June 28, 1955 R. L. BURCHETT ET AL 2,711,645

CIGAR LIGHTER TESTING AND FUEL CHARGING APPARATUS

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Fig. 1.

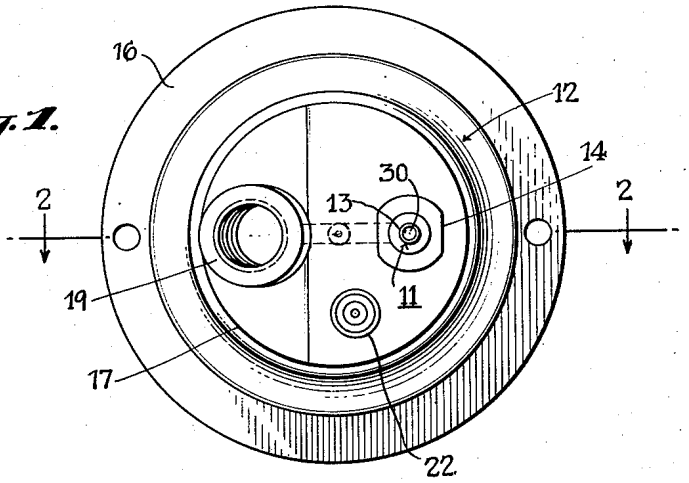

Fig. 2.

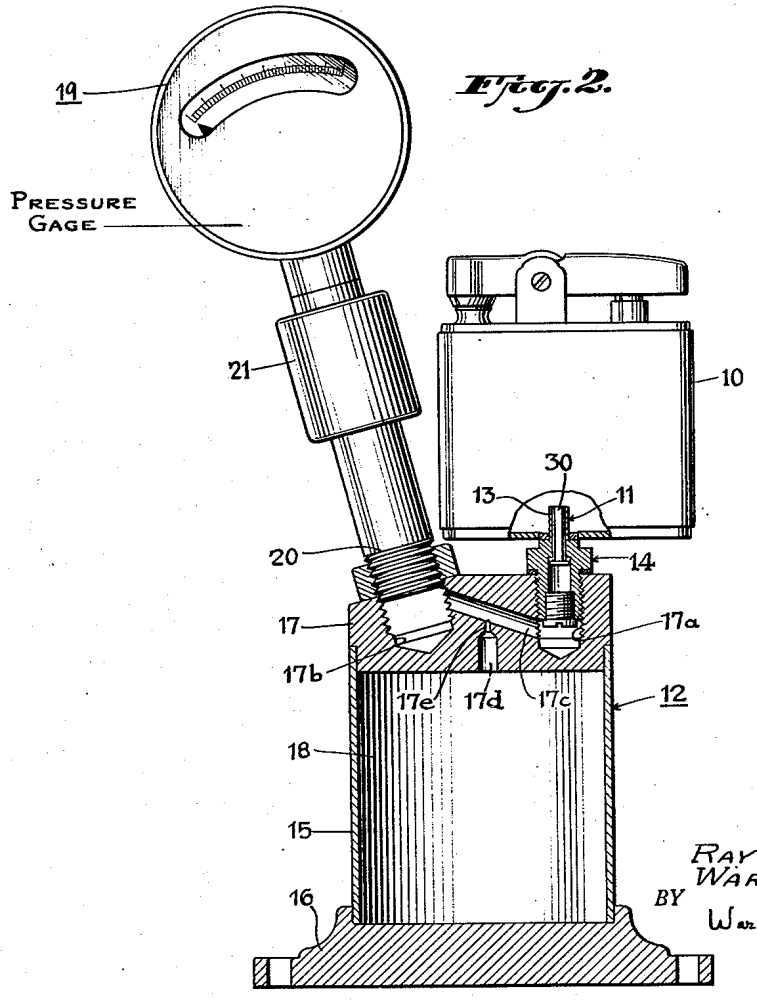

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Fig. 5.

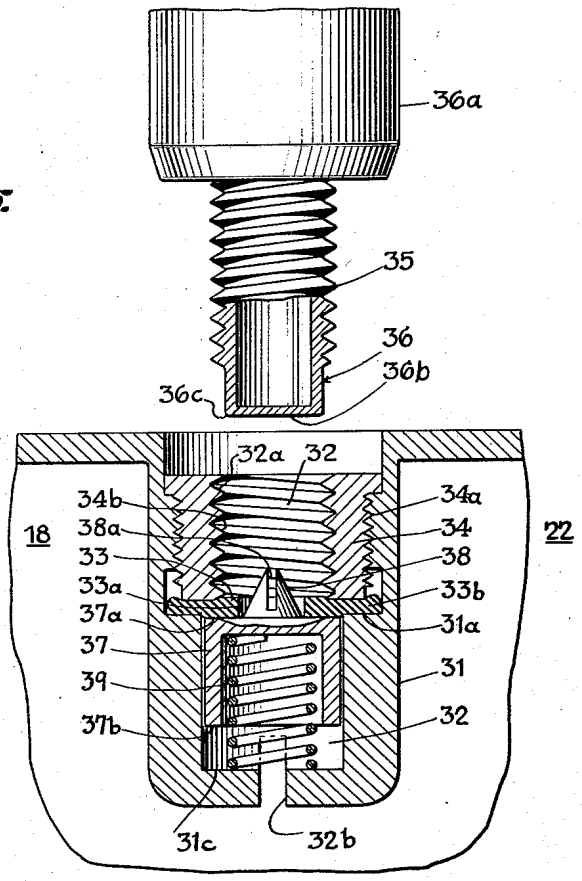


Fig. 3.

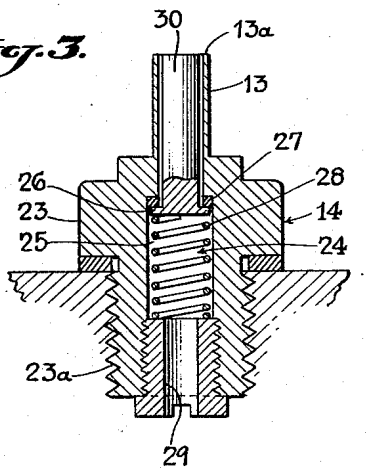
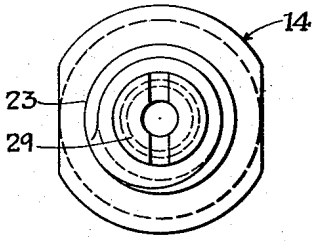


Fig. 4.



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CIGAR LIGHTER TESTING AND FUEL CHARGING APPARATUS

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Application January 8, 1952, Serial No. 265,426

3 Claims. (Cl. 73—40)

This invention relates to cigar lighter testing and fuel charging apparatus, and more particularly to such apparatus designed for use with cigar lighters fueled by gases such as butane, which are usually charged into the lighter under pressure, partly in liquid and partly in gaseous form.

The invention in one aspect thereof is constituted by a fuel casing having a fuel chamber therein and an injection valve structure to facilitate the injection of fuel under pressure therein from a disposable charging cartridge which may be of the same type employed for charging a gas fueled lighter. It is desirable to employ charging cartridges of the type having an injection nozzle with a frangible membrane which is punctured for the delivery of the fuel into the fuel chamber, there being a suitable gastight seal made with the injection nozzle thereof effective at or prior to the puncture of the membrane to prevent gas leakage to exterior space. In the form shown, the injection valve structure includes an elastic sealing diaphragm with its rim clamped in fuel-tight engagement with the wall of an injection valve passageway, said diaphragm having a central opening for the passage of fuel. A valve member normally closes such opening but can be moved relative to the diaphragm whereby the opening is opened in response to insertion of the injection nozzle of the cartridge. A puncturing head is positioned in the passageway in alignment with such perforation for puncturing said membrane after said valve member and sealing diaphragm have moved to the open position thereof, at which time the sealing diaphragm engages such injection nozzle in fluid-tight engagement as aforementioned. A so-called check valve is also connected to the testing apparatus for providing a protruding neck portion adapted to enter into the charging valve structure of a lighter undergoing test, such check valve being opened in response to the insertion thereof into such cigar lighter valve structure. The check valve preferably includes a protruding neck portion having a valve passage therethrough in which is axially movable a valve stem which controls the opening and closing of the valve structure via a check valve member. The latter normally is urged toward the closed position by suitable resilient means, such as a coil spring. In such closed position the check valve member engages, for example, a suitable resilient valve washer to seal the valve passageway through such check valve structure. The check valve stem can be shifted axially by the insertion into such neck of a suitable instrument, such as a pin, for releasing gaseous pressure within the fuel chamber of the test apparatus in order to adjust such pressure to a desired degree or to permit the escape of undesired substances therefrom such as a neutral pressurizing gas. A suitable pressure gauge is connected to the fuel casing for giving, for example, visual indication of the gaseous fuel pressure in the fuel chamber.

In one of its aspects the invention aims to provide a cigar lighter testing apparatus which will facilitate the

injection into the lighter of a small charge of fuel of the above nature, which charge will be in gaseous form and sufficient for testing purposes, but without necessarily injecting a full normal charge of fuel unless desired. Thus the cigar lighter may be tested with respect to height of flame, proper operation, possible gas leaks and the like, without requiring subsequent venting and wastage of fuel, if the lighter is to be so shipped or stored after test that a normal fuel charge therein would be undesirable. In another aspect the invention aims to provide such cigar lighter testing apparatus which can be charged by puncturable, disposable charging cartridges containing fuel of the character above referred to. The cartridge also preferably contains a neutral pressurizing agent such as nitrogen or carbon dioxide, such agent being preferably of lower specific gravity than the fuel, and consequently tending to rise above the fuel when confined either in the testing and fuel charging apparatus, or in a lighter. The present invention provides a satisfactory way of venting the pressurizing agent when desired, prior to the charging of a cigar lighter so that the fuel charged into the lighter will not be affected thereby. Further objects and advantages of the invention will be in part obvious and in part specifically pointed out in the description hereinafter contained which, taken in conjunction with the accompanying drawings, discloses a cigar lighter testing structure of preferred form which is constructed to operate in accordance with the invention; the disclosure, however, should be considered merely illustrative of the invention in its broader aspects.

In the drawings:

Fig. 1 is a plan view of a structure embodying one form of the invention;

Fig. 2 is a sectional view taken substantially along line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view of a check valve employed in the present invention;

Fig. 4 is a bottom plan view of the check valve of Fig. 3; and

Fig. 5 is a longitudinal view, partly in section and with parts broken away, of an injection valve structure employed in the present invention.

Referring to the drawings, when it is is desired to test a cigar lighter, as at 10 (Fig. 2), for the purposes above set forth, a cover plate is removed from the injection valve structure thereof indicated at 11, and the lighter is engaged with the testing apparatus which is generally indicated at 12. For this purpose the apparatus is provided with a lighter supporting post, in which is mounted a check valve 14 having a neck 13 which engages and opens the injection valve structure 11 of the cigar lighter. The cigar lighter is thereupon charged as later more fully described, and the lighter may then be tested while so supported, its operation is observed and it is adjusted as desired.

The cigar lighter testing apparatus includes a casing 15 having a base 16 and a top wall 17, which define a fuel chamber 18.

The check valve 14 preferably is mounted on the top wall 17 and is threadedly secured thereto within a suitable threaded bore 17*a* formed therein. A pressure gauge as indicated at 19, is provided with a nipple 20 and a coupling 21. The nipple 20 threadedly engages a bore 17*b* formed in said top plate 17. The bores 17*a* and 17*b* are in communication with one another via a passageway 17*c* formed therebetween, the latter passageway being in communication with the chamber 18 via passage 17*d* which is provided with a suitable restricted portion 17*e* which may serve as a meter.

In addition to the above-described check valve 14 and pressure gauge 19, an injection valve is associated with

the test apparatus and preferably is mounted upon the top plate 17 with the longitudinal axis thereof substantially vertical, such injection valve being shown in Fig. 1 at 22. This valve serves the purpose of facilitating the charging of the test apparatus with a suitable fuel from a disposable charging cartridge, such as the type employed for charging the cigar lighter which is to be tested.

The above-mentioned check valve 14 is shown in greater detail in Figs. 3 and 4, and is constituted by said neck 13, and a body 23 having a threaded portion 23*a* for engaging the threaded bore 17*a*. The body 23, including the neck 13, has a passageway 24 therethrough for the passage of fluid, including a valve chamber 25 in which there is movable a check valve control or valve member 26 which normally is urged to a closed position against, for example, a resilient valve washer 27 which may be of rubber-like material, such valve member being so urged by means, for example, of a coil spring 28, positioned in such chamber between said valve member and a removable threaded bushing 29. The check valve member can be axially shifted to open the check valve by means of a valve stem 30 which is positioned in the passageway defined by the neck 13 and which is secured to the valve member 26. The valve stem 30 preferably extends to the outermost opening of the neck 13 and can be thrust downwardly to open such valve by the above-mentioned injection valve structure 11 (Fig. 2). Also the stem 30 may be thrust open by a suitable pin in order to dissipate certain gases within the casing 15 as above mentioned.

The injection valve structure 22 may be of the type shown in Fig. 5 which consists of an injection valve housing 31 having a passage therethrough, as at 32, the latter having an inlet 32*a* and an outlet 32*b*. A resilient or flexible sealing diaphragm 33 is positioned in the passage 32 and is provided with an opening 33*a* in the center thereof. The rim portion 33*b* of the diaphragm is secured in fluid-tight engagement with the wall defining the passage 32 by means of a bushing 34 which clamps same against a shoulder 31*a* of housing 31. The bushing 34 is in turn provided with outer threads, as at 34*a*, for engaging suitable complementary threads formed internally in the housing 31, and said bushing is also provided with internal threads 34*b* for engaging the threads 35 of an injection nozzle 36. The latter is attached in a well known manner to a fuel-charging cartridge 36*a* and is provided with a frangible membrane 36*b*. The sealing diaphragm 33 normally closes the passageway 32 in cooperation with a movable valve member 37 which is positioned in such passageway inwardly of such diaphragm and is movable between an outer closed position, as shown in Fig. 5, wherein the portions 37*a* thereof are in fluid-tight engagement with the under surface of the diaphragm 33 to close the opening 33*a*, and an outer position wherein said valve member and diaphragm are separated and such opening 33*a* is open. A puncturing head 38 is preferably secured to the valve member 37 and is directed outwardly and in alignment with the opening 33*a*. Such puncturing head may normally extend through the opening 33*a*. When the injection nozzle 36 is inserted into the passage 32 it will engage the puncturing head 38 and thrust same downwardly against the pressure of a coil spring 39 until a lower portion 37*b* thereof engages a limit-stop 31*c* and is arrested whereupon further insertion of the injection nozzle will puncture the frangible membrane 36*b*. Prior to such puncturing an outer lip or edge 36*c* of the nozzle 36 will engage the diaphragm 33 in fluid-tight engagement thereby preventing leakage of gas to exterior space when the membrane 36*b* is punctured. The puncturing head 38 is provided with a slot 38*a* permitting egress of gas after puncturing of the membrane, the gas following a path through said slot to the chamber 18 via a space between the valve member 37 and the housing 31, and thence via the outlet 32*b*.

In operation, the testing apparatus fuel chamber 18 may be filled, for example, by the contents of two or three of the charging cartridges 36*a*, one of which normally is adequate to provide a charge for a single pocket lighter. The charging cartridge 36*a* is inverted and inserted into the injection valve 22 until the membrane 36*b* is broken and the contents of the cartridge transferred to the chamber 18. During such operation not only is the fuel for example butane, transferred into the chamber 18, but also the neutral pressurizing agent is also transferred. Consequently for satisfactory testing of a cigar lighter, such neutral pressurizing gas (being lighter than the butane) should be released and this is done by thrusting downwardly upon the stem 30 by a suitable pin and bleeding off same down to a point where only the liquid butane remains in the chamber 18 whereupon valve 14 is closed. Of course, at the instant when all of the neutral gas has escaped from the chamber 18 there will be a small amount of vaporized butane above the liquid level which will increase in pressure until the vapor pressure of the butane (at the ambient temperature) has been reached, for example, a constant pressure somewhere between 20–25 p. s. i. To accomplish this, one or more of such charging cartridges may be emptied into the chamber 18 whereupon a pressure reading then may be observed upon the pressure gauge 19. Such gauge may, for example, indicate 65 p. s. i. whereupon a depression of the stem 30 can release the neutral pressurizing gas until the pressure in the chamber 18 is diminished to the vapor pressure of the butane at the ambient temperature, for example, 70 to 80 F., for example, to the aforementioned constant value in such range of about 20–25 p. s. i. at which pressure the neutral gas is exhausted, leaving only the butane. The latter fuel is partially in liquid and partially vapor form within the casing 18 and the apparatus now will emit from the valve 14 only the desired fuel vapor or gas to permit a satisfactory testing. Thereafter, as aforementioned, the cigar lighter 10 is placed in operative connection with the testing apparatus by inserting the neck 13 into an injection valve structure of the lighter. Such injection valve structure may be identical to that described in Fig. 5. An outer edge or lip 13*a* of the neck 13 can engage a sealing diaphragm of such lighter valve, thereby forming a fluid-tight engagement therewith and the stem 30 will move the puncturing head to separate a movable injection valve member from the sealing diaphragm, the check valve 14 being simultaneously opened. The pressure gauge 19 thereupon will show a slight pressure drop when the check valve is so opened. Then almost immediately thereafter the former pressure will appear, indicating that the pressures in both the cigar lighter and the chamber 18 are the same. Holding the lighter upon the check valve will not add an undesirable amount of fuel to the lighter but rather will add only an amount of gas sufficient to provide adequate testing. The cigar lighter now can be checked with respect to the flame height at the burner valve thereof, the proper operation of its injection valve, and possible leaks in each valve. For example, the lighter may be removed from the test apparatus and permitted to stand for a pre-determined length of time, say one-half hour, whereupon it is operated to determine if the flame is of the proper height. Of course if the flame is low or non-existent, there is a leak. Alternatively, the lighter may be withdrawn from the apparatus and immersed in a liquid to observe if bubbles occur.

While the invention has been disclosed as carried out by a cigar lighter transfer valve of the specific construction above described, it should be understood that changes may be made therein without departing from the invention in its broader aspects within the scope of the appended claims.

We claim:

1. In an apparatus for testing a cigar lighter of the type having a fuel injection valve, including a puncturing head, the combination which comprises: a casing having a fuel chamber therein and a fuel charging valve struc-

ture having a passageway leading through said casing to said chamber; a check valve mounted upon said casing in communication with the chamber therein, said check valve including a valve neck protruding therefrom and having a passageway therethrough, a check valve control member for sealing the passageway through the check valve in one position and for opening said passageway in another position, a check valve stem secured to said check valve control member and extending through said valve neck, said valve neck and stem structure being insertable into the injection valve of the cigar lighter to be tested, whereby said valve stem is axially shifted by the puncturing head of said injection valve to open said check valve; and a pressure gauge device operatively connected to the fuel chamber of said casing for indicating the gaseous pressure therein.

2. In a cigar lighter testing apparatus, the combination comprising: a casing having a fuel chamber therein, a fuel-charging valve structure for said chamber having a fuel-charging passageway leading through said casing to the chamber, said structure including an elastic sealing diaphragm extending transversely across such passageway and having an opening therethrough, a valve member positioned in said passageway and movable relative to said elastic sealing diaphragm between a closed position wherein it is in fluid-tight engagement with said sealing diaphragm for closing said opening and an open position wherein it is spaced from said sealing diaphragm, said valve member and sealing diaphragm being relatively movable to said open position in response to the insertion of an injection nozzle of a charging cartridge into said passageway, such nozzle engaging said sealing diaphragm in fluid-tight engagement when said valve member and sealing diaphragm are so separated, said valve structure also including a cartridge piercing head positioned for puncturing a frangible membrane of such injection nozzle when the latter is in such last-mentioned position; a check valve structure for said test apparatus also having a passageway therethrough leading through said casing to said chamber, said check valve structure including a neck member protruding from said casing and defining a portion of such last-mentioned passageway, and a valve stem axially shiftable in said neck member, a check valve member movable in such passageway between an open and a closed position in response to movement of said valve stem; and a pressure gauge operatively connected to the fuel chamber of said casing for indicating the gaseous pressure therein.

3. A cigar lighter testing apparatus of the class described, including a fuel casing having a chamber therein, a check valve structure having a neck portion protruding therefrom for insertion into the valve structure of a cigar lighter, said check valve structure having a valve stem therein axially shiftable by the injection valve structure of such cigar lighter for opening such check valve to permit gaseous fuel to enter the cigar lighter for testing purposes, said check valve structure being closable in response to removal of the cigar lighter therefrom, said stem being axially shiftable in the absence of a cigar lighter positioned thereupon, for releasing gas under pressure from said casing; a fuel injection valve structure for receiving a disposable fuel cartridge for injecting fuel into such casing, such injection valve having a passageway leading through said casing to the fuel chamber therein, a charging cartridge puncturing head positioned in such passageway for engaging a frangible membrance of such cartridge and puncturing same when an injection nozzle thereof is inserted into such passageway, a sealing diaphragm also positioned in said passageway having the rim portion thereof secured in fluid-tight relationship to the wall defining such passageway and also having an opening therethrough, a valve member movable relative to said sealing diaphragm between a first position closing said opening and a second position opening same, said diaphragm being positioned for engaging the injection nozzle in fluid-tight engagement in response to the insertion of such nozzle into the passageway wherein said diaphragm and valve member are relatively moved to said open position; and a pressure gauge operatively connected with said fuel chamber of the testing apparatus for indicating gaseous pressure therein.

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