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EUROPEAN PATENT APPLICATION

21 Application number: 88850099.8

51 Int. Cl.⁴: **F 17 C 3/02**
F 17 C 9/02, F 17 C 13/12

22 Date of filing: 23.03.88

30 Priority: 25.03.87 SE 8701242

43 Date of publication of application:
28.09.88 Bulletin 88/39

84 Designated Contracting States:
AT BE CH DE ES FR GB IT LI LU NL

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A request for correction of page 4 of the originally filed description has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 2.2).

54 Arrangement in a tank for cooling- or freezing medium.

57 The present invention relates to an arrangement in a tank (1), especially for holding an evaporable liquid medium intended for cooling and freezing purposes and having low temperature, such as nitrogen and the like, which tank has a filling opening and a permanently open outlet pipe (14) for leading evaporated medium to a receiving space, for instance the space of a loading container.

The novel features of the invention reside in that the outlet pipe (14) for evaporated medium, which has its inlet end (21) located in a portion of the medium tank (1) which, in the normal position of the tank, is occupied by evaporated medium, has at least one likewise permanently open branch conduit (22) having an inlet opening (24) located in a portion of the tank which, when the tank is in a position different from its normal position, is occupied by evaporated medium in order, whether the tank is in its normal position or in a position different therefrom, to provide a free outlet for evaporated medium.

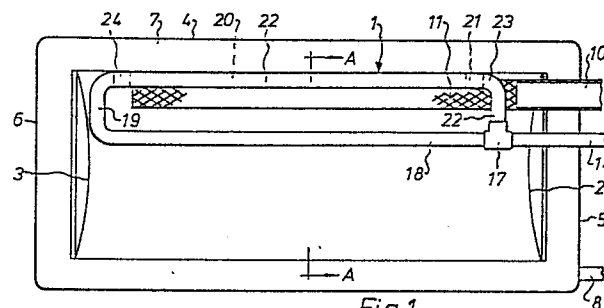


Fig. 1

Description

ARRANGEMENT IN A TANK FOR COOLING OR FREEZING MEDIUM

The present invention relates to an arrangement of the type stated in the preamble of the claim.

From Swedish Patent 8303938-8 is previously known a lid device for a loading container holding one or more tanks for cooling or freezing medium, more specifically liquid nitrogen or like low-temperature medium. The tanks are provided with outlet pipes which are arranged to be permanently open to the space to be cooled, which means that medium in gaseous form is discharged from the tank as soon as it has been refilled. This invention sets out from the same basic concept of arranging in a space to be kept at a low temperature, one or more refillable tanks from which the temperature-lowering medium in gaseous form freely flows into said space.

Media of the type here discussed, i.e. liquid nitrogen and the like, may involve certain hazards in connection with the handling thereof, e.g. the risk of liquid medium splashing onto unprotected skin. In lid devices of the above-mentioned type, this risk is eliminated in that refilling of the tanks is not carried out until the lid has been applied to the loading container. In the case of loose coolant tanks which, after refilling, are placed in the loading container and the space to be cooled, careless handling may however entail such risks.

The object of the present invention is to provide an arrangement which eliminates the risk of liquid cooling or freezing medium unintentionally escaping, splashing or otherwise causing damage to the user.

The characterizing features of the arrangement according to the invention are recited in the claims.

An embodiment of the arrangement according to the invention will be described in more detail here inbelow with reference to the accompanying drawing, in which Fig. 1 schematically shows a tank according to the invention in longitudinal section, Fig. 2 shows the tank as seen from one end thereof, Fig. 3 is a section taken along the line A-A in Fig. 1, Fig. 4 shows the end portion to the right in Fig. 1 when completed, and Fig. 5 shows a filling device adapted to the arrangement of the invention.

The tank, which is designated 1, has a cylindrical shell and slightly inwardly curved end walls 2 and 3 welded to the shell. The tank may have relatively thin walls since it should not serve as a pressure vessel. The tank is disposed in an outer casing 4 having straight end walls 5 and 6. The space 7 between the tank 1 and the outer casing 4 is completely filled with a foamed plastic insulating material, such as polyurethane. 8 designates a pipe which is used for the foaming. The tank 1 is filled with an anti-slosh material 9 of woolly structure, suitably a material available under the trade name "KAOWOOL".

Through one end wall 2 there extend two pipes. One pipe 10 is a filling pipe which opens inside the tank 1 into a sleeve 11 of net or grid structure. The sleeve 11 is arranged, when refilling the tank with liquid medium, to prevent the wool material from being deformed and to ensure that there is a free passage from the pipe 10 to the opposite end wall 3

of the tank.

As appears from Fig. 4, there is provided at the pipe 10 a connecting member 12 which in the state of operation is equipped with a lid 13 provided with a bursting element which should yield if, for some reason or other, the permanently open outlet should be blocked, thus causing a pressure increase in the tank by evaporation.

The other pipe 14 provided at the tank end wall 2 serves as an outlet for evaporated medium and, as appears from Fig. 4, is connected to a pipe 15 extending to the nozzles (not shown) opening into the transport space. Between the pipe 15 and the pipe 8, used for foaming purposes only, there is mounted a blind pipe length 16 for stabilizing the pipe 15 so that it can be used as carrier handle. In order to prevent rain or waterdrops from entering into the pipe 15 when empty tanks are stored outdoors, the pipe 15 is oriented downwards. An insulating sleeve (not shown) is provided around the pipe 15.

The outlet pipe 14 extending through the tank end wall and the end wall of the outer casing is provided, immediately inwardly of the tank end wall 2, with a T-piece 17 from which a pipe portion 18 extends straight towards the far end wall 3 of the tank in order, via a U-bend 19, to then merge into a straight pipe portion 20 having its open inlet end 21 approximately on a level with the T-piece 17.

A further pipe 22 extends from the T-piece via an angled portion 23 up to the far end wall 3 of the tank where it has its open inlet end 24. The outlet pipe 14 and, thus, the pipe 15 communicate with the interior of the tank via the two openings 21 and 24 each located at one end of the tank 1. The risk of liquid medium being pressed out through the gas outlet pipe in a tank of the type here concerned arises when the liquid surface reaches above the inlet end of the outlet pipe and gas is enclosed in the space thereabove. As long as the tank 1 is in its horizontal position of use, there is no risk - even if a single inlet opening is disposed at the upper portion of the tank - that liquid would escape since the pipe opening is situated entirely above the surface of the liquid. Thus, gas only will leave through the pipe 14. When handling the tank, e.g. if it is carried by the handle provided at one end wall thereof, there would however be a risk, when the tank is filled with liquid, that the gas volume entrapped at the then closed upper portion of the tank, would squeeze liquid out through the outlet pipe. This risk is eliminated by the solution here proposed.

Irrespective of which end of the tank is turned upwards, the upwardly oriented portion of the tank always has a free pipe opening 21 or 24 through which gas can escape unimpededly so that any undesired pressure build-up can be eliminated. When the tank is carried by the handle consisting of the pipe 15, the opening 24 will be situated below the liquid level whereas the opening 21 is exposed. If, e.g. when placing the tank in the transport space,

the other end of the tank happens to be on a lower level, the opening 21 will be covered with liquid while the opening 21 is free. The pipe coil 18, 19, 20 even prevents medium from flowing out by gravity.

At the outer casing 4, there are provided carrier rings or rails 25 by means of which the tank is suspended and pushed into the loading space. The tank thus is intended, when in its position of use, to be in a horizontal position while, when being refilled and stored, it is standing on the end wall 6, suitably provided with adequate protective means, with the handle 15 facing upwards.

Refilling is carried out by means of the filling device 26 (Fig. 5) comprising a filling pipe 27 which is connected by means of a hose or the like 28 to a tank for liquid medium/nitrogen. The pipe 27, which has an end piece at its free end, is substantially smaller than the filling pipe 10 of the tank 1 and the sleeve 11 so that a play is formed between the two pipes.

The filling pipe 27 is fixed to a connecting member 29 designed in substantially the same way as the lid 13 provided with a bursting element, with two eccentric locks arranged to engage with a circumferential recess in a connecting nipple at the connecting member 12 fixed to the end of the pipe 10. The connecting member 29, like the lid 13, has a seal which sealingly engages with the end of the connecting nipple. At the connecting member 29, there is also fixed a jacket 30 surrounding the filling pipe 27 and communicating with the interior of the pipe 10 by openings radially inwardly of said seal. At its far end, the jacket 30 is sealingly connected to the filling pipe 27 and provided with an outlet pipe 31, suitably connected to a hose or the like 32.

When supplying liquid medium into the tank, the medium flows through the pipe 27 and into the pipe 10 and the net or grid sleeve 11 (Fig. 1). Part of the medium will then immediately evaporate and the gas may leave both through the gas outlet 14, 15 previously described and through the play around the portion of the pipe 27 extending into the pipe 10 and the sleeve 11, and the passage at the connecting member and the jacket 30 to the outlet 31, 32. In this manner, refilling can be carried out rapidly since the counter-pressure produced upon evaporation is efficiently equalized. When the tank has been filled to the desired level, the filling device is removed and the lid 13 is applied.

For practical reasons and for reasons of handling, the tank, which during filling is standing on one end wall, should only be filled approximately up to the level of the inlet opening 21 located closest to the filling pipe 10, there being sufficient space and a free outlet for gas evaporating during the filling procedure. In the illustrated embodiment, an outlet piping system having two inlet openings 21 and 24 is eccentrically disposed in the tank, it being presupposed that the tank, when not stored in an upright position, should be oriented with said piping system facing upwards. In a modified embodiment for tanks where such a position cannot always be ensured, one or more further branch conduits having peripherally spaced inlet openings may be provided in the tank so that, even if the tank should be laid down and roll, one pipe opening will always be in a gas-filled

space.

The invention must not be considered restricted to the embodiment described above and illustrated in the drawing, but may be modified in several different ways within the spirit and scope of the accompanying claims.

Claims

1. An arrangement in a tank (1), especially for holding an evaporable liquid medium intended for cooling and freezing purposes and having low temperature, such as nitrogen and the like, said tank having a filling opening and a permanently open outlet pipe (14) for conducting evaporated medium to a receiving space, for instance the space of a loading container, **characterized** in that the outlet pipe (14) for evaporated medium, which has its inlet end (21) located in a portion of the medium tank (1) which, in the normal position of the tank, is occupied by evaporated medium, is provided with at least one likewise permanently open branch conduit (22) having an inlet opening (24) located in a portion of the tank which, when the medium tank is in a position different from its normal position, is occupied by evaporated medium in order, whether the tank is in its normal position or in a position different therefrom, to provide a free outlet for evaporated medium.

2. Arrangement as claimed in claim 1, **characterized** in that the outlet pipe (14) for evaporated medium is designed as a substantially U-shaped coil (20) which, counting from the inlet opening (21), extends towards the portion of the tank which is filled with medium when the tank is in a position different from its normal position, while the branch conduit (22) which is branched from the outlet pipe on a level with the inlet end (21) thereof has its inlet end (24) located substantially on a level with the turning point (19) of the pipe coil (18, 19, 20).

3. Arrangement as claimed in claim 1 or 2, **characterized** in that two or more branch conduits (22) are connected to the outlet pipe (14) and have inlet openings located in portions of the tank which, in conceivable positions different from the normal position of the tank, will be occupied by evaporated medium.

4. Arrangement as claimed in claim 1, **characterized** in that the interior of the tank is filled with anti-slosh material (9), preferably of woolly structure, and that there is inserted in said material a sleeve (11) formed of netting, grating or the like and constituting an open duct from the filling opening (10).

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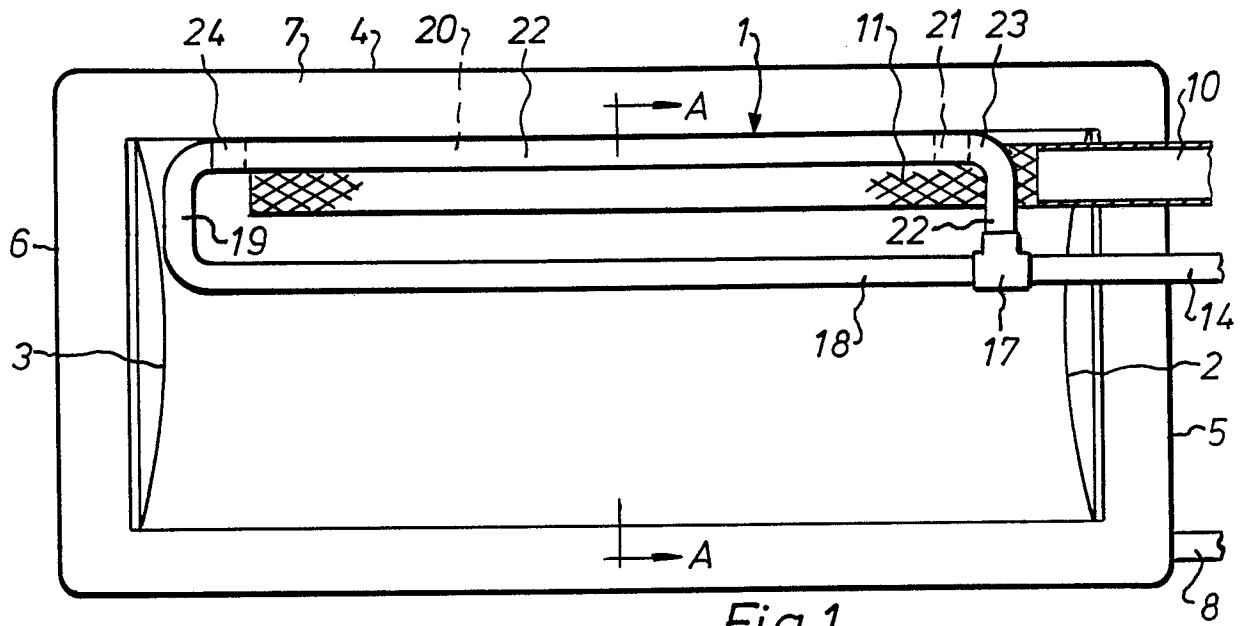


Fig. 1

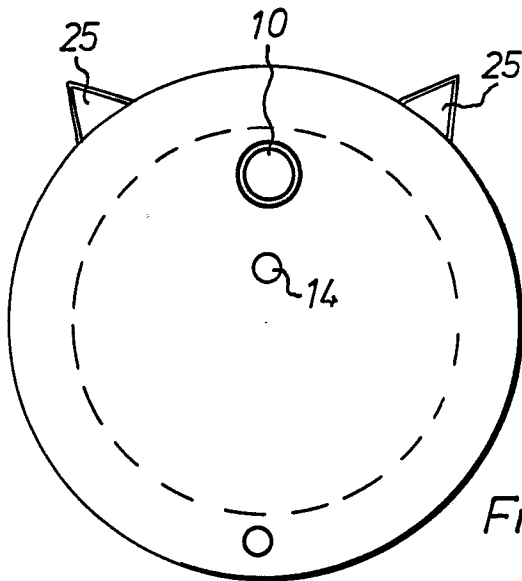


Fig. 2

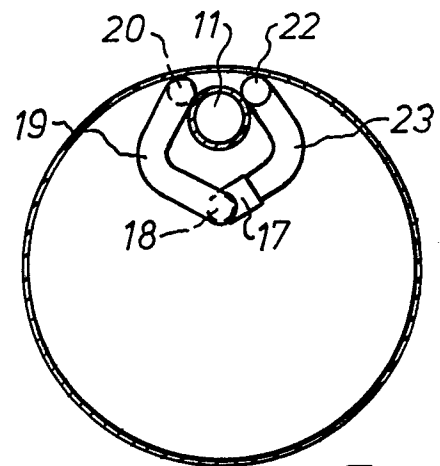


Fig. 3

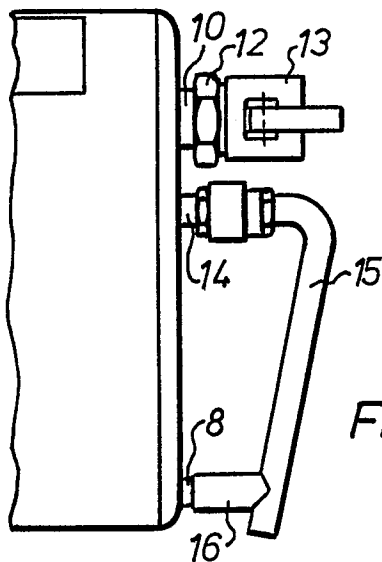


Fig. 4

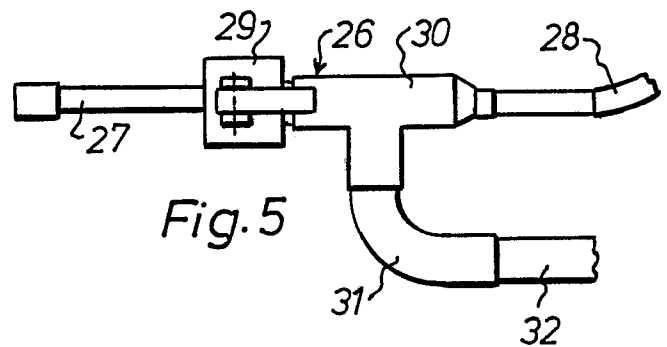


Fig. 5