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

(11) EP 2 199 655 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
31.08.2011 Bulletin 2011/35

(21) Application number: **09178694.7**

(22) Date of filing: **10.12.2009**

(51) Int Cl.:
F17C 5/00 *(2006.01)* ***F17C 13/12*** *(2006.01)*

(54) **A leakage control mechanism for LPG cylinders**

Leckprüfmechanismus für Flüssiggaszylinder

Mécanisme de contrôle des fuites pour cylindres LPG

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **18.12.2008 TR 200809620**

(43) Date of publication of application:
23.06.2010 Bulletin 2010/25

(73) Proprietor: **Aygaz Anonim Sirketi**
Istanbul (TR)

(72) Inventors:
- **Citil, M.Fevzi**
  34394, ISTANBUL (TR)
- **Isbilen, Emrah**
  34394, ISTANBUL (TR)
- **Tikiroglu, Can**
  34394, ISTANBUL (TR)

(74) Representative: **Dericioglu, Ekin**
Ankara Patent Bureau Limited
Bestekar Sokak No: 10
Kavaklidere
06680 Ankara (TR)

(56) References cited:
EP-A2- 0 387 542
DE-A1- 10 017 252
DE-A1- 19 622 715
DE-C1- 4 208 841
JP-A- 2000 352 539

EP 2 199 655 B1

Description

Field of the invention

[0001] This invention is related with the mechanism which checks LPG cylinders against leakage.

Background of the invention

[0002] LPG cylinders that arrive at many filling facilities are checked regarding their conformity for filling according to various standards and nonconforming cylinders are set apart before filling. One of the most important among these checks is the cylinder leakage control. As LPG is a flammable and explosive material, this check is critical for fire safety. Leakage control is performed after filling, and the cylinder's body and valve is required to be checked against leakages. For the sake of operation efficiency, this control process is performed by operators and/or machinery on the filling conveyor line, while the cylinders advance.

[0003] European patent document EP0387542 mentions an LPG cylinder leakage detection system. The system takes the cylinder on the conveyor line and performs the leakage test. The system includes a sensor which sends a signal to the system and ensures discarding the cylinder from the conveyor when the system identifies a mechanical brake or leakage that stops the newly received cylinder. This system resembles to the invention with regard to taking the cylinder from the conveyor line and transferring to leakage detection section. In this system, only the valve leakages can be identified. Valve and the body of the cylinder are not checked simultaneously. Besides, the air wiped from the leakage zone in the system is taken to the combustion room and it is burnt there, and the existence of LPG in the environment is checked according to the emerging energy level.

[0004] European patent document EP0441632 mentions an apparatus which detects minor gas leakages in compressed containers. The apparatus is plugged to the neck of the pressurized container. There is an O ring on the skirt of the apparatus, which is used for preventing gas leakage from the apparatus. The section between the apparatus and the neck is a room. And the air that remains in the room may exit through the hole 48. If the container leaks, then the pressure in the room increases and this pressure is detected by the sensor. This document mentions a simple apparatus.

[0005] Japanese patent document JP2000352539 mentions a gas leakage detection system. In this system, the component to be tested is placed in the hollow section of the pressure tank and the pressure of the hollow section and the pressure of the pressure section are equated. Gas leakage from a potential hole increases the pressure of the hollow section. The pressure difference is detected by the pressure sensor. This system resembles to the invention as it includes a reference pressure compartment and a pressure sensor.

[0006] American patent document US5831147 mentions a gas leakage detection system. In this system, the test object is dropped in a test compartment. It is known that this system makes a measurement by using the pressure difference. It is required to be examined and compared by the owner of the invention. This system is not automated.

[0007] According to the practices known by those skilled in the art, the checks are performed with the machinery that employ infrared and catalytic technology and with the leakage control pool where manual check is performed. With this machinery, LPG leakages higher than 1.5 gr/h can be detected and the leakages on the cylinder body cannot be detected. Failure to detect body/welding leakages has necessitated a solution for this technical problem.

Brief Description of the Invention

[0008] The purpose of the invention is to create a leakage control mechanism for LPG cylinders which enables detecting 0.2 gr/h valve and body leakages.

[0009] Another purpose of the invention is to develop a leakage control mechanism for LGP cylinders which provides automatic control on the line without requiring the operator's intervention.

Detailed Description of the Invention

[0010] "A leakage control mechanism for LPG tubes" which has been realized to achieve this purpose is shown in the appended figures, and among these figures;

Figure 1 - Displays valve and body leakage control mechanism on an LPG cylinder
Figure 2- Elevation of impermeability surface

[0011] The pieces in the figures are numbered individually and the following items are represented by the reciprocal numbers.

1. A leakage control mechanism for LPG cylinders
2. Compartment
3. Impermeability surface
4. Measuring equipment
5. Tank
6. Valve
7. Cylinder

[0012] A leakage control mechanism for LPG cylinders (7) most basically contains;

- Minimum one leak-proof compartment (2) that allows for measuring the leakage,
- In the leak-proof compartment (2), an impermeability surface (3) which can be in different shapes preferably in conical shape with double o-rings and which creates a leak-proof environment to isolate the cyl-

inders from the external environment and measure,

- minimum one measuring equipment (4) which measures the pressure difference that would be created by the cylinder after the leak-proof compartment (2) is closed through the movement of the filaments which are included in the sensor group that the compartment contains,
- minimum one compensation tank (5) which ensures a constant external atmospheric pressure and which prevents potential pressure changes, thus ensuring a safe measurement,
- Minimum two discharge valves (6) that open and close in order to discharge the pressure which occurs in the control mechanism,
- and the LPG cylinder (7) which is checked against leakage.

[0013] The invention is related with the leakage control of LPG cylinders with a leakage control mechanism (1) for LPG cylinders. The cylinders (7) on the conveyor line are initially taken into the leak-proof compartment (2). After the cylinder (7) is taken into leak-proof compartment (2), the leak-proof compartment (2) is lowered on the cylinder (7) and the cylinder (7) is isolated from the external environment. A fully impermeable environment is created with the impermeability surface (3). After full impermeability is obtained, the pressure changes of the compartment (2) are measurement by the measuring equipment (4), and the leaking cylinders (7) are automatically removed from the line according to the pressure differences that occur in the case of a leakage. Accordingly, if any point of the cylinder (7) leaks, then the pressure in the leak-proof compartment (2) increases. As a result, a flow occurs due to the positive pressure from the leak-proof compartment (2) to the compensation tank (5). The compensation tank (5) compensates the pressure changes in the external environment and creates an environment with a constant pressure; so the pressure changes in the leak-proof (compartment) are correctly detected by the measuring equipment (4). Measuring equipment (4) detects this flow, that is the leakage which occurs on the cylinder (7). When the identified leakage would be higher than the pre-defined value, the measuring equipment (4) sends a signal to remove the leaking cylinders from the line.

[0014] In the leak-proof compartment (2) of the invention, the cylinder (7) is required to be taken in a completely impermeable volume. The conical and double O-ring surface (3) in the leak-proof compartment (2) isolates the cylinders from the external environment. The section to be controlled is required to be isolated from the environment as fully impermeable. So, the impermeable environment desired for measuring is created. The leak-proof compartment (2) and the impermeability surface (3) play critical roles for the measurement to be realized as free of defects. When impermeability cannot be fully provided, conducting the measurement by the measuring equipment (4) shall not be possible.

[0015] In the mechanism, conical and double O-ring impermeable surface (3) is used to isolate the leak-proof compartment (2) from the external environment. They can be in different sizes, volumes and shapes.

[0016] Discharge valves (6) open during the lowering of the leak-proof compartment (2) in order to compensate the sudden pressure change which occurs during the closure of the leak-proof compartment (2) that includes a leakage control mechanism (1) for LPG cylinders. After the pressure changes are stabilized, the valves (6) are closed and the pressure change in the leak-proof compartment (2) is monitored by the pressure change measuring equipment (4). Compensation tank (5) is used to have a correct measurement. Compensation tank (5) provides a constant atmospheric pressure in the external environment and prevents potential pressure changes.

[0017] The compensation tank (5) of the invention compensates the pressure changes in the external environment and creates an environment with constant pressure. So, the pressure changes in the leak-proof compartment (2) are detected by the measurement equipment (4).

Claims

1. In order to use for leak detection of LPG cylinders (7);

- minimum one leak-proof compartment (2),
- An impermeable surface (3) in leak-proof compartment (2),
- a small measuring equipment (4) which is found between the leak-proof compartment (2) and the compensation tank (5), and connected with the valves,
- minimum one balancing tank (5) which ensures a constant external atmospheric pressure and which prevents potential pressure changes, thus ensuring a safe measurement,
- Minimum two discharge valves (6) that open and close in order to discharge the pressure which occurs in the control mechanism,
- A leakage control mechanism (1) for LPG cylinders (7) **characterized in that** it contains a LPG cylinder (7) which is checked against leakage, and minimum one leak-proof compartment (2), in which the cylinder (7) is placed to measure the leakage and which isolates the cylinder (7) from the external environment.

2. A leakage control mechanism (1) for LPG cylinders (7) according to Claim 1, **characterized in that** it contains an impermeability surface (3) which may be in different shapes, preferably in conical shape with double O-rings, and which creates complete impermeability for measurement in the leak-proof compartment (2).

3. A leakage control mechanism (1) for LPG cylinders (7) according to Claim 1 and 2 **characterized in that** it contains minimum one measurement equipment (4) which monitors the pressure changes of the leak-proof compartment (2) after full impermeability is obtained, and which emits the signals that are required for automatically separating leaking cylinders (7) from the line according to the pressure differences that occur in the case of a leakage.

4. A leakage control mechanism (1) for LPG cylinders (7) according to Claims 1 to 3 **characterized in that** it contains a compensation tank (5) which compensates the pressure changes in the external environment and creates an environment with a constant pressure; so the pressure changes in the leak-proof (compartment) are correctly detected by the measuring equipment (4).

Patentansprüche

1. Ein Lecksuch-Mechanismus zur Verwendung bei der Leckprüfung von LPG-Behältern umfassend,

   - mindestens einen lecksicheren Raum (2),
   - eine undurchlässige Oberfläche (3) in dem lecksicheren Raum (2),
   - eine kleine Meßeinrichtung (4), welche sich zwischen dem lecksicheren Raum (2) und dem Ausgleichsbehälter (5) befindet und mit den Ventilen verbunden ist,
   - mindestens einen Ausgleichsbehälter (5), der für einen gleichbleibenden äußeren atmosphärichen Druck sorgt und eventuelle Druckänderungen verhindert, wodurch eine sichere Messung gewährleistet wird,
   - mindestens zwei Auslassventile (6), die auf- und zugemacht werden können, um den im Regelmechanismus entstehenden Druck abzuladen, ein Leckprüfmechanismus (1) für LPG-Behälter **dadurch gekennzeichnet, daß** der einen LPG-Behälter (7), der gegen Leckverlust geprüft ist und mindestens einen lecksicheren Raum (2) aufweist, worin der Behälter (7) zur Messung von Undichtigkeiten angeordnet wird und welcher den Behälter (7) von der äußeren Umwelt isoliert.

2. Ein Leckprüfmechanismus (1) für LPG-Behälter (7) gemäß Anspruch 1, **dadurch gekennzeichnet, daß** er eine undurchlässige Oberfläche (3) aufweist, die in verschiedenen Formen, vorzüglich in der Form eines Kegels mit O-Ringen sein kann, und welche die gesamte Dichtung für Messung im lecksicheren Raum (2) bildet.

3. Ein Leckprüfmechanismus (1) für LPG-Behälter (7) gemäß Ansprüche 1 und 2, **dadurch gekennzeichnet, daß** er mindestens eine Meßeinrichtung (4) aufweist, welche nach der Erreichung der vollen Undurchlässigkeit die Druckänderung des lecksicheren Raums (2) überwacht und die Signale aussendet, die erforderlich sind gemäß den Druckänderungen, die im Falle eines Leckverlustes entstehen, die undichten Behälter (7) von der Linie automatisch abzutrennen.

4. Ein Leckprüfmechanismus (1) für LPG-Behälter (7) gemäß Ansprüche 1 bis 3, **dadurch gekennzeichnet, daß** er einen Ausgleichsbehälter (5) umfaßt, der die Drcukänderungen in der äußeren Umgebung ausgleicht und eine Umgebung mit konstantem Druck ausbildet, damit die Druckänderungen im lecksicheren Teil (Raum) durch die Meßeinrichtung (4) richtig erfaßt werden.

Revendications

1. Mécanisme de contrôle de fuite (1) utilisé pour la détection de fuite dans les cylindres de LPG (7), **caractérisé en ce qu'**il comporte un compartiment (2) à l'imperméabilité minimal dans lequel est placé un cylindre (7) positionné pour mesurer la fuite et isoler ledit cylindre (7) de l'environnement extérieur et un cylindre de LPG (1) contrôlé contre la fuite, comportant

   - Un compartiment résistant à l'étanchéité minimale (2),
   - Une surface imperméable (3) dans ledit compartiment étanche (2)
   - Un petit équipement de mesure (4) se trouvant entre ledit compartiment étanche (2) et le réservoir d'équilibrage (5), et relié avec des valves, et
   - Au moins un réservoir d'équilibrage (5) assurant une pressure constante extérieure et empêchant possibles changes de pression, et ainsi assurant une mesure sûre,
   - Au moins deux clapets de décharge (6) s'ouvrant et se fermant afin de décharger la pression formée à l'intérieur du mécanisme de contrôle.

2. Mécanisme de contrôle de fuite (1) pour les cylindres de LPG (7) selon la revendication 1, **caractérisé en ce qu'**il comprend une surface d'imperméabilité pouvant être en formes différentes, de préférence, en forme conique avec double anneaux annulaires, et créant une imperméabilité complète afin de réaliser mesures dans ledit compartiment étanche (2).

3. Mécanisme de contrôle de fuite (1) pour les cylindres de LPG (7) selon la revendication 1 ou 2, **caractérisé en ce qu'**il comprend au moins deux équipements

de mesure (4) contrôlant les changements de pressure dudit compartiment étanche (2) après imperméabilité complète est obtenu, et émettant signaux requis pour séparer lesdits cylindres (7) automatiquement de la ligne selon les différences de pressure apparaissant en cas de fuite.

4. Mécanisme de contrôle de fuite (1) pour les cylindres de LPG (7) selon la revendication 1 ou 3, **caractérisé en ce qu'**il comprend un réservoir d'équilibrage (5) compensant les changements de pressure à l'environnement extérieur et créant un environnement à pressure constante; et ainsi les changements de pressure dans (ledit compartiment) étanche sont correctement détectés par équipement de mesure (4).

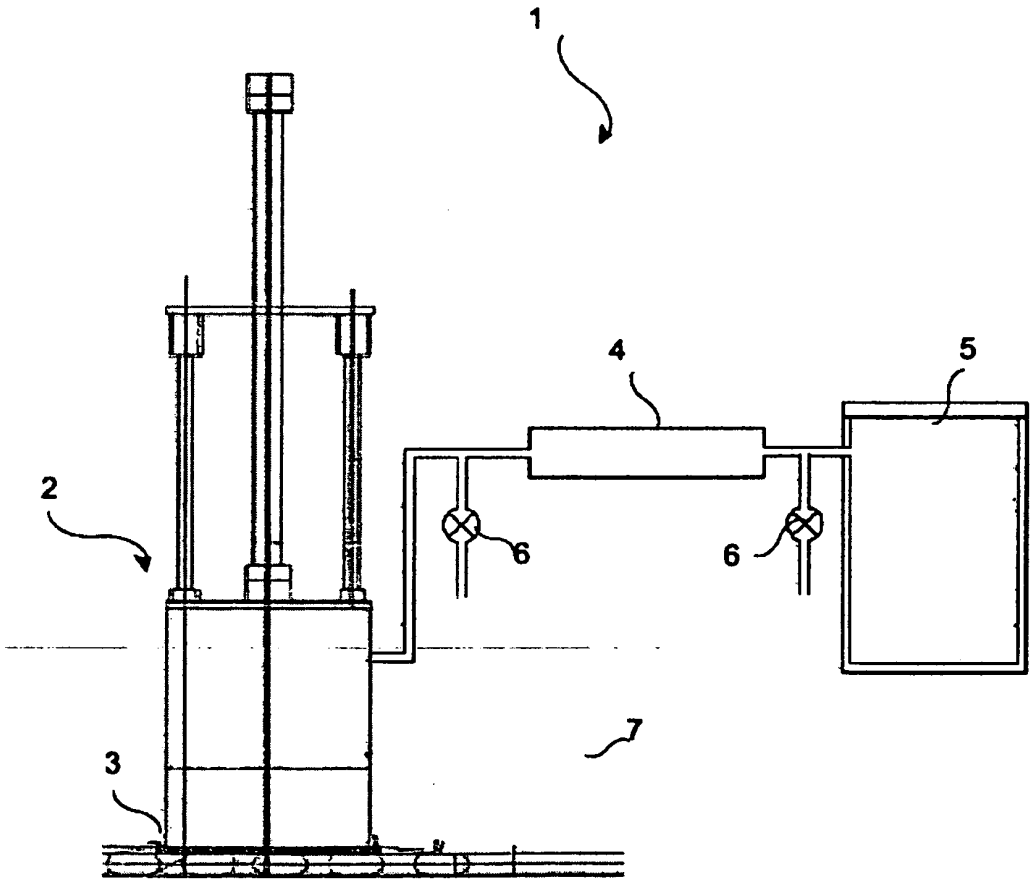

Figure 1

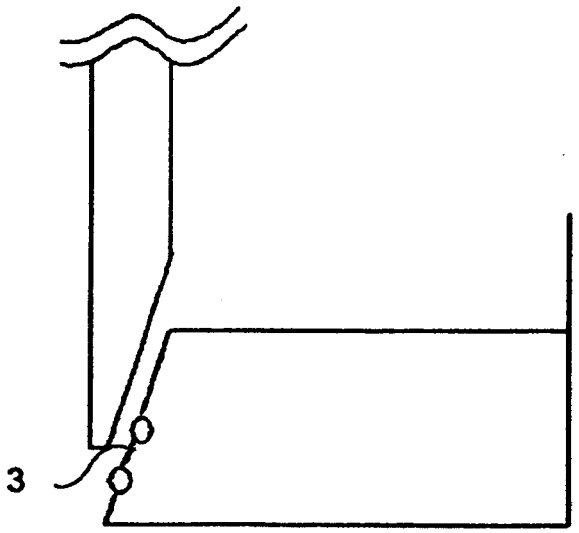

Figure2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0387542 A **[0003]**
- EP 0441632 A **[0004]**
- JP 2000352539 B **[0005]**
- US 5831147 A **[0006]**