FLUID TRANSFER SYSTEM
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The invention relates generally to fluid transfer systems, and more particularly to a fluid transfer system of a closed type.

The invention is particularly applicable to the transfer of volatile, flammable liquids and the like, as for example, gasoline wherein the discharge of vapors from a supply container, as the same is being filled, may present a serious fire hazard, as for example, within close confinement of enclosures, in the vicinity of sparks, static charges or other igniting means.

The invention thus has among its objects the production of a fluid transfer system wherein the fluid may be transferred from a supply container to the receiving container and simultaneously vapors within the receiving container may be displaced into the supply container within a closed transfer system to eliminate any discharge of vapors into the atmosphere.

Another object of the invention is the production of novel conduit connections for effecting the desired transfer results, as well as a novel supply container which is provided with means for operatively discharging vapors and the like from a receiving container to the interior of the supply container.

A further object of the invention is the production of such a system and supply container therefor which is provided with novel means for restricting the flow of fluid into the vapor passages of the supply container when the same is not in discharging relation to the receiving container.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

In the drawings, wherein like reference characters indicate like or corresponding parts:

FIG. 1 is a sectional view through a supply container, portion of a receiving container and connecting conduit means therebetween; and

FIG. 2 is a similar sectional view of a portion of the supply container illustrating the valve means on the vapor return line.

The invention contemplates the production of a fluid transfer system embodying a multiple conduit connection between a receiving container and the supply container, whereby one conduit may be employed to supply fluid from the supply container to the receiving container and the other conduit may be employed to transfer displaced vapor from the receiving container to the supply container, thereby eliminating any possibility of hazards resulting from the discharge of vapor from the containers to the atmosphere. The invention is particularly applicable to small manually carried supply cans which are adapted to be inverted to effect discharge of the fluid therefrom and which may be provided with valve means for preventing the flow of fluid into the vapor line of the supply can when the latter is in its normal non-inverted position.

Referring to the drawings, the reference numeral 1 indicates a fluid supply container, as for example, a supply can, which is adapted to be operatively connected to a fluid receiving container or tank indicated generally by the numeral 2 through a flexible multiple fluid conduit indicated generally by the numeral 3, the container 1 being adapted to be inverted to the position as illustrated in FIG. 1 whereby fluid may flow therefrom through the conduit structure 3 into the container 2 under the action of gravity.

The conduit structure 3 is illustrated as comprising an outer fluid supply conduit 4 and an inner vapor discharge conduit 5 having their end portions in concentric relation. The conduits 4 and 5 may be of any suitable construction, having sufficient flexibility to permit inversion of the container 1 from a normal upright position to the inverted position illustrated in FIG. 1.

The conduit structure 3 may be operatively connected to the container 1 by means of a fitting 6 of generally tubular construction, having a body portion 7 which is provided with a mounting flange 8 suitably secured by bonding or other means to the top wall 9 of the container 1, the wall 9 having an opening 11 communicating with the interior of the body member 7. The fitting 6 may be provided with a tubular portion 12 which is concentrically positioned with respect to the body member 7 and secured thereto by means of a plurality of radially extending webs 13, only two of which are illustrated in FIG. 1, the space between adjacent webs providing adequate flow area for the fluid from the container 1. Positioned within the container 1 is a tube 14 having one end secured to the adjacent end of the tubular portion 12, whereby the interior of the tube 14 is in communication with the bore 15 of the portion 12, the opposite end of the tube 14 being positioned adjacent the bottom 16 of the container 1, and illustrated as secured to a valve body 17 which may be suitably mounted on one of the side walls of the container.

The valve body 17 is provided with a passageway comprising intersecting bores 18 and 19, the bore 19 being of a size to receive the adjacent end of the tube 14 which is suitably secured thereto. The valve body 17 is counterbored as indicated at 21 to form a valve seat 22 adapted to cooperate with a ball valve member 23 positioned in the counterbore 21 and secured to be releasable by suitable means, as for example, a transversely extending pin 24. If desired, additional intersecting passages may be provided to accommodate the fluid from the tube 14. It will be apparent that when the container 1 is inverted as illustrated in FIG. 1, the ball 23 may uncover the valve seat 22, thereby opening the adjacent end of the tube 14, but when the container 1 is in its normal non-inverted position the valve structure will assume the position illustrated in FIG. 2, the ball 23 seating on the seat 22 and operatively closing the adjacent end of the tube 14.

The conduit structure 3 may be suitably secured to the fitting 6, either as a permanent attachment or, as disclosed in FIG. 1, detachably secured thereto by a mounting ring 26 having internal threads 27 adapted to engage external threads 28 on the body member 7, the ring 26 being provided with an internally directed flange 29 adapted to engage a cooperate flange 31 formed on the end of the conduit 4, a suitable gasket 32 being provided, if desired, between the flange 31 and the adjacent end of the body member 7. Likewise, the adjacent end of the tubular portion 12 may be provided with suitable means, as for example, external ribs 33 adapted to engage the inner surface of the conduit 5 and frictionally retain the adjacent end of the conduit 5 thereon.

The opposite end of the conduit structure 3 is adapted to be connected to the container 2 through suitable means, as for example, a connector fitting indicated generally by the numeral 34 secured to the container 2 and cooperating with a connector fitting indicated generally by the numeral 35 carried by the adjacent end of the conduit structure 3.

The fitting 34 comprises a tubular body member 36 having a mounting flange 37 thereon which may be bonded or otherwise secured to the top wall 38 of the receiving container 2, the top wall 38 thereof having an
opening 39 therein communicating with the interior of the body member 36 through which fluid may flow into the container.

The connector fitting 35, in the embodiment illustrated, comprises a sleeve member 41 of a size to be inserted in the adjacent end of the conduit 4, the latter being expanded to radially engage the former and secure the latter thereto. The opposite end of the sleeve 41 may terminate in an outwardly directed annular flange 42 adapted to be engaged by an inwardly directed flange 43 on a lock ring 44 having internal threads 45 adapted to engage external threads 46 on the body member 36, a gasket member 47 being interposed between the flange 42 and the adjacent end of the body members 36 to provide an effective seal theretwixt.

Carried by the sleeve 41 and illustrated as being disposed concentrically therewith is a tubular member 48 which is connected to the sleeve 41 by a plurality of radially extending webs 49, only two of which are illustrated in FIG. 1. The upper end of the member 48, as viewed in FIG. 1, may be provided with suitable means for effecting a connection thereto of the adjacent end of the conduit 5, as for example, a plurality of annular ribs 51 operative to provide a secure frictional connection between the engaged parts.

Carried by the body member 36 and extending concentrically therewith is a tubular element 52, the latter being supported by the body member 36 through a plurality of radially extending webs 53, only two of which are illustrated in FIG. 1. The lower end of the tubular element 52 is adapted to communicate with the interior of the container 2, while the upper end is adapted to be received in the counterbore 54, thereby operatively connecting the element 52 with the tubular member 48 and conduit 5. To facilitate engagement of the element 52 with the adjacent end of the member 48, the counterbore 54 may be flared at its outer end as illustrated.

The supply container 9 may be provided with suitable means, as for example, a filler spout 55 having a threaded cap 56 and a suitable cap or plug may be threaded into the ring 44 for normally closing the outer end of the conduit 3. Likewise, the fitting 34 may be closed by a suitable threaded cap member similar to the member 56.

In use, the filled container 1 is positioned adjacent the receiving container 2, the container 1 being in a normal non-inverted position, and the connector fitting 35 secured to the fitting 34, the flexible conduit structure 3 being of sufficient length to permit such a connection with the container 1 in a non-inverted position. Following connection of the conduit structure 3 to the fitting 34 the container 1 is inverted to the position illustrated in FIG. 1, whereby the fluid in the container 1 may flow between the inner conduit 5 and the outer conduit 4 into the receiving container 2, while simultaneously therewith vapor at the top of the container 2 may flow through the tubular member 52, the tubular portion 48 of the connecting structure 45, conduit 5, tubular member 15 and tube 14 from which it is discharged into the uppermost part of the inverted container 1. Thus as the fluid flows from the container 1 into the container 2 the vapor and air displaced from the container 1 is transferred to the container 1, taking the place of the fluid transferred therefrom.

To deflect the incoming fluid into the container 2 from the end of the tubular element 52, the latter may be provided adjacent its lower end with a radially outwardly extending flange 57 and if desired, a suitable flame arresting screen 58 or the like may be interposed in the path of the incoming fluid, such screen extending from the top wall 38 of the container 2 to the flange 57. Obviously, the specific details of the conduit structure as well as the connecting fittings, etc., may vary widely to meet the specific requirements of individual applications of the invention.

It will be particularly noted that I have provided a novel fluid transfer system which eliminates fire hazards attendant to the release of combustible vapors into the atmosphere during the filling of supply tanks and the like, which system is relatively simple in construction and highly efficient in operation.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described, or as using any particular method.

What I claim as new and desire to secure by Letters Patent is:

1. A closed fluid transfer system comprising a fluid supply container and a fluid receiving container, a detachable and flexible multiple fluid conduit structure comprising a fluid connecting conduit operatively connecting in fluid tight relation the interior of the supply container with the interior of the receiving container and sealing said containers with respect to the exterior thereof, said detachable conduit structure also comprising a concentric second fluid conduit operatively associated with said first fluid connecting conduit and also operatively connecting said containers together in fluid transfer relation, said second fluid conduit together with said containers being sealed by said first fluid conduit with respect to the exterior of said containers, one end of said second fluid conduit being disposed to receive vapor from the receiving container, and the opposite end being disposed to discharge vapor into the supply container whereby may be transferred from the supply container to the receiving container, and vapor may simultaneously be displaced from the latter container to the supply container and discharge of vapor exteriorly of the containers is thereby prevented, each of said conduits being detachable from at least one of said containers, said supply container being constructed to be inverted for transfer of fluid therefrom to the receiving container by gravity, the adjacent end of said second fluid conduit being disposed within said supply container adjacent the bottom of the latter whereby it is positioned above the fluid level therein when the supply container is inverted, and the end of said second fluid conduit disposed in said supply container contiguous to the bottom of said supply container and comprising a gravity-operated ball-check valve means for closing said second fluid conduit end when the supply container is in a non-inverted position and for opening said second fluid conduit in the inverted position of said supply container.

2. A fluid transfer system as defined in claim 1, wherein said supply container is provided with a fitting having means for connecting said conduits to the supply container, said fitting being constructed for attachment of the first fluid connecting conduit thereto, a tube having one end thereof disposed adjacent the bottom of the supply container operatively connected to said gravity-operated ball-check valve means and the other end operatively connected to said fitting, for operative connection to the adjacent end of said second fluid conduit, said second fluid conduit providing an inner vapor discharge conduit, the end of said tube adjacent the bottom of the supply container operatively connected to said gravity-operated ball-check valve means, said gravity-operated ball-check valve means comprising a valve body having a passageway operatively connecting the tube with the interior of the supply container, and a gravity-actuated ball valve member disposed in said passageway operative to close the latter when the liquid level in the supply container is above the opened position of said supply container, and operative to open the passageway in the inverted position of said supply container.

3. A fitting for connecting a flexible multiple fluid
conduit structure including a fluid connecting conduit and an inner vapor discharge conduit to a container, comprising a tubular body member having means at one end for a fluid-tight connection to a container, means on said tubular body member for detachably securing said fluid connecting conduit in fluid-tight relation to the opposite end thereof, tubular means carried by and disposed within said fitting with one end thereof disposed for communication with the interior of such a container, and the opposite end disposed adjacent the conduit receiving end of said tubular body member for operative connection with said inner vapor discharge conduit disposed within said first-mentioned fluid connecting conduit, said tubular body member and said tubular means concentrically disposed, the end of said tubular body member in communication with such a container provided with means for shielding said end from fluid incoming through said fluid connecting conduit, and said fitting provided with a flame arresting means operatively interposed in the flow path of fluid passing through the fitting into such a container and concentric to the end of the tubular body member disposed for communication with the interior of the container.

4. A fluid supply container having an opening through which fluid may be discharged, a fitting mounted in fluid-tight relation on said container at said opening and forming the fluid discharge opening for the container, said fitting having a body portion constructed for connection of a fluid discharge conduit thereeto, a discharge conduit connected at one end in fluid-tight relationship thereto, tubular means disposed in said container having one end operatively connected to said fitting and constructed for operative connection to a second fluid conduit, said second fluid conduit disposed in the first conduit and operatively connected to said tubular means, the opposite end of said tubular means being disposed within the container at a point which is above the normal fluid level in the container during fluid discharge operations therefrom, means disposed at the free end of said first conduit for detachably connecting the latter in fluid-tight relation to a cooperable connector fitting on a receiving container, said first-mentioned fitting operatively mounting a tubular portion corresponding substantially in size to said tubular means, the adjacent end of the tubular means secured to the inner end of said tubular portion, the outer end of said tubular portion formed for connection to said second fluid conduit, said body portion and said tubular portion concentrically disposed, and said fluid supply container adapted to be inverted for transfer of fluid therefrom, the inner end of said tubular means operatively connected with gravity-actuated ball-check valve means including a valve body having a passageway and a gravity-actuated ball-check valve member operatively disposed in said passageway operative to close the passageway when the liquid level in the container in its non-inverted position is above the mouth of said passageway and also operative to open the tubular member in the inverted position of said supply container in the transfer of fluid therefrom.

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