United States Patent [19]

Donovan

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[45] **Feb. 12, 1974**

[54] **CHARGE FORMING APPARATUS**

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[73] Assignee: **Borg-Warner Corporation,** Chicago, Ill.

[22] Filed: **Apr. 12, 1973**

[21] Appl. No.: **350,370**

Related U.S. Application Data

[62] Division of Ser. No. 79,855, Oct. 12, 1970, abandoned.

[52] **U.S. Cl.**..... **261/35,** 261/69 A, 261/DIG. 68, 251/363

[51] **Int. Cl.**..... **F02m 17/04**

[58] **Field of Search**..... 261/353, 295, 69 A, 35, 70, 261/DIG. 68; 251/359, 363, 365

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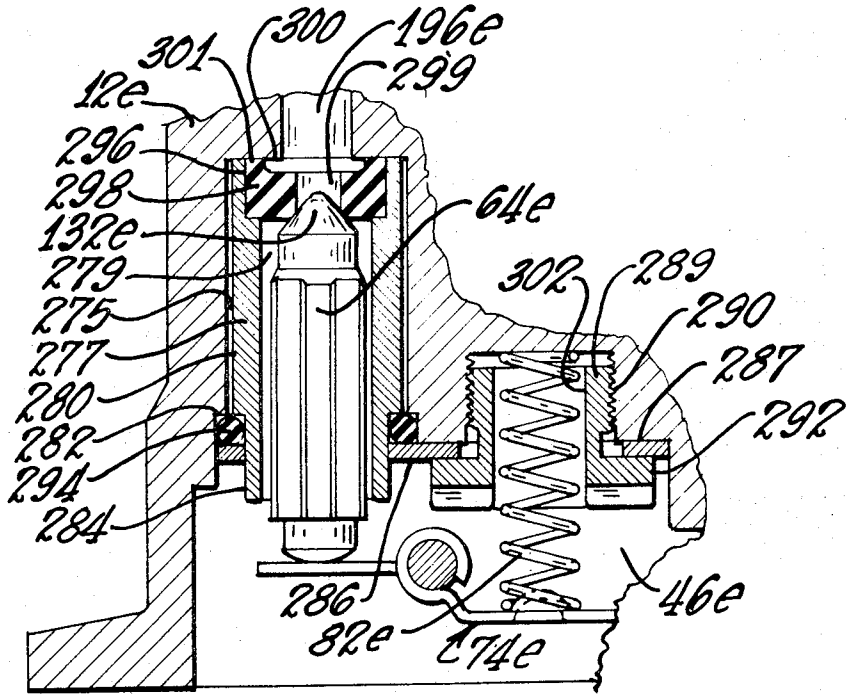
Primary Examiner—Tim R. Miles

Attorney, Agent, or Firm—Harry O. Ernsberger

[57] **ABSTRACT**

The disclosure embraces a charge forming apparatus or carburetor having a body embodying a guide and valve seat construction for a fuel inlet valve, the valve guide being disposed to seal off porosity adjacent the inlet valve region of the body of the charge forming apparatus or carburetor to prevent seepage or leakage of liquid fuel through a porous region that may exist or be uncovered by processing operations on the carburetor body.

8 Claims, 23 Drawing Figures



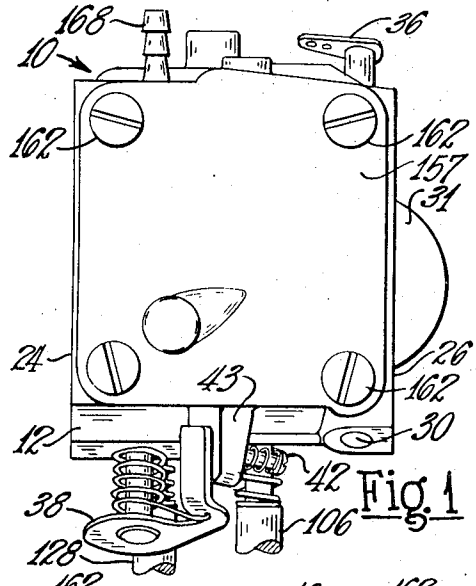


Fig. 1

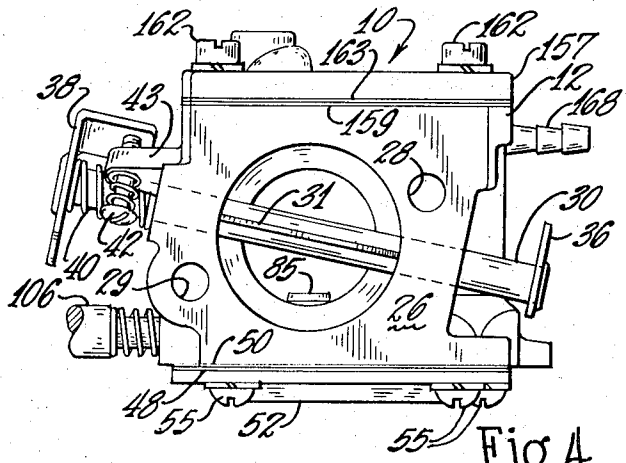


Fig. 4

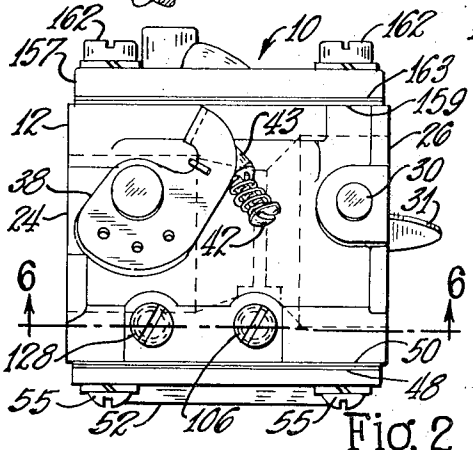


Fig. 2

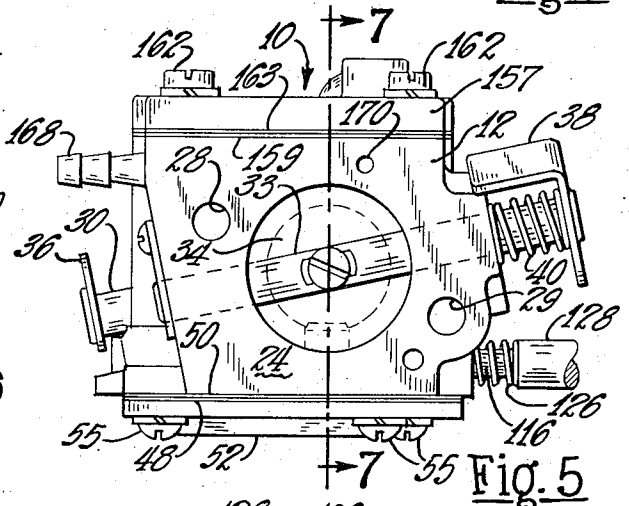


Fig. 5

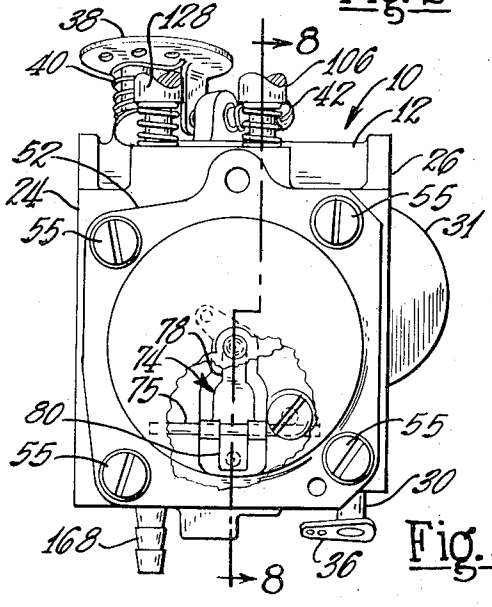


Fig. 3

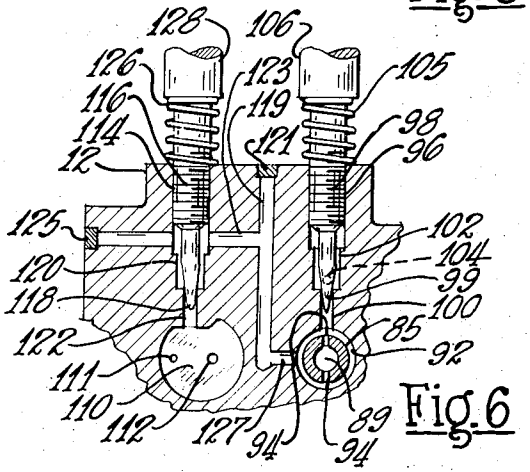


Fig. 6

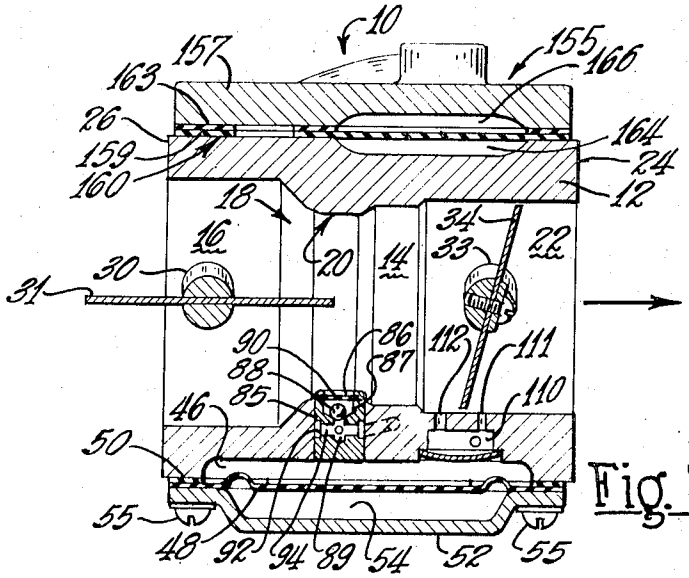


Fig. 7

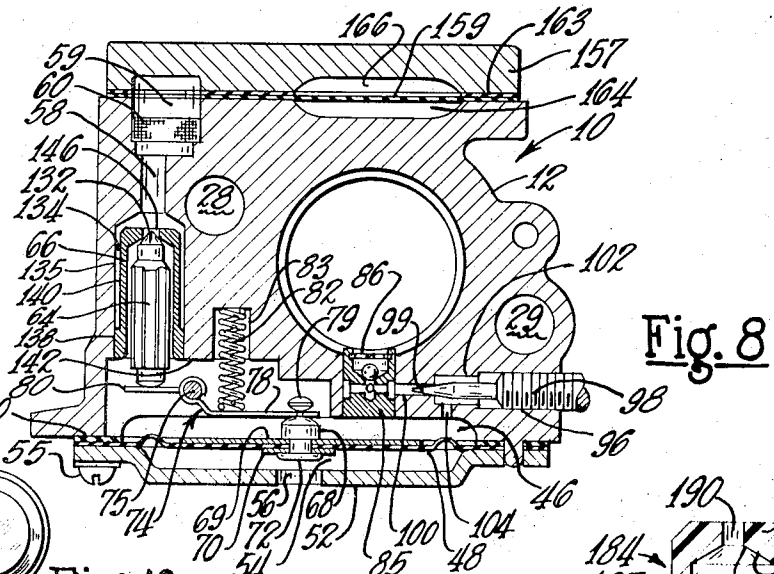


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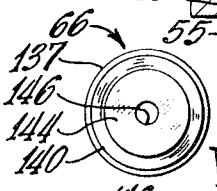


Fig. 10

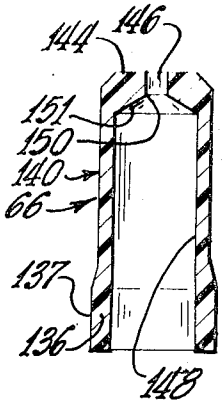


Fig. 9

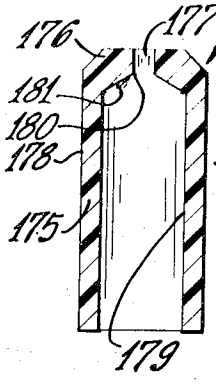


Fig. 11

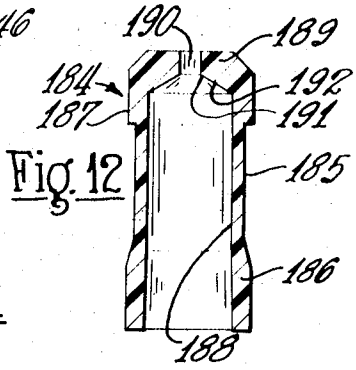


Fig. 12

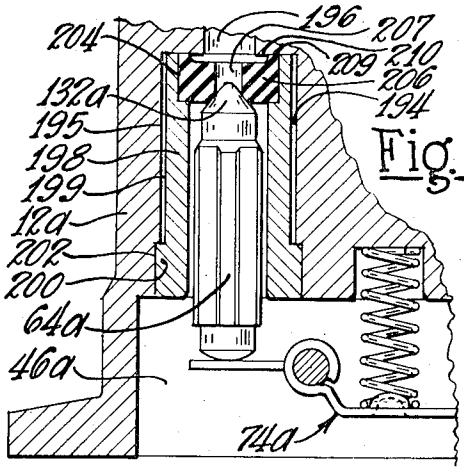


Fig. 13

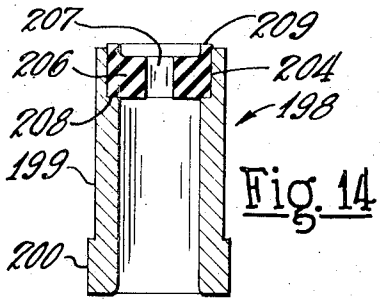


Fig. 14

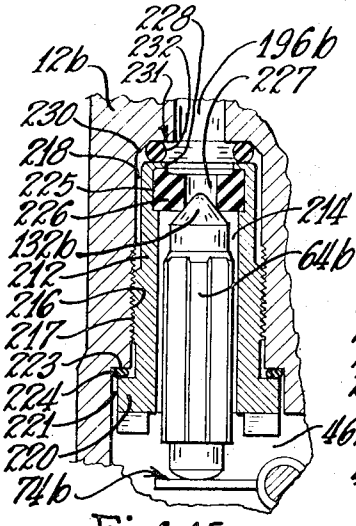


Fig. 15

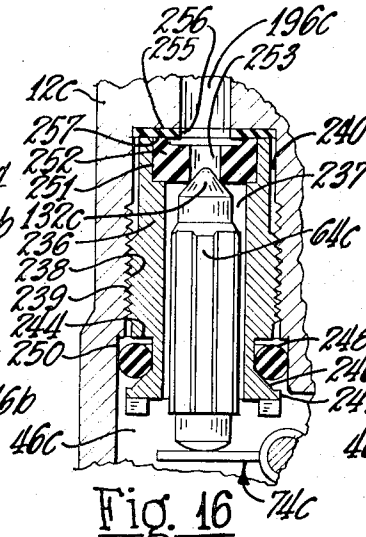


Fig. 16

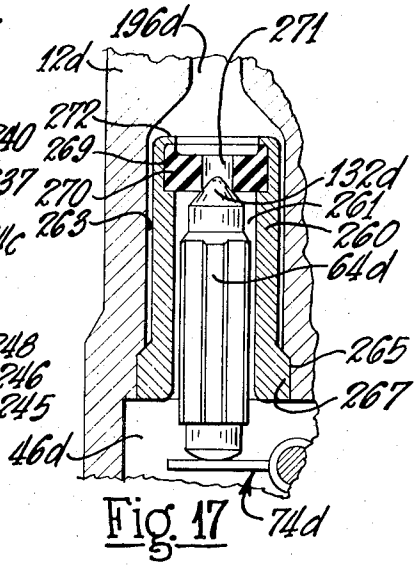


Fig. 17

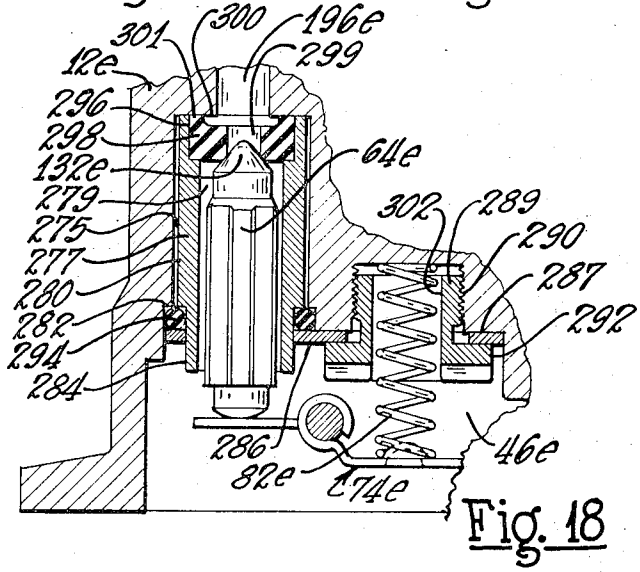


Fig. 18

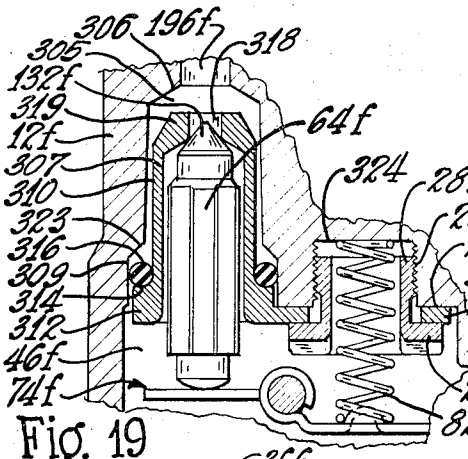


Fig. 19

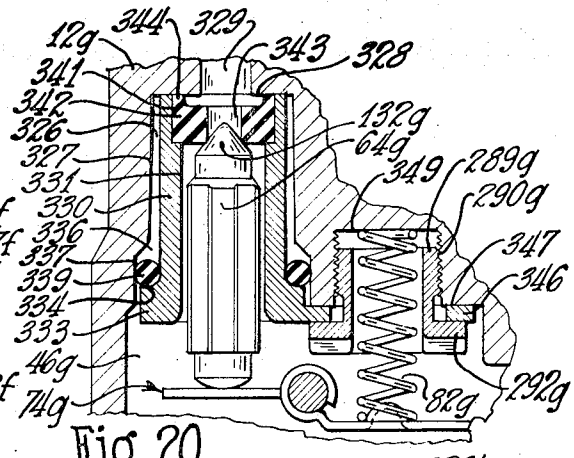


Fig. 20

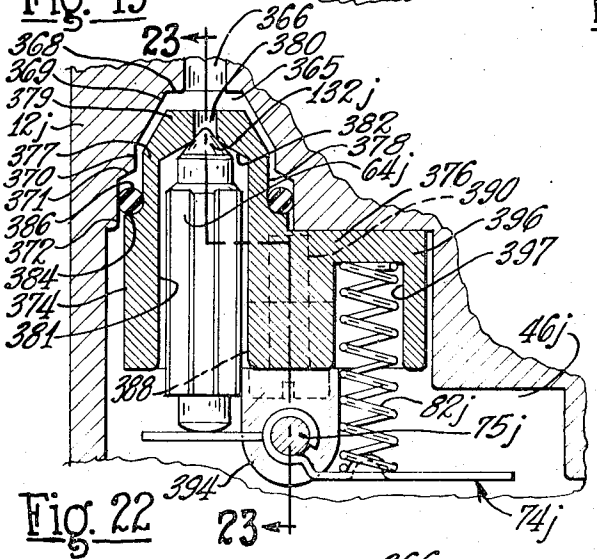


Fig. 22

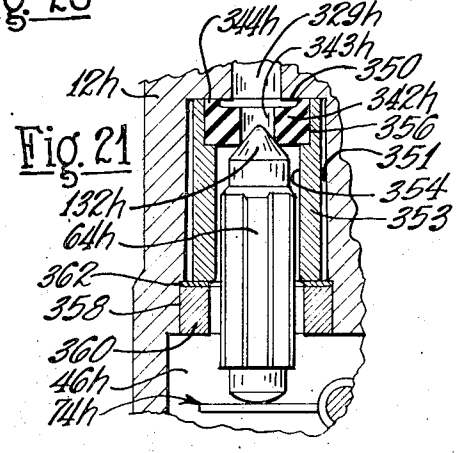


Fig. 21

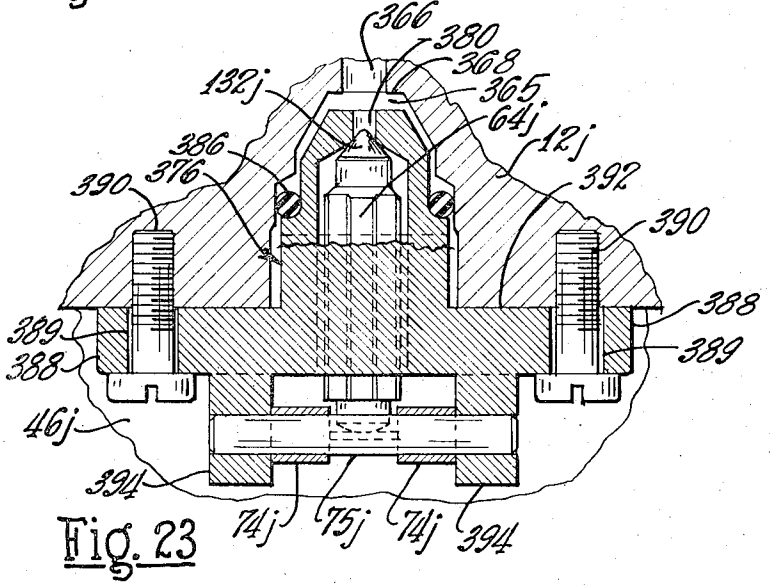


Fig. 23

CHARGE FORMING APPARATUS

This application is a division of my copending application Ser. No. 79,855, filed Oct. 12, 1970, now abandoned.

In the manufacture of carburetors or charge forming apparatus of the disphragm type wherein the fuel is aspirated from a fuel chamber into the fuel and air mixing passage by reduced pressure in the mixing passage, or a type of charge forming apparatus or carburetor of the float-controlled inlet valve type, the bodies of such carburetors are usually fashioned of metal by die-casting methods.

Carburetors of the aspirated diaphragm type are usually of very compact construction to provide a minimum weight and size especially where the carburetor is used with two-cycle engines for powering chain saws, earth tampers, snowmobiles, outboard marine engines and the like. In the method of forming a die cast body the molten metal, such as an alloy of aluminum or an alloy of zinc, is flowed into a casting die which is usually of complex construction because of the use of several slidable core pins for forming small passages in the die cast body. Certain regions of the die cast body are processed by machining operations, such as drilling, reaming or threading to properly accommodate interior components, such as a choke valve, a throttle valve and a fuel inlet valve, either diaphragm controlled or float controlled, for regulating fuel flow into the fuel chamber of the carburetor for delivery into the mixing passage. Heretofore it has been a practice to drill, ream or machine the cored passage or chamber in the carburetor accommodating and guiding the fuel inlet valve and to machine a seal for the fuel inlet valve in the metal of the body or a valve seat insert whereby the cone-shaped end of the needle valve cooperates with the seat under the influence of the position of the diaphragm in an aspirated diaphragm carburetor, or under the influence of the float means of a float type carburetor for regulating fuel flow into the fuel chamber in the carburetor in accordance with the requirements of the engine.

One of the characteristics of a die cast body for a carburetor is that the surfaces of the cast metal at the walls of the die and at the surfaces of the cores are usually not porous as the molten or flowable metal engaging such surfaces tends to form a shell which is imperforate. In a die casting or other metal casting operation, it is conventional to provide vents in the die to provide for the escape of air as the molten metal flows into the die. In casting the body for a carburetor wherein many of the passages or chambers are fashioned by cores extending into the die, it is virtually impossible to vent or exhaust all of the air and hence some air may be entrapped in the metal resulting in a porous condition in the metal beneath the imperforate shell of metal existent at the exterior surfaces contiguous with the die surfaces and the surfaces of the cored passages. It is found that there tends to be more porosity in the metal adjacent the surfaces of the cored passages and that upon reaming or machining of a cored passage, a porosity condition of the metal may be uncovered or exposed.

In many instances the drilling or reaming operation of the cored inlet valve guide passage or chamber and the machining of the seat in the fuel inlet passage or chamber for the inlet valve, porosity in the casting is uncovered and leakage of fuel occurs from the fuel

pressure side of the inlet valve seat into and along the machined or reamed guide surface for the inlet valve so that fuel leakage occurs through the porosity in the body into the fuel chamber around the fuel inlet needle, a condition impairing the metering or control of the fuel for delivery into the mixing passage and, in many instances, renders the carburetor useless.

The leakage caused by uncovered porosity is usually not discovered until the carburetor components are completely assembled in the carburetor body and the assembled unit given a pressure test. If leakage through uncovered porosity occurs, the carburetor must be discarded as waste and it has been found that a substantial percentage of die cast carburetor bodies in which the machining or reaming of the guide passage for the inlet valve and the valve seat resulted in porosity leakage of liquid fuel.

The invention embraces a charge forming apparatus or carburetor having an inlet valve for controlling fuel flow into a fuel chamber of the carburetor wherein the carburetor body is fashioned with a chamber or passage accommodating a valve guiding means and valve seat construction of a character providing more efficient and effective control of fuel flow into the carburetor fuel chamber.

This invention resides in the provision in a carburetor of means for sealing surface regions of the carburetor body adjacent a fuel inlet control valve to prevent bypassing of liquid fuel into carburetor fuel chambers which would otherwise impair the operation of the charge forming apparatus or render the carburetor unfit for use.

Another object of the invention embraces a charge forming apparatus or carburetor having an inlet valve for controlling fuel flow into a fuel chamber in the carburetor body and a valve guiding means and valve seat construction disposed in the body in a manner preventing bypassing of liquid fuel around the valve guiding means and valve seat construction to provide positive control by the inlet valve of fuel flow from a supply into the carburetor fuel chamber.

An object of the invention embraces the provision of a carburetor having a die cast metal body of a means associated with a machined or reamed wall of a chamber in the body accommodating a fuel control valve to effectively seal off porosity which may be present at the machined or reamed surface and thereby prevent leakage of fuel through the porous region.

An object of the invention resides in the provision of a carburetor having a die-cast metal body and operative components including a fuel inlet control valve wherein a valve guide member equipped with a valve seat is disposed in a region in the body to prevent leakage of fuel through porous regions of the carburetor body.

Another object of the invention resides in a carburetor embodying a cast metal body and a fuel inlet control valve, the body having a chamber accommodating a valve guide means equipped with a valve seat, the valve guide means being disposed in the passage and having a region in liquid-tight engagement with a region of the passage for eliminating leakage of fuel around the valve guide means by reason of porosity that may exist in the carburetor body at the region of the valve guide means.

Another object of the invention resides in a carburetor embodying a cast metal body and a fuel inlet con-

trol valve, the body having a chamber accommodating a valve guide means equipped with a valve seat, and sealing means associated with the valve guide means for sealing off the chamber in a manner preventing leakage of fuel around the valve guide means.

Another object of the invention resides in a carburetor having a cast metal body wherein a sleeve means is disposed in a machined region to the body to effectively seal any porous region that may be uncovered by the machining operation.

Another object of the invention is the provision in a cast metal body carburetor of a drilled, reamed or machined passage with a sleeve or member accommodated in the passage for closing or sealing off porosity in the region of the metal defining the passage.

Another object of the invention resides in the provision of a carburetor of the aspirated diaphragm type wherein a porosity sealing and inlet valve guide means is provided to eliminate leakage of fuel from the fuel inlet region adjacent the valve through the porosity into the diaphragm fuel chamber to thereby avoid impairment of the operation of the carburetor which may occur in the event of fuel bypassing the inlet valve through pores in the carburetor body.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIG. 1 is a top plan view of a combined diaphragm carburetor and fuel pump construction embodying the invention;

FIG. 2 is a side elevational view of the carburetor and pump construction shown in FIG. 1;

FIG. 3 is a bottom plan view of the construction shown in FIG. 1 with a portion broken away;

FIG. 4 is a view of the air inlet end of the construction shown in FIG. 1;

FIG. 5 is a view of the mixture outlet end of the construction shown in FIG. 1;

FIG. 6 is a fragmentary sectional view taken substantially on the line 6—6 of FIG. 2;

FIG. 7 is a vertical longitudinal sectional view, the view being taken substantially on the line 7—7 of FIG. 5;

FIG. 8 is a transverse sectional view taken substantially on the line 8—8 of FIG. 3;

FIG. 9 is an enlarged longitudinal sectional view illustrating one form of fuel inlet valve guide means embodying a porosity sealing region;

FIG. 10 is a top plan view of the construction shown in FIG. 9;

FIG. 11 is a sectional view illustrating a modified form of fuel inlet valve guide and valve seat means;

FIG. 12 is a sectional view illustrating another form of fuel inlet valve guide and seat means;

FIG. 13 is an enlarged fragmentary sectional view of a portion of a carburetor body illustrating another form of fuel inlet valve guide embodying a valve seat and providing a porosity seal;

FIG. 14 is a detail sectional view of the valve guide and valve seat means shown in FIG. 13 before assembly in a carburetor body;

FIG. 15 is an enlarged fragmentary view of a portion of a carburetor body embodying another form of fuel inlet valve guide and valve seat construction and fluid sealing means;

FIG. 16 is a view similar to FIG. 15 illustrating another form of fuel inlet valve guide and valve seat construction and fluid sealing means;

FIG. 17 is a view similar to FIG. 16 illustrating another form of fuel inlet valve guide and valve seat construction;

FIG. 18 is a sectional view illustrating a portion of a carburetor body embodying another form of fuel inlet valve guide and valve seat construction with a fluid sealing means;

FIG. 19 is a view similar to FIG. 18 illustrating another form of fuel inlet valve guide and valve seat construction with fluid sealing means;

FIG. 20 is a sectional view similar to FIG. 19 illustrating another form of fuel inlet valve guide and valve seat construction with fluid sealing means;

FIG. 21 is a sectional view of a portion of a carburetor body embodying a fuel inlet valve guide means and valve seat with fluid sealing means;

FIG. 22 is a sectional view of a portion of carburetor body embodying a fitting provising a valve guide and valve seat in association with fluid sealing means, and

FIG. 23 is a sectional view of the construction shown in FIG. 22, the section being taken substantially on the line 23—23 of FIG. 22.

While the forms of the invention are illustrated as embodied in an aspirated type of diaphragm carburetor or charge forming apparatus, it is to be understood that the fuel inlet valve guide and valve seat construction and fluid sealing arrangement may be incorporated in other types of carburetors or charge forming apparatus wherever it may be found desirable or necessary for sealing fluid sealing purposes and especially for sealing off porosity regions in a machined portion of a cast metal carburetor body.

The diaphragm carburetor illustrated in the drawings and embodying the invention is of a character particularly for use with two-cycle engines such as those particularly employed for power chain saws, lawnmowers and the like, but it is to be understood that the invention may be embodied in other types of disphragm carburetors and float-controlled carburetors for use with engines of both two-cycle and four-cycle types.

Referring to the drawings in detail and initially to FIGS. 1 through 8, there is illustrated a combined carburetor and fuel pump comstruction 10 of the aspirated disphragm type, the carburetor having a cast metal body 12. The metal body 12 is preferably fashioned as a die casting, the metal being preferably of aluminum, zinc or alloys thereof. The carburetor body 12 embodies several passages, ducts or chambers, which are fashioned through the use of slidable cores in the die casting operation.

The cast metal body 12 is fashioned with a fuel and air mixing passage 14 having an air inlet region 16, and a Venturi configuration 18 providing a restricted region or choke band 20, the mixing passage having a mixture outlet 22. The mixture outlet end of the carburetor body 12 is fashioned with a planar surface 24 which is adapted to be mounted by a suitable boss portion of an engine crankcase or cylinder of a two-cycle engine or by a manifold of an engine of the four-cycle

type, a conventional heat insulating gasket (not shown) being disposed contiguous with the surface **24.**

When the carburetor is used with a two-cycle engine, the mixture outlet **22** is in registration with an opening in the crankcase wall of a two-cycle engine for delivering air and fuel mixture into the engine crankcase through a conventional valve construction (not shown) in the mixture admission port. In the use of the carburetor with a two-cycle engine having an inlet port in a cylinder wall or with the intake manifold of a four-cycle engine, an admission port valve construction is unnecessary.

The opposite end of the carburetor body is fashioned with a surface **26** to which is fitted with an air filter or air cleaner (not shown) of conventional construction. In the carburetor illustrated, the body **12** is provided with two cylindrical passages or passageways **28** and **29** extending through the body **12** accommodating bolts (not shown) for securing the air filter to the carburetor body and securing the body to an engine crankcase or to a mixture intake manifold.

Extending across the air inlet region **16** and journalled in bores in the body **12** is a shaft **30** supporting a disc-type choke valve **31** for engine starting purposes. Extending across the mixture outlet **22** and journalled in bores in the body **12** is a throttle shaft **33** supporting a disc-type throttle valve **34** for controlling the mixture flow to the engine. The shaft **30** is provided with an arm **36** for manipulating the choke valve **31** and the shaft **33** is equipped with an arm **38** for manipulating the throttle valve **34.**

A coil spring **40** surrounds the throttle shaft **33** and is disposed between the arm **38** and the body **12,** one end being anchored to the body and the other end engaging the arm **38** to bias the throttle valve toward closed or engine-idling position, viz. the position shown in FIG. **7.** An abutment screw **42** is threaded into an opening in a lug **43** provided on the body **12** for engagement with the arm **38,** the screw being rotatable for adjusting the engine idling position of the throttle valve **34.**

The body **12** is fashioned with a generally circular shallow recess **46** providing a shallow fuel chamber in the body. A flexible member of diaphragm **48** extends across the recess or chamber **46** and forms a flexible wall of the fuel chamber. A gasket **50** is disposed between the peripheral region of the disphragm **48** and the body portion defining the recess **46** to form a liquid-tight seal. A cover member **52** is disposed beneath the diaphragm **48,** the cover member having a depressed central region providing a space **54** to accommodate flexure of the diaphragm **48.**

The gasket **50,** the peripheral region of the diaphragm **48** and the cover member **52** are secured in assembled relation with the body **12** by screws **55** threaded into bores in the body **12.** The central depressed region of the cover member **52** is fashioned with a vent opening **56** to vent the space **54** at the dry side of the diaphragm to the atmosphere. The diaphragm or membrane **48** is arranged to be actuated or flexed by engine aspiration or reduced pressure in the mixing passage **14** for controlling or metering the flow or delivery of liquid fuel into the fuel chamber **46** by an inlet valve member **64,** hereinafter described in detail.

The fuel chamber **46** is unvented except through the fuel flow channels establishing communication between the fuel chamber **46** and the mixing passage **14.** The body **12** is fashioned with a fuel inlet duct **58** in communication with a duct or chamber **59** containing a filter element or screen **60** for filtering imcoming fuel. The chamber is in communication with a fuel pump construction hereinafter described. The flexure or movement of the diaphragm **48,** under the influence or aspiration in the mixing passage, controls the position of the fuel inlet valve body or valve member **64.**

A valve guiding means for the inlet valve member **64** and valve seat construction **66** will be hereinafter described in detail. The central region of the diaphragm is provided with a member or button **68** having a tenon portion extending through the diaphragm and through openings in reinforcing discs **69** and **70** at opposite sides of the diaphragm, the tenon portion of member **68** being swaged as at **72** to secure the member to the diaphragm and the discs.

A motion multiplying means, such as a lever **74** is arranged between the diaphragm **48** and the inlet valve member or body **64** for transmitting flexure or movement of the diaphragm **48** to the inlet valve member or body **64.** The lever **74** is fulcrumed intermediate its ends on a fulcrum pin **75** carried by the body **12.** The lever **74** is formed of sheet metal, the long arm **78** of the lever being bifurcated at its distal end to engage in a recess formed on the valve member or body **68,** the recess being defined by a head portion **79,** as shown in FIG. **8.** The short arm **80** of the lever is engaged with the inlet valve member **64.**

Spring means, such as a coil spring **82,** nested in a recess **83** in the carburetor body engages the long arm **78** of the lever exerting a biasing force urging the fuel inlet valve member **64** toward closed position. Engine aspiration set up in the mixing passage **14** is communicated through fuel passages hereinafter described to the fuel chamber **46,** the reduced pressure flexing the diaphragm **48** toward the mixing passage, swinging the lever **74** in a counterclockwise direction, as viewed in FIG. **8,** to open the fuel inlet valve portion **132** formed on the valve body or member **64** to valve in fuel into the fuel chamber **46.**

The carburetor body **12** is fashioned with a main or primary fuel delivery system for delivering fuel into the mixing passage for intermediate and high speed engine operation, and a secondary fuel delivery system for engine idling and low speed operation. The primary fuel delivery system includes a main orifice construction comprising a cylindrically shaped fitting **85** pressed into a bore in the body **12,** the fitting having an outlet **86** forming the main orifice or main fuel delivery means.

The fitting **85** is fashioned with a counterbore **87** in which is loosely disposed a check valve means, such as a ball check valve or member **88,** which seats against a ledge provided at the juncture of the counterbore **87** with a smaller bore **89,** the ball check member **88** being retained in the counterbore **87** by a grid-like retainer **90.** The fitting **85** is provided with a peripheral recess **92** in communication with the bore **89** by transverse passages **94,** particularly shown in FIG. **6.** The main orifice **86** delivers fuel into the mixing passage for intermediate and high engine speeds.

As shown in FIGS. **6** and **8,** the body **12** is fashioned with a threaded bore **96** accommodating the threaded portion of a manually adjustable valve body **98** having a needle valve portion **99** which cooperates with a restricted passage **100** in communication with a counter-

bore 102, the counterbore 102 receiving fuel from the chamber 46 through a fuel passage 104. The restricted passage 100 is in communication with the peripheral recess 92 of the fitting.

Through this arrangement, fuel for delivery through the main orifice flows from chamber 46 through passage 104, counterbore 102 past a needle valve 99 through the restricted passage 100, recess 92, transverse passages 94, through the counterbore 89 past the ball check valve 88 and through the main orifice 86 into the choke band or restricted region 20 of the Venturi in the mixing passage 14. A coil spring 105 surrounds the valve body 98 and is disposed between an outer surface of the carburetor body and an enlarged portion 106 of the valve body 98 to establish friction for retaining the valve body 98 in adjusted position.

The secondary fuel delivery system for engine idling and low speed operation is shown in FIGS. 6 and 7. The body 12 is provided with a supplemental chamber 110 which is in communication with the mixing passage by an engine idling orifice or passage 111 and a low speed orifice or passage 112. As shown in FIG. 6, the body 12 has a second threaded bore 114 accommodating the threaded portion of a valve body 116, the valve body 116 having a needle valve portion 118 on a portion of the valve extending through the counterbore 120, the needle valve portion 118 extending into a restricted passage 122 opening into the supplemental chamber 110.

A coil spring 126 surrounds the valve body 116 and is disposed between the surface of the body 12 and an enlarged portion 128 of the valve body 116 to establish friction for holding the valve body 116 in adjusted position. The needle valve portion 118 of the valve body 116 cooperates with the restriction or restricted passage 122 to regulate or control fuel flow into the supplemental chamber 110 for delivery through the engine idling orifice 111 and the low speed orifice 112 into the mixing passage.

In the fuel chamber arrangement shown in FIG. 6, the fuel for the secondary fuel delivery system is derived from the peripheral recess 92 in the fitting 85. A passage 119 has its outer end closed by a plug 121. A passage 123 establishes communication between passage 119 and the counterbore 120, the outer end of passage 123 being closed by a plug 125. A short passage 127 is in communication with the fuel passage 119 and the peripheral recess 92 in the fitting 85.

In this arrangement, fuel for the secondary orifices 111 and 112 flows from the peripheral recess 92 in the fitting 85 through connected passages 127, 119 and 123 into the counterbore 120 past the adjustable needle valve 118 into the supplemental chamber 110. The fuel for the secondary orifices is primarily metered by the high speed adjusting needle valve 99, supplemental adjustment of fuel for the secondary orifices being obtained by adjusting the needle valve 118. The enlarged portions 106 and 128 of the respective bodies 98 and 116 may be fashioned with knurled heads (not shown) for manually adjusting the needle valves 99 and 118.

The function of the check ball or valve means 88 in the main orifice construction or fitting 85 is to prevent back bleeding of air through the main orifice 86 into the secondary fuel channel system when fuel is being delivered into the mixing passage through one or both of the secondary orifices 111, 112. Otherwise, air bled into the fuel channels 127, 119 and 123 of the secondary fuel system would lean the engine idling fuel mixture causing the engine to stall.

An important feature of the invention resides in a guide means for the fuel inlet valve body 64 and the valve seat for the cone-shaped valve or valve portion 132 of the valve body 64. One form of guide means and valve seat construction 66 is illustrated in FIGS. 8, 9 and 10.

The carburetor body 12 is fashioned by a die casting method. In casting them metal body 12, the die construction is equipped with cores extending into the die whereby passages such as the mixing passage 14, passages 28 and 29 accommodating the securing bolts, the chamber 59, passage 58, passage or chamber 134 and the recess 83 are fashioned by the cores in the casting operation, the cores being slidable to enable the cast carburetor body to be removed from the die.

The fuel inlet valve guide, sleeve or member 66 is fashioned with a peripheral boss portion 136 having an exterior cylindrical surface 137. In order to accommodate the valve guide means or sleeve 66, the portion 138 of the surface 135 defining the chamber 134 is machined or reamed to a dimension whereby the boss portion 136 of the member 66 may be press fitted in the machined or reamed portion of the cored surface 135. The surface portion 140 of the member 66 is of reduced diameter so as to be received in the cored passage 134 without machining or reaming the remaining region of the interior surface 135 of the cored chamber 134. The snug or press fit of the surface 137 of the valve guide member 66 with the machined or reamed surface 138 of the cored passage 134 seals off any porosity that may be uncovered by reaming or machining of the surface 138, thus preventing any seepage or leakage of fuel from any porous region into the fuel chamber 46.

The surface portion 142 of the body 12 adjacent the reamed or machined surface 138 is imperforate because it is a cast exterior surface of the carburetor body 12 and leakage of fuel does not occur at the surface 142. As the unmachined surface region of cored chamber 134 and, as the surfaces defining the chamber 59 and the passage 58 are not machined or reamed, there is no porosity uncovered in these surfaces to cause seepage or leakage of fuel at these regions. The inlet valve guide member or fitting 66 is fashioned to provide an inlet port and a valve seat for the cone-shaped valve portion 132 of the inlet valve body 64. As particularly shown in FIG. 9, the end wall 144 integral with the member 66 is provided with a port 146.

The interior cylindrical surface 148 of member 66 is of a diameter to slidably accommodate the inlet body 64 with only sufficient clearance to accommodate movement of the valve body so that the valve portion 132 effectively engages the valve seat 150 at the juncture of the chamfered or frusto-conical interior surface 151 with the cylindrical wall defining the port 146. The valve body 64 is of polygonally shaped cross section providing facets to facilitate flow of liquid fuel entering the port 146 along the valve body 64 into the fuel chamber 46.

The member 66 provides a means for properly guiding the valve body 64 into engagement with the valve seat 150 in the member 66 in addition to the function of the portion 136 of the member in sealing off any porosity in the body 12 at the region of engagement of the surface 137 with the machined or reamed surface 138

defining an entrance region of the passage or chamber **134.** The member or fitting **66** is preferably fashioned of Delrin (polyoxymethylene) as such material is nonporous and highly resistant to deterioration by hydrocarbon fuels and it may be accurately molded to the desired shape.

It is to be understood that the inlet valve guide means and valve seat **66** may be fashioned of other suitable materials such as other nonporous resinous plastics or metals which are nonporous. The valve body **64** may be fashioned of Delrin, nylon or other resinous material not subject to deterioration by hydrocarbon fuels, or the valve body **64** may be fashioned of metal such as stainless steel or aluminum and the cone-shaped portion **132** faced with synthetic rubber or the like.

The construction illustrated in FIGS. **1** through **8** includes a diaphragm fuel pump construction associated with the carburetor, the fuel pump being of the general character disclosed in U. S. Pat. to Philipps, No. 3,275,306. The pump is inclusive of a plate or cover member **157** with a pumping diaphragm **159** disposed between the plate and a planar surface **160** on a side of the carburetor body opposite the metering diaphragm, as shown in FIGS. **7** and **8.** Screws **162** extend through openings in the plate **157** and through openings in the diaphragms into threaded bores in the carburetor body **12** for securing these components in assembled relation.

A sealing gasket **163** is provided between the plate **157** and the diaphragm to provide an effective seal, the diaphragm **159** being of substantially the same shape as the plate **157.** The carburetor body **12** is fashioned with a shallow circular recess providing a fuel receiving chamber **164** and the plate **157** fashioned with a similar shallow recess providing a pulse or pumping chamber **166.**

The flexible pumping diaphragm **159** is provided with integral flap valves (not shown) cooperating with inlet and outlet ports for the fuel chamber **164** whereby movements of the diaphragm **159** pumps fuel from a supply into the chamber **59** and passage **58** in the carburetor body **12** to the zone adjacent the port **146** in the end wall of member **66.** The inlet port for the fuel chamber **164** of the pump is in communication with a hollow nipple **168** which is connected by a flexible tube (not shown) with a fuel tank or source of liquid fuel.

The pumping diaphragm **159** is vibrated or actuated by varying fluid pressure such as the varying pressures in the crankcase of a two-cycle engine. The pulse chamber is in communication with a channel **170** which opens at the mounting surface **24** for registration with an opening in the engine crankcase wall whereby the varying fluid pressure in the engine crankcase is communicated to the pumping diaphragm **159** to flex or vibrate the pumping diaphragm for pumping fuel from the supply through the fuel chamber **164** and chamber **59** to the region of the inlet port **146.**

The operation of the carburetor is as follows: When it is desired to operate the engine with which the carburetor is associated, the operator closes the choke valve **31** and opens the throttle valve **34.** The engine is then started in the conventional manner and the choke valve opened. When the throttle valve **34** is at an intermediate or open position, the aspiration in the mixing passage established by suction or reduced pressure in the engine crankcase aspirates fuel into the mixing passage **14** from the main orifice **86,** the check ball or ball valve **88** being elevated from its seat by the aspiration.

The aspiration or reduced pressure, transmitted through the fuel channels or passages, **104, 100, 89, 92** and **94** to the fuel chamber **46,** flexes the disphragm **48** upwardly, swinging the lever **74** about its fulcrum **75** in a counterclockwise direction as viewed in FIG. **8.** Movement of the lever in this direction compresses the coil spring **82,** the short arm **80** of the lever moving downwardly whereby the valve body **64** and the valve portion **132** thereof move downwardly to admit or valve in fuel through the port **146** along the facets of the valve body **64** into the fuel chamber **46** to satisfy the fuel requirements of the engine.

When the throttle valve **34** is moved to near closed or engine idling position, viz, the position shown in FIG. **7,** the engine aspiration on the down stream side of the throttle valve **34** is effective through the engine idling orifice **111** to deliver fuel through orifice **111** into the mixing passage for engine idling purposes, the fuel for engine idling flowing from the peripheral recess **92** in the fitting **85** through passages **127, 119, 123** and counterbore **120** past the needle valve **118** into the supplemental chamber **110.**

The fuel for engine idling may be adjusted by manipulation of the valve body **116** of needle valve **118.** During delivery of fuel through the orifice **111,** the ball check valve **188** is seated to close the counterbore **89** and thereby prevent back-bleeding of air into the fuel conveyed through the fuel channels foe delivery through the engine idling orifice **111.**

When the throttle valve **34** is partially opened from engine idling position, fuel is delivered into the mixing passage by engine aspiration through the engine idling orifice **111** and the low speed orifice **112.** As the throttle is further opened, the main orifice **86** delivers fuel into the mixing passage for normal engine operation with little or no fuel being delivered through the secondary orifices **111** and **112.**

FIG. **11** illustrates a modification of the fuel inlet valve guide means and seat construction. The valve guide and seat means or member **174** is of hollow or tubular configuration wherein the wall portion **175** is of uniform thickness throughout its length. A wall **176** at one end of the tubular portion is provided with a fuel inlet port **177** as in the construction shown in FIG. **9.** In this form the exterior surface **178** of the member is cylindrical and of uniform diameter throughout its length. The arrangement shown in FIG. **11** is used with a carburetor body of the character shown in FIG. **8** but with the surface of the chamber **134** reamed or machined throughout its length so that the member **174** is press fitted in the chamber.

Thus the press fit or snug fit of the surface **178** of member **174** with the reamed or machined surface of the chamber **134,** any porosity that may be uncovered in the adjacent regions of the carburetor body resulting from the machining or reaming operations is sealed off. The interior cylindrical surface **179** is of a diameter to snugly, yet slidingly accommodate an inlet valve body **64** with the cone-shaped valve portion **132** cooperating with the circular seat **180** provided at the juncture of the cylindrical wall of the port **177** with the frustoconically shaped inner surface **181** of the end wall **176.** The member **174** is preferably made of Delrin, but may be fashioned of nonporous metal or other suitable material.

FIG. 12 illustrates a modification of fuel inlet valve guide and seat construction. In this form of the tubular member **184** has an intermediate cylindrical wall portion **185** of reduced exterior diameter with a portion **186** at its lower end of greater diameter to be snugly received or press fitted in a valve guide chamber such as that shown at **134** in FIG. **8.** The upper end has an enlarged region or portion **187** which may be of the same diameter as the lower region **186.** The construction shown in FIG. **12** is pressed into the chamber or passage **134,** the portions **186** and **187** snugly engaging the machined or reamed interior cylindrical surface of the chamber **134.**

The snug engagement of portions **186** and **187** with the upper and lower regions of the machined or reamed wall of chamber **134,** such as that shown in FIG. **8,** seals off any porosity which may be uncovered by the machining or reaming operation so that there is no seepage or leakage of fuel bypassing the member **184** through porosity.

The interior cylindrical wall **188** is of a diameter to slidably accommodate and guide the valve body such as the valve body **64** shown in FIG. **8.** The end wall **189** of member **184** is fashioned with an inlet port **190,** the juncture **191** of the frusto-conically shaped surface **192** with the circular surface defining the valve seat for the cone-shaped or needle portion **132** of an inlet valve body. The member **184** may be made of Delrin, nonporous metal or other suitable material.

FIGS. **13** and **14** illustrate another form of fuel inlet valve guiding means and valve seat construction. The carburetor body **12a** formed by die casting is provided with a cored passage or chamber **194** defined by a surface **195.** The fuel inlet duct **196** is a cored passage in communication with the inner end of the chamber **194.** The valve guide means or member **198** is of tubular construction having an exterior cylindrical surface **199** throughout its length except at its lower end which is provided with a circular raised or boss portion **200** of slightly larger diameter than the cylindrical portion **199.**

The region **202** of the cylindrical wall **195** defining the chamber **194** is machined or reamed to provide a sealing fit or engagement with the outer cylindrical surface of the portion **200** so that any porosity uncovered in the carburetor body **12***a* by the machining or reaming operation at the region **202** is sealed off so that there is no seepage or leakage of fuel into the fuel chamber **46***a* through porosity.

In the form shown in FIGS. **13** and **14,** the upper end region of member **198** is fashioned with a counterbore **204** in which is snugly fitted an annular valve seat means or member **206** fashioned of synthetic rubber of the like, the seat means **206** being fashioned with an inlet port **207.** The lower end of the valve seat **206** is engaged with a ledge **208** at the base of the counterbore **204.** The valve seat **206** is fashioned with a peripheral annular ridge **209** projecting beyond the end of the cylindrical member **198** a short distance, as shown in FIG. **14.**

As shown in FIG. **13,** an annular surface **210** defines the inner end of the chamber **194.** In assembly, the member **198** and the valve seat means **206** mounted in the counterbore **204** are inserted in the chamber **194** until the inner end of member **198** engages the end wall surface **210.** In the position shown in FIG. **13,** the annular ridge **209** of the valve seat means **206** is compressed and distorted into engagement with the end wall surface **210** providing a seal adjacent the upper end of member **198.**

The exterior surface of the portion **200** of larger diameter than the cylindrical portion **199** is pressed into snug engagement with the machined or reamed surface portion **202** to seal off any porosity that may be uncovered in the machining or reaming operation. The valve body **64***a* is equipped with a needle or cone-shaped valve portion **132***a* which seats against the member **206** at the region at the lower end of the port **207,** the position of the valve member or body **64***a* being controlled by movement of a diaphragm, transmitted through the lever **74***a* to meter or regulate flow of fuel into the fuel chamber **46***a.*

FIG. **15** illustrates another form of fuel inlet valve guide and valve seat construction. The inlet valve guide means includes a member **212** having a hollow cylindrical interior chamber **214** slidably accommodating a valve body or member **64***b*, the body having a cone-shaped or needle valve or valve portion **132***b.* The member **212** has an exterior threaded region **216** which is threaded into a threaded interior wall region **217** of a generally cylindrically shaped chamber **218** in the carburetor body **12***b.* The carburetor body has a fuel duct **196***b* opening into a region at the inner end of the chamber **218.**

The lower end of the member **212** adjacent the fuel chamber **46***b* is fashioned with an outwardly extending circular flange **220** which is accommodated in a circular recess **221,** the latter being cored in the carburetor body **12***b* in the casting operation. Disposed between the flange **220** on member **212** and an annular ledge **223** defining the end wall of the recess **221** is a flexible or yieldable sealing ring or annulus **224** which, in assembly, is compressed to provide a sealing engagement to prevent seepage or leakage of fuel into the fuel chamber **46***b* through any porosity that may be uncovered by the operation of machining the threaded portion **217** in the wall defining the chamber **218.**

In this form, the upper end region of the member **212** is fashioned with a counterbore **225** in which is disposed an annular valve seat means or member **226** of synthetic rubber or the like providing an inlet port **227.** A wall portion of member **212** extending beyond the seat **226** is swaged in engagement with the seat **226** to provide a shoulder **228** securing the valve seat **226** in the counterbore in member **212.** A chamfered region **230** and an annular flat surface **231** defines the upper end of the chamber **218** adjacent the fuel inlet duct **196***b.*

A sealing means or member such as a flexible or yieldable ring or annulus **232** is disposed between the ledge or surface **231** and the shoulder **228** and is compressed when member **212** is drawn up to provide a seal for the upper end of the chamber **218.** The sealing means or gasket **224** is compressed in assembly providing a seal for the lower end of the chamber. The member **212** is of nonporous metal, such as aluminum, brass, stainless steel or other suitable nonporous material.

The arrangement shown in FIG. **15** functions in the same manner as the other forms of the invention, the position of the fuel inlet valve member or body **64***b* being under the control of the flexible diaphragm through the medium of the lever **74***b* disposed in the

fuel chamber 46*b* to regulate fuel flow into the fuel chamber.

FIG. 16 illustrates a modified form of fuel inlet valve guide and valve seat construction similar to the arrangement shown in FIG. 15. The inlet valve guide means includes a member 236 having a cylindrical interior chamber 237 which slidably accommodates and guides an inlet valve body 64*c* provided with a cone-shaped or needle valve portion 132*c*. The member 236 has an intermediate exterior threaded region 238 which is engaged with a threaded interior wall region 239 of a generally cylindrically-shaped chamber 240, the chamber 240 and a fuel inlet duct 196*c* being cored in the die cast body 12*c*.

The lower end region of member 236 is fashioned with a peripheral recess 244 which defines an outwardly extending flange portion 245, the recess 244 having a chamfered wall portion 246. Disposed in the recess 244 is a sealing ring or annulus 248 of yieldable material which engages the chamfered surface 246 of the flange 245, the bottom of the recess and an interior substantially cylindrical wall surface 250, the latter being a cored or unmachined surface in the die cast body, the sealing ring 248 preventing fuel reaching the fuel chamber 46*c* in the carburetor body through any porosity that may be uncovered by the operation of threading portion 239 of the wall of chamber 240.

When the sleeve or member 236 is drawn up in assembled position in the chamber 240, the ring 248 is compressed to provide a seal at the lower end of the chamber 240. The upper end region of the member 236 is fashioned with a counterbore 251 in which is disposed an annular valve seat means or member 252 of synthetic rubber or the like having an inlet port 253 in registration with a fuel inlet duct 196*c*. At the entrance end of the fuel duct 196*c*, an annular planar surface 255 defining the end of the chamber 240 is provided.

Disposed between the upper end of member 236 and the surface 255 is a sealing gasket 256 which may be of copper or semihard synthetic rubber, providing a seal between the upper end of member 236 and the surface 255. A raised ridge 257 on the annular valve seat 252, similar to the ridge 209, shown in FIG. 14, is compressed in assembly in sealing engagement with the gasket 256.

Any porous region or porosity uncovered by forming the threads 239 in the wall of chamber 240 is sealed off by the gaskets 248 and 256. The position of the valve 64*c* and valve portion 132*c* in controlling flow of fuel flow into the chamber 46*c* is under the influence of the lever 74*c* which is controlled by movements of the diaphragm responsive to aspiration in the mixing passage.

FIG. 17 illustrates another form of fuel inlet valve guide and valve seat construction. The inlet valve guide means includes a tubular member or sleeve 260 having a cylindrical interior chamber 261 which slidably accommodates and guides an inlet valve body 64*d* having a cone-shaped or needle valve portion 132*d*. The sleeve or member 260 is disposed in a cored passage or chamber 263 which is in communication with a fuel inlet duct 196*d*. The wall of the chamber 263 adjacent the carburetor fuel chamber 46*d* is machined as by drilling or reaming to provide a machined cylindrical surface 265 of larger diameter than the cored region of the chamber 263.

The sleeve or member 260 is fashioned with a circular boss portion 267 having its exterior diameter of a dimension to be press fitted into snug engagement with the surface 265 which seals any porosity that may be uncovered in the machining of the surface 265. The upper end region of the sleeve or member 260 is fashioned with a counterbore 269 in which is disposed an annular valve seat means or member 270 of synthetic rubber or the like having a fuel inlet port 271 with which the needle valve portion cooperates in regulating fuel flow into the fuel chamber 46*d*.

A wall portion of the member 260 extending beyond the valve seat 270 is swaged into engagement with the seat 270 providing a shoulder 272 securing the valve seat in the counterbore 269. The cored wall surface defining the chamber 263 and the fuel inlet duct 196*d* are impervious and hence there is no leakage of fuel along these surfaces into the fuel chamber 46*d*. Any porosity uncovered by machining, such as drilling or reaming, of the surface 265 is sealed by the boss portion 267 of member 260 press fitted contiguous with the surface 265.

The valve body 64*d* having the valve portion 132*d* is slidable within and guided by the wall of chamber 261 in member 260 as in the other forms of the invention, the valve body or member 64*d* being under control of the flexible diaphragm through the medium of the lever 74*d* disposed in the fuel chamber 46*d*.

FIG. 8 illustrates another form of fuel inlet valve guide and seal construction. The carburetor body 12*e* of cast metal is fashioned with a cored chamber or passage 275, the surface 300 of the end wall of the chamber 275 being machined or reamed. The fuel inlet valve guiding means includes a member 277, the cylindrical interior chamber 279 slidably accommodating and guiding the valve body 64*e*, the latter having a cone-shaped or needle valve portion 132*e*. The exterior surface 280 of member 277 is of lesser diameter than that of the cored chamber 275. Provided in the carburetor body 12*e* at the lower end of the chamber 275 is a circular recess 282.

The lower end region of the sleeve or member 277 adjacent the fuel chamber 46*e* is fashioned with a cylindrical portion or tenon 284 of reduced diameter. A fitting or plate 286 is disposed contiguous with a flat surface 287 of the roof of the fuel chamber 46*e*, the plate 286 having an opening accommodating the portion 284 on the valve guide member 277. A tubular member 289 is threaded into a threaded bore 290, the member 289 having a head portion 292 engaging the plate 286. The member 289, when tightly drawn up, secures the plate 286 in engagement with the flat surface 287. Disposed in the circular recess 282 in the body 12*e* and in the space provided by the reduced portion 284 of member 277 is a selaing means or sealing ring 294.

The upper end of member 277 is fashioned with a counterbore 296 accommodating an annular valve seat 298 having a central port 299 in communication with a fuel inlet duct 196*e*. The plate 286 compresses the sealing ring 294 into engagement with the tenon 284 on member 277 and with the surfaces defining the recess 282 providing a seal to eliminate seepage through porosity that may be uncovered by machining or reaming the surface 300 and thereby prevent fuel in such porous region seeping along the exterior of member 277 into the fuel chamber 246*e*.

The annular valve seat 298 has a raised portion 301, such as that shown at 209 in FIG. 14, which is engaged and compressed against the surface 300 defining the

end of the chamber **275**, the compressed ridge **301** of the valve seat **298** providing a seal with the surface **300**. In event that porosity is uncovered by the machining of the surface **300**, the ring **294** of yieldable material and the ridge **301** of the annular valve seat **298** provide effective seals at the respective end regions of the inlet valve guide member **277**.

The tubular interior **302** of the threaded member **289** accommodates the coil spring **82***e* bearing against the lever **74***e*. The valve body **64***e* and the valve portion **132***e* function in the same manner as in the other forms of the invention, the valve body being under control of the flexible diaphragm through the medium of the lever **74***e* disposed in the fuel chamber **46***e*. In this form of construction the inlet valve guide member **277** and its associated components may be readily installed in the chamber **275** by drawing up the securing member **289**.

FIG. **19** illustrates another form of the invention. The carburetor body **12***f* is fashioned with a cored chamber or passage **305** in communication with a fuel inlet duct **196***f* which is cored in the body **12***f* in the casting operation. A frusto-conically shaped surface **306** defines the end of the chamber **305** at the region of communication of the chamber with the fuel inlet duct **196***f*. A fuel inlet valve guiding means comprises a member or sleeve **307** disposed in the chamber **305**. The hollow interior of the member **307** is of a diameter to slidably accommodate and guide an inlet valve body **64***f* having a cone-shaped or needle valve portion **132***f*.

The chamber **305** is formed with an enlarged cylindrical surface **309** at its entrance region. In the construction shown in FIG. **19**, the surfaces defining chamber **305**, the frusto-conically shaped surface **306**, the fuel inlet duct **196***f* and the enlarged cylindrical region **309** are cored surfaces and are not machined. The exterior cylindrical surface **310** of member **307** is of lesser diameter than the interior diameter of chamber **305** to accommodate member **307**. The member **307** is preferably formed of molded plastic material, such as Delrin (polyoxymethylene), nylon or the like.

The end region of member **307** adjacent the fuel chamber **46***f* is fashioned with an enlarged generally circular boss portion **312** providing an annular ledge **314**. Disposed in the circular recess between the surface **310** of member **307** and the surface defining the cylindrical region **309** is a sealing means such as a sealing ring **316** of which is engaged with the circular ledge **314**. The exterior diameter of the sealing ring **316** is greater than the diameter of the surface of the cylindrical region so that when the member **307** is assembled in the position illustrated, the sealing ring **316**, being of yieldable or compressible material, is compressed or distorted to provide an effective seal preventing leakage of fuel from chamber **305** exteriorly of member **307** into the fuel chamber **46***f*.

Thus, all of the fuel entering the chamber **46***f* flows through the port **318** provided in an end wall portion **319** of member **307**, the fuel flow being controlled by the position of the needle valve portion **132***f*. As shown in FIG. **19**, there is integrally formed with the boss portion **312** a laterally extending plate-like portion or extension **321** disposed contiguous with a flat surface **287***f* forming a portion of the roof of the fuel chamber **46***f*, the plate portion **321** having an opening registering with an internally threaded bore **290***f* provided in the carburetor body **12***f*.

A tubular member **289***f* is threaded into the bore **290***f*, the member **289***f* having a head portion **292***f* engaging the plate-like portion **321** of member **307**. When the member **289***f* is tightly drawn up, it secures the member **307** in the chamber **305** and maintains the sealing means **316** under compression in sealing engagement with the cylindrical surface defining the region **309** in the body **12***f*. The interior wall of chamber **305** is joined with the surface of the enlarged cylindrical region **309** by a frusto-conical surface **323**.

As shown in the drawing, the sealing ring **316** is preferably spaced from the surface **323** so that there is no appreciable strain or stress on member **307**. The tubular member **289***f* accommodates an expansive coil spring **82***f* disposed between the surface **324** of bore **290***f* and the lever **74***f* for biasing the inlet valve body **64***f* to normally engage the valve portion **132***f* with the valve seat defined by the end of the inlet port **318**.

The fuel inlet valve body **64***f* and its needle valve portion **132***f* function in the same manner as in the other forms of the invention, the inlet valve being under control of the flexible diaphragm through the medium of the lever **74***f* pivotally supported in the fuel chamber **46***f*. Through the provision of the threaded securing member **289***f*, assembly of member **307** in the chamber **305** is facilitated by drawing up the member **289***f* and establishing the seal at the sealing means **316**.

FIG. **20** illustrates another form of the invention similar to that shown in FIG. **19**. The die-cast carburetor body **12***g* is formed with a cored chamber or passage **326** having an upper end wall surface **328**, a fuel inlet duct or channel **329** being also cored in the body **12***g* in the casting operation. The surface **328** is preferably machined or coined to provide a flat or planar surface. The fuel inlet valve guide means includes a tubular member **330**, the interior cylindrical wall **331** being of a diameter slidably accommodating and guiding the inlet valve body **64***g*, the body having a cone-shaped or needle valve portion **132***g*.

The wall **327** defining the cored chamber **326** is of a dimension to provide clearance accommodating the member **330**. The end region of member **330** adjacent the fuel chamber **46***g* is provided with an enlarged generally circular boss portion **333** providing an annular ledge **334**. The body **12***g* is fashioned with a circular recess **336** defined by a generally cylindrical surface **337**. Disposed in the circular recess **336** and engaging the ledge **334** is a sealing means or sealing ring **339** of flexible or yieldable material.

The exterior diameter of the sealing ring **339** is greater than the diameter of the surface **337** so that the sealing ring **339** is distorted or compressed when in assembled relation to provide an effective seal for the lower end of the chamber **326**. Thus, fuel that may enter the chamber **326** through any porosity that may be uncovered by the machining of the surface **328** is prevented from seeping into the fuel chamber **46***g*. The upper end of member **330** is provided with a counterbore **341** accommodating an annular valve seat **342** of synthetic rubber or the like providing an inlet port **343** which is in communication with the fuel inlet duct **329**.

The annular valve seat member **342** is fashioned with a peripheral ridge **344** of the same character shown at **209** in FIG. **14**, the ridge normally extending above the upper end of member **330**. When the member **330** is assembled in the chamber **326**, the ridge **344** is compressed into sealing engagement with the surface **328**

of the chamber **326.** A seal is provided in the region of the ridge **344** at the upper end of the member **330** and a seal provided adjacent its lower end by the sealing ring **339** so that no liquid fuel enters the fuel chamber **46***g* except through the inlet port **343** past the inlet needle valve **132***g*.

The member **330** may be of non-porous metal, such as brass or of resinous material such as Delrin (polyoxymethylene). Integrally formed with the boss portion **333** of member **330** and extending laterally is a plate-like portion or extension **346** disposed contiguous with a flat surface **347** forming a portion of the roof of the fuel chamber **46***g*, the plate portion **346** having an opening registering with an integrally threaded bore **290***g*. An externally threaded tubular member **289***g* is threaded into the bore **290***g*, the member **289***g* having a head portion **292***g* engaging the plate portion **346** of member **330.**

When the member **289***g* is tightly drawn up, it secures the member **330** in the chamber **326,** the ridge **344** in compressed sealing engagement with the surface **328** and the ring **339** in sealing engagement with the ledge **334** and the surface **337** of the body **12***g*. The tubular member **289***g* accommodates an expansive coil spring **82***g* disposed between a surface **349** defining the bottom of the bore **290***g* and the lever **74***g*, the spring biasing the fuel inlet valve body **64***g* to engage the valve or needle portion **132***g* with the valve seat at the end of the inlet port **343.**

The inlet valve body **64***g* and its valve portion **132***g* function in the same manner as in the other forms of the invention, the valve body being under control of the flexible diaphragm through the medium of the lever **74***g* pivotally supported in the fuel chamber **46***g*. The arrangement provides for ease of assembly of the inlet valve guide and valve seat means in the chamber **326** in the carburetor body **12***g*.

FIG. **21** illustrates another form of fuel inlet valve guide and valve seat arrangement. The carburetor body **12***h* is fashioned with a cored passage **351** having an end wall surface **350** which is machined to provide a smooth surface, the carburetor body being provided with a fuel inlet duct **329***h*. The fuel inlet valve guide means includes a member **353** of tubular configuration, the exterior diameter of member **353** being less than the interior dimension of chamber **351** so that the member **353** is accommodated in the chamber without machining or reaming the wall surface defining the chamber **351.**

The interior surface **354** of member **353** is of a diameter to slidably accommodate and guide the fuel inlet valve body **64***h* provided with a cone-shaped or needle valve portion **132***h*. The upper end of the member **353** is fashioned with a counterbore **356** which snugly accommodates an annular valve seat means or member **342***h* of synthetic rubber or the like having a central port **343***h* in communication with the fuel inlet duct **329***h*. The valve seat member **342***h* is fashioned with an annular ridge **344***h* which normally extends beyond the upper end of member **353** in the manner illustrated at **209** in FIG. **14.**

In assembly of member **353** in the chamber **351,** the ridge **344***h* is in fluid sealing engagement with the surface **350.** Means is provided for retaining the valve guide member **353** in chamber **351** and maintaining the ridge **344***h* in compressed condition against the end wall surface **350.** Fashioned at the lower end of chamber **351** in the body **12**h is a counterbore **358** which is machined or reamed to provide an accurate diameter.

Pressed or press fitted into the counterbore **358** is a securing member or ring **360** of metal which retains the member **353** in proper position with its upper end engaging the surface **350** of chamber **351.** A sealing gasket **362,** preferably of copper or other suitable material, is disposed between the lower end of member **353** and the retaining ring **360** to effect a seal between the retaining ring **360** and the member **353.** Porosity uncovered by machining the counterbore **358** will be sealed by the retaining ring **360** press-fitted into the counterbore.

In event porosity may be uncovered in machining, reaming or coining the surface **350,** fuel which may seep through the uncovered porosity around the annular ridge **344***h* of the valve seat **342***h* and enter the chamber **351** will be prevented from entering the fuel chamber **46***h* by the sealing ring or gasket **362** or the retaining member **360.** The valve body **64***h* and its needle valve portion **132***h* function in the same manner as in the other forms of the invention, the valve body being under control of a flexible diaphragm through the medium of the lever **74***h* pivotally supported in the fuel chamber **46***h*.

FIGS. **22** and **23** illustrate a further form of the invention. In this form the carburetor body **12***j* is fashioned with a cored chamber **365** which is in communication with a fuel inlet duct **366** cored in the case carburetor body. The chamber **365** is defined by an end surface **368,** a frusto-conically shaped surface **369** joined with a substantially cylindrical surface **370,** and a second frusto-conical surface **371** which is joined with a substantially cylindrical surface **372.**

The chamber **365** accommodates an upper region of a fuel inlet valve guide and seat arrangement **374** for a fuel inlet valve body **64***j* having a frusto-conically shaped or needle valve portion **132***j*. The inlet valve guide and valve seat construction **374** is inclusive of a body portion **376** fashioned with an upwardly extending portion **377** defined by an outer cylindrical surface **378** and an end wall portion **379.** The interior cylindrical chamber **381** is of a diameter to slidably accommodate and guide the valve body **64***j*. The member **374** may be of Delrin or other suitable material. The end wall **379** is provided with an inlet port **380.**

The interior surface **382** of the end wall **379** of frusto-conical in shape, the juncture of the surface with the cylindrical wall of the port **380** providing a valve seat for the needle valve portion **132***j* of the valve body **64***j*. The member **376** is fashioned with an annular ledge **384** adjacent the cylindrical surface **372.** Disposed in engagement with the annular ledge **384** is a sealing means or sealing ring **386** which is compressed between the surface **378** on member **376** and the surface **372** of the carburetor body to provide a seal preventing leakage of fuel from the chamber **365** into the fuel chamber **46***j* so that all fuel entering the chamber **46***j* passes through the port **380** past the fuel inlet valve **132***j*.

In the arrangement shown in FIG. **22** the surfaces defining the chamber **365** may be unmachined cored surfaces in the carburetor body **12***j*. The member **376** is fashioned with laterally extending lugs or projections **388,** shown in FIG. **33,** provided with openings **389** accommodating bolts **390** extending into threaded openings in the body **12***j*, the bolts **390** securing the member **376** in assembled position illustrated in the drawings

with the lug portions engaging a planar surface **392** of the carburetor body.

The member **374** has depending projections **394** provided with openings accommodating a fulcrum pin **75***j* upon which is fulcrumed the lever **74***j*, the short arm of the lever being engageable with the fuel inlet valve body **64***j*. The lever **74***j* is controlled by a flexible diaphragm such as the diaphragm **48** shown in FIG. **8**, actuated by aspiration in the mixing passage, for regulating the position of the fuel inlet valve body **64***j* to meter or control fuel flow through the port **380** past the needle valve **132***j*.

The member **374** is fashioned with an extension **396** having a recess or chamber **397** accommodating an expansive coil spring **82***j*, the spring biasing the lever **74***j* whereby the long arm of the lever engages a member carried by the diaphragm. The member **374** is preferably of Delrin (polyoxymethylene) but may be made of nonporous metal such as aluminum. The construction shown in FIGS. **22** and **23** comprises an assembly of inlet valve guide means and valve seat, an inlet valve body, a fulcrum support for the lever **74***j*, the spring **82***j* and the sealing ring or member **386.** This assembly of components may be quickly installed or removed by manipulation of the securing bolts **390.**

The arrangement functions in the same manner in the other forms of the invention. Flexure of the diaphragm under influence of aspiration swings the lever **74***j* in a counterclockwise direction as viewed in FIG. **22** whereby the valve **132***j* moves away from its seat and thereby regulates or controls fuel flow from a supply into the fuel chamber **46***j* for delivery into the carburetor mixing passage. The sealing means or ring **386** prevents fuel in the chamber **365** from entering the chamber **46***j* except through the valve-controlled inlet port **380.**

In all forms of the invention means is provided to prevent fuel flow from a supply into the fuel chamber of the carburetor except through the valve-controlled inlet port. The arrangement of sealing means enables the valve guide means and seat means to be accurately manufactured and positioned in a chamber in the carburetor body whereby the fuel inlet valve body is accurately guided so that the needle valve portion is effectively engaged with its seat to interrupt fuel flow when aspiration ceases in the mixing passage of the carburetor. The sealing means is effective in certain forms of the construction to seal off any porosity that may be uncovered by machining or reaming surfaces within the carburetor body so as to prevent fuel leakage through a porous region into the diaphragm fuel chamber. Through the provision of means for sealing porosity that may be uncovered by machining or reaming operations, the carburetor body is rendered useable and hence does not have to be discarded as waste material.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein described, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

I claim:

1. Apparatus of the character disclosed including, in combination, a carburetor body construction having a fuel and air mixing passage and a fuel chamber, a throttle valve in the mixing passage, a fuel chamber in said body construction, a fuel metering diaphragm forming a wall of the fuel chamber, channel means for conveying fuel from the fuel chamber into the mixing passage, a fuel inlet passage for the fuel chamber provided in the body construction, a fuel inlet valve, said body construction having a recess, a fitting having a tubular portion extending into the recess slidably accommodating the inlet valve, valve seat means associated with the tubular portion of said fitting providing a fuel port in communication with the fuel inlet passage, sealing means between the tubular portion and a wall of the recess, a pivotally supported member in said fuel chamber engageable with the diaphragm and the fuel inlet valve whereby the relative position of said inlet valve is controlled by said diaphragm, spring means normally biasing the fuel inlet valve toward port-closing position, said fitting having a laterally extending portion, and means engaging said laterally extending portion for securing said fitting to the carburetor body construction.

2. The combination according to claim **1** wherein the valve seat means is provided by an end wall of the tubular portion, and the fuel port provided by an opening in said end wall.

3. The combination according to claim **1** wherein the securing means is in threaded engagement with the body construction, said securing means having an opening accommodating the spring means.

4. Apparatus of the character disclosed including, in combination, a carburetor body construction having a fuel and air mixing passage and a fuel chamber, a throttle valve in the mixing passage, a fuel chamber in said body construction, a fuel metering diaphragm forming a wall of the fuel chamber, channel means for conveying fuel from the fuel chamber into the mixing passage, a fuel inlet passage for the fuel chamber provided in the body construction, a fuel inlet valve, said body construction having a recess, a tubular member in said recess, valve seat means for the inlet valve associated therewith, said fuel inlet valve being slidably disposed in the interior of the tubular member and having a valve portion cooperating with the valve seat means, sealing means disposed between the tubular member and the wall of the recess, a pivotally supported member engageable with the diaphragm and the fuel inlet valve whereby the position of the inlet valve is controlled by the diaphragm, a plate having an opening accommodating a portion of the tubular member, said plate engaging the sealing means, said plate extending laterally of the tubular member, and means extending through a second opening in the plate and threaded into the carburetor body construction for securing the plate in engagement with the sealing means.

5. Apparatus of the character disclosed including, in combination, a carburetor body construction having a fuel and air mixing passage and a fuel chamber, a throttle valve in the mixing passage, a fuel chamber in said body construction, a fuel metering diaphragm forming a wall of the fuel chamber, channel means for conveying fuel from the fuel chamber into the mixing passage, a fuel inlet passage for the fuel chamber provided in the body construction, a fuel inlet valve, said body construction having a recess, a fitting having a tubular portion extending into the recess, said tubular portion slidably accommodating the inlet valve, valve seat means for the inlet valve associated with the tubular portion of the fitting and providing a fuel port, said fuel port being in communication with the fuel inlet passage, sealing means engaging the tubular portion and the wall

of the recess, said fitting having a laterally extending portion, securing means engaging the laterally extending portion of the fitting for securing the fitting in position, said fitting having depending portions, a pin extending through openings in the depending portion, a member supported on said pin for pivotal movement, said member having portions engageable with the diaphragm and the fuel inlet valve whereby the position of the inlet valve is controlled by the diaphragm, and spring means normally biasing the fuel inlet valve toward port-closing position.

6. The combination according to claim **5** wherein the inlet valve seat means is an integral portion of the fitting.

7. The combination according to claim **5** wherein the fitting is of resinous material.

8. The combination according to claim **5** wherein the fitting is of polyoxymethylene.

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