

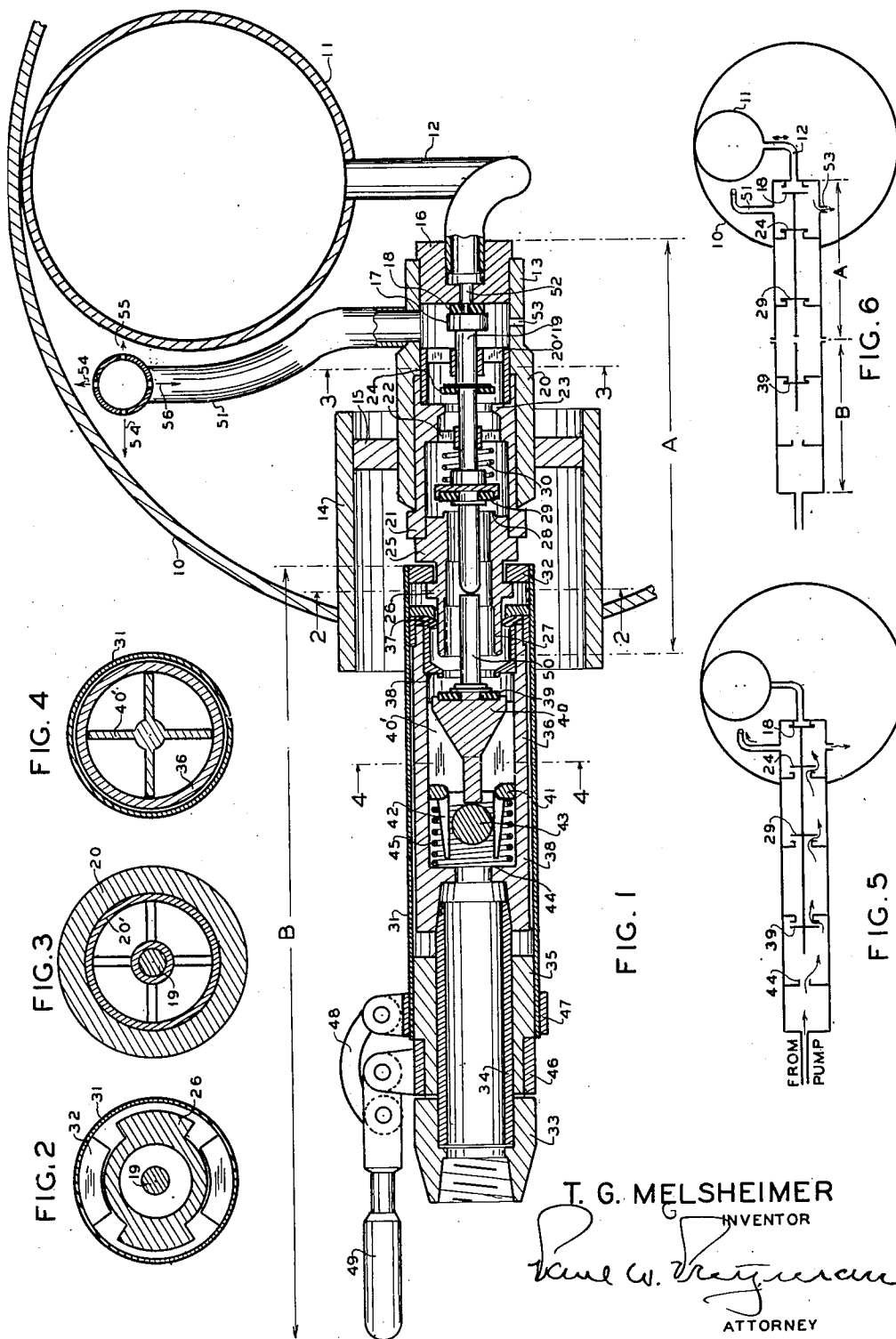
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SAFETY NOZZLE FOR FILLING BUTANE TANKS

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SAFETY NOZZLE FOR FILLING BUTANE TANKS

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This invention refers to a device for safely introducing butane or other highly volatile and inflammable liquid into a closed tank such as the fuel supply tank of an automotive vehicle.

A purpose of the invention is to prevent loss of liquid from the tank in the event of bursting of a filling hose while the tank is being filled.

A purpose of the invention is to prevent loss of liquid from either the hose or the tank when the filling operation is completed and the filling connection is broken.

A purpose of the invention is to provide automatic means for preventing liquid from entering an outage tank, located within the fuel supply tank, while filling is in progress and for placing the outage tank in communication with the supply tank when filling is discontinued.

A purpose of the invention is to provide means for reducing the pump pressure required for the filling of a given tank with a given volatile liquid.

The invention may best be understood with reference to the attached drawings and the following description thereof, in which

Fig. 1 is a longitudinal section through an illustrative embodiment of the invention, showing the device mounted in a tank and assembled in filling position;

Fig. 2 is a cross section of the same as on the line 2—2 of Fig. 1;

Fig. 3 is a cross section through the device as on the line 3—3 of Fig. 1;

Fig. 4 is a cross section through the device as on the line 4—4 of Fig. 1;

Fig. 5 is a diagram illustrating the positions of the liquid control valves and the flows of liquid during the filling of the tank, and

Fig. 6 is a diagram showing the positions of the valves when the filling operation is completed and the demountable portion of the device separated from the fixed portion.

Referring first to Fig. 1, 10 is a fragment of the wall of a cylindrical tank and 11 is an outage tank supported within the larger tank and communicating with its interior only through a tube 12.

The filling device consists of two assemblies: a fixed assembly A which is permanently mounted in a more or less horizontal position in the wall of tank 10, and a demountable assembly B which is attached to the end of a suitable pump discharge hose not shown and, when required, is attached to the fixed assembly.

The fixed assembly consists first of a sleeve 13 supported in the wall of tank 10, preferably by means of a short section of heavy pipe 14 and a spacing web 15. The pipe section should project beyond the tank wall at least as far as the outermost end of the fixed assembly, to prevent breaking off of this connection in the event of collision and the possible loss of the contents of the tank.

The end of sleeve 13 is closed by a bored plug 16 to which the lower end of tube 12 is attached, the inner (left) end of this plug being faced to provide a seat for a valve consisting of a metallic disc 17 and a disc 18 of neoprene or other oil-resistant elastic substance. The stem 19 on which this valve is mounted is supported and guided by a sleeve 20 and spider unit 20' as shown in section in Fig. 3.

Within and affixed to sleeve 13 is a sleeve 21 carrying a second spider and guide 22 for stem 19, this sleeve having an inwardly projected shoulder 23. The right hand side of this shoulder is faced to provide a seat for a neoprene disc 24 which is mounted on and moves with stem 19.

Within and affixed to sleeve 21 is a sleeve 25 carrying lugs 26 which form part of a bayonet catch shown in cross section in Fig. 2. The projecting end 27 of this sleeve is smoothly surfaced circumferentially. The right hand end of this sleeve has a shoulder 28 which is faced on its end to provide a seat for a neoprene disc 29 which is mounted in fixed position on stem 19. The stem and the three attached valves are urged toward the left or outer end of the fixed assembly by a suitably located spring such as that shown at 30.

The detachable assembly B consists first of a tube 31 carrying inwardly projected lugs 32 which make part of the bayonet catch. Slidable within this tube is an assembly consisting of a hose connection 33, a connecting tube 34, a sleeve 35 and a sleeve 36, these elements being permanently connected as by screw threads or by welding.

At the end of sleeve 36 a ring 37 of neoprene is mounted, the inner diameter of this ring being slightly smaller than the outer diameter of projection 27. Thus when the ring is passed over the projection it is distorted and a tight seal is formed. This particular form of seal, which is disclosed in U. S. Patent 2,061,012 to Wade, may be replaced by any form of flexible gasket which is capable of forming a tight joint between elements 27 and 36.

Sleeve 36 is also provided with an inserted element having an internally projected flange 38, the left side of which is faced to provide a seat for a flexible disc 39. This disc is mounted on an element 40 having vanes 40' forming a spider (see Fig. 4), a ring 41 integral with the spider, and guides 42 projected from this ring and retaining a ball 43. In the event of failure of the pump discharge hose while the tank is being filled, this ball is moved to the left by liquid returning from the tank and seats on a shoulder 44 projected inwardly from sleeve 38, thus cutting off the return flow. Except in this event the ball remains in the position shown.

The assembly consisting of units 39 to 42 inclusive is slidable within sleeve 38 and is urged toward the right hand by an open coil spring

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45, which keeps disc 39 in contact with seat 38 so long as the demountable assembly B is separated from fixed assembly A.

A ring 46 is mounted on sleeve 35 and a similar ring 47 on the end of tube 31, a toggle 48 having a handle 49 being coupled between these rings. When the handle is brought down to the position shown in Fig. 1 (after engaging the bayonet catch lugs 26 and 32) sleeves 35 and 38 are forced to the right and the end of stem 50 engages the end of stem 19, causing disc 18 to seat against block 16 and lifting discs 24, 29 and 39 away from their seats. In this position the flow of liquid under pump pressure toward the tank will be as illustrated in the diagram Fig. 5, the sole entrance to outage tank 11 being closed and the pumped liquid being delivered into main tank 10 through conduit 51. A small quantity of the pumped liquid will flow into the lower part of the tank through drainage orifice 53 in the lower side of sleeve 13.

The positions of the valves when demountable element B is separated from fixed element A are illustrated in Fig. 6. When handle 49 is raised to the vertical position, sleeves 35 and 38 are moved to the left, causing disc 39 to engage seat 38 and thus prevent loss of liquid from the hose on disconnection. At the same time stem 19 is urged to the left by spring 30, causing disc 24 to engage seat 23 and disc 29 to engage seat 28, preventing outflow of liquid or vapor from the tank and permitting the hose and the demountable assembly A to be removed. At the same time disc 18 is withdrawn from its seat against block 16, placing outage tank 11 in communication with the main tank through tube 12, port 52 and drainage orifice 53. As the pressure in the outage tank will initially be below that in the main tank, liquid will then flow into the outage tank until the pressures equalize, this liquid gradually draining back as the liquid level in the main tank falls.

The provision of the two valves 29 and 24 in series is precautionary only, either one being capable of stopping reverse flow. As during the use of the contents of the tank a leak through these valves would provide a vent to the open air, this precaution is advisable though not essential.

An important feature of the invention is the provision of means for reducing the pressure otherwise created in the tank during its filling with a highly volatile liquid. Butane, for example, usually contains a small but appreciable quantity of propane and at least traces of ethane and methane. These normally gaseous hydrocarbons tend to separate during the filling of the tank, requiring a high pump pressure and placing a higher bursting stress on the tank than it will have to carry after the liquid charge has come into equilibrium with the overlying gas and vapor.

I have discovered that when the entering liquid is introduced into the tank vapor space, in the form of fine streams or of flowing films in contact with the vapor, a material proportion of the vapor and even some fixed gas will be absorbed and liquified, and the vapor pressure within the tank thus materially reduced.

I therefore prefer to carry the liquid delivery tube 51 into the upper part of the main tank, as shown in Fig. 1, and discharge it into the tank through a multiplicity of relatively small perfora-

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tions. These may direct streams of entering liquid against the inner wall of the main tank, as at 54-54, or against the outer wall of the outage tank as at 55, either producing a film flowing down the wall, or downwardly into the body of liquid, as at 56.

While the only supply tank illustrated is one provided with an outage tank, it will be understood that the portion of the structure containing the reverse flow valves may be used to equal advantage in the filling with volatile liquid of any closed tank. When the outage tank is not provided, elements 12, 17 and 18 would likewise be omitted, as well as port 52 in block 16. It will also be understood that delivery pipe 51 may be terminated in any part of the main tank if it is not desired to utilize the described means for reducing vapor pressure in pumping.

I claim as my invention:

1. Apparatus for safely introducing a volatile inflammable liquid into a pressure tank provided with an outage tank, comprising: a tubular stationary element projected through the wall of said pressure tank and nonleakably fixed therein; means for discharging liquid from the inner portion of said stationary element into said pressure tank; a conduit connecting the inner end of said stationary element with the lower portion of said outage tank; a first valve in said stationary element arranged to prevent flow of liquid out of said pressure tank when closed and to permit flow of liquid into said pressure tank when open; a second valve arranged to cut off communication between said stationary element and said conduit when closed, said first and second valves being mounted on a common stem and so disposed that one of them is closed by a movement of said stem which opens the other; a tubular removable element having means at one end for coupling to a pump discharge hose and arranged at the opposite end to be nonleakably coupled to said stationary element; a third valve in said removable element arranged to prevent outflow of liquid from said hose when closed; stems projected toward each other from said first and third valves, the lengths of said stems being so adjusted that the movement of said removable element into coupling position with said stationary element causes said first and third valves to open and said second valve to close, and resilient means urging said first and third valves into closed position and said second valve into open position when said elements are separated.

2. Structure as described in claim 1, in which said means for discharging liquid into said pressure tank includes a liquid delivery pipe extending from said stationary element into the upper portion of said pressure tank, said delivery pipe being provided with perforations arranged to direct streams of liquid against a metallic surface in contact with the vapor in said pressure tank.

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REFERENCES CITED

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