

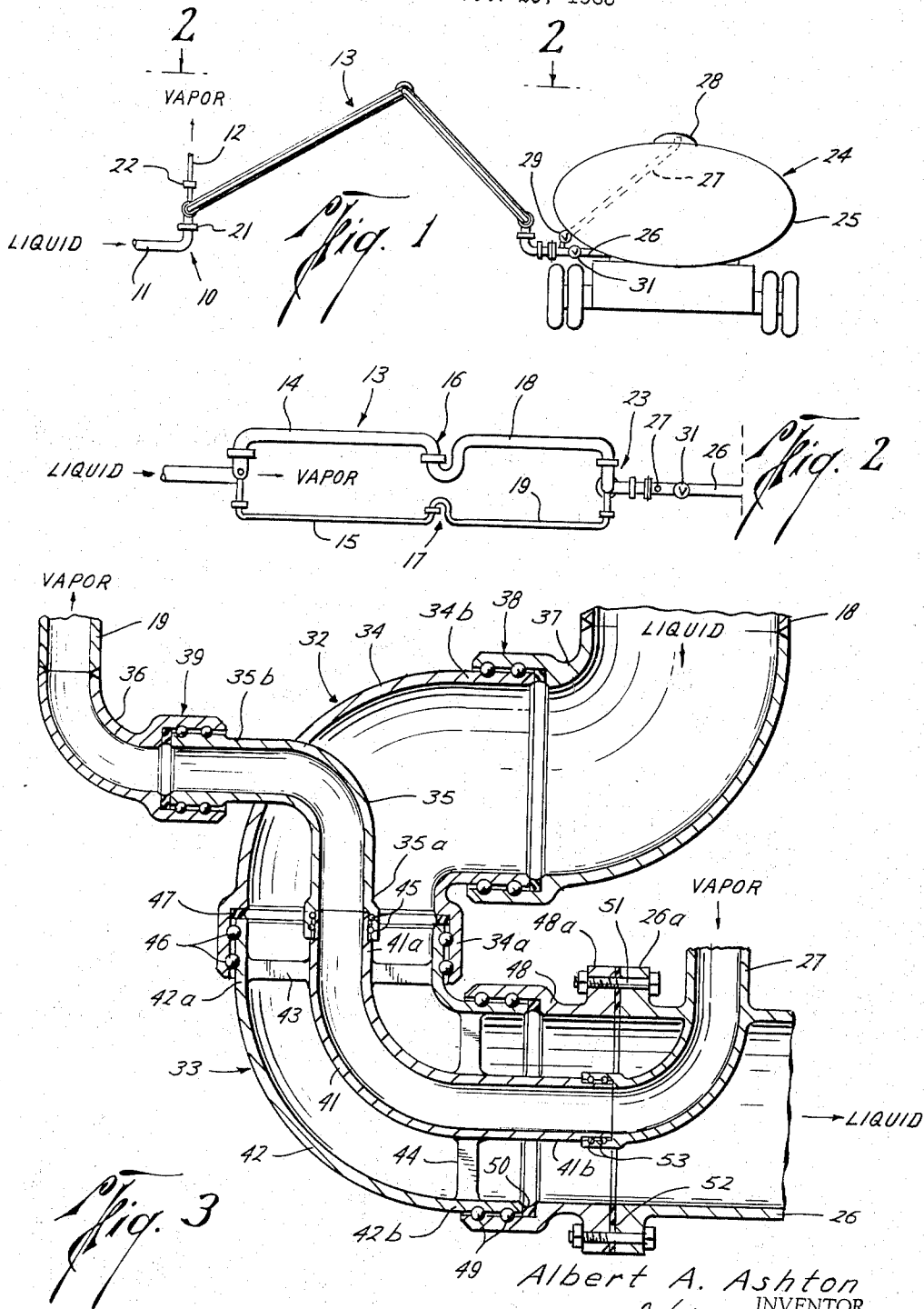
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BOTTOM LOADING ARM

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BOTTOM LOADING ARM

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This invention relates to loading arm assemblies for loading liquid into vehicular tanks. More particularly, the invention relates to loading arms with which a tank may be bottom loaded and vapors from the tank recovered through the same loading arm. In one important aspect, the invention relates to a novel swivel which permits a double conduit loading arm to be attached to a tank for bottom loading with a single connection.

It is well known that when liquids such as gasoline are dropped from a height, there is a great deal of mist and evaporation, whereas if the fuel is introduced into the bottom of a tank, this action is minimized. There is sufficient evaporation present when loading fuel at bulk stations or refineries, that it has been proposed to recover the vapors. No system has previously been devised which permits bottom loading and vapor recovery with an arrangement integral with the loading arm.

This invention may be summarized as parallel loading arms connected to a tank by a single connection and a swivel for making such connection.

It is an object of this invention to provide a liquid transfer system which permits bottom loading of vehicular tanks and recovery of vapors from the tanks through a single integrated loading arm.

Another object is to provide a system for bottom loading of vehicular tanks and recovery of vapors from the tanks utilizing a double conduit loading arm and a single connection between the loading arm and tank.

Another object is to provide a swivel joint for connecting two conduits together while providing for rotation in at least two planes.

Another object is to provide a swivel joint joining two parallel conduits to two concentric conduits while providing for rotation in at least two planes.

Other objects, features and advantages of the invention will be apparent from the drawing, the specification and the claims.

In the drawing, wherein there is shown an illustrative embodiment of this invention, FIGURE 1 is a schematic illustration of the liquid loading system of this invention and showing fuel being introduced through a loading arm into a vehicular tank;

FIGURE 2 is a fragmentary view along the line 2-2 of FIGURE 1; and,

FIGURE 3 is a view in cross-section on a greatly enlarged scale of the swivel assembly between the outer conduits of the loading arm and the liquid and vapor conduits attached to the tank.

Referring to FIGURE 1, a loading station is indicated generally at 10. This station receives liquid through conduit 11 from a suitable source such as a tank farm, not shown. Vapors resulting from the loading operation are returned to the station 10 and are sent through line 12 to a suitable facility for handling the vapors. Such a facility may include means for reliquefying the vapors.

A double loading arm is indicated generally at 13. This loading arm is best seen in FIGURE 2 to include an inner arm made up of two conduits 14 and 15 connected by swivel means indicated generally at 16 and 17 to an outer arm which includes the two conduits 18 and 19.

The loading facility 10 may be generally conventional in nature and provide for rotation of the loading arm about a vertical plane by swivels indicated generally at

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21 and 22 in the pipes 11 and 12, respectively. Also, suitable counterbalancing means, not shown, will normally be associated with the loading arm.

At the outer end of the loading arm there is provided a swivel assembly 23 which provides for movement in at least two planes and preferably three to facilitate coupling the loading arm conduits to the vehicle indicated generally at 24.

The vehicle 24 may be of any desired construction in which a tank 25 is to receive liquid from the loading station and transported to some other point. The vehicular tank 25 has attached to its lower section a liquid inlet conduit 26 which is in fluid communication with the interior of the tank. A vapor conduit shown in dashed lines at 27 has its inlet at the top of the tank, and preferably at the manhole 28, and has its outlet end concentric with the conduit 26 as is shown in FIGURE 3, and will be more fully explained hereinbelow. While the vapor conduit might be associated with the liquid conduit inside of the tank 25, it is preferred that the vapor conduit 27 exit through the side wall of the tank and extend through the wall of the liquid conduit 26 so that a suitable valve 29 may be placed in the conduit 27 at a point exterior of the tank. This permits closing off of the vapor conduit separate from the valve 31 which is utilized to close off the conduit 26. While the illustrated embodiment shows the vapor conduit to extend into the liquid conduit, it will be appreciated that this relationship could be reversed.

Reference is now made to FIGURE 3 which shows a novel swivel assembly 23 for connecting the two pipes of the loading arm to the vehicular tank with a single connection.

The swivel assembly 23 includes a first elbow indicated generally at 32 and a second elbow indicated generally at 33.

The first elbow 32 is provided with two pipes 34 and 35. The ends of these two pipes are arranged on common central axes. At one end of the first elbow 32 the end 35a of the pipe 35 and the end 34a of pipe 34 are arranged concentric with each other. The pipe 35 extends through the wall of the pipe 34 so that its other end 35b is exterior of the pipe 34. However, it will be noted that, as stated above, the end 35b is formed on the same central axis of the end 34b of pipe 34.

Suitable fittings 36 and 37 are secured, as by welding, to pipes 19 and 18, respectively. These two fittings are sealingly and rotatably connected to the pipe ends 34b and 35b by the swivel assemblies indicated generally at 38 and 39, respectively. These seal and swivel assemblies may take any desired form.

The second elbow is provided with inner and outer pipes 41 and 42, respectively. Suitable spiders 43 and 44 secure the inner pipe 41 within the outer pipe 42 with the ends 41a and 41b of the second elbow arranged on the same central axes, respectively, as the ends 42a and 42b of the outer pipe 42. It will be noted that these respective ends of the pipes 41 and 42 are concentric.

Suitable means is provided for rotatably and sealingly connecting the two elbows together. The inner pipe 41 may be connected to the pipe 35 by suitable seals such as O-rings 45. The ends 34a and 42a of pipes 34 and 42 may be connected together by the conventional ball assemblies 46. A seal may be provided between the pipe ends 34a and 42a by a seal member 47.

Preferably, a fitting 48 is provided for connecting the second elbow to the vehicular tank conduit 26. This fitting includes the ball assemblies 49 and the seal member 50 so that the fitting will be rotatable relative to the second elbow to permit ease in aligning the bolts 51 which are used to secure the flange end 48a of the fitting 48 to the flange end 26a of pipe 26. A suitable gasket

52 is interposed between the two flanges 48a and 26a. It will be appreciated that if other means are used to secure the pipe end 42b of the second elbow to the pipe 26, and no bolts or the like are required which require alignment, that the fitting 48 would not need to be rotatable relative to the second elbow, and such is contemplated by this invention.

The inner pipe end 41b of the second elbow slips into the end of the vapor conduit 27 and suitable seals provided by a pair of O-rings 53 seal this connection.

From the above description, it is believed apparent that a liquid transfer system has been provided for introducing liquid into the bottom of the tank so that a minimum of vapors will be formed during the loading operation. Such vapors as are formed in the tank are recovered and removed through the same loading arm. The loading arm may be quickly and easily attached to the tank, as only a single connection need be made up. This connection automatically results in a sealing connection between the two loading arm pipes and the conduits of the tank.

It will be appreciated that with the loading arm 13 providing for movement of its outlet end in two planes, as is conventional, the provision of the swivel assembly which provides for movement in two planes permits ready connection of the loading arm with the vehicle without necessity of closely spotting the vehicle. The provision of a third plane of rotation in the swivel assembly permits the preferred form of attaching the assembly to the vehicle as shown.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. A system for transferring liquid comprising,
 - a vehicular tank,
 - a liquid conduit attached to and in fluid communication with the lower section of the tank,
 - a vapor conduit having its inlet end in the top of said tank and its outlet end concentric with said liquid conduit,
 - a loading arm having a pair of inner conduits and a pair of outer conduits,
 - means for conducting liquids to and vapors from said loading arm,
 - a first elbow having two pipes with one pipe extending through the wall of the other pipe,
 - the ends of said one pipe having common central axes with the respective ends of said other pipe,
 - the ends of said pipes being concentric at one end of said first elbow,

fittings sealingly and rotatably connecting the non-concentric end of said elbow pipes, respectively, to said pair of outer conduits,
 a second elbow having an inner and an outer pipe with the ends of the pipes at each end of the elbow having common central axes,
 means sealingly and rotatably connecting the pipes at one end of the second elbow to the concentric ends of the pipes of the first elbow,
 and means sealingly connecting the pipes of the other end of the second elbow to the said vapor and liquid conduit.

2. The system of claim 1 wherein the means for connecting the pipes of the second elbow to the vapor and liquid conduits provides a rotatable connection between said pipes and conduits.

3. A swivel system for connecting a loading arm to the lower section of a tank for filling and venting said tank comprising,

- a first elbow having two pipes with one pipe extending through the wall of the other pipe,
- the ends of said one pipe having common central axes with the respective ends of said other pipe,
- the ends of said pipes being concentric at one end of said first elbow,
- a second elbow having an inner and an outer pipe with the ends of the pipes at each end of the elbow having common central axes,
- means sealingly connecting the two pipes of the first elbow for free rotation about the two pipes of the second elbow,
- freely rotatable fittings sealingly connected to the ends of both pipes of the first elbow remote from the second elbow,
- and freely rotatable fittings sealingly connected to the ends of the inner and outer pipes of the second elbow remote from the first elbow whereby said pipes can rotate relative to each other without any relative axial movement of cooperating elements.

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