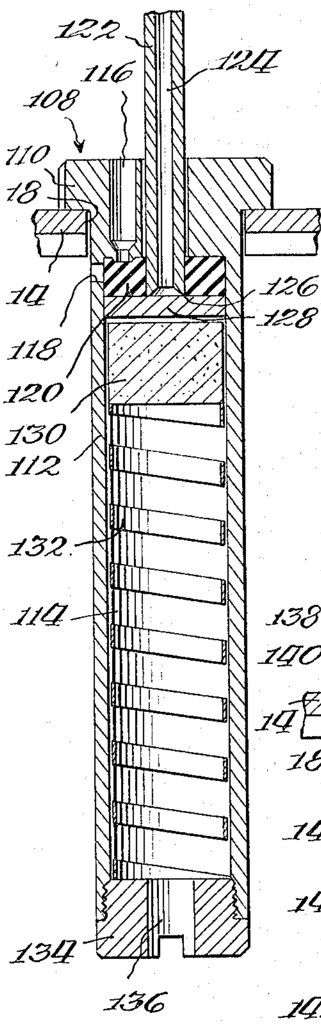


Fig. 9

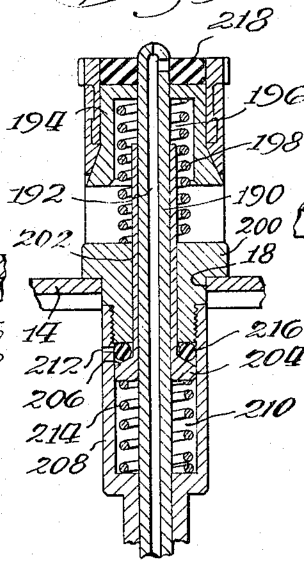
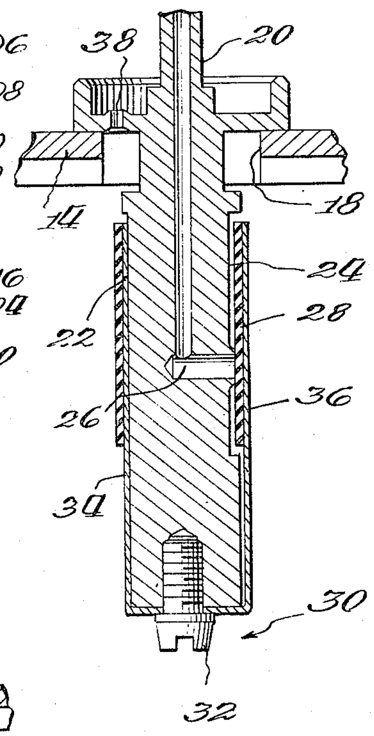


Fig. 8



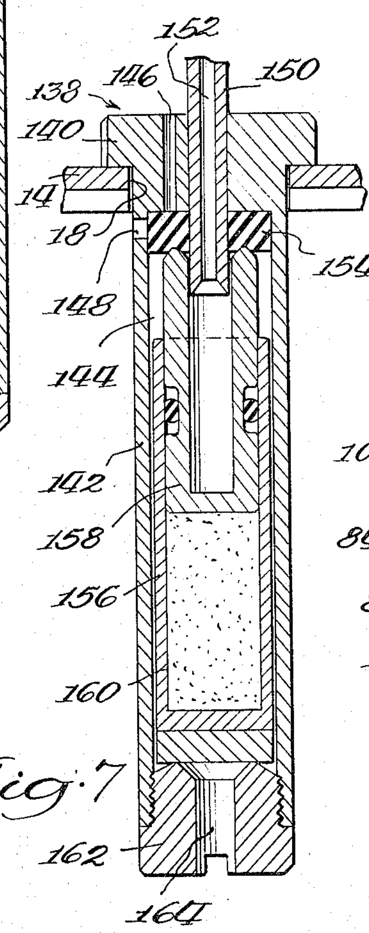
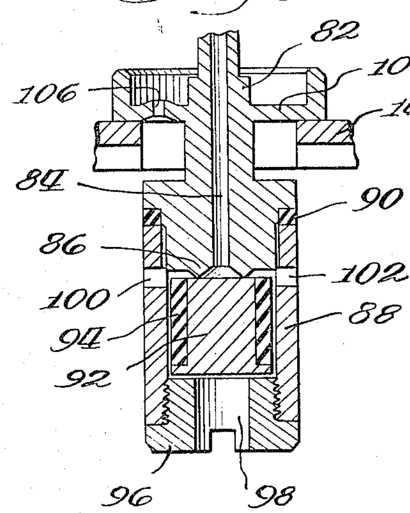


Fig. 7

Fig. 5



United States Patent Office

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FUEL VALVE

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13 Claims. (Cl. 141—18)

This invention relates to valves and more particularly to valves of the class adapted for use in the charging of a reservoir with liquefied gas under pressure from a fuel container.

The invention is adapted for use in gas cigarette lighters, gas candles, stoves, and other burner devices utilizing liquefied gas fuel.

The gas most frequently used in this type of device is liquefied butane which has a very high cofficient of expansion, as of the order of 2 percent of its volume for an increase of 10° C.

During the filling of a fuel reservoir with liquefied butane under pressure from a disposable fuel container, the temperature of the gas released from the disposable container decreases substantially below the surrounding temperature by reason of the expansion and evaporation of same. The reservoir is vented during filling to facilitate the inflow of fuel. When filling is completed, the reservoir and its contents return to the surrounding temperature.

In the type of lighter valve assembly which utilizes the gas pressure in the fuel reservoir to seal its gas inlet passageway, there is a problem of leakage in a "twilight zone," that is, when the ambient temperature drops to about 40° F. as on a cold day. At this temperature the gas in the reservoir is contracted and there is not enough pressure to seal the reservoir against leakage. The valve assembly herein disclosed obviates this leakage problem.

It is a primary object of this invention to provide a new and improved fuel charging valve.

Another object of the present invention is to provide a simplified construction for a fuel charging valve.

Another object of this invention resides in providing a fuel charging valve having an effective seal against the leakage of fuel from the reservoir.

A further object of this invention is to provide a fuel charging valve for filling a reservoir with liquefied gas fuel under pressure from a disposable container which utilizes the temperature changes occurring during the filling of the reservoir for its operation.

A further object of the present invention is to provide a new and improved valve assembly for charging a reservoir and liquefied gas fuel under pressure from a disposable fuel container which vents the reservoir to atmosphere while charging the reservoir with fuel.

Further objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is an elevational view of a lighter, partly in section and with parts broken away illustrating one form of the vent valve structure;

FIGURE 2 is a fragmentary sectional view of one form of the fuel charging valve;

FIGURE 2*a* is a sectional view taken along line 2*a*—2*a* of FIGURE 2;

FIGURE 3 is a fragmentary sectional view of another form of fuel charging valve;

FIGURE 3*a* is a sectional view taken along line 3*a*—3*a* of FIGURE 3;

FIGURE 4 is a fragmentary sectional view in elevation of another form of the fuel charging valve structure of the invention;

FIGURE 5 is a fragmentary sectional view in elevation of still another form of the new valve assembly;

FIGURE 6 is a fragmentary sectional view in elevation of a further modification of the fuel charging valve structure of the invention;

FIGURE 7 is a fragmentary sectional view in elevation of another form of the invention;

FIGURE 8 is a fragmentary sectional view in elevation of yet another form of the fuel charging valve structure of the invention; and

FIGURE 9 is a fragmentary sectional view in elevation of another form of the reservoir venting valve structure of the valve assembly embodying the invention.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail several embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

The valve assembly shown generally at **10** is shown in a butane gas lighter having a mechanical operating assembly (not shown) including a manually operable igniting means for igniting fuel at a fuel burner structure (not shown). The lighter is filled with liquefied gas fuel under pressure from a fuel container **12** inserted into the lighter as shown in FIGURE 1. The valve assembly **10** is mounted on a casing **14** of fuel reservoir **16** with a portion of the valve assembly **10** extending through an opening **18** in the casing **14** and into the reservoir **16** for charging same with fuel.

Referring now more particularly to FIGURE 8 showing a preferred embodiment of a fuel charging valve structure of valve assembly **10**, there is provided a filler tube **20**, one end of which is adapted to receive a fuel container **12** as shown in FIGURE 1 and a second end extending into the fuel reservoir. Filler tube **20** has opposed, substantially flat wall portions **22** and **24** and a fuel passageway **26** opening through flat wall portion **24** into the fuel reservoir. A rubber sealing tube **28** encircles the lower portion of filling tube **20** for closing fuel passageway **26**. This tube may be composed of any suitable resilient material. A bimetal member shown generally at **30** is secured to the bottom of filler tube **20** by suitable means such as screw **32**. The bimetal member has a pair of flexible arms **34** and **36** for moving the sealing tube into and out of passageway closing position. Arm **34** extends between the rubber sealing tube **28** and the flat wall portion **22** of filler tube **20** and arm **36** extends over the outside of rubber sealing tube **28**. The arms **34** and **36** of bimetal member **30** are normally in an expanded position so that arm **34** pulls the rubber sealing tube **28** into fluid-tight engagement with filler tube **20** to close fuel passageway **26**. The arms **34** and **36** are adapted to move inwardly toward the filler tube **20** to a contracted position in response to the lowering of the temperature in the reservoir as fuel under pressure is released from a fuel container **12** inserted over filler tube **20** and the venting of the reservoir through gas escape port **38** in filler tube **20**. The dimensions of arms **34** and **36** are such that the compression against the rubber sealing tube **20** will be less than the pressure of the input gas in fuel passageway **26** and thus, during filling, the input gas forces its ways through fuel passageway **26** into the fuel reservoir, but immediately after the gas input is stopped, the bimetal arm **36** will compress the rubber sealing tube **28** against the filler tube **20** to stop leakage until the temperature rises. When the temperature rises to normal, the arms **34** and **36** move to their expanded position and arm **34** pulls the rubber sealing tube **28** tight against filler tube **20**. This pull plus the increasing gas pressure within the fuel reservoir causes a fluid-tight seal and the higher the temperature, the tighter the seal becomes.

When the ambient temperature drops into the "twilight zone," about 40° F., as on a cold day, and the temperature of the gas in the reservoir **16** is lowered thus reducing the gas pressure in the reservoir so the leakage is imminent the temperature responsive bimetal arms **34** and **36** move to their respective contracted positions and arm **36** compresses the rubber sealing tube **28** tightly against the filler tube **20** to stop leakage through passageway **26** during the time when the lighter is subjected to relatively low temperature. When the ambient temperature rises to normal, assuming room temperature to be normal, the temperature responsive bimetal arms **34** and **36** move to their respective expanded positions and arm **34** again pulls the rubber sealing tube **28** tightly against the filler tube **20**.

The fuel charging valve structure shown in FIGURE 2 has a filler tube **40** extending into the fuel reservoir and having a fuel passageway **42** for passing fuel from a disposable fuel container into the fuel reservoir. The filler tube **40** has two opposed substantially flat wall portions **44** and **46** as seen in FIGURE 2*a*, the fuel passageway **42** opening into the fuel reservoir through the wall portion **44**. A resilient sealing tube **48** encircles the filler tube **40** and overlies the fuel passageway **42**. A U-shaped bimetal member **50** is secured to the bottom of filler tube **40** by suitable means such as screw **52** and has a pair of flexible arms **54** and **56** overlying the resilient sealing member **48** adjacent the flat wall portions **44** and **46**. The flexible arms **54** and **56** are normally in an expanded position away from the resilient sealing member **48**. When the arms **54** and **56** are in this expanded position, the resilient sealing member **48** is held in fuel passageway closing position by the pressure of the fuel in the fuel reservoir. When the ambient temperature drops to about 40° F., as on a cold day, and the temperature of the gas in the reservoir is lowered and the pressure is reduced so that leakage is imminent, the temperature responsive bimetal arms **54** and **56** contract to compress the resilient sealing member **48** against the filler tube **40** to prevent leakage of fuel through the passageway **42**. The compressive force exerted by the arm **56** against the resilient sealing member **48** is of such a nature that when it is desired to fill the reservoir with fuel, the pressure of the fuel released from the fuel container moves the are **56** and the resilient sealing member **48** out of contracted position.

This form of fuel charging valve may be constructed so that the flexible arms **54** and **56** of the bimetal member **50** are normally in a contracted position compressing the resilient sealing member **48** into fuel passageway closing position. When the ambient temperature drops into the "twilight zone," thus reducing the pressure in the reservoir so that leakage through passageway **42** is imminent, the temperature responsive bimetal arms **54** and **56** exert a still greater compressive force against resilient sealing member **48** to prevent any leakage from occurring. Here again the compressive force exerted by the arm **56** against the resilient sealing member **48** is of such a nature that it is moved out of its contracted position by the pressure of the fuel released from pressurized fuel container **12** into passageway **42** to facilitate filling of the reservoir **16**.

FIGURE 3 shows a fuel charging valve structure which operates in the same manner as the valve shown in FIGURE 2. In the valve of FIGURE 3, the bimetal member **50'** is held against the end of filler tube **40'** by a protective valve casing **58** which is threaded onto flange **60** of filler tube **40'**. The casing **58** has a hole **62** therein for passing fuel from the interior of the protective valve casing **58** into the fuel reservoir.

The valve shown in FIGURE 4 utilizes both gas pressure in the reservoir and temperature responsive means

for sealing a fuel passageway **64** in filler tube **66**. The filler tube **66** forms a valve seat **68** at its lower end. A tubular valve casing **70** is threaded on filler tube **66**. A flapper valve **72** is disposed in the tubular valve casing **70** for movement into and out of sealing engagement with valve seat **68**. The pressure of the gas in the fuel reservoir normally maintains the flapper valve **72** in fluid-tight engagement with the valve seat **68**. When the ambient temperature drops into the "twilight zone," thus reducing the gas pressure in the reservoir so that leakage through passageway **64** is imminent, piston **74** is moved upward into engagement with flapper valve **72** by the bimetal coil **76** to assist in holding flapper valve **72** against valve seat **68** to prevent leakage of fuel into fluid passageway **64**. The forces holding flapper valve **72** in engagement with valve seat **68** are of such a nature that flapper valve **72** is moved out of sealing engagement with valve seat **68** by the pressure of the fuel released from fuel container **12** into fuel passageway **64** to facilitate filling of the reservoir with fuel. In the form shown, the filler tube **66** has a flange portion **78** having a gas escape port **80** therethrough for venting the fuel reservoir to atmosphere during the filling of the reservoir with fuel.

The fuel charging valve shown in FIGURE 5 has a filler tube **82** of magnetic material having a longitudinal fuel passageway **84** therethrough and forming a valve seat **86** at its lower end. A hollow valve casing **88** is sealed on the lower end of filler tube **82** by a sealing ring **90**. Within the hollow casing **88** there is disposed a resilient sealing member **92** adapted to seat against valve seat **86** and having a permanent magnet **94** secured thereto so that the resilient sealing member **92** is normally attracted toward the filler tube **82** and therefore in engagement with the seat **86**. The end of hollow casing **88** is closed by a plug **96** which is threaded into the casing and which has a fluid flow port **98** therethrough for admitting fuel from the interior of the hollow casing **88** into the fuel reservoir. The casing **88** also has ports **100** and **102** for admitting fuel to the fuel reservoir. The filler tube **82** has a flange portion **104** with a gas escape port **106** therethrough similar to that shown in FIGURE 1 for use with the vent valve structure shown in FIGURE 1 to vent the fuel reservoir to atmosphere simultaneously with the charging of the reservoir with fuel as is hereinafter more particularly pointed out.

The magnetic attraction of permanent magnet **94** for the filler tube **82** is of such a nature that the resilient sealing member **92** is moved out of engagement with valve seat **86** by the pressure of fuel released from a fuel container into the fuel passageway **84** to facilitate filling of the fuel reservoir.

In the valve assembly shown in FIGURE 6 affording simultaneous charging of a fuel reservoir with liquefied gas fuel under pressure from a fuel container and escape of gas from the reservoir, a valve casing shown generally at **108** has a top wall **110** overlying the reservoir casing **14** and closing the opening **18** therein. The casing **108** has a depending cylindrical wall **112** extending into the fuel reservoir and defining a recess **114**. The casing **108** has a gas escape port **116** in its top wall **110** communicating with recess **114** and a side vent **118** in cylindrical wall **112** communicating the fuel reservoir with recess **114**. A resilient sealing member **120** is carried in recess **114** for closing the gas escape port **116**. A filler tube **122** of magnetic material protrudes through the top wall **110** of valve casing **108** into recess **114**. The filler tube **122** has a longitudinal fuel passageway **124** therethrough communicating with recess **114** and providing a valve seat surface **126**. A flapper valve **128** is disposed in recess **114** of the casing **108** for movement into and out of sealing engagement with valve seat surface **126**. A permanent magnet **130** having magnetic attraction for the filler tube **122** is disposed in recess **114** below flapper valve **128** for moving the resilient sealing member **120** into port closing position and flapper valve **128** into sealing engagement against valve seat surface **126** to close fuel passageway **124**. The valve assembly is provided with a temperature responsive bimetal coil **132** which expands against magnet **130** in response to a lowering of the temperature in the fuel reservoir. The force exerted by the bimetal coil **132** assists in preventing leakage through the gas escape port **116** and fuel passageway **124** when the magnetic attraction of magnet **130** for filler tube **122** and the pressure in the fuel reservoir are not sufficient to prevent leakage. The end thrust of the bimetal coil **132** is received by a threaded plug **134** turned into the casing **108**. The plug **134** has a fuel port **136** therethrough for allowing fuel to pass from recess **114** into the fuel reservoir. The forces exerted by the bimetal coil **132** and magnet **130** are of such a nature that the flapper valve **128** and resilient sealing member **120** will be moved out of their respective closed positions by the pressure of fuel being inserted into fuel passageway **124** from a fuel container inserted over the upper end of filler tube **122** to facilitate filling of the fuel reservoir.

FIGURE 7 shows a valve assembly having a valve casing shown generally at **138**. The casing **138** has a transversely extending top wall portion **140** overlying the reservoir casing **14** and closing the opening **18** therein. The casing **138** also has a depending cylindrical wall portion **142** extending into the fuel reservoir and defining a recess **144**. The top wall portion **140** of casing **138** has a gas escape port **146** therethrough communicating with recess **144** and the cylindrical wall **142** of casing **138** has a side vent **148** therethrough communicating the fuel reservoir with recess **144**. A filler tube **150** protrudes through the top wall portion **140** of casing **138** into recess **144**, the tube having a fuel passageway **152** therethrough. A resilient sealing ring **154** is carried in recess **144** for closing gas escape port **146**. A cylindrical sleeve **156** is carried in recess **144** and a piston **158** is mounted in cylindrical sleeve **156** for reciprocating movement, the piston **158** being adapted to cut off communication between the fuel passageway **152** and recess **144** and to cause resilient sealing member **154** to close gas escape port **146**. The valve assembly has temperature responsive means for reciprocating piston **158** comprising a fluid **160** in the cylindrical sleeve **156** which changes its volume at a lower temperature than the liquefied gas fuel which is inserted into the fuel reservoir. In the case where butane gas is being inserted into the fuel reservoir, either alcohol or propane, for example, is a suitable fluid for this purpose. The recess **144** is closed by a plug **162** threaded into the cylindrical side wall **142** of casing **138**, the plug having a fuel port **164** therethrough communicating recess **144** with the fuel reservoir to facilitate passage of fuel into the reservoir. The over-all system including the temperature responsive fluid **160** is such that when the reservoir is to be filled, the fluid **160** will rapidly contract due to the extremely low temperature of the fluid fuel from the supply to thereby permit the pressure of the fluid fuel to move piston **158** downwardly while allowing the pressure of fluid fuel remaining in the reservoir to act upwardly on the underside of the sleeve **156** to move the latter upwardly thereby permitting additional fluid fuel to enter the reservoir through the port **164**. When the refilling operation has been completed, it will be appreciated that the fluid **160** will not immediately expand to cause the piston **158** to move into a sealing relationship with the sealing member **154**. However, the pressure of the fuel in the reservoir will act on the underside of the sleeve **156** to cause the latter to move the piston **158** into such a sealing relationship. After a short period of time, the temperature of the fluid **160** will attain the temperature of the environment, expanding as the temperature increases until the structure is arranged in the manner shown in FIG. 7. As mentioned above, the fluid **160** is selected such that a significant volume change will only occur at a lower temperature than a similar volume change of the gas fuel in the reservoir. Accordingly, when fluid **160** is subjected to a low environmental temperature, it will still exert a significant sealing force against the piston **158** although the pressure of the fluid fuel in the reservoir against the underside of the sleeve **156** may have decreased significantly.

FIGURE 1 shows one form of a vent valve structure of the valve assembly **10** associated with a fuel container **12**. This form of vent valve comprises a filler tube **166** having a fuel passageway **168** therethrough and a transverse flange portion **170** closing the opening **18** in the casing **14** of reservoir **16**. The flange portion **170** of the filler tube **166** has a gas escape port **172** venting reservoir **16** to atmosphere as shown in FIGURE 1.

The filler tube **166** has an upper stem portion **174** adapted to be inserted into the fuel container **12**, the stem having an opening **176** therein for admitting liquefied gas fuel under pressure from the fuel container **12** into the fuel passageway **168**.

A plunger **178** is mounted for reciprocating movement between an upper position and a depressed position on the stem portion **174** of filler tube **166**. The bottom surface **180** of the plunger **178** lies in a plane which is at an acute angle with the longitudinal axis of the plunger **178**. This inclined surface **180** engages a washer **182** which, in turn, engages a resilient sealing ring **184** adapted to open and close the gas escape port **172**.

The plunger **178** has a recess **186** therein which receives a helical spring **188** for normally urging the plunger **178** toward its upper position and the resilient sealing ring **184** into its port closing position.

When the fuel container **12** is inserted over the stem portion **174** of the filler tube **166**, it forces the plunger **178** into its depressed position as shown in FIGURE 1. When the plunger **178** is in its depressed position, the inclined surface **180** compresses one side of the resilient sealing ring **184** while allowing the other side of the resilient ring covering the gas escape port **172** to be lifted out of its port closing position, thus venting the reservoir **16** to atmosphere.

FIGURE 9 shows a modified form of a reservoir vent valve structure having a filler tube **190** which has a top end adapted to receive a fuel container **12** as shown in FIGURE 1 and a body portion extending into the fuel reservoir. The filler tube **190** has a fuel passageway **192** therethrough opening into the fuel reservoir.

A plunger **194** is mounted on the filler tube **190** for reciprocating movement between a normal position, as seen in FIGURE 9, and a depressed position. The plunger **194** has a recess **196** therein having a helical plunger spring **198** which urges plunger **194** toward its normal position. The end thrust of the spring **198** is taken by a plug **200** inserted through hole **18** in the reservoir casing **14**.

A vent valve slide **202**, movable between a normal position and a depressed position, encircles the filler tube **190** and is received within plug **200**. The vent valve slide has an end flange **204** having inclined upper surface **206**.

A vent valve casing **208** has a recess **210** therein and a gas escape port **212** therethrough for venting the fuel reservoir to atmosphere. A vent valve spring **214** in recess **210** urges vent valve slide **202** toward its normal position. When the vent valve slide **202** is in normal position, the inclined upper surface **206** of the end flange **204** compresses an O-ring **216** against vent valve casing **208** and plug **200** to close the gas escape port **212**. During the filling of the fuel reservoir with liquefied gas fuel under pressure from the fuel container inserted over the end of filler tube **190**, the vent valve slide **202** is moved into its depressed position thus releasing the compressive force on O-ring **216** and unblocking the gas escape port **212** and venting the fuel reservoir to atmosphere. The vent valve slide **202** is moved into its depressed position by plunger **194** which is moved into its depressed position against vent valve slide **202** by the fuel container inserted over the end of filler tube **190**.

This vent valve structure may have a resilient sealing ring **218** for closing the fuel passageway **192** as shown in FIGURE 9.

I claim:

1. A valve assembly for simultaneously charging a reservoir with liquefied gas fuel under pressure from a fuel container and venting the reservoir to atmosphere, comprising: a filler tube having one end adapted to receive said fuel container and a second end extending into said fuel reservoir, said filler tube having opposed substantially flat wall portions, said filler tube having a fuel passageway therethrough opening through one of said flat wall portions into said reservoir; a rubber sealing tube encircling said filler tube for closing said fuel passageway; a bimetal member secured to said filler tube and having a pair of flexible arms for moving said sealing tube into its closed position, one of said arms extending between said rubber sealing tube and the flat wall portion of the filler tube opposite said fuel port, the second arm of said bimetal member extending over the outside of said rubber sealing tube, said arms of the bimetal member normally being in an expanded position so that said first arm pulls the rubber sealing tube into fluid-tight engagement with said filler tube to close said fuel passageway, said arms being adapted to urge inwardly toward the filler tube to a contracted position in response to a lowering of the temperature in said reservoir as said fuel under pressure is released from said fuel container into the filler tube and said reservoir is vented to atmosphere, the construction of said second arm being such that when urging toward its contracted position its compressive force against the rubber sealing member is less than the pressure of the fuel in the fuel passageway of the filler tube so that the fuel passes through the passageway into the fuel reservoir.

2. A valve assembly for simultaneously charging a fuel reservoir with liquefied gas fuel under pressure from a fuel container and venting the reservoir to atmosphere comprising: a filler tube having one end adapted to receive said fuel container and a second end extending into said fuel reservoir, said filler tube having opposed substantially flat wall portions, said filler tube having a fuel passageway therethrough opening through one of said flat wall portions into said reservoir; means for venting said reservoir to atmosphere; a rubber sealing tube encircling said filler tube for closing said fuel passageway, a bimetal member secured to said filler tube and having a pair of flexible arms overlying said rubber sealing tube, said arms normally being in a contracted position compressing said rubber sealing tube against said filler tube to close said fuel passageway, said arms being adapted to be moved away from said filler tube into an expanded position in response to the pressure of the fuel released from said fuel container into said fuel passageway and a lowering of the temperature of the bimetal member as the fuel released from said fuel container expands in the fuel passageway of the filler tube and the reservoir is vented to atmosphere.

3. A valve assembly for simultaneously charging a reservoir with liquefied gas fuel under pressure from a fuel container and venting said reservoir to atmosphere, comprising: a filler tube having one end adapted to receive said fuel container and a second end extending into said fuel reservoir, said filler tube having a pair of opposed substantially flat wall portions, said filler tube having a fuel passageway therethrough and opening through one of said flat wall portions into said fuel reservoir; a rubber sealing tube encircling said filler tube for closing said fuel passageway; a U-shaped bimetal member secured to said filler tube and having a pair of flexible arms overlying said rubber sealing tube, said arms normally being in an expanded position away from said rubber sealing tube, said rubber sealing tube normally being compressed against the filler tube by the pressure of the fuel in said fuel reservoir to close the fuel passageway, said flexible arms adapted to be moved inwardly toward said filler tube into a contracted position compressing said rubber sealing tube against said filler tube in response to a lowering of the temperature in said reservoir to prevent leakage through said fuel passageway, the flexibility of said arms being of such a nature that they are moved away from the filler tube by the pressure of the fuel released from said fuel container into said fuel passageway to facilitate filling of the fuel reservoir.

4. A valve assembly affording simultaneous charging of a fuel reservoir with liquefied gas fuel under pressure from a fuel container and escape of gas from the reservoir, comprising: a valve casing having a top wall and a cylindrical side wall extending into said reservoir and having a recess therein, said casing having a gas escape port in its top wall communicating with said recess and a side vent in said side wall communicating said reservoir with said recess; a resilient sealing member carried in the recess of said casing for closing said gas escape port; a filler tube of magnetic material protruding through the top wall of said valve casing into said recess; said tube having a fuel passageway therethrough and providing a valve seat; a flapper valve carried in the recess of said casing for movement into and out of sealing engagement with said valve seat; means having magnetic attraction for said filler tube for moving said resilient sealing member into port closing position and said flapper valve into sealing engagement against said seat to close said fuel passageway; and temperature responsive means for holding said magnetic means against said flapper valve to prevent leakage of fuel from said reservoir, said magnetic means and said temperature responsive means being of such a nature that said resilient sealing member is moved out of port closing position and the flapper valve is moved out of sealing engagement against said valve seat by the pressure of the fuel released from said fuel container into said fuel passageway to facilitate filling of the fuel reservoir.

5. A valve assembly affording simultaneous charging of a fuel reservoir with liquefied gas fuel under pressure from a fuel container and escape of gas from the reservoir, comprising: a valve casing having a top wall, a cylindrical side wall extending into said reservoir and a recess therein, said casing having a gas escape port in its top wall communicating with said recess and a vent in said side wall communicating said reservoir with said recess, said casing having a filler tube through said top wall and extending into said recess, said filler tube having a fuel passageway therethrough communicating with said recess; a resilient sealing ring carried in the recess of said casing for closing the gas escape port; a cylindrical sleeve in the recess of said casing; a piston mounted in said cylindrical sleeve for reciprocating movement, said piston being adapted to cut off the communication between said fuel passageway and said recess and to cause the resilient sealing member to close said gas escape port; and temperature responsive means for reciprocating said piston, said casing having an outlet port communicating said recess with said fuel reservoir.

6. The valve assembly as described in claim **5** wherein the temperature responsive means for reciprocating the piston comprises a fluid in said cylindrical sleeve which changes its volume at a lower temperature than the liquefied gas fuel.

7. The valve assembly as specified in claim **6** wherein said fluid is propane and said fuel is butane.

8. The valve assembly as specified in claim **6** wherein said fluid is alcohol and said fuel is butane.

9. In a filler valve assembly for the fuel reservoir of a liquefied gas fuel device that is subjected to use in an environment that is subject to temperature variants and having means defining a fuel passageway opening through a valve seat into said reservoir together with a valve member movable toward and away from said valve seat, said assembly including fluid pressure responsive means for urging said valve member toward said valve seat with a force proportional to the pressure of fuel in said reservoir, the improvement comprising: thermal responsive means in said reservoir for urging said valve member toward said seat with a force inversely proportional to the temperature of said reservoir, whereby when the pressure of fuel in said reservoir decreases in response to a decrease in environmental temperature, the force urging said valve member toward said valve seat applied by said thermal responsive means will increase to insure maintenance of said valve member in a sealing relation with said valve seat.

10. The filler valve assembly of claim **9** wherein said fuel passageway opens through a valve seat in an end member of a tubular casing extending within the reservoir, said valve member is a flapper disc in said casing and said thermal responsive means is an elongated bi-metal spiral which, upon a reduction in temperature, urges said flapper disc against said valve seat.

11. The filler valve assembly of claim **10** wherein said tubular casing is open ended, said bi-metal spiral is seated against a surface in said reservoir outside said casing and operates on said valve member through a piston slidable in said casing.

12. The filler valve assembly of claim **10** wherein said tubular casing has a closed end and said elongate spiral bi-metal element acts between said closed end and said flapper disc.

13. A filler valve assembly for the fuel valve of a liquefied gas fuel device having means defining a fuel passageway formed in an elongated tubular member and an opening through a valve seat in the side wall of a fuel reservoir, and a valve member movable toward and away from said valve seat, said valve member comprising a resilient band surrounding said tubular member and being urged by said valve seat by the pressure of fuel in said reservoir and away from said seat by the pressure of fuel from a supply connected with said passageway, and the improvement comprising: a thermal responsive element in said reservoir and operable on reduction of the temperature of said reservoir to supplement the pressure of fuel in said reservoir and hold said valve member against said seat, said thermal responsive element comprising a fixed elongated bi-metal strip having one end positioned to urge said band toward said valve seat upon a reduction in temperature.

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