

Jan. 16, 1962

R. J. BRANDT
 DEVICE FOR EXTRACTING FUMES FROM LIQUID
 FUEL STORAGE CONTAINERS

3,016,928

Filed Jan. 19, 1959

2 Sheets-Sheet 1

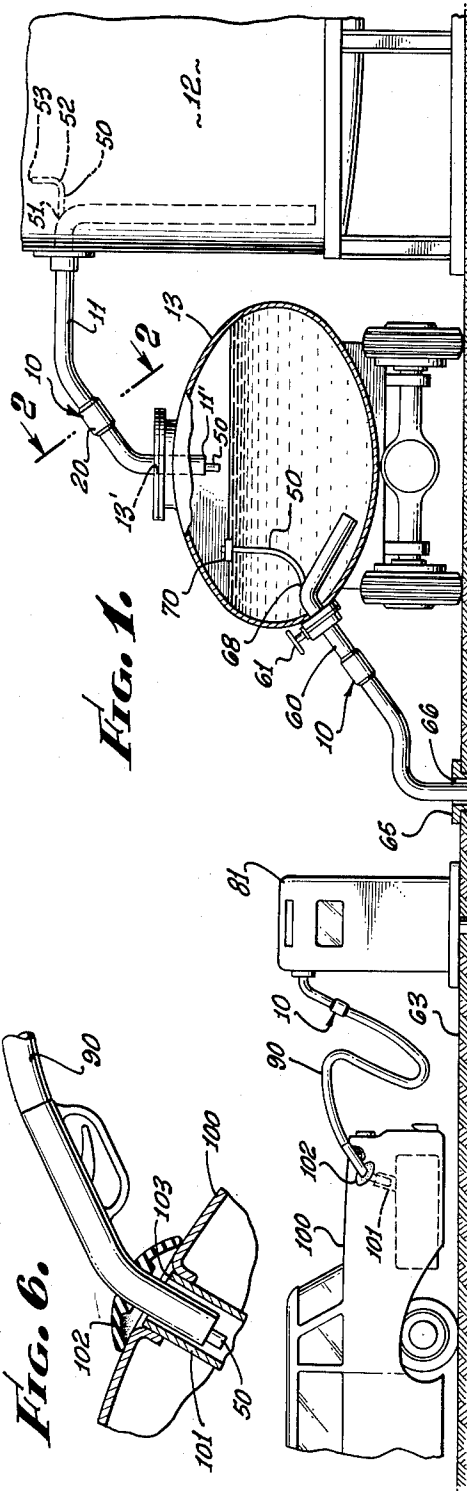
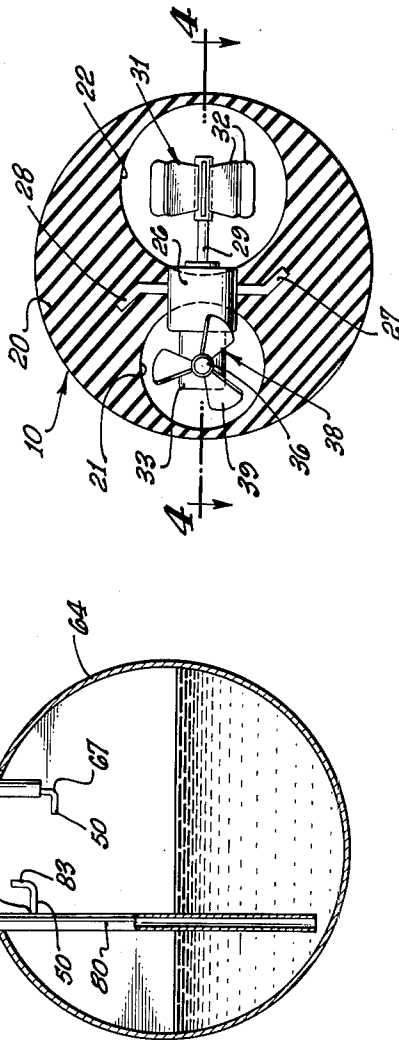


Fig. 1.

Fig. 2.



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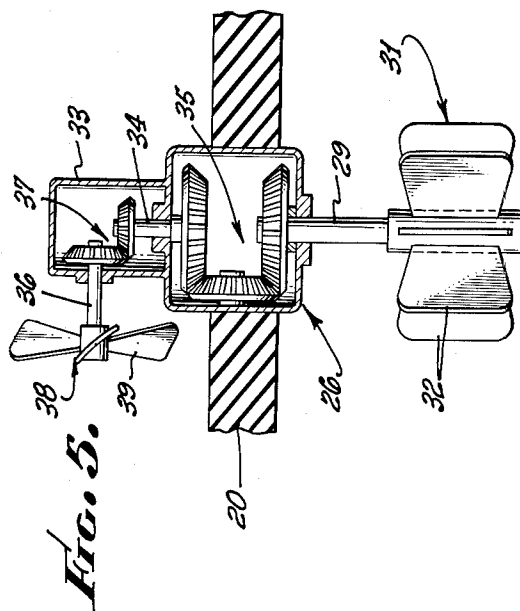
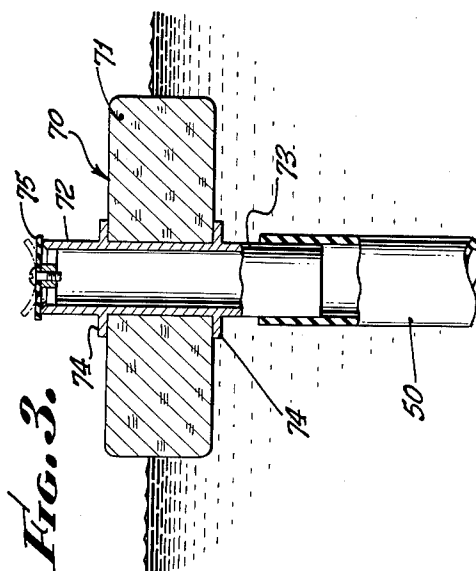
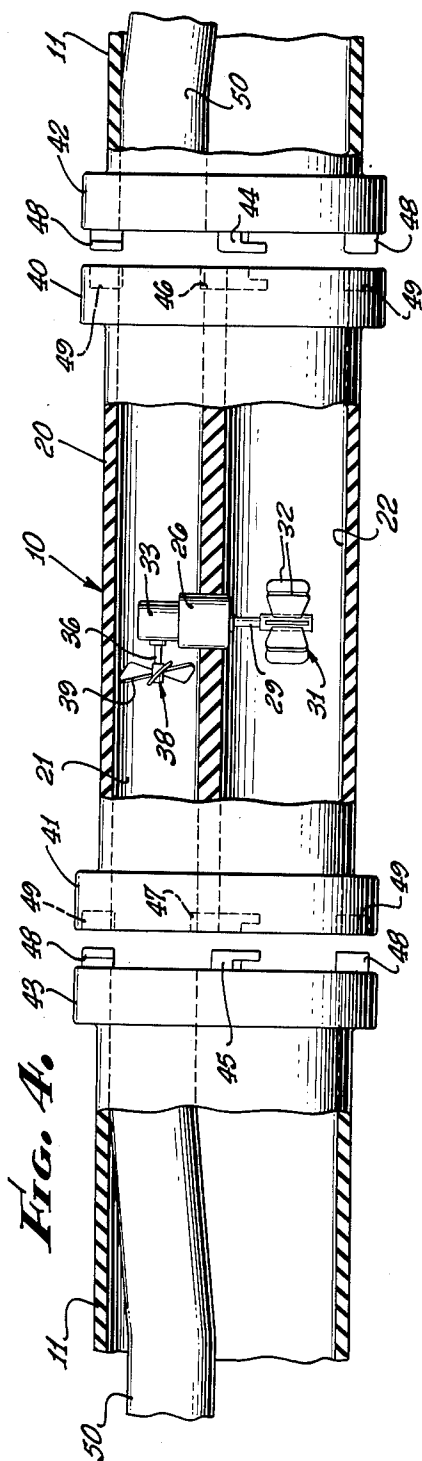
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DEVICE FOR EXTRACTING FUMES FROM LIQUID FUEL STORAGE CONTAINERSRobert Jay Brandt, Los Angeles, Calif.
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Filed Jan. 19, 1959, Ser. No. 787,523

8 Claims. (Cl. 141-45)

This invention relates generally to a device for extracting gases and fumes from one liquid storage container and depositing them into another container. More specifically, the invention relates to a device inserted into a hose line used to pump liquids from one tank or container to another and is designed to withdraw simultaneously fumes from the container into which the liquid is being pumped and deposit them in the container from which it is being pumped.

Heretofore, when, for example, gasoline was being pumped from a bulk storage tank into a tank truck, or from a tank truck into an underground storage tank at a gasoline service station, or from the service station's tank into an automobile gasoline tank, no attempt was made to arrest the hydrocarbons in the tank being filled which were given off in the form of fumes as the storage tank was filled with fuel which replaced the hydrocarbon gases. These hydrocarbon fumes were merely exhausted into the atmosphere by the pressure of the liquid fuel filling the tank. In view of the fact that this process was repeated at every refinery, at every "farm" and bulk storage plant, and at every gasoline service station, a great deal of hydrocarbon pollutants were allowed freely to fill the atmosphere, such fumes being noxious and often injurious to health.

It is therefore one of the objects of the invention to provide a device which will automatically withdraw the gases and fumes from a tank being filled and direct them into a tank being emptied, and thus prevent or limit the release of said gases and fumes into the atmosphere.

Another object of the invention is to provide a device of the character described which can be quickly and easily installed in present fuel gravity flow or pump lines.

Still another object of the invention is to provide such a device which will be operated by the pressure of flow of the liquid fuel in the syphon or pumping system and will require no outside source of power.

A further object of the invention is to provide such a device which may be fully installed without the necessity of enlarging present tank openings or of providing additional openings in tanks.

Still another object of my invention is to provide a device of the character described which is simple in construction, relatively inexpensive to manufacture, and easy to install and replace.

How the above and other objects of the invention are achieved will be more readily understood by reference to the following description and to the annexed drawing, in which:

FIGURE 1 is a schematic drawing illustrating the various steps involved in pumping fuel from a bulk storage tank to a tank truck; from a tank truck to an underground storage tank; and from an underground storage tank to a consumer's automobile.

FIGURE 2 is an enlarged cross section taken on line 2-2 of FIG. 1.

FIGURE 3 is an enlarged cross section of the float device in the tank truck shown in FIGURE 1.

FIGURE 4 is a view taken on line 4-4 of FIGURE 2.

FIGURE 5 is an enlarged vertical cross-sectional view of the impeller device shown in FIGURE 4.

FIGURE 6 is an enlarged view of the gasoline pump hose nozzle shown in FIGURE 1.

Referring to FIGURE 1, there is illustrated therein

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various stages of liquid fuel transportation and delivery at which the device may be positioned, and it will be seen that it may be coupled into a hose line from a bulk tank to a fuel tank truck into the line from the truck to a fuel service station storage tank, and into the line from the fuel service station tank to a vehicle to be supplied with fuel, such examples being given by way of illustration and not by way of limitation.

A coupling 10 is mounted on a liquid fuel supply hose or pipe line 11, intermediate the ends thereof. Said fuel line 11 in turn is mounted in and projects from a liquid fuel bulk storage tank 12. As shown in FIGURE 1, said fuel line 11 may be arranged in the form of a syphon, or may be otherwise arranged with liquid fuel pump means, not shown. Fuel line 11 is disposed so as to permit the passage of liquid fuel from said bulk storage tank 12 to another tank or container, such as the fuel tank truck 13, and said fuel line 11 enters the tank 13 through a suitable, relatively snug opening 13'.

Coupling 10 is comprised of a solid cylindrical casing 20 of hard rubber or other suitable material, drilled horizontally to form two parallel cylindrical open-ended passageways 21 and 22, respectively.

Mounted in said casing 20, at approximately the center thereof, intermediate said passageways 21 and 22, and projecting into said passageways 21 and 22, is a gear box 26, securedly mounted in the casing 20 by suitable means, such as brace bars 27 and 28.

A shaft 29 projects outwardly from said gear box 26, and extends into passageway 22. An impeller 31 is mounted at the free end of said shaft 29, and is disposed in said passageway 22 transversely thereof. Said impeller 31 has protruding fins 32 positioned thereon and disposed so that liquid fuel passing through passageway 22 will act on the fins 32, causing impeller 31 to turn, and in turn causing shaft 29 to revolve.

A second gear box 33 is mounted on gear box 26 at the end thereof opposite the shaft 29 and is disposed in passageway 21. A second shaft 34 projects from the gear box 26 into the second gear box 33.

A gear train 35 or similar drive means is disposed in the gear box 26, and arranged so that the revolving motion imparted to the shaft 29 by the impeller 31 will impart a revolving motion to the second shaft 34.

Mounted at right angles to the second shaft 34 is a third shaft 36, connected by gear train 37 or similar drive means to the second shaft 34. Said third shaft 36 projects outwardly from the second gear box 33 in a line parallel with the center longitudinal axis line of passageway 21. Rigidly mounted on the free end of said third shaft 36 is a section propeller 38, having blades 39 disposed in said passageway 21 in a manner to permit propeller 38 to turn freely therein.

The coupling 10 has at the ends thereof outwardly directed flanges 40 and 41, designed to mate with outwardly directed flanges 42 and 43, respectively, mounted on the fuel line 11. Illustrated in FIGURE 4 is a method of mating and coupling said flanges, consisting of bayonet projections 44 and 45, bayonet receiving slots 46 and 47, a series of studs 48, and a series of matching recesses 49. However, it will be understood that any other suitable means of fastening coupling 10 to fuel line 11 intermediate the ends thereof, such as standard matching threaded male and female coupling parts, may be provided.

Joined to passageway 21 at both open ends thereof, by any suitable means, and of approximately the same inside diameter as passageway 21, is an air hose line 50, which is disposed within the fuel line 11, and which has a substantially lesser outside diameter than the inside diameter of said fuel line 11. At its lower end, said air line 50 extends slightly beyond the end 11' of fuel

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line 11. At its upper end, said air line 50 pierces the outer surface of fuel line 11 inside the bulk storage tank 12 at a suitable opening 51, in which it is tightly disposed. A preferred procedure is to provide an upward bend 52 in said air line 50 externally of said fuel line 11 and toward the end of said air line 50 so that the upper end 53 thereof is disposed in the bulk storage tank 12 at a position close to the top thereof and upwardly directed.

Mounted in the fuel tank truck 13 and projecting therefrom, is a fuel supply line 60. Said fuel supply line 60 may be arranged in the form of a syphon, or may be equipped with pump means, not shown. It may also be equipped with a valve 61, or other suitable means for controlling the flow of liquid fuel in said fuel supply line 20. Said fuel supply line 60 is arranged for insertion into a supply pipe 62, which gives access from ground level 63 to an underground storage tank 64. Suitable cap means 65 is arranged on the supply pipe 62 at ground level 63 and the fuel supply line 60 is inserted in an opening 66 in said cap 65 and is snugly disposed therein.

A second coupling 10 is mounted on the fuel supply line 60 intermediate the ends thereof; and joined to passageway 21 of said coupling 10 at both ends thereof is another air hose line 50, disposed within the fuel supply line 60 and having a substantially lesser outside diameter than the inside diameter of said fuel supply line 60. Said hose line 60 extends beyond the lower extremity of said fuel supply line 60 and may be bent in a right angle turn, as at 67, a short distance below its projection from said fuel supply line 60.

The upper end of said air line 50 pierces the outer surface of fuel supply line 60 inside the tank 13, at a suitable opening 68, in which it is tightly disposed. It may be flexible and equipped with a float 70.

A preferred form of construction of float 70 is to provide a block of material of light displacement 71, mounted on a hollow tube 72, the outside diameter 73 of which is only slightly less than the inside diameter of said hoseline 50 into which it is inserted. Said tube 72 may be provided with outwardly extending flanges or collars 74, arranged to seat the float on the tube 72. A flutter valve 75 may be mounted at the upper end of the tube 72 in the manner illustrated in FIGURE 3.

A feedline 80 to a gas service station pump 81 is disposed in the underground storage tank 64; and intermediate the ends thereof and at a point near the upper end of underground storage tank 64 is an opening 82 in which a third flexible hoseline 50 is tightly disposed. Said air line 50 may be provided with an upward bend 83.

A third coupling 10 is disposed on the flexible fuel supply hose 90 intermediate the ends thereof, and is, of course, connected in the pump 81 to the feed line 80. The flexible air line 50 is disposed in said feed line 80 and said flexible fuel supply hose 90. It has a substantially lesser outside diameter than the inside diameter of said supply line 80 and said flexible fuel supply hose 90, and projects, at its upper end, a relatively short distance beyond the outside extremity of said flexible fuel supply hose 90. Said air line 50 is, of course, connected to both ends of the passageway 21 in said third coupling 10.

An automobile 100 has the usual fuel tank, not shown, and is equipped with a pipeline 101, giving access thereto. The flexible fuel supply hose 90 is equipped with a suction cup-shaped gasket 102, designed to fit snugly on the outside surface of the automobile 100, at the head 103 of said pipeline 101 when the flexible fuel supply hose 90 is inserted therein.

In operation, liquid fuel is syphoned or pumped from bulk storage tank 12 through the upper part of pipeline 11, then through passageway 22 in coupling 10, and then through the lower part of pipeline 11 until it flows into fuel tank truck 13. In going through passageway 22, the flow of liquid fuel in said passageway acts on

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the fins 32 of the impeller 31, causing impeller 31 to turn the shaft 29. The gear chain 35 thus turns the shaft 34, causing the gear chain 37 to turn the shaft 36, in turn causing the suction propeller 38 to revolve in passageway 21. By reason of the fact that the gear chain 37 is smaller than gear chain 35, the suction propeller 38 will revolve at a speed somewhat greater than the rate of turn of the impeller 31.

The revolving suction propeller 38 will cause the gases and fumes in tank truck 13 to enter the flexible air line 50 and be expelled through the opening 53 into the upper part of bulk storage tank 12, so that, as liquid fuel runs or is pumped from bulk storage tank 12 into fuel tank truck 13, the level of the fuel will decrease in bulk storage tank 12 and increase in fuel tank truck 13, while at the same time the gases and fumes in fuel tank truck 13 will be drawn out of fuel tank truck 13 and forced into bulk storage tank 12 in the space provided by the reduction in the level of the liquid fuel therein.

The relative operation between fuel tank truck 13 and underground storage tank 64 is similar to that between bulk storage tank 12 and fuel tank truck 13, and so is the relative operation between the fuel tank in the automobile 100 and the underground storage tank 64.

The float 70 being mounted on the flexible hoseline 50 and disposed in fuel tank truck 13, will float on the surface of the liquid fuel in said fuel tank truck 13, so that the open end of said flexible air line 50 will have continual access to the area of the fuel tank truck 13 above the level of the liquid fuel therein. The flutter valve 75 acts in the usual manner of such valves to open to allow the free passage of gases and fumes from the end of hoseline 50, but to close to prevent liquid fuel from entering air line 50 in the event float 70 becomes submerged.

The use of upward bend 83 in the third flexible air line 50 is recommended to permit the free flow of gases and fumes into the upper part of underground storage tank 64, while at the same time preventing the passage of liquid fuel into said third flexible air line 50.

The cup-shaped gasket 102, when fitted snugly on the outside surface of automobile 100, prevents the free escape of gases and fumes from the automobile gas tank into the atmosphere.

While the invention has been shown and described herein in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein but is to be accorded the full scope of the claims and so as to embrace any and all equivalent apparatus.

Having thus described the invention, what is claimed as new and is desired to secure by Letters Patent is:

1. A device for extracting fumes from liquid fuel containers comprising a storage container and a receiving container, a fuel supply line from said storage container to said receiving container, an air line of substantially less diameter disposed in said fuel supply line, protruding therefrom at both ends thereof, having one end thereof disposed in the air space in the receiving container and the other end thereof disposed in the air space in the storage container, a float mounted on the end of the air line disposed in the air space in the storage container, an impeller mounted in said fuel supply line, and a suction fan mounted in said air line and connected by gear chain to said impeller whereby, when liquid passes through said fuel supply line toward said container, the impeller revolves, in turn causing the suction fan to draw fumes through said air line from the receiving container and into the storage container.

2. A device for extracting fumes from liquid fuel containers comprising a storage container and a receiving container, a fuel supply line from said storage container to said receiving container, an air line of substantially less

diameter disposed in said fuel supply line, protruding therefrom at both ends thereof, having one end thereof disposed in the air space in the receiving container and the other end thereof disposed in the air space in the storage container, a float mounted on the end of the air line disposed in the air space in the storage container, a flutter valve mounted on said float and adapted to permit the free passage of fumes from said air line but prevent the entrance of fluids into said air line, an impeller mounted in said fuel supply line, and a suction fan mounted in said air line and connected by gear chain to said impeller whereby, when liquid passes through said fuel supply line toward said container, the impeller revolves, in turn causing the suction fan to draw fumes through said air line from the receiving container and into the storage container.

3. A device for extracting fumes from liquid fuel containers comprising a storage container and a receiving container, a fuel supply line from said storage container to said receiving container, an air line disposed in said fuel supply line protruding therefrom at both ends thereof and having its ends disposed in the air space in each container respectively, an impeller mounted in said fuel supply line and rotatable in a plane parallel with the longitudinal axis of said fuel supply line, a suction fan mounted in said air line and rotatable in a plane transverse to the longitudinal axis of said air line, drive means having an input shaft and an output shaft, said input and output shafts having said impeller and said suction fan respectively rotatably mounted thereon, whereby when liquid passes through said fuel supply line from said storage container to said receiving container said impeller turns the suction fan and causes it to draw fumes through said air line from said receiving container into said storage container, and said drive means having a speed ratio of output shaft to input shaft greater than one.

4. A device for simultaneously extracting fumes from a container while passing liquid into said container comprising a container, a fuel supply line to said container, an air line from said container, an impeller rotatably mounted in said fuel supply line, a suction fan rotatably mounted in said air line, drive means having an input shaft and an output shaft, said input and output shafts having said impeller and said suction fan respectively mounted thereon, whereby when liquid passes through said fuel supply line toward said container, the impeller turns the suction fan and causes it to draw fumes through said air line from said container, and said drive means having a speed ratio of output shaft to input shaft greater than one.

5. A detachable coupling for extracting fumes from a liquid fuel container, wherein said container is fitted with a fuel supply line and an air line of substantially less diameter than said fuel line disposed within said fuel supply line, said fuel supply and air lines being interrupted and adapted to receive said coupling between said interruption, said coupling comprising an outer tube having a diameter generally equal to the diameter of said fuel supply line, locking means mounted on the respective ends of said tube adapted to engage reciprocal locking means positioned on said interrupted ends of said fuel line and interfit said tube between said interruption of said fuel supply line, an inner tube disposed within said outer tube having a diameter generally equal to the diameter of said air line and adapted to be aligned with

and joined with said air line, an impeller mounted in said outer tube and rotatable in a plane parallel with the longitudinal axis of said outer tube and adapted to be rotated by liquid passing through said fuel line and said outer tube, a suction fan mounted in said inner tube and rotatable in a plane transverse to the longitudinal axis of said inner tube adapted to draw fumes through said inner tube and said air line from said container, drive means mounted within said outer tube having an input shaft and output shaft, said input and output shafts having said impeller and said suction fan respectively rotatably mounted thereon whereby rotation of said impeller will cause said suction fan to rotate, and said drive means having a speed ratio of output shaft to input shaft greater than one.

6. The combination of: a container for receiving liquid, a fuel supply line to said container, an air line disposed in said fuel line, a fume extracting coupling mounted in said fuel supply line, said coupling having an outer tube and an inner tube disposed within said outer tube, said tubes being aligned and joined with said respective fuel line and air line, an impeller rotatably mounted in said outer tube, a suction fan rotatably mounted in said inner tube, drive means having an input shaft and an output shaft, said input and output shafts having said impeller and said suction fan respectively mounted thereon, whereby when liquid passes through said fuel line and said outer tube toward said container, the impeller turns imparting rotation to said fan through said drive means so that fumes in said container may be drawn from said container through said air line and said inner tube, and said drive means having a speed ratio of output shaft to input shaft greater than one.

7. A device for extracting and confining fumes from a vehicle fuel tank while simultaneously loading it with liquid fuel comprising a vehicle fuel tank, a pipe leading from said tank to the outside surface of said vehicle, a storage container, a fuel line from said container having an end adapted to fit within said pipe adjacent said outside surface of said vehicle, an air line disposed in said fuel supply line, an impeller rotatably mounted in said fuel line, a suction fan rotatably mounted in said air line, drive means having an input shaft and an output shaft, said input and output shafts having said impeller and said suction fan respectively mounted thereon, so that when fuel is passed from said fuel line into said pipe and container the impeller will rotate in turn activating the fan through said drive means which will draw fuel fumes through said pipe and air line from said tank into said container, said drive means having a speed ratio of output shaft to input shaft greater than one, and sealing means on said fuel line adjacent the end adapted to fit within said pipe so as to prevent the escape of fuel fumes to the atmosphere.

8. A device for extracting and confining fumes as defined in claim 7 wherein the sealing means comprises an elastic dished flange surrounding said fuel line.

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