United States Patent [19]

Forry

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[54] **APPARATUS FOR TANK FILLING**

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[73] Assignee: **The United States of America as represented by the Secretary of the Army**, Washington, D.C.

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[21] Appl. No.: **363,768**

[52] **U.S. Cl.** **53/88**

[51] **Int. Cl.** **B65b 31/02**

[58] **Field of Search** 53/88, 97, 101, 269, 287, 53/320, 324

[56] **References Cited**

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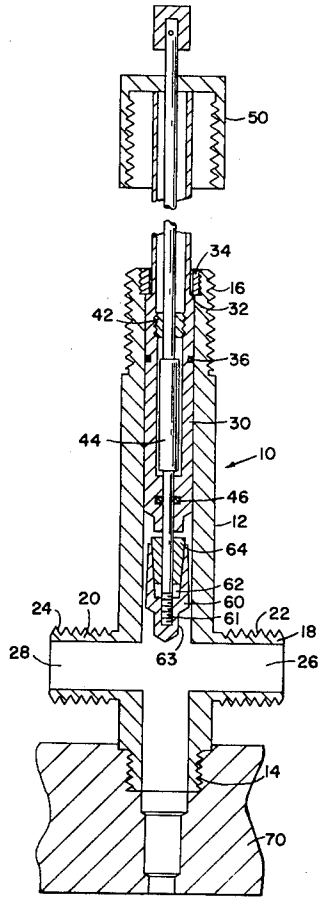
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[57] **ABSTRACT**

A tool for filling tanks adapted to be threaded into the fill opening of a tank to be filled. Said tool being provided with a mandrel carrying a plug adapted to be inserted in said fill opening beneath the threaded portion thereof and a sleeve adapted to force a wedge into said plug to wedge same into said fill opening to seal same.

3 Claims, 5 Drawing Figures



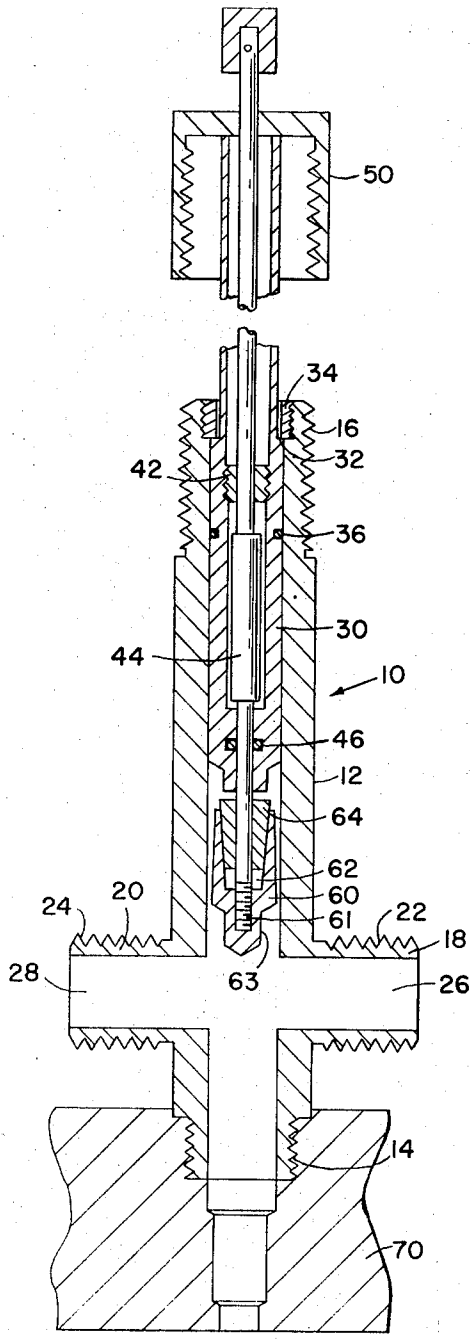


FIG. 1

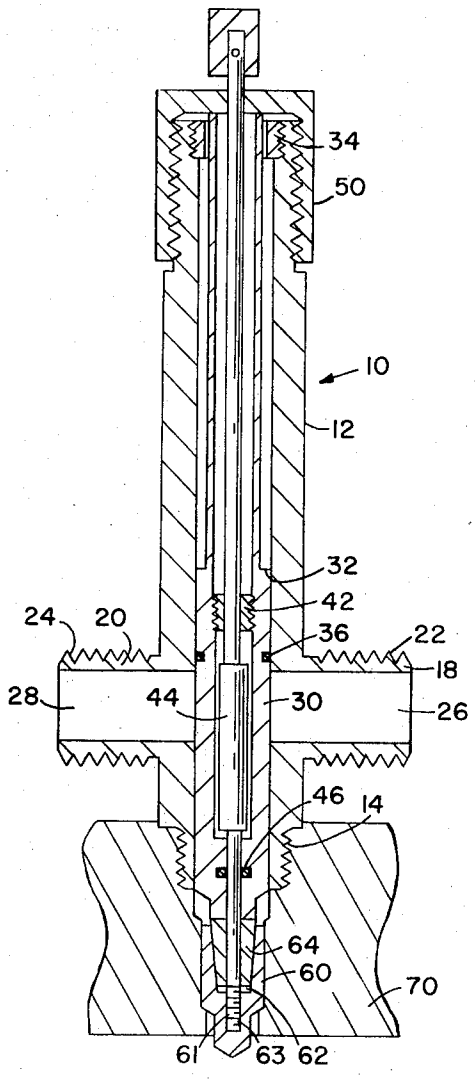


FIG. 2

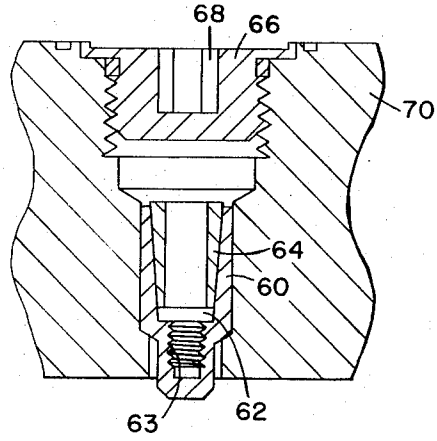


FIG. 3

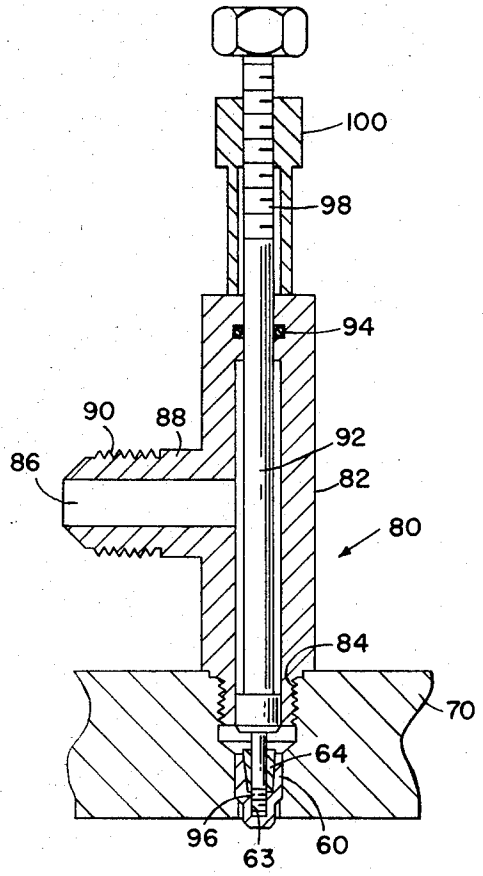

100
98
94
90
88
92
86
82
80
84
70
64
96
63
60

FIG. 4

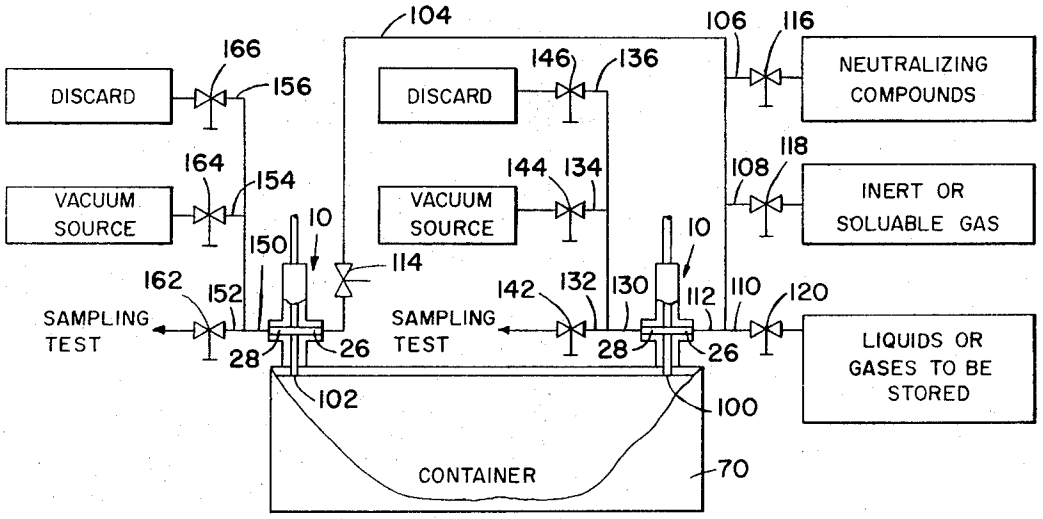

104
106
116
166
146
136
DISCARD
156
DISCARD
NEUTRALIZING COMPOUNDS
164
144
134
118
108
VACUUM SOURCE
154
VACUUM SOURCE
INERT OR SOLUABLE GAS
10
10
150
114
162
152
142
132
130
112
110
120
SAMPLING TEST
SAMPLING TEST
LIQUIDS OR GASES TO BE STORED
28
26
28
26
102
100
CONTAINER
70

FIG. 5

APPARATUS FOR TANK FILLING

BACKGROUND OF THE INVENTION

The present invention relates to the introduction of liquids or gases into containers for storage for various lengths of time. Particularly the invention relates to filling the liquid fuel and oxidizer tanks for a missile using hypergolic fuels.

An object of the invention is to provide an apparatus for filling containers which eliminates the inclusion of contaminates during the filling procedure.

Another object of the invention is to eliminate the danger of exposure of operating personnel to corrosive liquids or gases.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a section through the filling apparatus of the present invention. The apparatus being shown in condition for filling operations.

FIG. **2** is similar to FIG. **1** but illustrates the apparatus in the plug inserting position.

FIG. **3** illustrates a container fill opening with the sealing plug in position.

FIG. **4** illustrates a tool similar to the filling apparatus of FIGS. **1** and **2** but designed for the removal of the sealing plug.

FIG. **5** illustrates schematically the operation of filling a container with the apparatus of FIGS. **1** and **2.**

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and more particularly to FIGS. **1** and **2** thereof, **10** generally indicates the tool of the present invention. The tool **10** comprises a tubular housing **12** having external threads **14** and **16** at its opposite ends. Two tubular bosses **18** and **20** extend laterally from housing **12** adjacent one end thereof. The bosses **18** and **20** are externally threaded as indicated at **22** and **24,** respectively, and constitute inlet and outlet ports **26** and **28,** respectively.

A sleeve **30** is slideably mounted within the housing **12.** The sleeve is narrowed at its upper end to provide an upwardly facing shoulder **32.** A ring **34** is threaded into the upper end of housing **12** and cooperates with the shoulder **32** to retain the sleeve **30** within the housing **12.** An O-ring **36** mounted within a groove on the outer surface of sleeve **30** bears against the inner wall of housing **12** to provide a seal therebetween.

A mandrel **40** is slideably mounted within the sleeve **30** and is retained therein by a ring **42** threaded into the sleeve **30.** The ring **42** cooperates with an enlarged portion **44** on the mandrel **40.** Sealing between the mandrel **40** and sleeve **30** is accomplished by an O-ring **46** mounted in a groove on the inner surface of the sleeve **30** and bearing against the mandrel **40.**

An internally threaded cap **50** is slideably mounted on the projecting portion of mandrel **40** and is adapted to bear against the upper end of sleeve **30** and be threaded onto thread **16** on the upper end of housing **12.**

A plug **60** is provided with internal thread **63** and is threaded onto thread **61** provided on the lower end of mandrel **40.** Plug **60** is provided with a conical recess **62** within which is positioned a conical wedge **64** which is slideable on mandrel **40** and adapted to be contacted by the lower end of sleeve **30.**

After the wedge **64** has been forced into the plug **60** and the tool **10** has been purged in the manner described hereinbelow, the tool may be unscrewed from the fill opening and a dust cap or secondary seal **66** screwed in the manner illustrated in FIG. **3.** The dust cap is provided with a recess **68** to accept an Allen type wrench so that nothing projects beyond the outer surface of the container **70.**

When it is desired to remove the plug **60,** the dust cap **66** is removed and replaced by a tool **80** illustrated in FIG. **4.** The removed tool **80** comprises a tubular housing **82** provided with external thread **84** adapted to be screwed into the fill opening of container **70.** A lateral discharge port **86** is provided in a base **88** on the tubular member **82.** The boss **88** has an external thread **90** to provide for correction with other devices.

A mandrel **92** is slideably mounted within tubular member **82** and sealed with respect thereto by an O-ring **94.** A thread **96** is provided at the lower end of mandrel **92** to be screwed into thread **63** in the plug **60.**

The projecting portion of mandrel **92** is threaded as indicated at **98.** A nut assembly **100** is mounted on the threaded portion of mandrel **98.** When the nut **100** is rotated relative to the mandrel **92** the lower end bears against the housing **82** forcing the mandrel **92** outwardly to withdraw the plug **60.**

The use of the tools **10** is illustrated in FIG. **5** wherein two tools **10** are screwed one into the fill opening **100** and one into vent opening **102** of container **70.** A pipe or tubing **104** connects port **26** of one tool **10** by means of branch pipes **106, 108** and **110** to a source of neutralizing compounds, inert or soluable gas, and the liquid or gases to be inserted into container **70,** respectively. A similar conduit **112** connects inlet port **26** of the other tool **10** to branch lines **106, 108** and **110.** Flow through branch line **106, 108** and **110** is controlled by valves **116, 118** and **120** respectively. A valve **114** controls flow through conduit **104.**

The discharge port **28** of one tool **10** is connected by a conduit **130** and branch conduits **132, 134** and **136** respectively to a sample test station, a vacuum source, and a discard station. Flow through branch conduits **132, 134** and **136,** respectively, is controlled through valves **142, 144** and **146.**

Similarly, conduit **150** connects the discharge port **28** of the other tool **10** with branch conduits **152, 154** and **156** to a sample test station, a vacuum source, and a discard station. Flow through branch conduits **152, 154** and **156,** respectively, is controlled by valves **162, 164** and **166.**

After the conduits have all been connected in the manner described above, valves **114, 116, 146** and **166** are opened to purge the filling tools **10.** The valves **142** and **162** are periodically opened to check the material issuing from the ports **28.** When the tools **10** are purged valves **146** and **114** are closed to purge the tank **70.**

As soon as the complete system is purged valve **116** is closed and valve **118** is opened to fill the entire system including tank **70** with an inert or soluable gas. Valve **118** is then closed and valve **120** opened to fill the container **70** with the liquid or gas to be stored. Valve **162** is periodically opened and when the liquid or gas to be stored appears the container **70** is full.

The mandrel **44** on each tool **10** is pushed inwardly to insert the plugs **60** into the fill openings. The caps **50** are screwed down to force the sleeves **30** downward to force wedges **64** into the plugs **60** thus sealing the openings in the container **70.**

The caps **50** are then unscrewed along with the mandrels **44** and both are withdrawn above the ports **26** and **28.** Valve **116, 114, 146** and **166** are again opened to purge the tools **10.** When samples taken by opening valves **142** and **162** show that all corrosive liquids or gases have been removed from the tools **10,** the valves are all closed, the conduits disconnected, and the tools **10** are unscrewed from the fill openings. Dust caps **66** are then screwed into the fill openings to protect the plugs **60.**

I claim:

1. A device for filling tanks comprising:

a tubular housing threaded externally at both ends,

an inlet port and an outlet port adjacent the end of said housing adapted to be threaded into said tank,

a sleeve slideably mounted within said housing and projecting from the outer end thereof,

means for sealing between said sleeve and said housing,

a mandrel slideably mounted within said sleeve, one end of said mandrel projecting inwardly toward said tank the other end projecting outwardly beyond said sleeve,

means for sealing between said mandrel and said sleeve,

a plug assembly releasably attached to the end of said mandrel which projects inwardly toward said tank,

wedge means slideable on said mandrel and receivable within said plug, and

means for moving said sleeve relative to said mandrel to force said wedge means into said plug.

2. A device as set forth in claim **1,** wherein said means for moving said sleeve relative to said mandrel is a cap adapted to be screwed onto said housing and to contact the outer edge of said sleeve.

3. A device as set forth in claim **2,** wherein said plug is threaded onto the inner end of said mandrel.

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