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(54) **Pressure differential discharge system for a shipping container and use thereof**

(57) A pressure differential discharge system is provided for use with a shipping container. The pressure differential discharge system includes a manifold (12) having a mock hatch (18) configured for attachment about a manhole of the shipping container; a mating plate

(20) attached to the mock hatch and defining a valve aperture (28) therethrough, the mating plate shaped complementary to the spillbox (14), wherein the mating plate and spillbox mate, the valve (42) of the spillbox extending through the valve aperture of the mating plate for discharge of the shipping container.

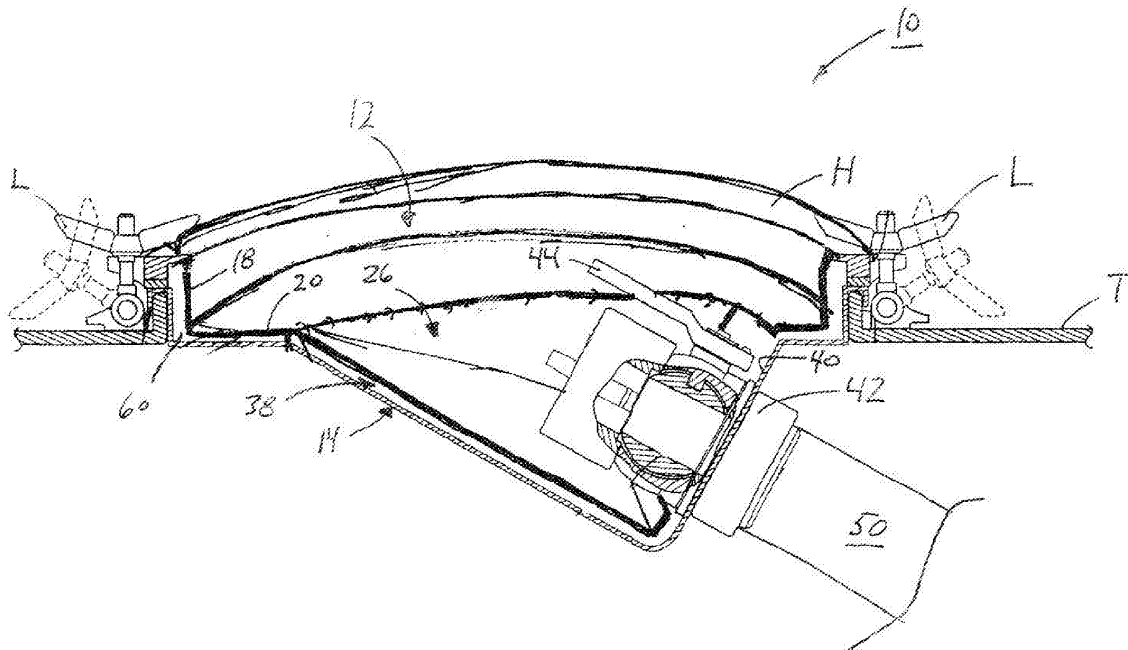


FIG. 5

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Description

Background of the Invention

[0001] Shipping containers can be used to carry a variety of liquids ranging from toxic chemicals to consumables such as wine and other beverages. When a shipping container is used to carry a chemical, for instance, from a loading point to a destination point, the shipping container must be cleaned thoroughly of chemical residue in order to reload the shipping container with another chemical. Often, the destination point may not have a cleaning station, so the shipping container must be shipped empty to a distant cleaning station to clean the chemical residue. This is inefficient and costly due to an empty transport or required repositioning of the shipping container. Even if the cleaning station is at the destination point, conventional cleaning of the cargo container is relatively expensive and inconvenient. Conventional cleaning is environmentally unfriendly due to hundreds of gallons of wastewater produced by such cleaning. Moreover, whether the shipping container is cleaned at the destination point or shipped to the distant cleaning station, the shipping container is unusable until cleaned and may be out of service for an undesirable period of time.

[0002] One approach to avoid conventional cleaning of the shipping container is to use a removable plastic carrier that lines an interior surface of the shipping container to carry the liquid chemical or the consumable liquid to the destination point. At the destination point, the liquid is discharged from the plastic carrier, which is removed from the shipping container and replaced with another, clean plastic carrier. These removable plastic carriers suffer from various drawbacks. For instance, the removable plastic carrier uses a plastic discharge sleeve attached near a bottom portion of the plastic carrier. At the installation point, a valve assembly on a lower exterior part of the shipping container is at least partially disassembled or removed entirely to open an aperture in the shipping container in order to extract the discharge sleeve through the aperture. Once the discharge sleeve has been extracted, the valve assembly is reassembled or reattached, which usually requires replacing numerous seals that are broken or spent during the extraction process. This sleeve extraction process requires intensive labor and skill, takes an inordinate amount of time and can be costly due to seal replacements or other damage to the valve assembly, and the valve must be replaced or special valves and fittings adapted for use with the liner must be installed.

[0003] In other instances, customers hook up a discharge hose to the valve on the lower exterior part of the shipping container and pressurize the shipping container via a pressure valve, usually located on top of the shipping container, to discharge chemical, industrial, food and other liquid products in a pressure differential (PD) discharge approach. No pump is needed but a pressure source is required to provide pressure, i.e., the liquid is

pushed out instead of pulled out.

[0004] Podd teaches a "Spillbox System for a Shipping Container", U.S. Serial No. 11/231,399, filed September 21, 2005, in which a drop in, pull out spillbox system is used with the conventional shipping container. Podd requires no preparation or modification of the shipping container. This spillbox system includes an elastomeric liner having a thickness of about 20 MIL to about 40 MIL with a reinforcement section having a thickness of about 40 MIL to about 80 MIL.

[0005] Podd further teaches a "Pressure Differential Manlid and Method of Discharging a Shipping Container Using a Pressure Differential", U.S. Serial No. 11/357,521, filed February 17, 2006, which uses a mock manlid to discharge liquid cargo via a pressure differential between the interior pressure of a carrier and exterior ambient pressure. However, the mock manlid is attached to an interior liner before securing the mock manlid to the carrier.

[0006] A system is needed in the shipping industry that is designed specifically for discharging a shipping container using a liner and spillbox in which the system is quickly and easily attached to the liner, spillbox and the shipping container.

Brief Summary of the Disclosure

[0007] The present invention is directed in general to a pressure differential discharge manifold system, which includes a mock hatch or manlid having a built-in mating plate for use with a spillbox system. The hatch permits rapid discharge of various liquids through a valve system of a spillbox without requiring additional hoses, piping or coupling joints. Since the liquid cargo does not flow through a pump, no bruising or destabilization of the liquid cargo occurs, which is a common problem with wine and latex. Additionally, the components of the hatch are simple to manufacture, install and use. Other advantages of various embodiments of the invention will be apparent from the following description and the attached drawings, or can be learned through practice of the invention.

[0008] In one aspect of the invention, a pressure differential discharge manifold for use with a spillbox includes a mock hatch configured for attachment about a manhole of a shipping container; a mating plate attached to the mock hatch and defining a valve aperture there-through, the mating plate shaped complementary to the spillbox, wherein the mating plate and spillbox mate, a valve of the spillbox extending through the valve aperture of the mating plate for discharge of the shipping container. In this aspect, the mock hatch and the mating plate are made of metal such as stainless steel, aluminum, and the like. Since the pressure differential discharge manifold is robustly constructed to withstand pressures of about 4 BAR to about 6 BAR, it can weigh approximately 60 pounds; therefore, one or more carrying handles are attached to the pressure differential discharge manifold to facilitate its portability and positioning.

[0009] The pressure differential discharge manifold can also include a number of lugs for attaching the mock hatch to the shipping container. For instance, the lugs attach to respective latches found on the shipping container, which are used normally to attach and close a standard manifold on the shipping container.

[0010] Also in this aspect of the invention, the pressure differential discharge can have a support flange disposed proximate the valve aperture. The support flange is configured to position the valve for discharge.

[0011] Further in this aspect, a restraining plate can be spaced apart from the support flange, the restraining plate defining a restraining plate aperture therethrough, the valve being configured to extend through the valve aperture and the restraining plate aperture for connection of a hose.

[0012] In yet another aspect of the invention, a pressure differential discharge system for use with a spillbox defining a valve includes a pressure differential discharge manifold including a mock hatch and an mating plate connected to the mock hatch, the mock hatch being configured for attachment about a manhole of a shipping container, the mating plate defining a valve aperture therethrough; and a spillbox being configured for insertion between the pressure differential discharge manifold and the manhole, the spillbox including a valve, the mating plate shaped complementary to the spillbox, wherein the mating plate and spillbox mate, the valve of the spillbox extending through the valve aperture of the mating plate for discharge of the shipping container. One or both of the mock hatch and the mating plate are made of metal such as stainless steel for durability and pressure resistance.

[0013] The pressure differential discharge system in this aspect also includes a support flange disposed proximate the valve aperture, the support flange being configured to position the valve for discharge.

[0014] The pressure differential discharge system in this aspect also includes a restraining plate spaced apart from the support flange, the restraining plate defining a restraining plate aperture therethrough, the valve being configured to extend through the valve aperture and the restraining plate aperture for connection of a hose.

[0015] Also in this aspect of the invention, the spillbox and the mating plate are tightly spaced apart from each other such that upon pressurization a seal is formed therebetween.

[0016] In another aspect of the invention, a method of unloading a shipping container with a pressure differential discharge system includes placing a spillbox about a manhole in a shipping container such that the spillbox covers the manhole; placing a pressure differential discharge manifold over the spillbox, the pressure differential discharge manifold including a hatch and an mating plate defining a valve aperture therethrough, the mating plate being shaped complementary to a contour of the spillbox such that a valve of the spillbox extends through the valve aperture; connecting the hatch of the pressure

differential discharge manifold to the shipping container; connecting a hose to the valve; and pressurizing the shipping container to cause a cargo in the shipping container to discharge through the valve.

[0017] Also according to the method in this aspect of the invention, the spillbox and the mating plate are tightly spaced apart such that upon pressurization, the spillbox and the mating plate move in a direction of each other to form a seal. In other words, the spillbox and the mating plate are molded complementary to each other to fit tightly together. Nevertheless, if desired, an o-ring or other additional seal can be provided.

[0018] Further, in this aspect the mating plate includes a support flange and a restraining plate defining a restraining plate aperture therethrough, the support flange and the restraining plate spaced apart from each other and disposed proximate the valve aperture, the valve extending through the restraining plate aperture, the support flange and the restraining plate controlling movement of the valve upon pressurization.

[0019] A valve or valve assembly suitable for use with various embodiments of the present invention are disclosed in U.S. Patent Application Serial Number 11/231,399, filed September 21, 2005 by Podd, which is incorporated herein by reference thereto for all intents and purposes. Likewise, suitable component materials and methods of pressurizing the shipping container can be found, for example but without limitation, in Podd, U.S. Serial No. 11/357,521, filed February 17, 2006, which is incorporated herein by reference thereto for all intents and purposes.

[0020] Other features and aspects of the present invention are discussed in greater detail below.

Brief Description of the Drawings

[0021] A full and enabling disclosure of the present invention, including the best mode thereof to one skilled in the art, is set forth more particularly in the remainder of the specification, including reference to the accompanying figures, in which:

FIGURE 1 is a perspective view of a pressure differential discharge system according to one aspect of the invention;

FIGURE 2 is a perspective view of a mock hatch and mating plate of the pressure differential discharge manifold as in FIGURE 1;

FIGURE 3 is a perspective view of the spillbox as in FIGURE 1 with the pressure differential discharge manifold removed for clarity;

FIGURE 4 is a perspective view of a liner being filled in the shipping container as in FIGURE 1 according to a further aspect of the invention;

FIGURE 5 is a cross-sectional elevational view of the pressure differential discharge system taken along line V-V in FIGURE 1; and

FIGURE 6 is a top perspective view of another embodiment of a pressure differential discharge system.

Detailed Description of the Disclosure

[0022] Detailed reference will now be made to the drawings in which examples embodying the present invention are shown. The detailed description uses numerical and letter designations to refer to features of the drawings. Like or similar designations of the drawings and description have been used to refer to like or similar parts of the invention.

[0023] The drawings and detailed description provide a full and written description of the invention, and of the manner and process of making and using it, so as to enable one skilled in the pertinent art to make and use it, as well as the best mode of carrying out the invention. However, the examples set forth in the drawings and detailed description are provided by way of explanation only and are not meant as limitations of the invention. The present invention thus includes any modifications and variations of the following examples as come within the scope of the appended claims and their equivalents.

[0024] The figures, which are about to be described in detail below, generally show a pressure differential discharge system broadly designated by the numeral 10. The pressure differential discharge system 10 generally includes a pressure differential manifold 12 for use with a spillbox 14 and/or a liner 16. The pressure differential manifold 12 is contoured to fit the spillbox 14 with minimal clearance to create a seal under pressure as will be better understood from the following description and exemplary methods of operation.

[0025] With reference now to FIGURE 1, one embodiment according to an aspect of the present invention includes the pressure differential discharge system 10 briefly introduced above. The pressure differential manifold 12 of the pressure differential discharge system 10 can be used in conjunction with the spillbox 14 and/or the liner 16 (see FIGURES 3 and 4). As shown in FIGURE 1, the spillbox 14 covers the manhole, and a false hatch or manlid 18 of the pressure differential manifold 12 is secured to the shipping container T using latches or other attachment devices L in a known manner. As further shown, a valve or valve assembly 42 of the spillbox 14 protrudes from the pressure differential manifold 12 in order to attach a loading and/or discharge hose H1, which is described in greater detail below.

[0026] Turning now to FIGURE 2, the pressure differential manifold 12 is shown most clearly. As shown, the hatch 18 is inlaid with a mating pan or plate 20 and includes a plurality of attachment lugs 22 or similar devices for attachment to the shipping container latches L. The

skilled artisan will appreciate that the hatch 18 and the mating plate 20 can be a unitary piece as shown in this example, or can be mechanically attached together. The hatch 18 also includes one or more handles 24, which are used to carry the pressure differential manifold 12 and position it over the manhole. In one aspect of the invention, two or more handles 24 are spaced apart as shown for two people to carry and position the pressure differential manifold 12, which can weigh between 25 and 100 pounds, depending on the metal selected for its manufacture. The skilled artisan will appreciate the pressure differential manifold 12 can include a hinge attachment similar to the hatch H for attaching the pressure differential manifold 12 to the shipping container T. The pressure differential manifold 12 may also include a separate cover for storing and shipping the pressure differential manifold 12 with the shipping container T.

[0027] Also shown in FIGURE 2, the mating plate 20 defines a recess 26, which is shaped complementary to the spillbox 14 as introduced above. More particularly, the recess 26 extends into a recess 38 of the spillbox 14, as described further with respect to FIGURES 3 and 5 below. As shown in FIGURE 2, the mating plate 20 includes a valve aperture 28, a support flange 30, and a restraining plate 32 spaced apart from support flange 30. The restraining plate 32 defines a restraining plate aperture 34. As noted above and shown here, the valve 42 extends through the valve aperture 28 and through the restraining plate aperture 34. The support flange 30 ensures axial (up-and-down) positioning of the valve 42 while under pressure while the restraining plate 32 ensures lateral (side-to-side) positioning of the valve 42.

[0028] FIGURES 3 and 4 show exemplary steps of positioning the spillbox 14 and attaching the liner 16. As shown, the spillbox 14 defines a collar or skirt 36, which defines a perimeter shaped to fit over the manhole of the tank T. The recess 38 of the spillbox 14 includes a support wall 40 to which the valve 42 is attached. A valve cam lever 44 is attached to the valve 42 to operate the valve 42, for instance, by moving a ball valve (not shown) inside the valve 42 to an open position or to a closed position.

[0029] FIGURE 3 particularly shows that the valve 42 includes a hose end 46 and a liner tube end 48. As shown, the hose H1 is connected to the hose end 46 for loading the liner 16 in the shipping container T. More particularly, a tube 50 is shown in FIGURE 4 having a first end 56 and a second end 58. The first end 56 is connected to the liner 16, and the second end 58 is connected to the hose end 46. In this example, the liner 16 can be seen partially filled with a liquid cargo (not shown).

[0030] Further examples of the spillbox 14 and the liner 16 shown in FIGURES 3 and 4 can be found in U.S. Patent Application Serial Number 11/231,399 and in U.S. Patent Application Serial Number 11/357,521, both to Podd, and both incorporated herein by reference thereto for all intents and purposes but without limitation.

[0031] With reference now to FIGURE 5, the recess 26 of the mating plate 20 extends into the recess 38 of

the spillbox 14. As shown, the hatch 18 seats about the manhole of the shipping container T with the spillbox 14 interposed between the manhole and the hatch 18. A gap or space 60 may exist between the hatch 18, and the spillbox 14, more particularly, between the mating plate 20 and the spillbox 14. In this example, the space 60 is about 5 mm; however, different clearances between components may be provided and in one aspect of the invention, a clearance close to zero is possible as long as the mating plate 20 and the spillbox 14 can be mated together. When pressure is applied to the system as described by example operation below, the pressure from inside the shipping container T is transferred to the mating plate 20 and accordingly, to the hatch 18. This transfer of pressure effectively closes the space 60 to create a seal, which concentrates the pressure against the liner 16 to discharge the liner 16.

[0032] Turning now to FIGURE 6, a detailed view of an alternative pressure differential discharge system 110 is shown. Many components of this exemplary system are the same or similar to components of the previous examples; therefore, only certain components are discussed below and reference is made to the foregoing embodiments for a full description of like or similar components. In this example, a hatch 118 is attached to a mating plate 120 and includes a plurality of attachment lugs 122 disposed about a perimeter of the hatch 118. The hatch 118 and the mating plate 120 can be molded together as a unitary piece or welded together after separate formation. If required, the hatch 118 can be made of one material, e.g., a thick aluminum, and the mating plate 120 can be another, e.g., stainless steel. Also shown in this example, a handle 124 is provided for carrying and installing the differential discharge system 110.

[0033] The invention may be better understood with reference to an exemplary operation.

[0034] As shown in FIGURES 3 and 4, the liner 16 is positioned in the shipping container T and filled in a manner as described by Podd in U.S. Patent Application Serial Number 11/231,399. The pressure differential manifold 12 is not shown in FIGURE 3 since the manifold 12 is used for unloading. In other words, only the spillbox 14 is needed for this loading step.

[0035] Turning once again to FIGURES 1 and 5, the pressure differential manifold 12 is placed over the spillbox 14 such that the respective recesses 26, 38 mate. As shown, the valve 42 extends through the valve aperture 28 and the restraining plate aperture 34. The shipping container latches L are attached to the lugs 22 of the mock hatch 18 to secure the manifold 12 in place over the manhole. The discharge hose H1 is attached to the valve 42 in the same manner as if loading as described above. An air hose H2 is attached to an air inlet valve V of the shipping container T. The valve 42 is opened, and the system is pressurized by delivering air via the air hose H2 into the shipping container T. With brief reference to FIGURE 4, the incoming air presses against the liner 16 and in less than a minute, the cargo

will begin discharging through the discharge hose H1. The typical shipping container will be substantially discharged in under thirty to forty-five minutes at about 1-1½ BAR pressure. Afterwards, the shipping container T is depressurized and the foregoing steps are reversed to remove the pressure differential manifold 12 and the liner 16 from the shipping container T. Since the pressure differential manifold 12 and the liner 16 prevent liquid from entering the shipping container 16, a new liner can be inserted almost immediately and the shipping container 16 readied for another load.

[0036] While preferred embodiments of the invention have been shown and described, those skilled in the art will recognize that other changes and modifications may be made to the foregoing examples without departing from the scope and spirit of the invention. For instance, various durable, recyclable materials can be used for the liner as described herein. Also, the geometries of the valves, the types of valves as described herein, and male-female connections can be modified, reversed and the like to meet particular customer requirements. It is intended to claim all such changes and modifications as fall within the scope of the appended claims and their equivalents.

Claims

1. A pressure differential discharge system for use with a spillbox defining a valve, the pressure differential discharge system comprising:

a mock hatch being configured for attachment about a manhole of a shipping container; and a mating plate disposed in the mock hatch and defining a valve aperture therethrough, the mating plate shaped complementary to the spillbox, wherein the mating plate and spillbox mate, the valve of the spillbox extending through the valve aperture of the mating plate for discharge of the shipping container.

2. The pressure differential discharge system as in Claim 1, wherein the mock hatch and the mating plate are made of metal.
3. The pressure differential discharge system as in Claim 1, further comprising a plurality of lugs for attaching the mock hatch to the shipping container.
4. The pressure differential discharge system as in Claim 3, wherein the lugs attach to respective latches of the shipping container.
5. The pressure differential discharge system as in Claim 1, further comprising a carrying handle.
6. The pressure differential discharge system as in

Claim 1, further comprising a support flange disposed proximate the valve aperture, the support flange being configured to position the valve for discharge.

7. The pressure differential discharge system as in Claim 1, further comprising a restraining plate spaced apart from the support flange, the restraining plate defining a restraining plate aperture there-through, the valve being configured to extend through the valve aperture and the restraining plate aperture for connection of a hose.

8. A method of unloading a shipping container with a pressure differential discharge system, the method comprising:

placing a spillbox about a manhole in a shipping container such that the spillbox covers the manhole;

placing a pressure differential discharge manifold over the spillbox, the pressure differential discharge manifold including a hatch and a mating plate defining a valve aperture therethrough, the mating plate being shaped complementary to a contour of the spillbox such that a valve of the spillbox extends through the valve aperture; connecting the hatch of the pressure differential discharge manifold to the shipping container; connecting a hose to the valve; and pressurizing the shipping container to cause a cargo in the shipping container to discharge through the valve.

9. The method of as in Claim 7, further comprising forming a seal between the spillbox and the mating plate upon pressurization.

10. The method of as in Claim 7, wherein the mating plate includes a support flange and a restraining plate defining a restraining plate aperture there-through, the support flange and the restraining plate spaced apart from each other and disposed proximate the valve aperture, the valve extending through the restraining plate aperture, the support flange and the restraining plate controlling movement of the valve upon pressurization.

11. A pressure differential discharge system for use with a spillbox defining a valve, the pressure differential discharge system comprising:

a pressure differential discharge manifold including a mock hatch and

a mating plate disposed in the mock hatch, the mock hatch being configured for attachment about a manhole of a shipping container, the mating plate defining a valve aperture there-

through; and

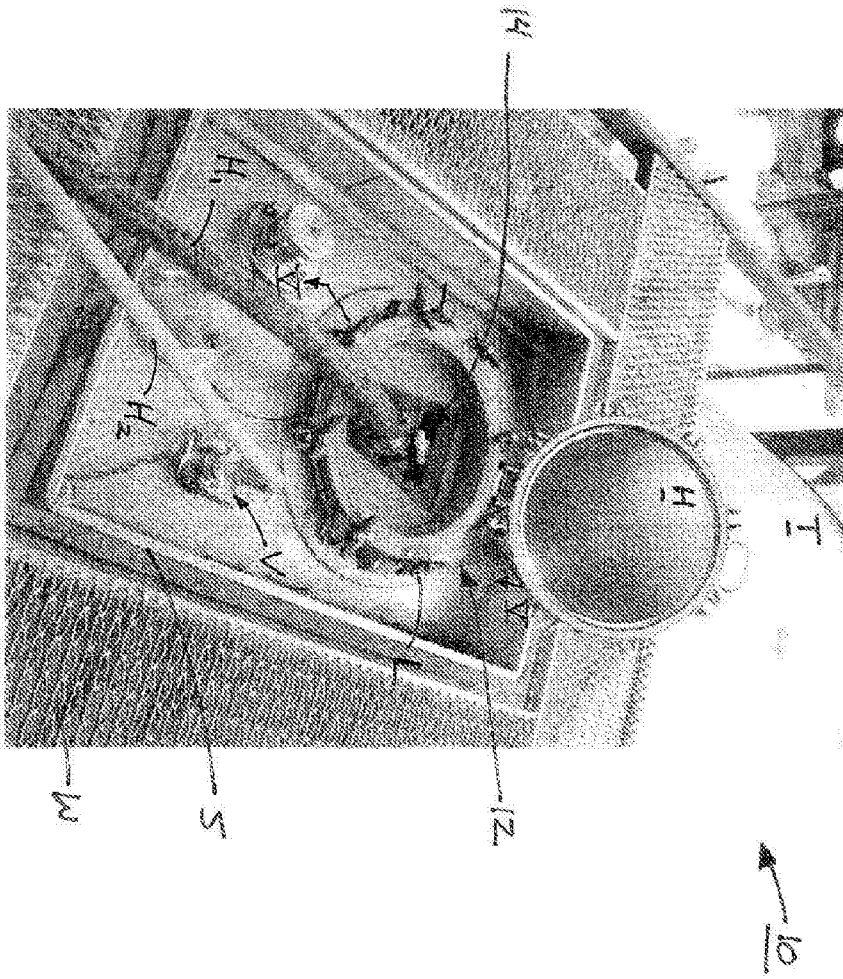
a spillbox being configured for insertion between the pressure differential discharge manifold and the manhole, the spillbox including a valve, the mating plate shaped complementary to the spillbox, wherein the mating plate and the spillbox mate, the valve of the spillbox extending through the valve aperture of the mating plate for discharge of the shipping container.

12. The pressure differential discharge system as in Claim 11, further comprising a support flange disposed proximate the valve aperture, the support flange being configured to position the valve for discharge.

13. The pressure differential discharge system as in Claim 11, further comprising a restraining plate spaced apart from the support flange, the restraining plate defining a restraining plate aperture there-through, the valve being configured to extend through the valve aperture and the restraining plate aperture for connection of a hose.

14. The pressure differential discharge system as in Claim 11, wherein the mating plate is a metal.

15. The pressure differential discharge system as in Claim 11, further comprising forming a seal between the spillbox and the mating plate upon pressurization.



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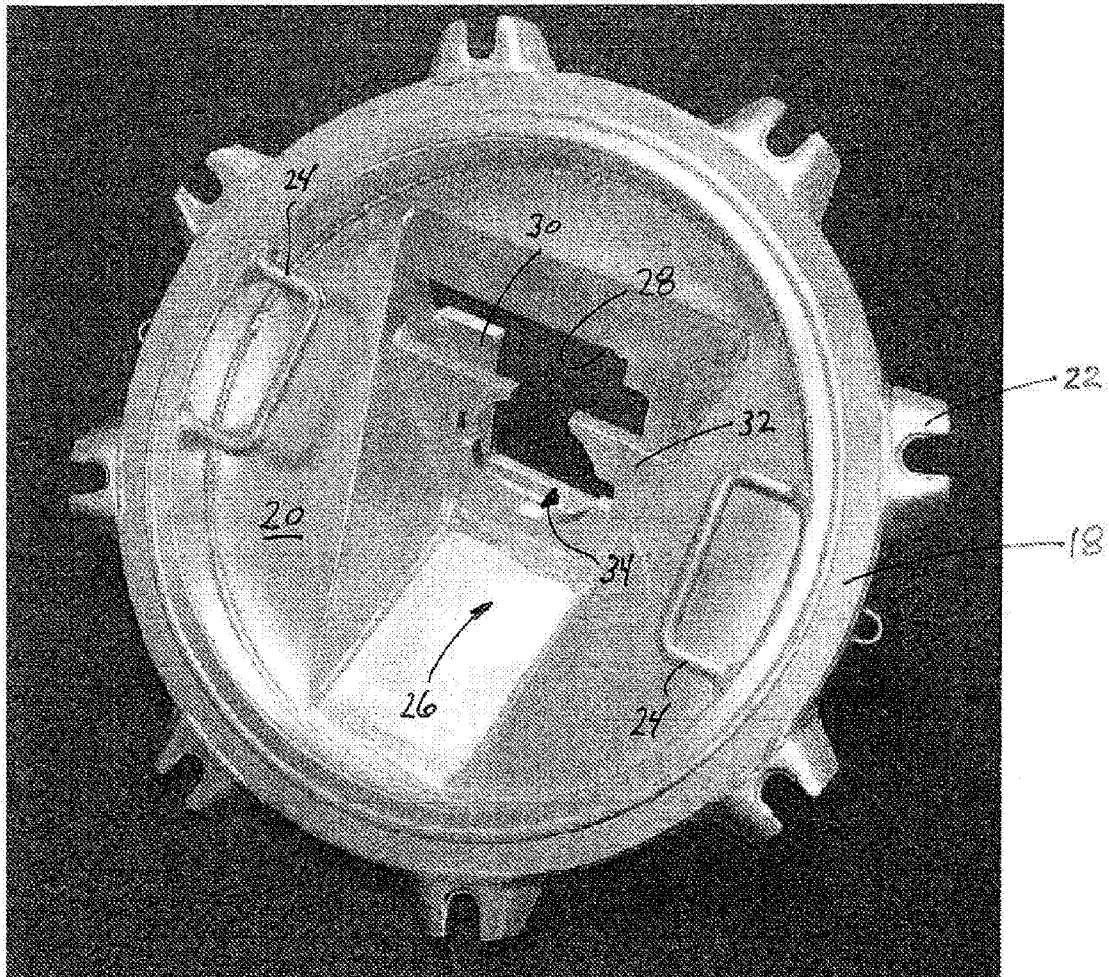


FIG. 2



FIG. 3

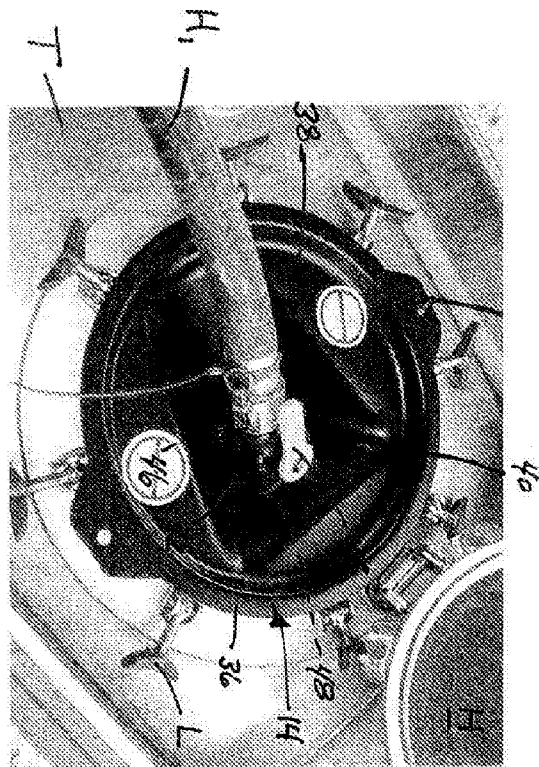


FIG. 4

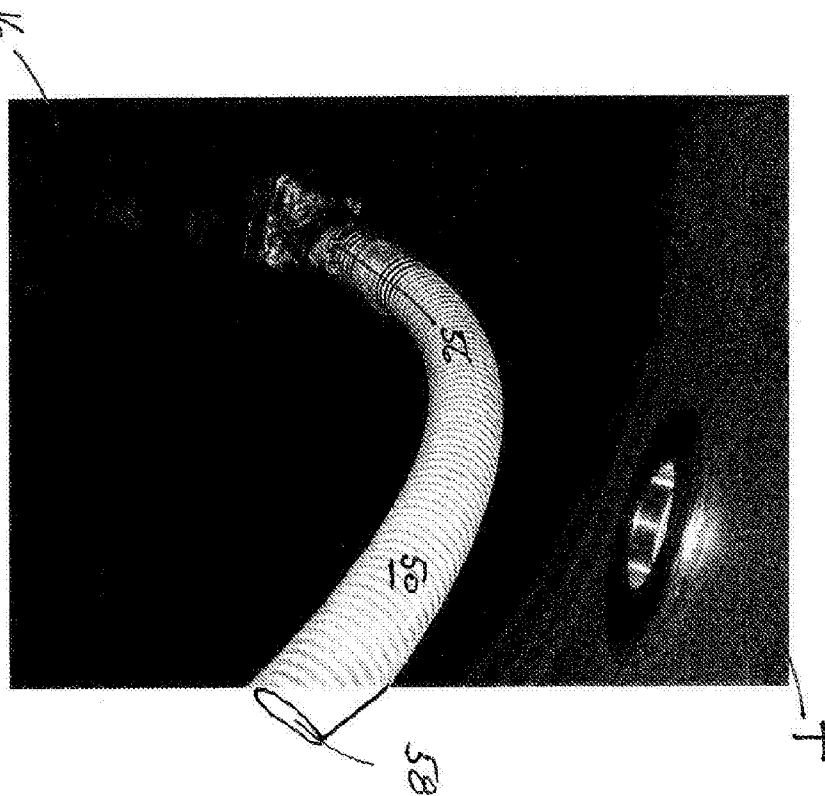


FIG. 5

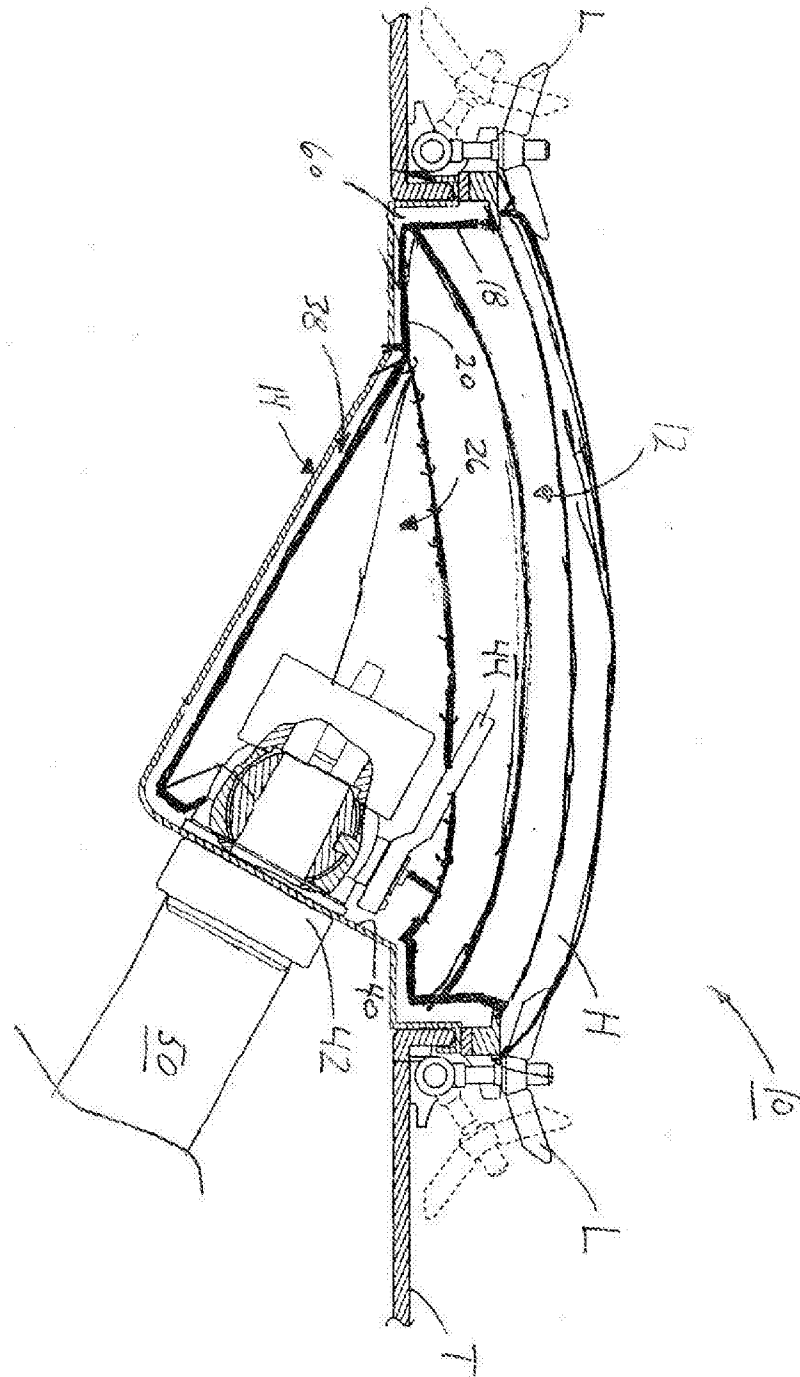
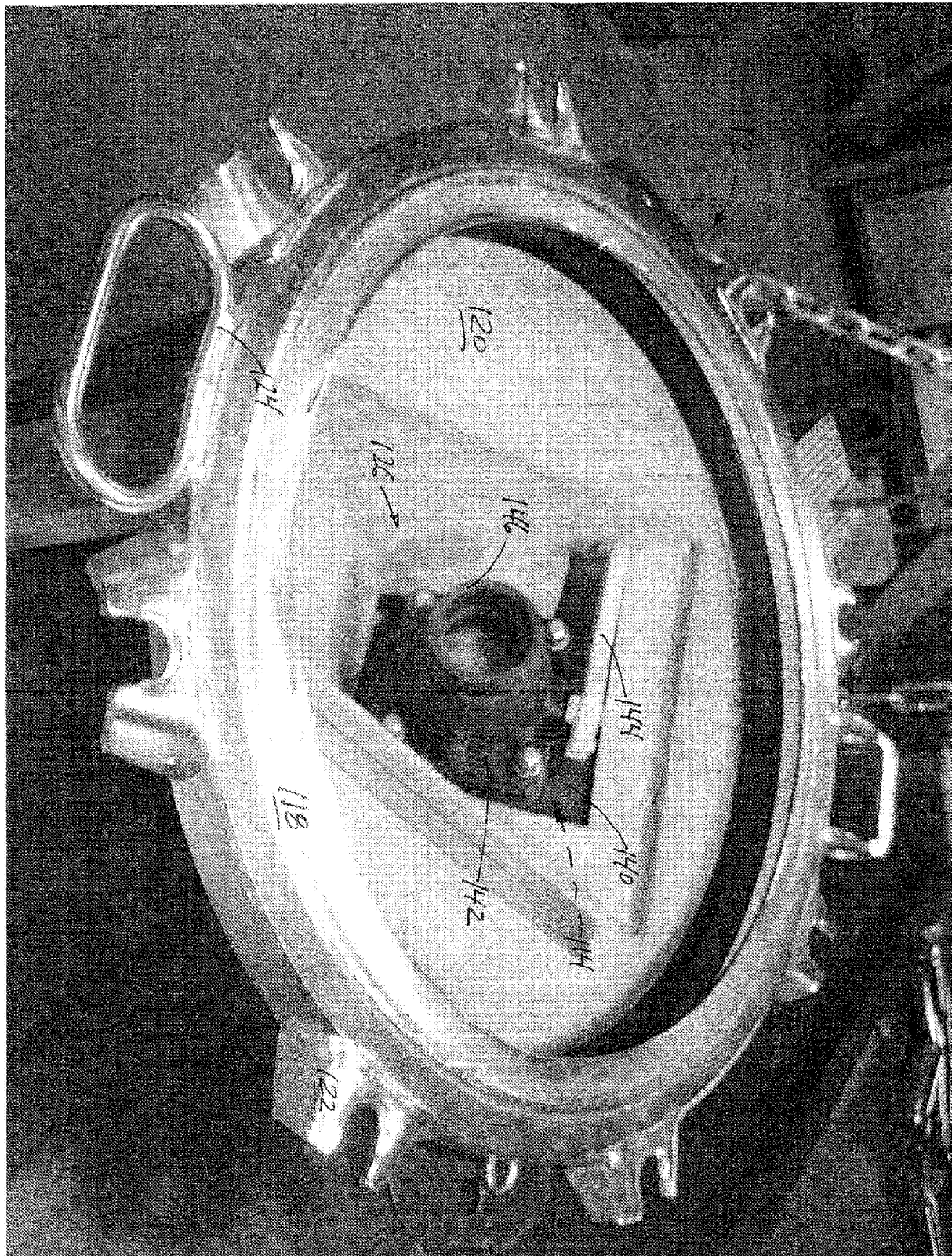


FIG. 6





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 2543

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Place of search Munich		Date of completion of the search 3 July 2007	Examiner Piolat, Olivier
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 10 2543

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