(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 063 191**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **21.08.85**

(51) Int. Cl.⁴: **B 63 B 25/10** // B63J2/08

(21) Application number: **81301781.1**

(22) Date of filing: **22.04.81**

(54) **Spill overflow prevention system for tanker vessels.**

(43) Date of publication of application:
27.10.82 Bulletin 82/43

(45) Publication of the grant of the patent:
21.08.85 Bulletin 85/34

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

(56) References cited:
FR-A-2 331 493
GB-A-2 041 895
US-A-3 628 559

(73) Proprietor: **Conway, Charles Stuart**
Featherbed Lane
New Vernon New Jersey 07976 (US)

(72) Inventor: **Conway, Charles Stuart**
Featherbed Lane
New Vernon New Jersey 07976 (US)

(74) Representative: **Bayliss, Geoffrey Cyril et al**
BOULT, WADE & TENNANT 27 Furnival Street
London EC4A 1PQ (GB)

EP 0 063 191 B1

Courier Press, Leamington Spa, England.

Description

The present invention relates to an automatic system for preventing external cargo spillage from tanker vessels resulting from the overflow of cargo from the cargo compartments of the vessel during loading thereof.

Presently, cargo comprising fluid chemical and petroleum products, such as, for example, oil, is loaded into tanker vessels by means of transfer hoses and cargo pipelines which are coupled to inlets communicative with the cargo compartments of the vessel. It sometimes occurs during loading or transfer of cargo that the fluid and chemical products continue to flow after the compartments are full. As a result, cargo overflows through ullage openings, gas vents or other deck apertures communicative with the compartments, over the deck of the vessel and into the water, thereby causing a spill and producing water contamination, atmospheric pollution, as well as a fire and explosion hazard.

Cargo spills are the result of a variety of causes. One, for example, is negligence on the part of personnel in charge of loading the cargo compartments of the vessel. Another is a faulty loading valve, for example, a leaky valve or a foreign substance wedged under the valve gate. Others are a leaking line under pressure within the cargo compartments; an increase, without notice, of the vessel loading rate; and a broken valve reach rod or other control segment during closing of an inlet valve after a cargo compartment has been filled. Such cargo overflows can cause significant pollution of coastal waterways, particularly when the cargo being loaded is crude oil. For example, depending upon the size of the vessel and the flow rate of the cargo during loading and the duration of the overflow before it is discovered, anywhere from several barrels to several thousand barrels of oil may be lost from a single cargo spill caused by an overflow.

Cargo tank overfill control systems have been devised to prevent overflows from cargo compartments of a tanker vessel during loading. High level alarms and continuous tank cargo level indicators, for example, are used to monitor cargo tank levels in a vessel during loading. While such devices are helpful, they are subject to malfunctions, are dependent on human monitors, and do not automatically prevent pollution, and these characteristics make such devices unacceptable for vessels carrying cargoes such as crude oil having the potential of creating serious environmental pollution in coastal waterways and ports in the event of spillage from the vessel caused by an overflow during loading. Remotely-actuated, quick-closing shut off valves have been used in such vessels to help reduce overflow but it has been found that such valves can create excessive surge pressures in the cargo transfer hoses and pipelines used to load the vessel which are great enough to rupture the hoses and line thereby resulting in the spillage of cargo. Such valves are, moreover, still dependent on human attention for effective operation.

U.S.—A—3628559 discloses a spillage prevention system for use on a cargo tanker in which the cargo tanks include expansion trunks and a main conduit runs fore and aft in the vessel with a plurality of lateral conduits connected to the main conduit and opening into the expansion trunks respectively whereby overflow from any of the tanks passes into the associated one of the lateral conduits and then into the main conduit for discharge into an empty cargo space.

No provision is made for dealing with unwanted gases accumulating in the cargo tanks and nor is there any provision for dealing with pressure build up in the cargo compartments due to the pumping of cargo into the compartments at high pressure which can cause structural damage to the vessel.

It is therefore an object of the present invention to provide an automatic spill overflow prevention system for tanker vessels which overcomes the aforementioned disadvantages of prior tank fill indicators and overflow handling systems and automatically prevents the spillage of fluid chemical and petroleum products during loading operations or cargo transfer operations in the vessel without the danger of causing a rupture of the hoses and pipelines used to load the vessel or the bulkheads of the vessel and also provides for release of un-wanted gases.

The invention provides a tanker vessel for the transportation of fluid chemical and petroleum products in water, which vessel includes a hull comprising a bottom and sides, a top deck a plurality of liquid-tight cargo compartments disposed within the hull between the top deck and the hull bottom for receiving the fluid chemical/petroleum products, means coupled to said cargo compartments for filling said compartments with said fluid chemical/petroleum products, longitudinally disposed trunk line means, branch line means coupled at one end to said trunk line means and at the other end to said cargo compartments, valve means coupled to said branch line means intermediate the ends thereof, for permitting the free flow of fluid chemical and petroleum products from said cargo compartments to said trunk line means through said branch line means, and retention tank means disposed in said vessel and coupled to said trunk line means for receiving fluid chemical/petroleum products from said tank line means, characterised in that said branch line means are dimensioned so as to prevent over-pressurization of said cargo compartments during the flow of said fluid chemical/petroleum products from said compartments to said trunk line means, in that said trunk line means have an end thereof extending downwardly and opening into said retention tank means, and in that liquid overflow pipe means are disposed within said retention tank means, having an enlarged opening at one end disposed below said end of said trunk line means in said retention tank means for receiving fluid chemical/

petroleum products therefrom and for directing said fluid chemical/petroleum products within said retention tank means whereby fluid chemical/petroleum products overflowing from said cargo compartments during filling thereof are directed from said cargo compartments to said retention tank means thereby preventing the spillage, and in that said enlarged opening of said pipe means is spaced apart from said end of said trunk line means in said retention tank means for directly venting gases from said trunk line means into said retention tank means.

The invention also provides a tanker vessel for the transportation of fluid chemical/petroleum products in water, which vessel includes a hull comprising a bottom and sides, a top deck, a plurality of liquid-tight cargo compartments disposed within the hull between the top deck and the hull bottom for receiving the fluid chemical/petroleum products, and means coupled to said cargo compartments for filling said compartments with said fluid chemical/petroleum products, longitudinally disposed trunk line means, branch line means coupled at one end to said trunk line means and at the other end to said cargo compartments, valve means coupled to said branch line means intermediate the ends thereof, for permitting the free flow of fluid chemical/petroleum products from said cargo compartments to said trunk line means through said branch line means, and retention tank means disposed in said vessel and coupled to said trunk line means for receiving fluid chemical/petroleum products from said trunk line means, characterised in that said branch line means are dimensioned so as to prevent over pressurization of said cargo compartments during the flow of said fluid chemical/petroleum products from the compartments to said trunk line means, in that vent means are provided for said cargo compartments including by-pass line means coupled to said branch line means intermediate the ends thereof and in parallel relationship therewith, and pressure vacuum relief valve means are coupled to said by-pass line means intermediate the end thereof, and in that further vent means are coupled to said retention tank means for venting gases from said retention tank means to the atmosphere.

The improved spill overflow system of the present invention will significantly reduce safety hazards, cargo loss, and the pollution of coastal waterways and ports caused by tank overflows during loading operations, transfers, discharge or cargo expansion in a tanker vessel. This is achieved by utilizing a retention tank, specifically one or more empty tanks, such as a cofferdam, void space or ballast tank or other suitable vessel space, as a plenum, and directing any overflows from the cargo compartments into such a retention tank.

These and other particular embodiments and advantages of the present invention will be described in greater detail in the following detailed description.

In the drawings, wherein similar reference numerals denote similar elements throughout the several views thereof:

Figure 1 is a perspective view, partially in cross-section, of a tanker vessel incorporating an improved spill overflow prevention system constructed according to the present invention;

Figure 2 is a partial, cross-sectional view of the improved spill overflow prevention system illustrated in Figure 1 showing the construction of the trunk line, branch line and control valve of the system; and

Figure 3 is a partial, cross-sectional view of the improved spill overflow prevention system illustrated in Figure 1 showing the construction of the retention tank.

Referring now to the drawings, there is shown a tanker vessel generally identified by the reference numeral 10 which includes a hull comprising a bottom 11 and sides 12, a top or a main deck 13, and a plurality of watertight cargo compartments 14. The cargo compartments are disposed within the hull between top deck 13 and hull bottom 11 for receiving cargo comprising fluid chemical and petroleum products, for example, crude oil, from a land storage tank 15. Cargo expansion trunks 16 are coupled to and open downwardly into each of cargo compartments 14. A cargo pipeline 17 is coupled to each of the cargo compartments 14 for filling the compartments with cargo from land storage tank 15.

Vessel 10 includes a longitudinal trunk line 18, which can be disposed either above or below top deck 13, and a plurality of branch lines 19 which are coupled at one end to trunk line 18 and at the other end to cargo expansion trunks 16. A plurality of valves 20, which may comprise either non-return clapper valves, weighted or spring-controlled to produce the required back pressure for vapor venting, or positive type closure valves, the latter preferably being butterfly-type valves, are coupled to the branch lines 19 intermediate the ends thereof for permitting the free flow of fluid chemical and petroleum products, i.e., the liquid cargo, from cargo expansion trunks 16 to trunk line 18 through branch lines 19. If non-return clapper valves are used, the valves permit the free flow of the liquid cargo only from cargo expansion trunks 16 to trunk line 18 through branch lines 19. A cargo retention tank 21, which may comprise either a wing tank or a plurality of interconnected tanks of the vessel, is coupled to trunk line 18 for receiving cargo from the trunk line. An overflow pipe 22 is disposed within the retention tank 21 for directing the cargo overflow within the retention tank and has an enlarged opening 23 at one end thereof which is disposed below the end of trunk line 18. The latter extends downwardly and opens into the retention tank 21 just below top deck 13. The enlarged opening 23 of pipe 22 receives cargo overflow from trunk line 18 and is spaced slightly apart from the end of the trunk line in tank 21 in order to permit gases, for example, hydrocarbon gases and the like to escape from the trunk line into the retention tank 21.

A plurality of apertures may also be disposed about the periphery of opening 23 to permit gases to escape into retention tank 21. The retention tank is provided with an exhaust vent 24 which includes a flame screen 25 and a pressure/vacuum relief valve 26 for venting gases from the retention tank to the atmosphere. Gases are vented from the cargo compartments 14 to the atmosphere during filling of the compartments through trunk line 18 and branch lines 19 to retention tank 21. A plurality of bypass lines 27 are coupled to branch lines 19 intermediate the ends thereof and in parallel relationship therewith, each including a pressure/vacuum relief valve 28, which preferably comprises a closed type pressure/vacuum relief valve, coupled to the bypass line intermediate its ends, for venting gases from cargo compartments 14 to retention tank 21 through trunk line 18 and branch lines 19 when valves 20 are positive type closure valves and are closed, i.e., during all operations on the vessel except when filling any cargo compartments or transferring cargo between the compartments. When valves 20 comprise non-return clapper valves, the bypass lines 27 and valves 28 permit vacuum relief in the cargo compartments 14. It should be noted that the bypass lines 27 are not required if the vessel is retrofitted with the spill overflow prevention system of the invention and already has an existing venting system which is retained.

Branch lines 19 are dimensioned, i.e., have a diameter which is large enough to prevent overpressurization of the cargo compartments during an overflow while loading or transferring cargo. The term "overpressurization" means a pressure build-up in the cargo compartments due to the pumping of cargo into the compartments at high pressure which would cause structural damage to the bulkheads of the vessel. Such a pressure build-up is relieved by sizing the branch lines 19 so that the lines have a diameter which is greater than the diameter of the filling lines or pipes used to load the compartments to such an extent that the pressure in the cargo compartments is reduced to a level below the maximum the vessel bulkheads can withstand before sustaining damage. It should be noted that both trunk line 18 and branch lines 19 may comprise rectangular or square-shaped ducts, or partially circular pipes, as well as the circular pipes illustrated in the drawings, and can be disposed either above or below the deck of the vessel. The diameter of trunk line 18, as a general rule, will always be considerably greater than that of the branch lines 19 and for that reason usually is not a factor in overpressurization of the cargo compartments 14. If, however, for some reason a back pressure were produced by the trunk line, for example, if the trunk line had a diameter which was less than that of the branch lines, this pressure would have to be considered along with the pressure produced by the branch lines in determining the dimensions of the lines which will keep the pressure in the compartments 14 below the maximum allowable overpressure.

A line flow alarm 29 is coupled in series with trunk line 18 for indicating the flow of cargo in the trunk line. In addition, retention tank 21 preferably comprises a side compartment of vessel 10 in order to provide an additional indication of the flow of cargo through the trunk line and of an overflow by causing the vessel to heel over slightly. This provides an additional level of protection in the event that the line flow alarm fails to indicate and/or crewmen working on the vessel are inattentive or are not present and fail to detect an overflow from the compartments through the trunk line.

In operation, in the event that the volume of cargo loaded into one or more of the cargo compartments of the vessel exceeds the capacity of the compartments and overflows, the excess cargo is directed through cargo expansion trunk 16 and branch line 19 to the trunk line 18 and flow through the trunk line into retention tank 21. If valves 20 comprise positive-type closure valves, the valves are opened prior to commencement of the loading operation. If non-return clapper valves are used, the valves will automatically open when an overflow occurs. The flow through the trunk line 18 is indicated by the flow alarm 29, which produces an audible and/or visible alarm. Cargo entering the retention tank is received by enlarged opening 23 of overflow pipe 22 and is directed by the pipe within the tank to the tank bottom. Gases present in cargo compartments 14, for example, hydrocarbon gases produced by petroleum products, are expelled from the compartments during loading or cargo transfer and flow through branch lines 19 into trunk line 18 and escape from the end of the trunk line in retention tank 21. The gases are then vented under pressure to the atmosphere through exhaust vent 24. The exhaust vent 24 is preferably designed so that it terminates at its open upper end at a level above the vessel's deck which is well clear of personnel areas and any hazard of ignition on the vessel. It should be noted that a closed tank loading system is required during loading or transfer operations on the vessel. This can be either an automatic or manual closed ullage system or a simple glass visor having an internal wiper device fitted in each ullage opening. The spill overflow system of the present invention may also be used for bunker tanks, chemical tanks, etc., to prevent overflow loss and hazard in the same manner as with cargo compartments.

In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made thereunto without departing from the broader spirit and scope of the invention as set forth in the appended claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than in a restrictive sense.

Claims

1. A tanker vessel for the transportation of fluid chemical and petroleum products in water, which vessel (10) includes a hull comprising a bottom (11) and sides (12), a top deck (13), a plurality of liquid-tight cargo compartments (14) disposed within the hull between the top deck and the hull bottom for receiving the fluid chemical/petroleum products, means (17) coupled to said cargo compartments (14) for filling said compartments with said fluid chemical/petroleum products, longitudinally disposed trunk line means (18), branch line means (19) coupled at one end to said trunk line means and at the other end to said cargo compartments (14), valve means (20) coupled to said branch line means (19) intermediate the ends thereof, for permitting the free flow of fluid chemical and petroleum products from said cargo compartments (14) to said trunk line means (18) through said branch line means, and retention tank means (21) disposed in said vessel and coupled to said trunk line means (18) for receiving fluid chemical/petroleum products from said trunk line means, characterised in that said branch line means (19) are dimensioned so as to prevent over-pressurization of said cargo compartments during the flow of said fluid chemical/petroleum products from said compartments to said trunk line means, in that said trunk line means (18) have an end thereof extending downwardly and opening into said retention tank means, and in that liquid overflow pipe means (22) are disposed within said retention tank means (21), having an enlarged opening (23) at one end disposed below said end of said trunk line means (18) in said retention tank means for receiving fluid chemical/petroleum products therefrom and for directing said fluid chemical/petroleum products within said retention tank means whereby fluid chemical/petroleum products overflowing from said cargo compartments during filling thereof are directed from said cargo compartments to said retention tank means thereby preventing the spillage, and in that said enlarged opening (23) of said pipe means is spaced apart from said end of said trunk line means in said retention tank means for directly venting gases from said trunk line means (18) into said retention tank means (21).

2. A vessel as claimed in claim 1, further comprising vent means for said cargo compartments including bypass line means (27) coupled to said branch line means (19) intermediate the ends thereof and in parallel relationship therewith, and pressure/vacuum relief valve means (28), coupled to said bypass line means intermediate the ends thereof.

3. A vessel as claimed in claim 2, wherein said pressure/vacuum relief valve means comprises a closed type pressure/vacuum relief valve (28).

4. A vessel as claimed in any of claims 1 to 3, further comprising vent means (24) coupled to said retention tank means (21) for venting gases from said retention tank means to the atmosphere.

5. A tanker vessel for the transportation of fluid chemical/petroleum products in water, which vessel (10) includes a hull comprising a bottom (11) and sides (12), a top deck (13), a plurality of liquid-tight cargo compartments (14) disposed within the hull between the top deck and the hull bottom for receiving the fluid chemical/petroleum products, and means (17) coupled to said cargo compartments (14) for filling said compartments with said fluid chemical/petroleum products, longitudinally disposed trunk line means (18), branch line means (19) coupled at one end to said trunk line means and at the other end to said cargo compartments, valve means (20) coupled to said branch line means (19) intermediate the ends thereof, for permitting the free flow of fluid chemical/petroleum products from said cargo compartments (14) to said trunk line means (18) through said branch line means, and retention tank means (21) disposed in said vessel and coupled to said trunk line means (18) for receiving fluid chemical/petroleum products from said trunk line means, characterised in that said branch line means (19) are dimensioned so as to prevent over pressurization of said cargo compartments (14) during the flow of said fluid chemical/petroleum products from the compartments to said trunk line means, in that vent means are provided for said cargo compartments (14) including by-pass line means (27) coupled to said branch line means (19) intermediate the ends thereof and in parallel relationship therewith, and pressure vacuum relief valve means (28) are coupled to said by-pass line means intermediate the ends thereof, and in that further vent means (24) are coupled to said retention tank means (21) for venting gases from said retention tank means to the atmosphere.

6. A vessel as claimed in any of claims 1 to 5, wherein said valve means coupled to the branch line means (19) comprises a positive type closure valve (20).

7. A vessel as claimed in any of claims 1 to 5, wherein said valve means coupled to the branch line means (19) comprises a non-return clapper valve (20).

8. A vessel as claimed in any of claims 1 to 7, further comprising line flow alarm means (18), for indicating the flow of fluid chemical and petroleum products in said trunk line means.

9. A vessel as claimed in any of claims 1 to 8 wherein said retention tank means (21) is located adjacent a side of said hull of said vessel.

10. A vessel as claimed in any of claims 1 to 9, wherein said retention tank means (21) comprises a plurality of interconnected empty cargo compartments of said tanker vessel.

Revendications

1. Pétrolier pour le transport de produits fluides chimiques et du pétrole dans l'eau, lequel navire

(10) comprend une coque comportant un fond (11) et des côtés (12), un pont supérieur (13), un certain nombre de compartiments étanches au liquide (14) de la cargaison disposés dans la coque entre le pont supérieur et le fond de la coque pour recevoir les produits fluides chimiques/du pétrole, un moyen (17) couplé auxdits compartiments (14) de la cargaison pour remplir lesdits compartiments desdits produits fluides chimiques/du pétrole, un moyen formant conduite principale longitudinalement disposée (18), un moyen formant réseau ramifié (19) couplé à une extrémité audit moyen formant conduite principale et à l'autre extrémité auxdits compartiments de la cargaison (14), un moyen formant vanne couplé audit moyen formant réseau ramifié (19) entre ses extrémités, pour permettre l'écoulement libre des produits fluides chimiques et du pétrole desdits compartiments (14) de la cargaison audit moyen formant conduite principale (18) par ledit moyen formant réseau ramifié et un moyen formant cuve de rétention (21) disposé dans ledit navire et couplé audit moyen formant conduite principale (18) recevoir les produits fluides chimiques/du pétrole dudit moyen formant conduite principale, caractérisé en ce que ledit moyen formant réseau ramifié (19) est dimensionné afin d'empêcher une surpressurisation desdits compartiments de la cargaison pendant l'écoulement desdits produits fluides chimiques/du pétrole desdits compartiments audit moyen formant conduite principale, en ce que ledit moyen formant conduite principale (18) a une extrémité qui s'étend vers le bas et qui débouche dans ledit moyen formant cuve de rétention et en ce qu'un moyen formant tube (22) de débordement du liquide est disposé dans ledit moyen formant cuve de rétention (21) ayant une ouverture élargie (23) à une extrémité disposée en dessous de ladite extrémité dudit moyen formant conduite principale (18) dans ledit moyen formant cuve de rétention pour en recevoir les produits fluides chimiques/du pétrole et pour diriger lesdits produits fluides chimiques/du pétrole dans ledit moyen formant cuve de rétention et ainsi les produits fluides chimiques/du pétrole débordant desdits compartiments de la cargaison pendant le remplissage sont dirigés desdits compartiments de la cargaison audit moyen formant cuve de rétention pour ainsi empêcher le déversement et ne ce que ladite ouverture élargie (23) dudit moyen formant tube est espacée de ladite extrémité dudit moyen formant conduite principale dans ledit moyen formant cuve de rétention pour directement éventer les gaz dudit moyen formant conduite principale (18) dans ledit moyen formant cuve de rétention (21).

2. Navire selon la revendication 1, comprenant de plus un moyen d'évent desdits compartiments de la cargaison comprenant un moyen formant conduite de dérivation (27) couplé audit moyen formant réseau ramifié (19) entre ses extrémités et en parallèle avec lui, et un moyen formant soupape de régulation de pression/dépression (28), couplé audit moyen formant conduite de dérivation entre ses extrémités.

3. Navire selon la revendication 2, caractérisé en ce que ledit moyen formant soupape régulatrice de pression/dépression comprend une soupape régulatrice de pression/dépression (28) du type fermé.

4. Navire selon l'une des revendications 1 à 3, comprenant de plus un moyen d'évent (24) couplé audit moyen formant cuve de rétention (21) pour éventer les gaz dudit moyen formant cuve de rétention vers l'atmosphère.

5. Pétrolier pour le transport de produits fluides chimiques/du pétrole dans l'eau, lequel navire (10) comprend une coque comportant un fond (11) et des côtés (12), un pont supérieur (13), un certain nombre de compartiments de la cargaison (14) étanches au liquide disposés dans la coque entre le point supérieur et le fond de la coque pour recevoir les produits fluides chimiques/du pétrole et un moyen (17) couplé auxdits compartiments (14) de la cargaison pour remplir lesdits compartiments desdits produits fluides chimiques/du pétrole, un moyen formant conduite principale (18) disposé longitudinalement, un moyen formant réseau ramifié (19) couplé à une extrémité audit moyen formant conduite principale et à l'autre extrémité auxdits compartiments de la cargaison, un moyen formant vanne (20) couplé audit moyen formant réseau ramifié (19) entre ses extrémités, pour permettre l'écoulement libre des produits fluides chimiques/du pétrole des compartiments (14) de la cargaison vers ledit moyen formant conduite principale (18) par ledit moyen formant réseau ramifié et un moyen formant cuve de rétention (21) disposé dans ledit navire et couplé audit moyen formant conduite principale (18) pour recevoir des produits fluides chimiques/du pétrole dudit moyen formant conduite principale, caractérisé en ce que ledit moyen formant réseau ramifié (19) est dimensionné de façon à empêcher une surpressurisation desdits compartiments de la cargaison (14) pendant l'écoulement desdits produits fluides chimiques/du pétrole des compartiments audit moyen formant conduite principale, en ce que des moyens d'évent sont prévus pour lesdits compartiments (14) de la cargaison comprenant des moyens formant conduites de dérivation (27) couplés audit moyen formant conduite principale (19) entre ses extrémités et en parallèle avec lui, et des moyens formant soupapes régulatrices de pression/dépression (28) sont couplés audit moyen formant conduite de dérivation entre ses extrémités et en ce que d'autres moyens d'évent (24) sont couplés audit moyen formant cuve de rétention (21) pour éventer les gaz dudit moyen formant cuve de rétention vers l'atmosphère.

6. Navire selon l'une des revendications 1 à 5, où ledit moyen formant vanne couplé au moyen formant réseau ramifié (19) comprend une vanne de fermeture du type positif (20).

7. Navire selon l'une des revendications 1 à 5,

où ledit moyen formant vanne couplé au moyen formant réseau ramifié (19) comprend un clapet de non retour (20).

8. Navire selon l'une des revendications 1 à 7, comprenant de plus un moyen d'alarme d'écoulement en ligne (18) pour indiquer l'écoulement des produits fluides chimiques et du pétrole dans ledit moyen formant conduite principale.

9. Navire selon l'une des revendications 1 à 8, où ledit moyen formant cuve de rétention (21) est placé adjacent à un côté de la coque du navire.

10. Navire selon l'une des revendications 1 à 9, où ledit moyen formant cuve de rétention (21) comprend un certain nombre de compartiments vides interconnectés de la cargaison dudit pétrolier.

Patentansprüche

1. Tankschiff zum Wassertransport von fluiden Chemie- und Erdölerzeugnissen, wobei das Schiff (10) aufweist: einen Rumpf mit einem Boden (11) und Seitenwänden (12); ein Deck (13); eine Vielzahl von flüssigkeitsdichten Laderäumen (14), die im Rumpf zwischen Deck und Rumpfboden zum Aufnehmen der fluiden Chemie/Erdölerzeugnisse angeordnet sind; Einrichtungen (17), die mit den Laderäumen (14) zum Befüllen derselben mit den fluiden Chemie/Erdölerzeugnissen verbunden sind; eine in Längsrichtung angeordnete Hauptleitungseinrichtung (18); Zweigleitungen (19), die an ihrem einen Ende mit der Hauptleitungseinrichtung und an ihrem anderen Ende mit den Lagerräumen (14) verbunden sind; Ventile (20), die zwischen den Enden der Zweigleitungen (19) mit denselben so verbunden sind, daß freies Strömen der fluiden Chemie- und Erdölerzeugnisse von den Lagerräumen (14) zu der Hauptleitungseinrichtung (18) durch die Zweigleitungen möglich ist; und eine Rückhaltetankeinrichtung (21), die in dem Schiff angeordnet und mit der Hauptleitungseinrichtung (18) zum Aufnehmen von fluiden Chemie/Erdölerzeugnissen von der Hauptleitungseinrichtung verbunden ist, dadurch gekennzeichnet, daß die Zweigleitungen (19) so dimensioniert sind, daß Belastung der Laderäume mit Überdruck während des Strömens der fluiden Chemie/Erdölerzeugnisse von den Laderäumen zu der Hauptleitungseinrichtung vermieden wird; daß ein Endabschnitt der Hauptleitungseinrichtung (18) sich nach unten erstreckt und sich in die Rückhaltetankeinrichtung öffnet; und daß ein Flüssigkeitsüberlaufrohr (22) in der Rückhaltetankeinrichtung (21) angeordnet ist, dessen erweiterte Öffnung (23) an ihrem einen Ende unter dem Endabschnitt der Hauptleitungseinrichtung (18) in der Rückhaltetankeinrichtung zum Aufnehmen von fluiden Chemie/Erdölerzeugnissen von demselben und zum Leiten der fluiden Chemie/Erdölerzeugnisse innerhalb der Rückhaltetankeinrichtung angeordnet ist, wobei fluide Chemie/Erdölerzeugnisse, die von den Laderäumen während der Befüllung derselben überlaufen, von den Laderäumen zu der Rückhaltetankeinrichtung geleitet werden, wodurch ein Auslaufen verhindert wird; und daß die erweiterte Öffnung (23) des Überlaufrohrs in einem Abstand vom Endabschnitt der Hauptleitungseinrichtung in der Rückhaltetankeinrichtung so angeordnet ist, daß Gase von der Hauptleitungseinrichtung (18) direkt in die Rückhaltetankeinrichtung (21) entlüftet werden.

2. Schiff nach Anspruch 1, das weiter aufweist: eine Entlüftung für die Lagerräume mit Umgehungsleitungen (27), die mit den Zweigleitungen (19) zwischen den Enden derselben und parallel mit denselben verbunden sind, und Druck/Vakuumentlastungsventile (28), die mit der Umgehungsleitung zwischen den Enden derselben verbunden sind.

3. Schiff nach Anspruch 2, bei dem die Druck/Vakuumentlastungsventile ein Druck/Vakuumentlastungsventil (28) vom geschlossenen Typ aufweisen.

4. Schiff nach einem der Ansprüche 1 bis 3, das außerdem eine Entlüfungseinrichtung (24) aufweist, die mit der Rückhaltetankeinrichtung (21) zum Entlüften von Gasen von der Rückhaltetankeinrichtung in die Atmosphäre verbunden ist.

5. Tankschiff zum Wassertransport von fluiden Chemie/Erdölerzeugnissen, wobei das Schiff (10) aufweist: einen Rumpf mit einem Boden (11) und Seitenwänden (12); ein Deck (13); eine Vielzahl von flüssigkeitsdichten Laderäumen (14), die im Rumpf zwischen Deck und Rumpfboden zum Aufnehmen der fluiden Chemie/Erdölerzeugnisse angeordnet sind; und Einrichtungen (17), die mit den Laderäumen (14) zum Befüllen derselben mit den fluiden Chemie/Erdölerzeugnissen verbunden sind; eine in Längsrichtung angeordnete Hauptleitungseinrichtung (18); Zweigleitungen (19), die an ihrem einen Ende mit der Hauptleitungseinrichtung und an ihrem anderen Ende mit den Lagerräumen verbunden sind; Ventile (20), die zwischen den Enden der Zweigleitungen (19) mit denselben so verbunden sind, daß freies Strömen der fluiden Chemie/Erdölerzeugnisse von den Lagerräumen (14) zu der Hauptleitungseinrichtung (18) durch die Zweigleitungen möglich ist; und eine Rückhaltetankeinrichtung (21), die in dem Schiff angeordnet und mit der Hauptleitungseinrichtung (18) zum Aufnehmen von fluiden Chemie/Erdölerzeugnissen von der Hauptleitungseinrichtung verbunden ist, dadurch gekennzeichnet, daß die Zweigleitungen (19) so dimensioniert sind, daß Belastung der Laderäume (14) mit Überdruck während des Strömens der fluiden Chemie/Erdölerzeugnisse von den Laderäumen zu der Hauptleitungseinrichtung vermieden wird; daß eine Entlüfung für die Laderäume (14) vorgesehen ist, die eine Umgehungsleitung (27) aufweist, die zwischen den Enden der Zweigleitung (19) mit derselben und parallel mit derselben verbunden ist; und daß Druck/Vakuumentlastungsventile (28) mit der Umgehungsleitung zwischen den Enden derselben verbunden sind; und daß weitere Entlüftungseinrichtungen (24) mit der Rückhaltetankeinrichtung (21) zum Entlüften von Gasen von der Rückhaltetankeinrichtung zur Atmosphäre verbunden sind.

6. Schiff nach einem der Ansprüche 1 bis 5, bei dem die mit den Zweigleitungen (19) verbundenen Ventile ein zwangsgesteuertes Absperrventil (20) aufweisen.

7. Schiff nach einem der Ansprüche 1 bis 5, bei dem die mit den Zweigleitungen (19) verbundenen Ventile ein Rückschlagventil (20) aufweisen.

8. Schiff nach einem der Ansprüche 1 bis 7, das außerdem Alarmeinrichtungen (18) für Strömung in einer Leitung aufweist, um das Strömen von fluiden Chemie- und Erdölerzeugnissen in der Hauptleitungseinrichtung anzuzeigen.

9. Schiff nach einem der Ansprüche 1 bis 8, bei dem die Rückhaltetankeinrichtungen (21) einer Seitenwand der Rumpfes des Schiffes benachbart angeordnet sind.

10. Schiff nach einem der Ansprüche 1 bis 9, bei dem die Rückhaltetankeinrichtungen (21) eine Vielzahl von miteinander verbundenen leeren Laderäumen des Tankschiffes umfassen.

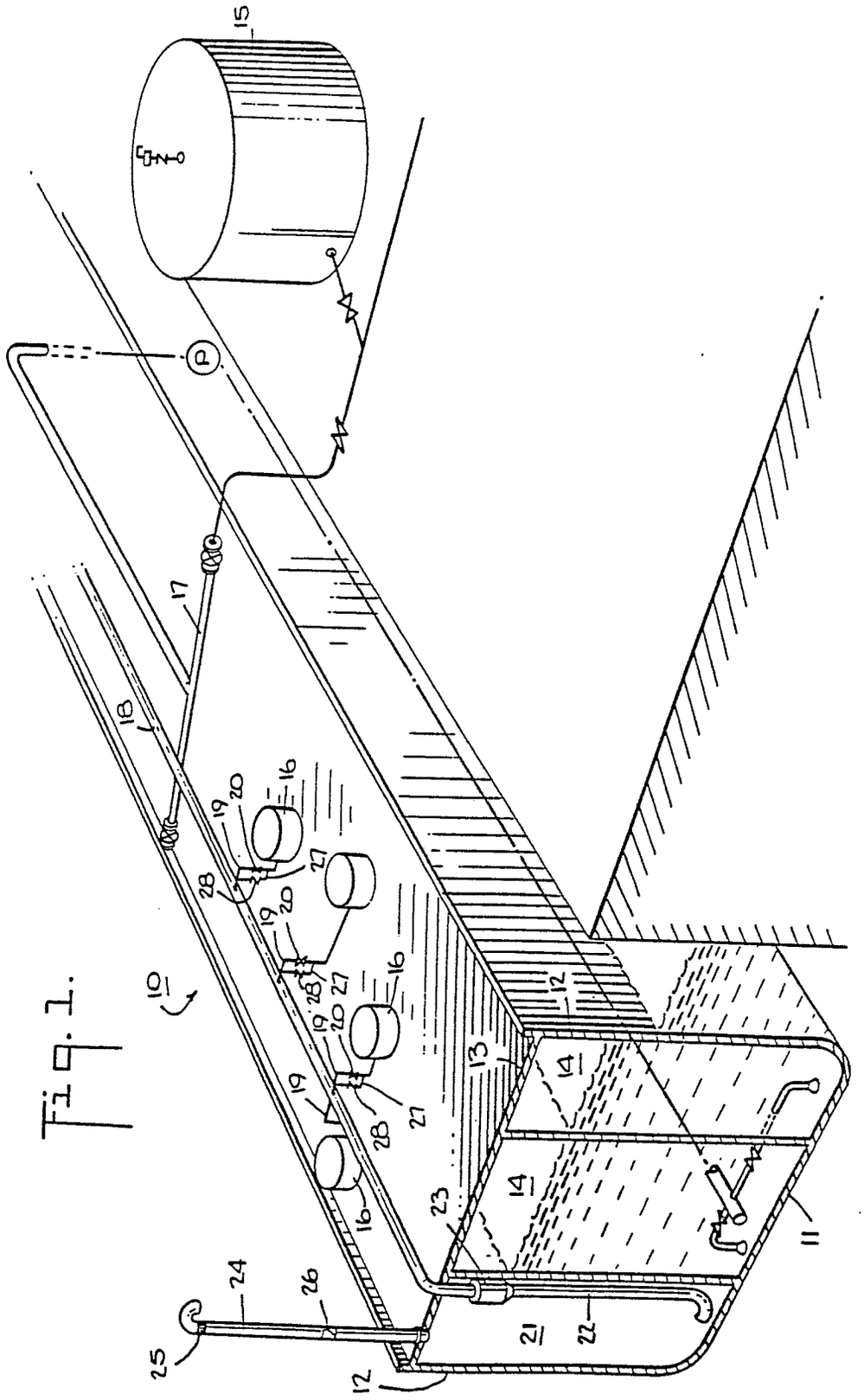

Fig. 1.

Fig. 2.

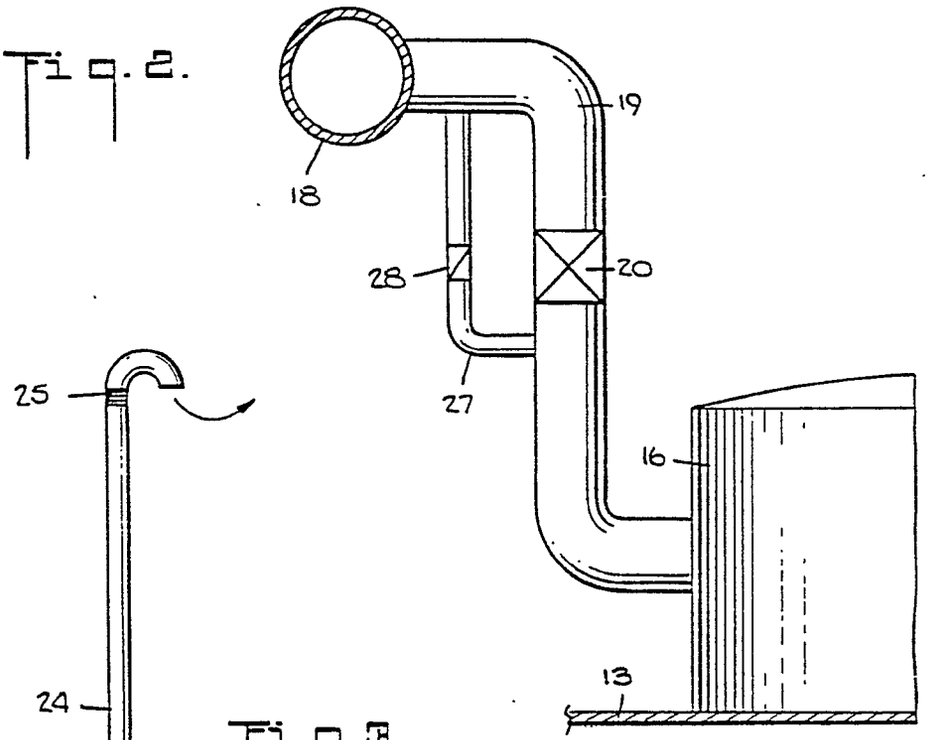

Fig. 3.