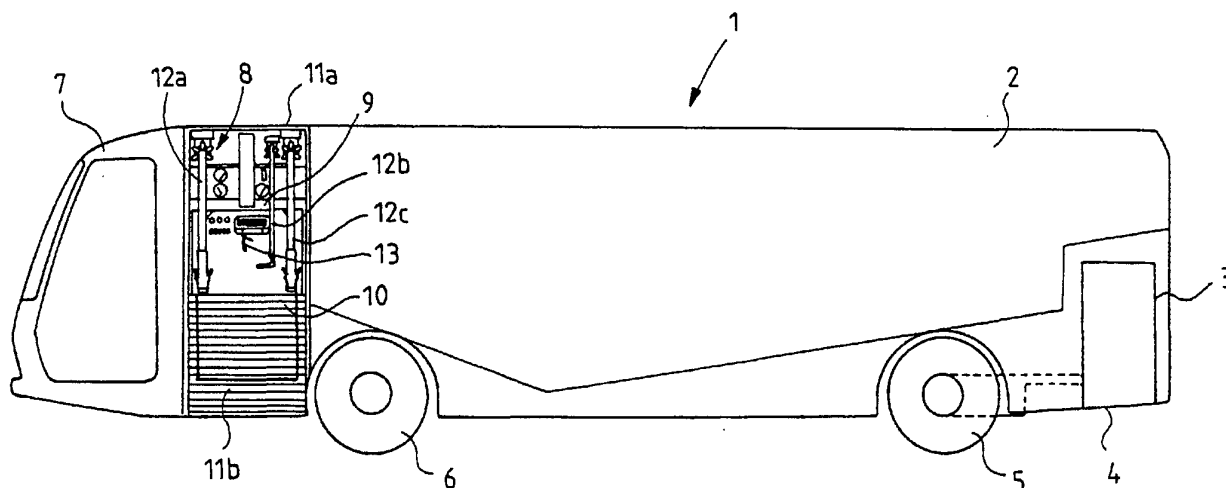




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/FI93/00559 (22) International Filing Date: 28 December 1993 (28.12.93) (30) Priority Data: 925900 28 December 1992 (28.12.92) FI (71) Applicant (for all designated States except US): EURO-TANKKI OY [FI/FI]; Mäkirinteentie, FIN-36220 Kangasala (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): SINKKONEN, Martti [FI/FI]; Reuharinkatu 15 J, FIN-33410 Tampere (FI). (74) Agent: OY KOLSTER AB; Stora Robertsgatan 23, P.O. Box 148, FIN-00121 Helsinki (FI).</p>		<p>(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. In English translation (filed in Finnish).</p>

(54) Title: A TANKER FOR AIRPORT USE



## (57) Abstract

A tanker (1) comprising a pump unit (6) and a lifter (9) arranged between a cab (7) and a tank (2) to enable tanking of aircraft. The lifter (9) is used for adjusting the driver's working plane to be suitable for the tanking. Further, the cage (10) contains controls (13) for the pump unit (8) and the lifter (9), the controls being also capable of being used by remote control.

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## A tanker for airport use

The invention relates to a tanker for airport use, the tanker having a frame arranged on top of front and rear axle arrangements, the frame being formed by a tank, a cab, a pump unit for conveying fuel, a lifter unit with a cage, controls for controlling the lifter unit and the pump unit, and fuel delivery hoses for connecting the pump unit to the fuel tank of an aircraft.

Tankers conventionally used at airports for tanking up aircraft have been developed from tanker frames designed for road traffic, tanking equipment and lifters being arranged therein afterwards. The overall structure is then rather clumsy and seldom practical at an airport. The cage of an articulated lifter is conventionally located at the rear of the tanker. The person filling the fuel tanks of an aircraft - usually the driver of the tanker - has to be in the cage so that his working plane is suitable for filling the tanks of the aircraft. For example, in case of fire or some other danger, the driver has a long way from the cage to the cab of the tanker. Since the movements of the cage are also very slow, it takes the driver a long time to move from the lifter unit in a tanking position to the cab of the tanker in case of danger to drive the tanker away from the vicinity of the aircraft.

At airports having a fuel delivery network underneath, aircraft fuel tanks are filled by a separate tanker, whereby the hoses used for conveying fuel from the fixed fuel delivery network to the aircraft tanks are transported in the tanker. It should also be noted that the aircraft are usually filled after the flight to what is known as a stand-by state. When an aircraft is then transferred to another route, weather conditions

change or the number of passengers varies, the fuel tanks of the aircraft may contain too much fuel, whereby the excess fuel has to be removed from the tanks by means of a tanker specifically designed for the purpose.

5 Consequently, even at relatively small airports three different types of tankers have be used in tanking, whereby the purchase price for different tanking equipment can be very high, and the maintenance costs are also quite high.

10 The object of the present invention is to remove the above defects and to improve the safety at the airport even under difficult tanking conditions. It is essential of the invention that the lifter unit is arranged immediately behind the cab, between the cab and

15 the tank, that the lifter unit with the cage and the controls are protected by a member that can be opened or closed in conjunction with the filling of the aircraft fuel tanks.

An essential idea of the invention is that the

20 lifter unit is arranged between the cab and the fuel tank, whereby it is easy for the driver to move from the lifter unit to the cab and vice versa. In the immediate vicinity of the lifter unit are the ends of the fuel delivery hoses, whereby they are easy to move and connect to the fuel tanks of the aircraft. Another essential

25 idea of the invention is that the lifter unit is protected by a rolling door, which in a closed position protects the lifter unit and the pump unit from dirt and, in winter, snow, when the lifter unit is not in

30 use. The lower part of the rolling door also serves as a wall to the cage of the lifter unit. Further, in the lower part of the rolling door is arranged a safety switch, which allows moving of the cage only when the safety circuit is switched on. It is also an essential

35 advantage that the cab has a sunroof above the driver's

head, the driver seeing the exact position of the tanker in relation to the wing of the aircraft through the sunroof, thereby being capable of positioning the tanker below the wing in a manner desired. A further essential  
5 idea is that the pump system of the tanker can be connected to the fixed fuel delivery network underneath the airport, whereby a separate vehicle for tanking or transportation of equipment is not needed. Further, the pump system of the tanker is arranged to operate such  
10 that it can also remove excess fuel from the wing of the aircraft.

An essential advantage of the invention is that all the tasks of the three different types of tankers can be carried out by means of one tanker, whereby the  
15 different tanker solutions required by different fuel delivery systems become unnecessary. In addition, arrangement of a pump unit between the cab and the tank together with a lifter unit makes it possible to use a transportation tank that is larger in volume. The  
20 solution also significantly improves the safety at the airport since it is possible for the driver to move fast from the lifter unit to the cab of the tanker and to drive the tanker away from the danger zone. Further, the closeable rolling doors protect the lifter unit and the  
25 reeling and pumping mechanisms of the fuel delivery hoses. The lifter unit is thus kept clean and the gauges arranged therein are well protected when the tanker is in motion. It is still easy for the driver to position the tanker in respect of the wing of the aircraft and  
30 to move the lifter unit to the position and height desired, whereby his working position is advantageous with respect to ergonomics. It should also be noted that expensive investments are avoided by this solution, and the need of maintenance decreases considerably.

In the following the invention will be described in greater detail with reference to the attached drawings, wherein

5 Fig. 1 shows a tanker according to the invention with the upper portion of the protective door of the lifter unit in an open position, and

Figs. 2a-2c show by way of example different ways of tanking an aircraft and illustrate the operation of the lifter unit.

10 Fig. 1 shows a schematic view of a tanker 1, comprising a load-bearing tank 2 forming a frame, a motor 3 and a hydrostatic power transmission system 4. Said power transmission system 4 is connected to a rear axle arrangement 5. The wheels attached to a front axle arrangement 6 pivot, whereby the tanker 1 can be steered  
15 from a cab 7. Between the cab 7 and the tank 2 is arranged a fuel pump unit 8 and a lifter unit 9 with a cage 10. The front wall of the cage 10 is formed by a lower part 11b of the rolling door. An upper part 11a  
20 of the rolling door is inserted into the upper part of the tanker. When the cage 10 of the lifter unit 9 is in the basic position, it is located between the cab 7 and the tank 2 and does not project from the outer surface of the tanker defined by them; they form a neat whole,  
25 which has a streamlined outer surface when the rolling door 11 is closed. Fuel delivery hoses 12a-12c of the pump unit 8 are wound on a reel such that during transportation, the ends of the hoses 12a-12c are protected by the closed rolling doors 11a and 11b. Further, gauges  
30 necessary for controlling fuel delivery are connected to the pump unit 8. Fig. 1 also shows controls 13 for the lifter unit 9 and the pump unit 8. The controls 13 can be implemented such that the lifter unit and the pump unit 8 are remote-controllable. Further, in the  
35 lower part 11b of the rolling door is arranged a safety

switch, which switches the safety circuit on when the rolling door 11b is lifted to a position where it forms the front wall of the cage 10. Only after the safety circuit has been switched on is it possible to move the cage 10 upward or downward by the lifting means of the lifter unit 9. Further, in the lower part of the cage 10 are arranged rails 14 on which the cage 10 can be moved sideways with respect to the tanker 1 as shown in Figs. 2b and 2c. Since the rails 14 enabling a sideward movement are known per se, they are not described in greater detail herein. The actuator effecting the sideward movement may be a hydraulic or pneumatic plunger case solution or an electric motor connected to a gear rack, whereby the sideward position of the cage 10 can be defined with sufficient accuracy.

Figs. 2a, 2b and 2c show different ways of filling the fuel tanks of an aircraft or removing the excess fuel from the tanks. Fig. 2a shows a wing 15 of an aircraft in which a fuel tank is arranged. Since the wing is sufficiently low, the driver 16 of the tanker is able to tank up the aircraft, and the fuel delivery hose 12a can be easily connected to the fuel tank of the wing 15 from the ground. Fig. 2a also shows a cross-sectional view of the tanker according to the invention, the cage 10 being lowered by the lifter unit 9 to the ground level. The Fig. also shows a reel 17 from which the fuel delivery hoses 12a can be unwound and on which they can be stored after tanking.

Fig. 2b shows a wing 15' of a larger aircraft, the wing being considerably higher than the tanker. The driver 16 mounts the cage 10 and closes the lower part 11b of the rolling door such that the safety switch switches the safety circuit on and allows the use of the lifter unit 9. After this, the driver 16 may lift the cage 10 and thereby the fuel delivery hose 12a. When the

driver 16 is at a suitable height in respect of the wing 15', he may adjust his position by moving the cage 10 along the rails 14 sideways of the tanker 1. Having positioned the cage 10 suitably for tanking, he may  
5 connect the fuel delivery hose 12a to the filling hole of the fuel tank in the wing 15'.

Fig. 2c shows a situation where the driver 16 has connected the fuel hose 12a to the fuel tank of a wing 15''. However, since the driver 16 has not con-  
10 sidered the working situation safe, he has lowered himself back to the ground level by the lifter unit 9 and operates the pump unit 8 by the detachable controls 13 for the lifter unit 9 and the pump unit 8. The driver 16 is thus better protected during the tanking.

The Figs. and their description are to be understood only as illustrating the idea of the invention. Further, a tanker can be connected to a fuel delivery network underneath an airport in many different ways, e.g. by means of separate delivery hoses which can  
15 be easily transported to the tanking place in the tanker 1. However, it should be noted that fuel delivery of a pump unit can be defined such that a fuel tank of an aircraft can be filled from a container of a tanker if desired, or alternatively from a fuel delivery network  
20 underneath the airport. Also, the fuel flow direction can be altered, whereby a fuel tank of a wing can be emptied either to a tank or to a fuel network underneath the airport. The tanker according to the invention may  
25 vary in its details within the scope of the claims.

## Claims

1. A tanker for airport use, the tanker having a frame arranged on top of front and rear axle arrangements (6, 5), the frame being formed by a tank (2), a cab (7), a pump unit (8) for conveying fuel, a lifter unit (9) with a cage (10), controls (13) for controlling the lifter unit (9) and the pump unit (8), and fuel delivery hoses (12a-12c) for connecting the pump unit (8) to the fuel tank of an aircraft, c h a r a c t e r - i s e d in that the lifter unit (9) is arranged immediately behind the cab (7), between the cab (7) and the tank (2), that the lifter unit (9) with the cage (10) and the controls (13) are protected by a member (11a, 11b) that can be opened or closed in conjunction with the filling of the aircraft fuel tanks.

2. The tanker according to claim 1, c h a r a c t e r i s e d in that the cage (10) of the lifter unit (9) in the basic position does not project from the outer surface of the tanker (1), whereby the cab (7), the lifter unit (9) and the tank (2) form a whole.

3. The tanker according to claim 1 or 2, c h a r a c t e r i s e d in that the member (11a, 11b) protecting the lifter unit (9) and the controls (13) is a rolling door.

4. The tanker according to claim 3, c h a r a c t e r i s e d in that at least one outer wall of the cage (10) of the lifter unit (9) is formed by the lower part (11b) of the rolling door.

5. The tanker according to claim 4, c h a r a c t e r i s e d in that in the lower part (11a, 11b) of the rolling door is arranged a safety switch, which switches the safety circuit on, thereby allowing the use of the lifter unit (9).

5 6. The tanker according to any one of the preceding claims, characterised in that the controls (13) of the pump unit (8) and lifter unit (9) can be detached so that they form a remote-controllable unit.

10 7. The tanker according to any one of the preceding claims, characterised in that the lifter unit (9) comprises lifting means for lifting the cage (10) upward and for lowering it essentially to the ground level.

15 8. The tanker according to any one of the preceding claims, characterised in that the lifter unit (9) comprises horizontal rails (14) on which the cage (10) can be moved sideways with respect to the tanker.

9. The tanker according to any one of the preceding claims, characterised by comprising means for connecting the pump unit to the fixed fuel delivery network of the airport.

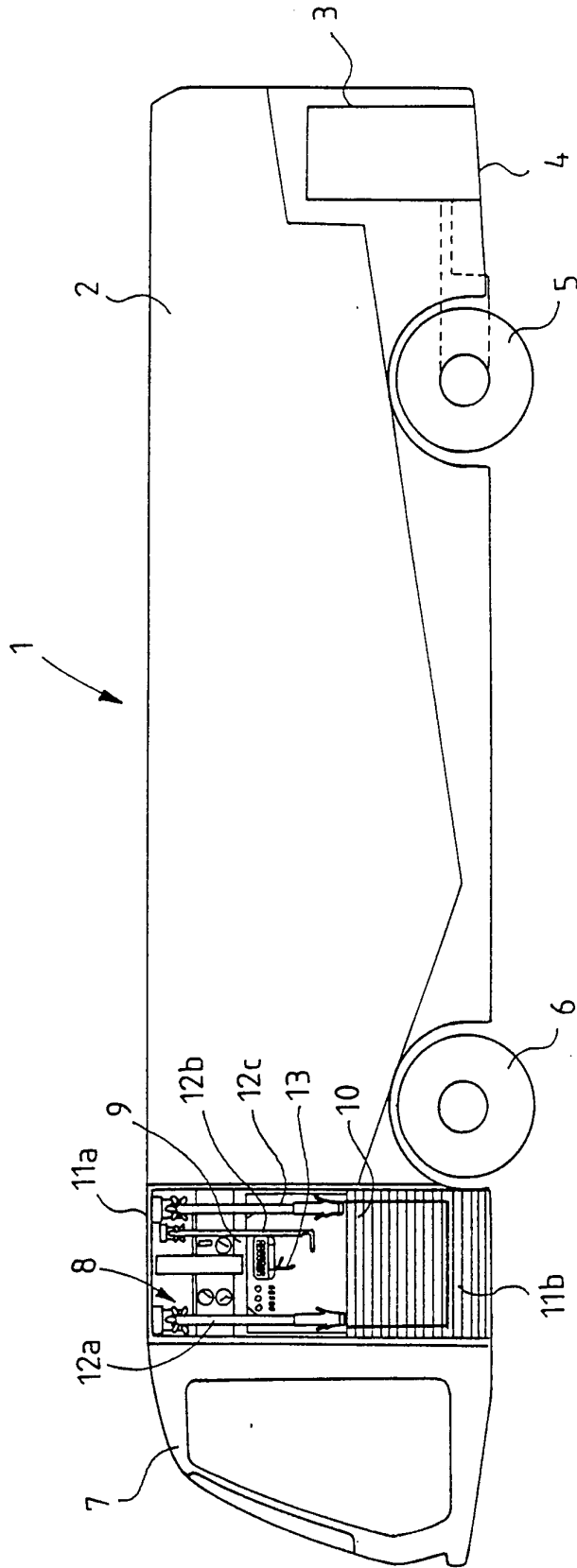


FIG. 1

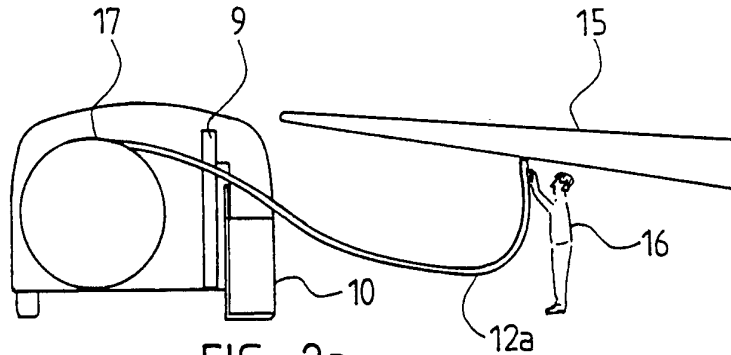


FIG. 2a

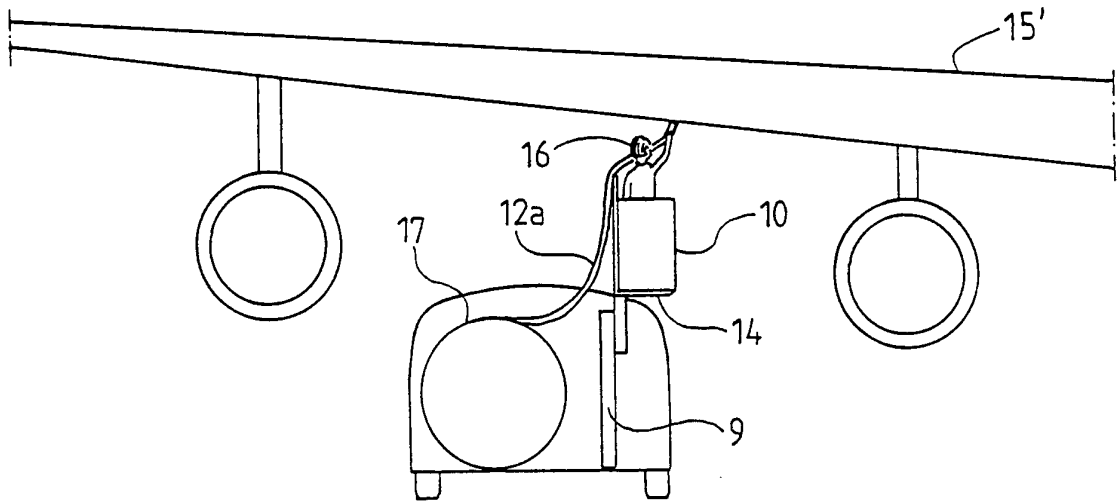


FIG. 2b

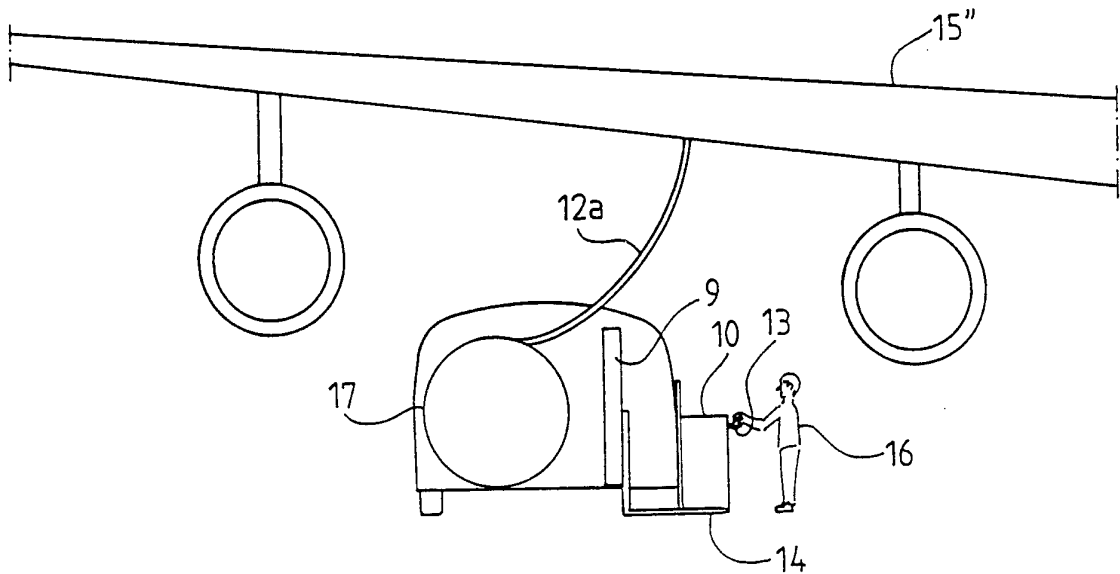


FIG. 2c

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 93/00559

A. CLASSIFICATION OF SUBJECT MATTER		
IPC5: B64F 1/28, B60P 3/22 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC5: B64F, B64D, B60P, B66F		
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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB, A, 1158920 (EAGLE ENGINEERING COMPANY LIMITED), 23 July 1969 (23.07.69), page 2, line 16 - line 30 --	1,2,3,7,9
Y	DE, B, 1145332 (JAY MILLER EITEL), 14 March 1963 (14.03.63), column 3, line 18 - line 20 --	1,2,3,7,9
A	DE, A1, 3334059 (ZEUNER, PETER), 18 April 1985 (18.04.85) --	1,2,3,7,9
A	DE, A, 2901786 (TRÄGER, HARALD), 24 July 1980 (24.07.80) -- -----	1,2,7
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 1158920	23/07/69	NONE	
DE-B- 1145332	14/03/63	NONE	
DE-A1- 3334059	18/04/85	NONE	
DE-A- 2901786	24/07/80	NONE	