

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **87308956.9**

51 Int. Cl.4: **B67D 5/06** , **B67D 5/32** ,  
**B65D 90/48**

22 Date of filing: **09.10.87**

30 Priority: **13.10.86 GB 8624531**

43 Date of publication of application:  
**04.05.88 Bulletin 88/18**

84 Designated Contracting States:  
**BE DE ES FR GB NL SE**

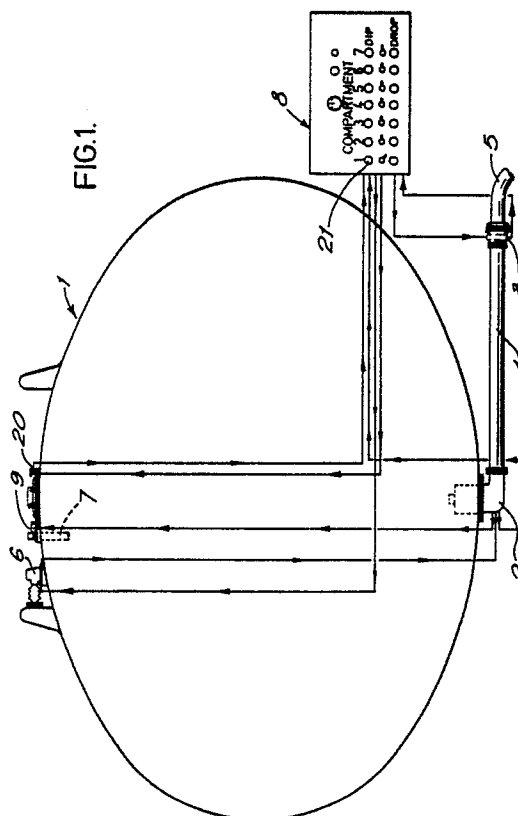
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54 **Fluid transport containers and control means therefor.**

57 A fluid transport container (1) comprises a foot valve (2) arranged in a lower part of the container and connected or connectable to an outlet valve (3) via a conduit (4), a dipstick insertable into the container via an aperture (7) therein for measuring the volume of fluid in the container, locking means (9) associated with the dipstick aperture and selectively operable to prevent the dipstick from being inserted into the container, and control means (8) for the foot valve (2) and locking means (9), such control means being adapted to release the locking means only when said foot valve is in an open condition (3).



### Fluid transport containers and control means therefor

This invention relates to fluid transport containers, such as containers forming part of or carried by road and rail tankers, and to control means therefor.

Fluid containers of e.g. road tankers are often provided with a so-called foot valve located in a lower region of the container through which fluid may be discharged from the container during unloading and by means of which a container may be filled with fluid by bottom loading under pressure. After bottom loading has been carried out, it is usual to join the foot valve to a further, outlet valve of the container via a conduit extending to an accessible position usually to one side of the container, the outlet valve being adapted to be coupled to a delivery hose leading e.g. to a garage storage tank.

In such containers it is normal to measure the quantity of fluid to be discharged from the container by means of a dipstick inserted through an aperture in the roof of the container, the dipstick being calibrated so that the volume of liquid in the container can be directly read from the wetting level on the dipstick. However, it is traditional that the dipstick be calibrated to indicate the total volume of fluid inclusive of the fluid contained in the conduit between the foot valve and outlet valve of the container, and therefore if the dipstick reading is taken at such time when the conduit is empty the actual volume of fluid in the container will be less than that apparent from the dipstick measurement. This can provide an opportunity for embezzlement and the delivery to customers of short measures of the fluid concerned.

Viewed from a first aspect the invention provides a fluid transport container comprising a foot valve arranged in a lower part of the container and connected or connectable to an outlet valve via a conduit, a dipstick insertable into the container via an aperture therein for measuring the volume of fluid in the container, locking means associated with the dipstick aperture and selectively operable to prevent the dipstick from being inserted into the container, and control means for the foot valve and locking means, such control means being adapted to release the locking means only when said foot valve is in an open condition.

Thus it will be seen that, in accordance with the invention, the possibility of embezzlement in the manner discussed above is avoided since it is only possible for the operator to take a dipstick measurement when the foot valve is open and thus when the conduit connecting the foot valve to the outlet valve is full.

It is of course important that when the foot valve is open means are provided to allow the ingress of air into the headspace above the liquid in the container so that fluid can flow freely from the container into the conduit leading to the outlet valve, and it is envisaged that a simple one-way valve might be provided for this purpose. In a preferred embodiment, however, a vent valve arranged in an upper part of the container is also responsive to the control means in such a way that the locking means is only released when both the vent valve and the foot valve are open.

The control means may take any convenient form, and it is envisaged that the foot valve, the dipstick locking means and optionally a vent valve might be electrically actuatable in response to suitable control circuitry. In a particularly preferred embodiment, however, the control means operates pneumatically and comprises a pneumatic switch unit arranged only to supply a pneumatic signal effective to release the dipstick locking means, after a pneumatic signal has been supplied to operate the foot valve and, if provided, the vent valve. In a preferred such embodiment, the vent valve, foot valve, locking means and switch unit are arranged in a series pneumatic circuit with a pressure gas source so that upon actuation of the switch unit to connect the circuit in a "dip" configuration, the vent valve, foot valve and locking means are sequentially opened and released in that order.

In a preferred embodiment, the outlet valve is also pneumatically operable and is opened upon application of a pneumatic signal supplied via the switch unit. Preferably, where it is desired to deliver the entire contents of the container, after dip measurement has been carried out the operator selects a further deliver or "drop" configuration of the switch unit whereupon the outlet valve is additionally opened. In a preferred embodiment, there is also provided a further, manually operable pneumatic switch adjacent the dipstick aperture which is connected to the main switch unit and enables the operator to open and close the outlet valve as desired which enables only part of the contents to be released.

It is preferred that the outlet valve is also arranged in series with the vent valve and foot valve so that the outlet valve can only be opened when the former valves are also open. This in broader terms is important, particularly where the container is adapted to be filled by pumping fluid under pressure through the fluid inlet/outlet valve.

Thus viewed from a second aspect, the invention provides a fluid transport container having a fluid inlet/outlet valve, and a vent valve arranged in an upper part of the container, wherein control means for said valves are adapted to permit opening of said inlet/outlet valve only when said vent valve is also open.

A preferred embodiment of dipstick locking means comprises a plate defining an aperture for receiving the dipstick and having a locking member movable in a transverse bore communicating with said aperture between a retracted condition and a locking condition wherein the member extends across the aperture and prevents the dipstick from being inserted therethrough. In a preferred such means the locking member is coupled to a piston slidable in a cylinder against the force of a biasing spring upon application of pneumatic signal so as to retract the locking member and release the locking means. In a preferred embodiment, the apertured plate of the locking means is adapted to be interposed between two flanges provided at the upper end of a standard container dip tube whereby the locking means may be incorporated without the need substantially to modify an existing container or dip tube.

It is preferred that pneumatically operated visual indicating means are provided both on the switch unit to confirm that the system is in either its "dip" or "drop" configuration and furthermore an indicating means is preferably also provided adjacent the dipstick locking means so that the operator will be aware as to whether or not the locking means is released.

In the case of e.g. a road tanker, the fluid container is typically divided longitudinally into a plurality of individual compartments in which case a separate foot valve, dipstick, dipstick locking means and control means may be provided for each compartment. The control means for all the compartments can, however, conveniently be incorporated in one central control unit.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying, wherein:

Figure 1 is a schematic transverse cross-section through one compartment of a fluid container of a road tanker;

Figures 2 and 2a illustrate a preferred form of dipstick locking means in cross-section and in side elevation respectively;

Figure 3 illustrates the pneumatic circuit in the "dip" configuration;

Figure 4 illustrates the pneumatic circuitry in its "part drop" configuration; and

Figure 5 illustrates the pneumatic circuitry in its "full drop" configuration.

Referring first to Figure 1, a fluid container 1 includes a foot valve 2 connected to an outlet valve via a conduit 4, the outlet valve 3 being adapted to be coupled to a delivery hose 5 e.g. on a garage forecourt. The container also includes a vent valve 6 and a dip tube 7 adapted to receive a dipstick (not shown).

The valves 2, 3 and 6 are all pneumatically operable, and are opened in response to a pneumatic signal applied via a control unit 8. The control unit includes pneumatic switches numbered one to eight for each of the compartments of the tanker, the other compartments being fitted with the same components as the illustrated one. Pneumatically operable valves are known in the art and typically comprise actuating means in the form of a piston and cylinder coupled to the valve closure means. The structure of the valves will not be described further herein.

The illustrated container also includes a dipstick locking means 9 which is shown in more detail in Figures 2 and 2a. Thus, the locking means comprises a plate 10 having an aperture 11 through which the dipstick may be inserted, a locking member 12 being movable in a transverse bore 13 from a locking condition to a retracted condition by application of a pneumatic signal to piston and cylinder actuating means 14. A biasing spring 15 normally urges the locking member into the locking condition wherein a dipstick cannot be inserted through the aperture 11. The configuration of the locking means is such that it may readily be incorporated between flanges normally provided in the upper region of the dip tube without the need substantially to modify the container or dip tube. The locking means is firmly clamped between such flanges by means of bolts extending through apertures 16.

The pneumatic circuitry connecting the valves 2, 3 and 6 and the locking means 9 to the control unit 8 is illustrated schematically in Figure 1 and in Figures 3, 4 and 5. Thus, the vent valve, emergency valve and dipstick locking means are connected in series to a pneumatic switch of the control unit which in turn is connected to a pneumatic gas pressure source (not shown). The outlet valve, which may comprise a known so-called API valve is also connectable in series with the vent valve and foot valve. As shown in Figure 3, in the "dip" configuration the operator actuates the switch so as to connect the vent valve, and dipstick locking means in series to the pressure source, so that the two valves open sequentially and only then is the dipstick locking means released. As discussed above, this ensures that a dip reading cannot be taken without both the vent valve and foot valve being open and thus the conduit 4 connecting the valves 2 and 3 being full of product. In the "dip"

configuration the outlet valve remains closed. The operator may then take a dip reading so that the customer can be advised of the total amount of fluid carried by the container.

When it is desired to release only part of the contents of the container, the operator depresses a manually operable pneumatic switch 20 provided externally on the container adjacent the dip tube, which causes a pneumatic signal to be applied to the outlet valve 3 so that fluid is discharged from the container. In this configuration, the outlet valve 3 is only open whilst the switch 20 is depressed, and the operator may close the valve once the desired amount of product has been delivered, as may be measured by the dipstick.

A further configuration is illustrated in Figure 5 which is intended to discharge all the fluid from the container. In this configuration, the switch on the main switching unit 8 is moved to a "drop" condition so that the outlet valve is connected in series with the outlet line from the foot valve and thus the outlet valve is opened. In this condition, the outlet valve remains open until all of the product has been delivered. Preferably, the outlet valve 3 includes a small float indicator which enables a customer to tell when the valve is completely empty of fluid. In this way, the customer can be sure that all the product has been duly delivered.

As shown in Figure 1, the control unit preferably includes pneumatically operable visual indicators 21 which provide an indication of whether or not the unit is in the "dip" or the "drop" mode. Furthermore, there is preferably provided a further indicator (not shown) associated with the dipstick locking means 9 which provides the operator with confirmation that the locking means is released.

As discussed above, an advantage of providing an outlet valve which is pneumatically operated by being switched in series with the vent valve and foot valve is that it is impossible for the outlet to be opened without the vent and foot valves also being opened. This is of particular significance when the container is adapted to be filled from the bottom by pumping fluid under pressure in through the outlet valve. Thus, it is important to avoid attempting to pump liquid in via the outlet valve 3 while either the vent valve or the foot valve is closed, and with the illustrated system it will be appreciated that this possibility cannot arise.

It is to be clearly understood that there are no particular features of the foregoing specification, or of any claims appended hereto, which are at present regarded as being essential to the performance of the present invention, and that any one or more of such features or combinations thereof may therefore be included in, added to, omitted

from or deleted from any of such claims if and when amended during the prosecution of this application or in the filing or prosecution of any divisional application based thereon.

## Claims

1. A fluid transport container comprising a foot valve arranged in a lower part of the container and connected or connectable to an outlet valve via a conduit, a dipstick insertable into the container via an aperture therein for measuring the volume of fluid in the container, locking means associated with the dipstick aperture and selectively operable to prevent the dipstick from being inserted into the container, and control means for the foot valve and locking means, such control means being adapted to release the locking means only when said foot valve is in an open condition.

2. A fluid transport container as claimed in claim 1 further comprising a vent valve arranged in an upper part of the container, such valve also being responsive to said control means whereby the locking means is only released when both the vent valve and foot valves are in open conditions.

3. A fluid transport container as claimed in claim 1 or 2 wherein the control means operates pneumatically and includes a pneumatic switch unit.

4. A fluid transport container as claimed in claims 2 and 3 wherein the vent valve, foot valve, locking means and switch unit are arranged in a series pneumatic circuit.

5. A fluid transport container as claimed in claim 3 or 4 wherein the outlet valve is pneumatically operable in response to a pneumatic signal supplied via the switch unit.

6. A fluid transport container as claimed in claim 5 comprising a manually operable pneumatic switch located adjacent the dipstick aperture and connected to the switch unit to enable an operator at the dipstick aperture selectively to open and close the outlet valve.

7. A fluid transport container as claimed in claim 5 or 6 wherein the outlet valve is arranged in a series pneumatic circuit with the vent and foot valves.

8. A fluid transport container as claimed in any preceding claim wherein the dipstick locking means comprises a plate defining an aperture for receiving the dipstick and having a locking member movable in a transverse bore communicating with said aperture between a retracted condition and a locking condition wherein the member extends across the aperture and prevents the dipstick from being inserted therethrough.

9. A fluid transport container as claimed in claim 8 wherein the locking member is coupled to a piston slidable in a cylinder against the force of a biasing spring upon application of pneumatic signal so as to retract the locking member and release the locking means.

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10. A fluid transport container as claimed in claim 8 or 9 wherein the apertured plate of the locking means is adapted to be interposed between two flanges provided at the upper end of a standard container dip tube whereby the locking means may be incorporated without the need substantially to modify an existing container or dip tube.

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11. A fluid transport container having a fluid inlet/outlet valve, and a vent valve arranged in an upper part of the container, wherein control means for said valves are adapted to permit opening of said inlet/outlet valve only when said vent valve is also open.

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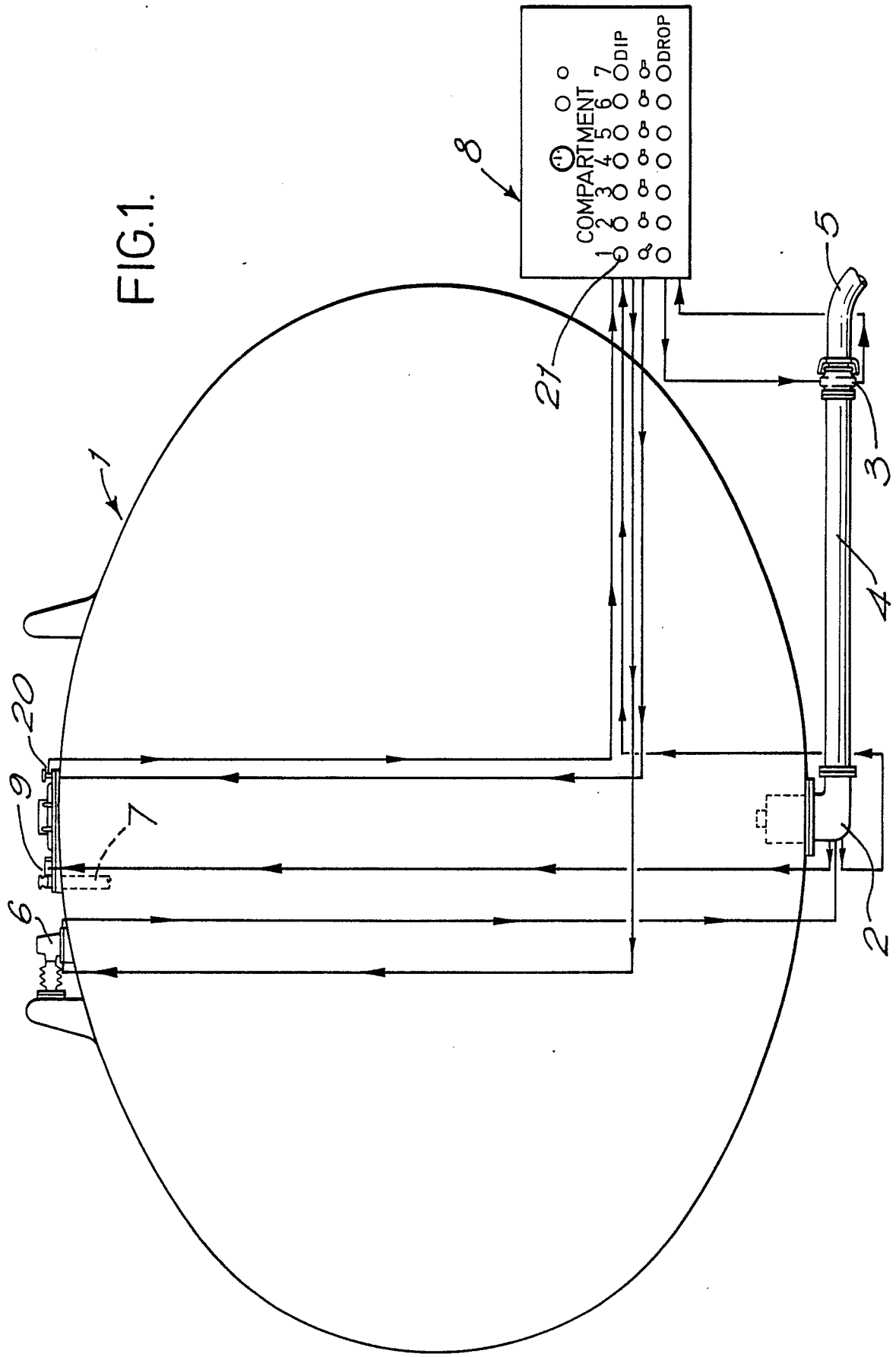


FIG. 2.

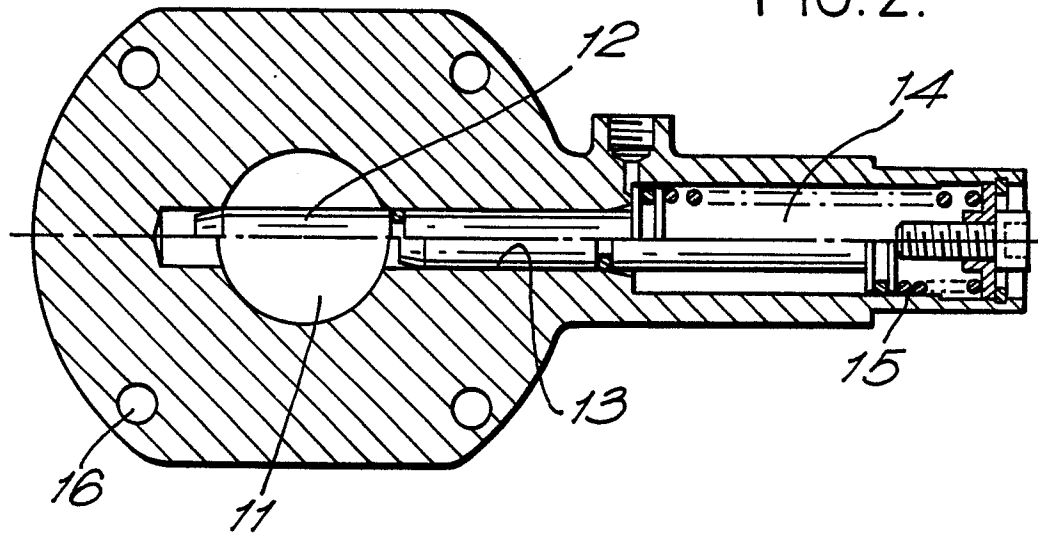


FIG. 2A.

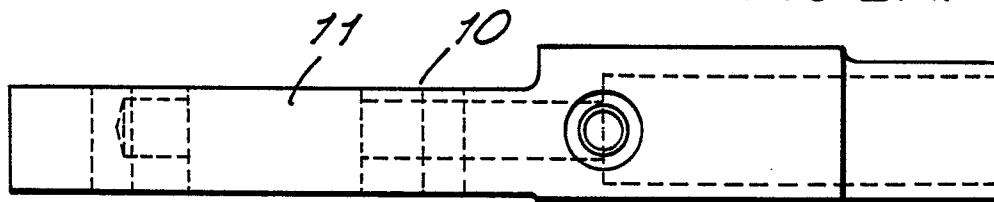


FIG. 3.

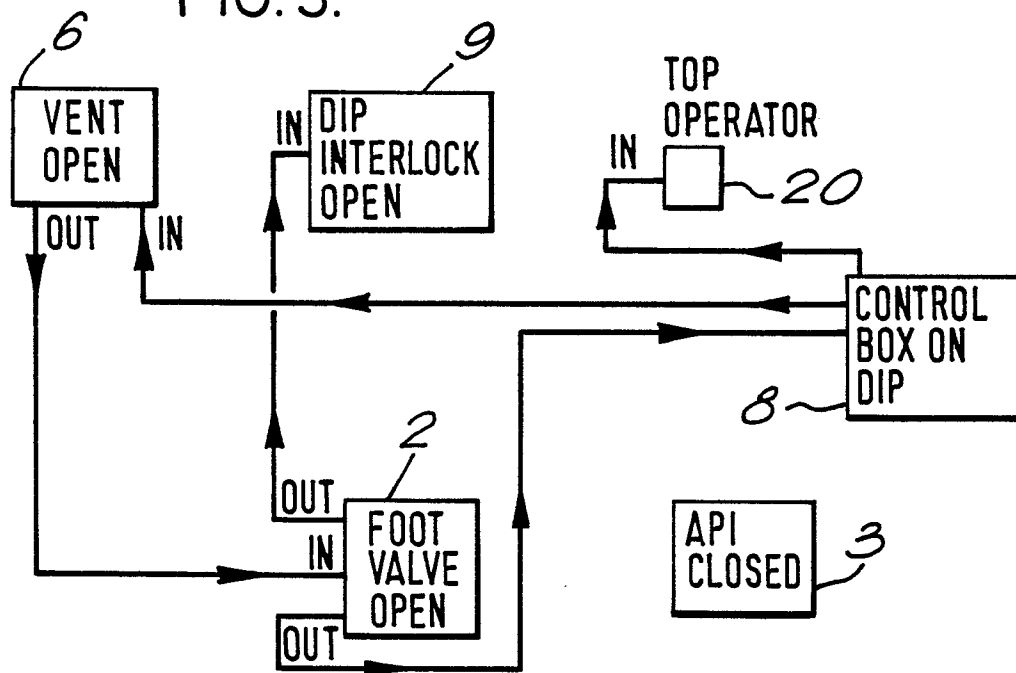


FIG.4.

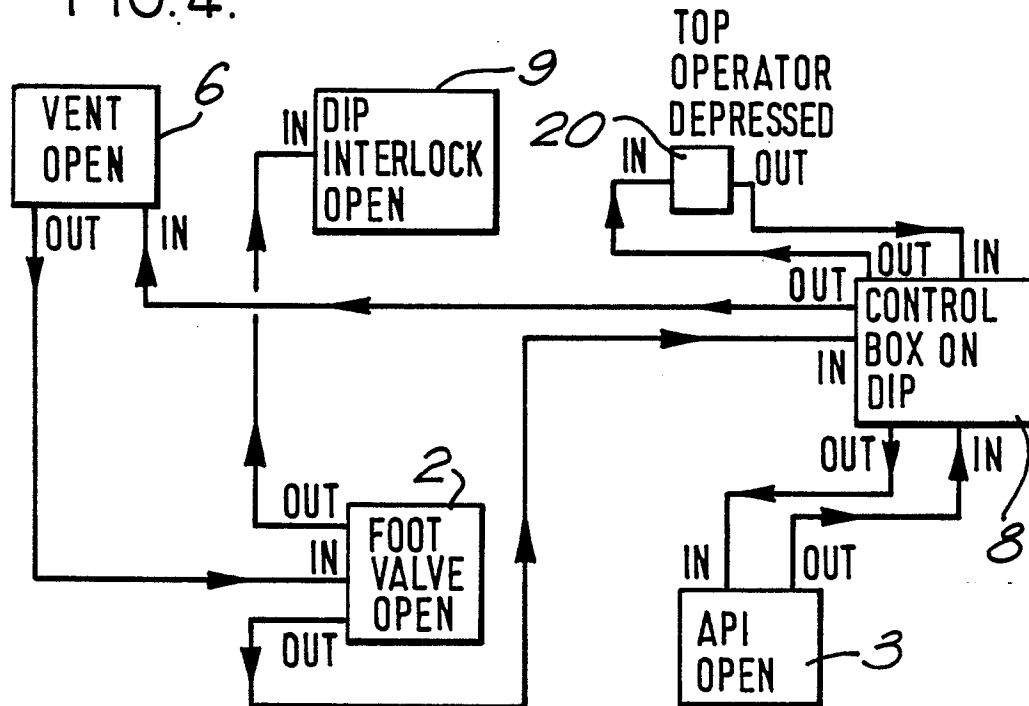
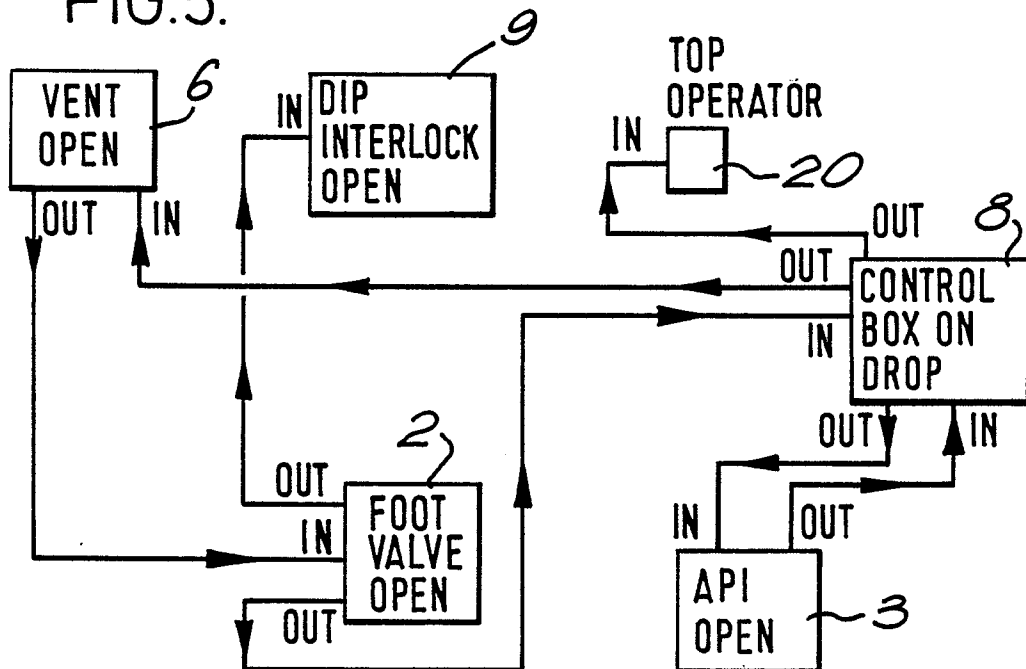


FIG.5.





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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	FR-A-2 436 921 (PEROLO) * Page 1, lines 30-37; page 5, lines 13-18; figures 1-3 *	11	B 67 D 5/06 B 67 D 5/32 B 65 D 90/48
A	---	1	
A	US-A-1 579 203 (AUCHINCLOSS) * Claim 2 *	1	
A	---		
A	US-A-4 109 677 (BURNSIDE) ---		
A	PETROLE ET TECHNIQUES, no. 283, October 1981, pages 186-188, Paris, FR; J. GRUCY: "Application du compteur a turbine au camion-citerne de livraison par gravité" -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 67 D B 65 D B 60 P G 01 F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13-01-1988	Examiner SCHELLE, J.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			