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(54) **Pressure vessel with flange provided with handle**

(57) The present invention relates to a gas cylinder (1) provided with a flange (3) or base ring, provided with a handle (5), by providing the handle (5) with a recess of opening (8) in the flange. Such gas cylinder (1) is also provided with a handle (10) at the top end, such that the gas cylinder (1) can easily and safely be manually and horizontally transported.

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Description

Technical Field

[0001] The present invention relates to a pressure vessel, in particular a gas cylinder. More in particular, the invention relates to a base ring or the flange of the pressure vessel.

Background of the invention

[0002] An important physical property of gasses in general is the fact that they are compressible. Hence, storage of gasses is usually done at elevated pressure. The advantage of such storage is that a large amount of gas, hence a large initial volume of gas, can be compressed and stored into a small volume. Depending of the physicochemical properties of the gas, in particular the vapour pressure and the boiling point associated therewith, compressed gasses may become liquid at a given temperature. Apart from compressed gasses (for example oxygen or nitrogen), and gasses liquefied under pressure (for example propane or chlorine), there is also the option to store gasses under pressure in a dissolved state (for example acetylene dissolved into an acetone-saturated solvent).

[0003] For storing of gasses at elevated pressure, the storage units should comply to certain demands. First of all, the storage units should be resistant to elevated pressure. In general, such storage units are called pressure vessels. These (sealable) pressure vessels are filled with the gas, wherein the maximum pressure is variable, depending on the type of pressure vessel. In general, the maximum pressure may be as much as a multiple of several hundred times the atmospheric pressure. Apart from the resistance to elevated pressure, the choice of material for a pressure vessel is determined by the type of gas that needs to be stored. The pressure vessel should be chemically inert with respect to the stored gas. In other words, the stored gas may not impair the pressure vessel (e.g. corrosion), which would present a considerable risk of leakage. Therefore, most pressure vessels are manufactured from steel or aluminium, but use is also made of different composite materials with a very high strength.

[0004] Since the pressure difference that is build up in the pressure vessel, relative to the ambient pressure, may present potentially grave dangers, the design of pressure vessels is strictly regulated, and certain structural demands are imposed. The sudden release of gas stored under high pressure may indeed inflict serious damage, both to the environment and to persons in the immediate vicinity. Apart from the materials used to manufacture the pressure vessels, also the thickness of the material is a determining structural factor with regard to safety. In general, the higher the pressure, the thicker the walls of the pressure vessel should be designed. Hence, a major consequence thereof is that pressure vessels in general are relatively heavy to very heavy.

[0005] A further structural characteristic that aids in the resistance to elevated pressure is the shape of the pressure vessel. In general, pressure vessels have a cylindrical shape, wherein the cylinder is closed at both ends with convex-formed end caps (mostly with a hemispherical, ellipsoidal or torispherical shape). Such a design offers an excellent pressure resistance, since the internal pressure is evenly divided over the inner surface and there are few weak spots (e.g. corners) in such a pressure vessel.

[0006] The specific cylindrical shape with convex end caps of a pressure vessel necessitates a number of additional modifications for the positioning or placement of such a pressure vessel. Since with such a pressure vessel, flat surfaces are not present, an additional support needs to be provided. With vertically positioned pressure vessels, wherein the longitudinal axis of the cylinder is perpendicular to the foundation, in general a base or flange is provided. Said flange is provided with a flat bottom and its top is usually welded to the cylinder. Hence, the pressure vessel may be vertically positioned in a stable manner on a flat foundation. Said flange also offers some form of protection to the pressure vessel as the cylinder is not in direct contact with the foundation.

[0007] The specific structural characteristics of pressure vessels in general, and of gas cylinders in particular, lead to the fact that transportation thereof is not always easy. As mentioned before, the weight of pressure vessels is quite considerable. Hence, it is preferred to move pressure vessels on wagons, trolleys and the like. Sometimes, transportation in such a manner is not possible (for example because of a height difference or lack of space), such that the pressure vessels need to be moved manually. To this end, at the top of the pressure vessel usually one or more handles are provided in all kind of embodiments.

[0008] Such handles allow to move the pressure vessel in an upright position. However, there are a number of disadvantages to this. As pressure vessels are usually elongated cylinders, transportation by means of one or more handles at the top is very clumsy. Not only is the carrier hindered when walking, often there is a lack of overview, such that safety is compromised. Furthermore, such way of transportation is not very ergonomic and may lead to back and/or other physical complaints. Combined with the in general high weight of a pressure vessel and the potential explosive force by the enormous pressure in the pressure vessel, this may lead to a considerable safety risk.

[0009] To this end, the invention provides a structural modification of the flange, such that the safety risks, both to the environment and to the carrier are considerably reduced.

Summary of the invention

[0010] The present invention related to a flange and a pressure vessel provided with such a flange. As men-

tioned before, a pressure vessel is usually provided with a flange to provide a stable base. The invention relates to the provision of at least one handle to such a flange. The handle is integrated into the flange and is designed such that it can be completely enclosed by a hand for a firm grip. To this end, the flange is provided with a recess such that an opening is formed between the flange and the gas storage unit, which opening is sufficiently large to be enclosed by a hand. The top end of the pressure vessel, the end which is provided with a gas discharge opening, is also provided with at least one handle. The handles on the top and on the flange are mutually in line with each other, such that the pressure vessel can easily manually be transported. The present invention is an improvement of the already known embodiments of pressure vessels, since it facilitates the transport of such pressure vessels. Furthermore, the invention provides a more safe and ergonomic way of transportation.

Description of the Figures

[0011]

Figure 1 shows a perspective front view of a pressure vessel according to the prior art.
Figure 2 shows a perspective front view of a preferred embodiment of the invention.
Figure 3 shows a detailed perspective front view of a flange of a pressure vessel according to the prior art (Figure 3a) and of a preferred embodiment of the invention (Figure 3b).
Figure 4 shows a vertical cross section of a preferred embodiment of the invention.

Definitions

[0012] In the context of the present invention, a pressure vessel is a sealable container, designed to store gasses or liquids at an elevated pressure, compared to the atmospheric or ambient pressure. Examples of pressure vessels are rounded cylindrical containers such as, among others, gas cylinders, gas containers, gas canister, gas bottle.

[0013] In the context of the present invention, a flange is meant to be a base or base ring, suitable to be fitted to the bottom side or base with regard to the longitudinal axis of a pressure vessel, in order to provide the pressure vessel with the necessary stability. A flange is usually a hollow ring-like or cylindrical structure with a flat bottom. The height of the flange is variable, but is preferably not more than 10 cm. The top of the flange is usually welded to the pressure vessel. The flange can be welded all around, but more preferably, the flange is welded to the pressure vessel via discrete contact points. Also, other fastening techniques, such as the shrinkage technique are options.

[0014] In the context of the present invention, handle is meant to be a means allowing an object to be gripped by hand. The handle is fixed to or integrated with the object and can be enclosed by a hand. With a handle is also meant a grip, hilt, hold, butt, lever, ear, hinge, button, crank, latch, bracket, holding device, support, mounting, band, strap. In particular is meant by handle of a flange, a recess provided in a flange, the dimensions of which allow to enclose the flange mounted on a pressure vessel by hand.

Detailed description of the invention

[0015] A preferred embodiment of the present invention is described by way of the figures. Such preferred embodiment comprises a gas cylinder provided with a flange provided with a handle.

[0016] Preferably, propane or butane gas cylinders are used with a content between 10 and 20 kg, more preferably about 15 kg (plus or minus 2 kg). Preferably, the height of the gas cylinder is between 50 and 100 cm, and more preferably about 75 cm (plus or minus 10 cm). Preferably, the diameter of the gas cylinder is between 20 and 50 cm, and more preferably about 35 cm (plus or minus 7 cm).

[0017] The gas cylinder (1) consists of a gas storage unit (2) which is provided with a flange (3). The gas storage unit (2) is a cylindrical-shaped container provided with convex closed end caps. In vertical position, the top cap of the gas storage unit (2) is provided with a gas discharge opening. The gas storage unit (2) is sealable and can be provided with a gas discharge valve (20) and a pressure regulator (21). A protective cover (9) can be provided to prevent the gas discharge valve (20) from being damaged.

[0018] The flange (3) is provided at the base (the bottom end relative to the longitudinal axis of the pressure vessel) of the gas storage unit (2). In general, the flange (3) provides the necessary stability to the gas storage unit (2) by its flat bottom and also offers some protection to the convex end of the gas storage unit (2). In general, the flange (3) has a ring-shaped or hollow cylindrical structure, wherein the diameter (17) of the flange (3) is usually as large as the diameter (15) of the gas storage unit (2). Such embodiment leads to a minimal loss of space. Usually, the flange (3) is welded on several points (4) to the gas storage unit (2). Alternatively, the flange (3) may also be connected to the gas storage unit (2) by the shrinkage technique or any other common technique.

[0019] The present invention is characterized by the presence of at least one handle (5) on the flange (3), there where on the prior art pressure vessels (1') no handle is found on the flange (3'). If multiple handles (5) are provided on the flange (3), preferably, they are provided symmetrically. The handle (5) forms an integral part of the flange (3). To this end, the flange (3) and handle (5) are manufactured from the same piece of base material and together, they form a whole. The advantage thereof is that there are no protruding parts present on the flange (3) and the flange (3) with handle (5) has a compact struc-

ture and does not require extra space. Furthermore, less material is required for manufacturing the flange (3) and handle (5) and the strength of such a structure is better warranted relative to a separate handle attached (e.g. welded) to the flange.

[0020] The handle is formed by providing the flange (3) at the top side with two notches (7) at a specified distance from each other, wherein the intermediary part (6) is curved inwardly. The height (19) of the handle (5), as well as the width, are such that the handle (5) can be enclosed by a hand. To this end, the height (19) of the handle (5) is usually smaller than the total height (18) of the flange (3). An additional advantage of such a structure is that the space or opening (8) between the handle (5) of the flange (3) and the gas storage unit (2) is sufficiently large for a hand to fit in.

[0021] The distance between the notches (7) is variable. In general, preferably this distance is minimum 5 cm, and more preferably minimum 10 cm, such that the handle (5) can be enclosed by a complete hand. Depending on the diameter (15, 17) of the gas storage unit (2) and the flange (3), and also the weight of the pressure vessel (2), the distance between the notches may be increased, such that the handle (5) is sufficiently large to optionally be enclosed with two hands.

[0022] Alternatively, the handle (5) can be formed by providing the top side of the flange with a recess, such that an opening (8) is formed between the gas storage unit (2) and the flange (3) having dimensions such that the flange (3) near the recess (8) can be enclosed by a hand. The edges of the recess (8) may optionally be finished or adapted such that the contact area with the hand is increased. To this end, for example inserts or frames made of plastic can be provided.

[0023] In another embodiment, the flange (3) may be provided with one or more openings. Preferably, such openings are provided centrally in the flange with respect to the height (18) of the flange (3), for example by punching. The dimensions of the openings are such that the flat of a hand can be inserted into the opening, in order to enclose the flange by a hand. Preferably, the openings are about 10 cm wide and about 3 cm high. The edges of the openings may optionally be finished or adapted such that the contact area with the hand is increased. To this end, for example inserts or frames made of plastic may be provided. Also, bending at least one of the edges is an option.

[0024] According to the present invention, the pressure vessel (1) is further provided with one or more handles (10) at the top end of the gas storage unit (2). This is the end which is also provided with a gas discharge opening and thus opposite to the end where the flange (3) is connected to the gas storage unit (2). The handle on the top end (10) is provided in line with the handle on the flange (5), with respect to the longitudinal axis of the pressure vessel (1). Both handles (5, 10) are located at the same side of the pressure vessel (1). In a preferred embodiment, the handle at the top end (10) consists of two vertical side wall (11), which are connected with a horizontal central section (12), which central section is preferably provided with a plastic insert (13). Preferably, the handle at the top end (10) is welded to the gas storage unit (2). Alternatively, the pressure vessel may be provided on the top end with a collar or ring, optionally a closed structure around the gas discharge opening, wherein a handle has been integrated. Other common forms of handles are also an option.

[0025] The diameter (15) of a pressure vessel in general and a gas cylinder in particular is usually smaller than the height (16) of the pressure vessel. Hence, pressure vessels usually have an elongated shape. The known pressure vessels (1') are usually provided with one or more handles at the top end. These permit the pressure vessel to be transported manually. The elongated shape of pressure vessels, as well as the usually heavy weight, lead to such a manual transport which is often clumsy, not ergonomic and often unsafe. The present invention provides a solution by also providing the flange (3) at the base of the pressure vessel with a handle (5). This handle (5) permits to transport the pressure vessel manually and horizontally, which is - from an ergonomic point of view - more interesting by providing an improved weight balance with less load on the body of the carrier. As the handle (5) can be completely enclosed by a hand, the carrier has an improved grip and the transport may be performed in a safer manner. The pressure vessel may slip less quickly out of the hands of the carrier. Also, the rounded shape of the handle (5) contributes to the comfort (a larger contact area with the hand and hence, a less concentrated load) and hence, to the safety with manual transportation. Furthermore, the handle (5) is integrated in the flange (3), such that a compact structure is formed and no additional external means need to be used for transportation. An additional advantage of a pressure vessel (1) provided with a flange (3) with a handle (5) is that transportation can be done in a safe manner by two carriers, for example if the dimensions (in casu the length) or the weight of the pressure vessel (1) do not allow the transportation by one carrier.

Claims

1. Gas cylinder (1) for temporary storage of gas at elevated pressure, comprising a rounded cylindrical-shaped gas storage unit (2) provided with a gas discharge opening and at least one handle (10) at one end and a ring-shaped flange or base (3) having about the same diameter (17) as the diameter (15) of the gas storage unit (2) attached around the opposite end, **characterized in that** the flange comprises at least one recess or opening (8) for use as a handle (5), wherein the flange near the recess or opening can be enclosed by a hand.

2. Gas cylinder according to claim 1, **characterized in that** the flange has a preferred height between 5 and 10 cm.

3. Gas cylinder according to any one of the claims 1 to 2, **characterized in that** the recess is formed by providing the flange at the top side of two notches (7) at a specified distance from each other, wherein the intermediary part (6) is curved inwardly.

4. Gas cylinder according to claim 3, **characterized in that** the distance between the notches is preferably at least 5 cm, and more preferably at least 10 cm.

5. Gas cylinder according to claim 1, **characterized in that** at least one edge of the recess or opening is provided with an insert or frame for increasing the contact area.

6. Gas cylinder according to any one of the claims 1 to 5, **characterized in that** the recess or opening provided on the flange, and the handle provided on the opposite end of the gas cylinder are in line with each other, with respect to the longitudinal axis of the gas cylinder.

7. Gas cylinder according to any one of the claims 1 to 6, **characterized in that** the flange is welded to the gas storage unit.

8. Gas cylinder according to any one of the claims 1 to 7, **characterized in that** the gas cylinder is a propane gas cylinder or butane gas cylinder.

9. Gas cylinder according to any one of the claims 1 to 7, **characterized in that** the gas cylinder preferably has a content between 10 and 20 kg, and more preferably a content of about 15 kg plus or minus 2 kg.

10. Gas cylinder according to any one of the claims 1 to 7, **characterized in that** the gas cylinder preferably has a height between 50 and 100 cm, and more preferably about 75 cm plus or minus 10 cm.

11. Gas cylinder according to any one of the claims 1 to 7, **characterized in that** the gas cylinder preferably has a diameter between 20 and 50 cm, and more preferably about 35 cm plus or minus 7 cm.

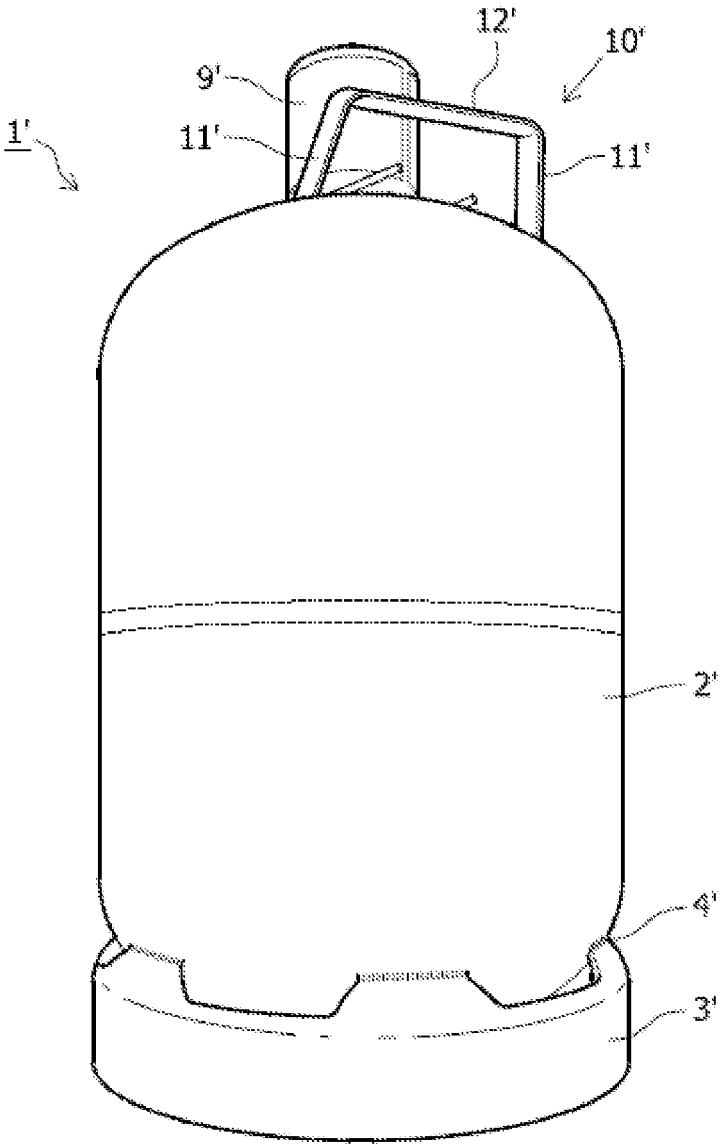


Figure 1

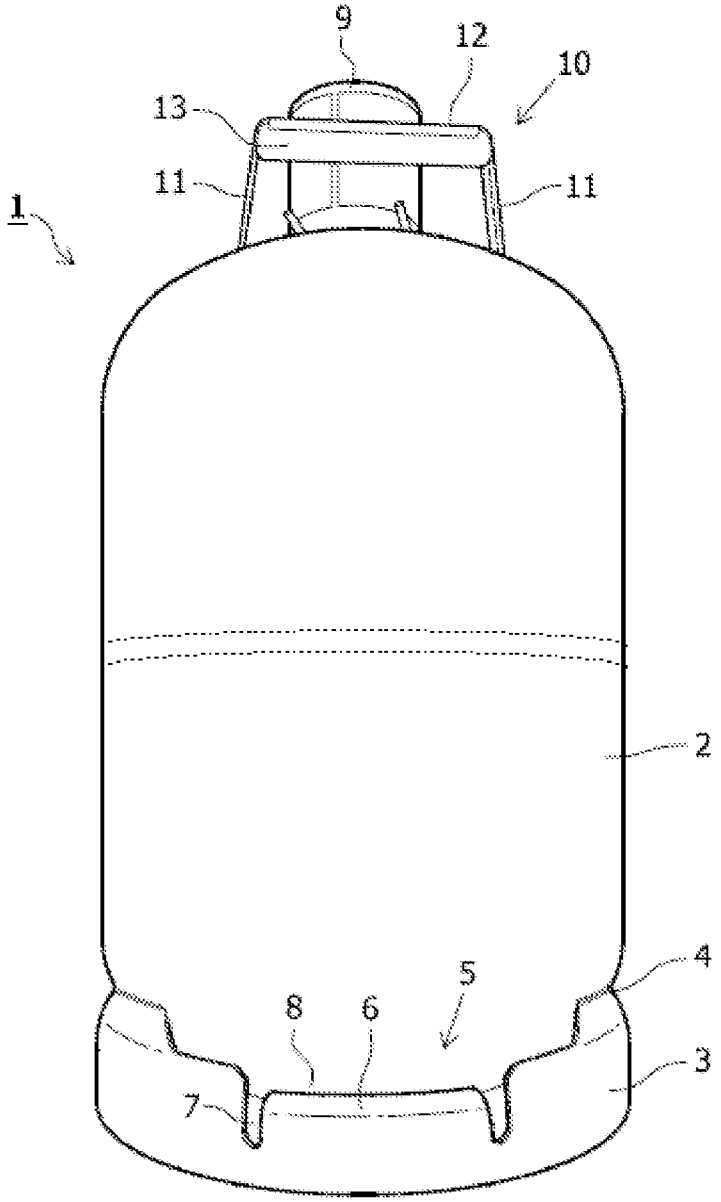
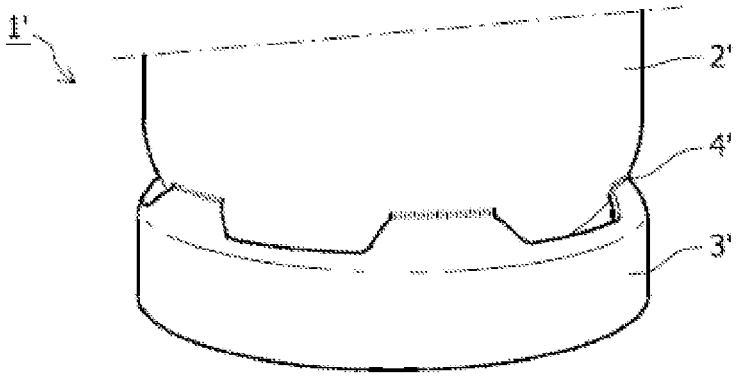


Figure 2

A



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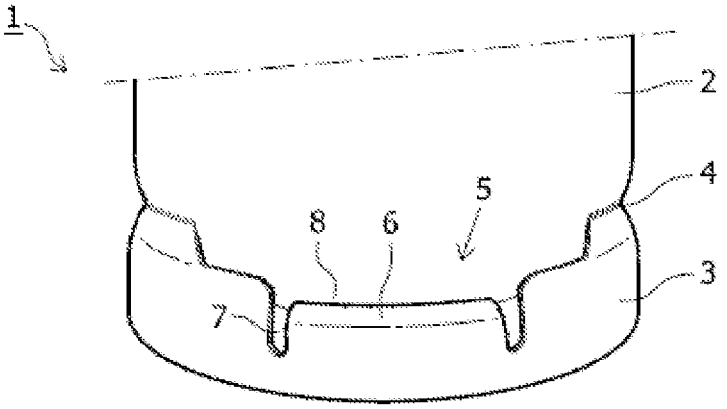

Figure 3

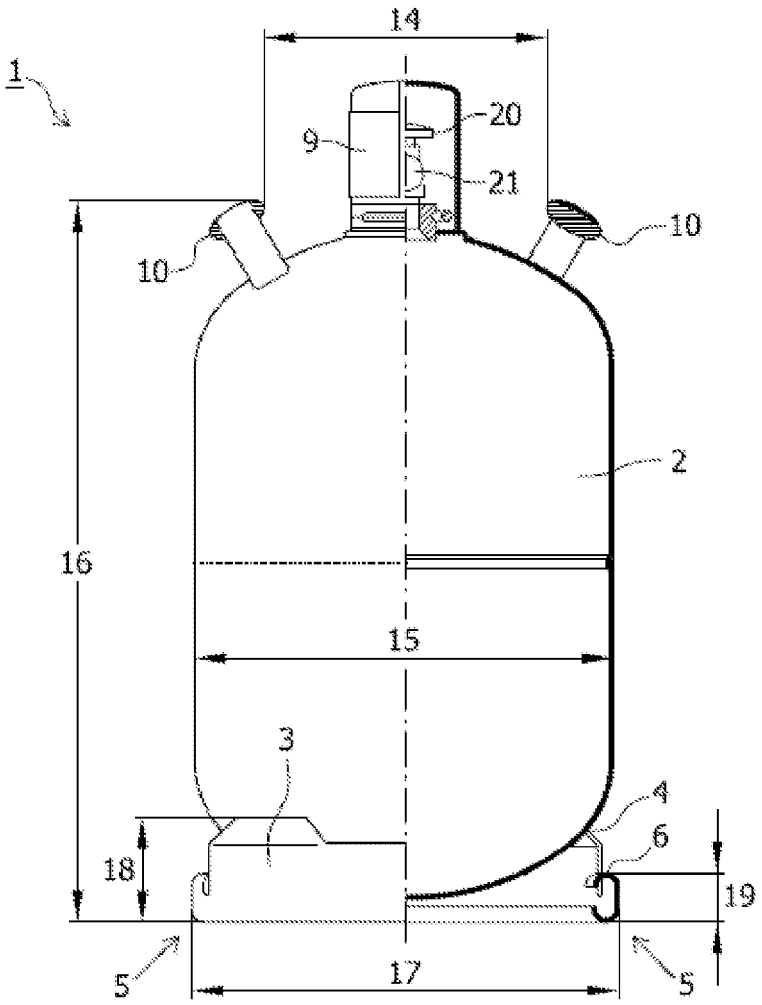

Figure 4

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 8384

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 June 2010	Lendfers, Paul

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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