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(71) Applicant: **SILEA S.r.l.**
Via Collegio di Spagna, 34
I-40064 Ozzano Emilia (Bologna) (IT)

(72) Inventor: **Zucchini, Giorgio**
Vicolo del Bosco 16
I-40100 Bologna (IT)

(74) Representative: **Modiano, Guido, Dr.-Ing. et al**
Modiano & Associati S.r.l.
Via Meravigli, 16
I-20123 Milano (IT)

(54) Floating saturation device for liquid fuel storage tanks.

(57) Saturation device (10) for liquid fuel storage tanks comprising a ventilation pipe (11) which is rigidly coupled to the top of the tank (2) and is suitable to be connected to the outside. One end of a floating saturation pipe (16) is articulated to the ventilation pipe (11) and has, at its opposite end, a curved tip portion (17) which ensures its immersion in the liquid fuel contained in the tank (2). A coaxial floating pipe (18) is rigidly coupled to the saturation pipe (16) and keeps the free end of the saturation pipe (16) floating on the surface of the liquid fuel.

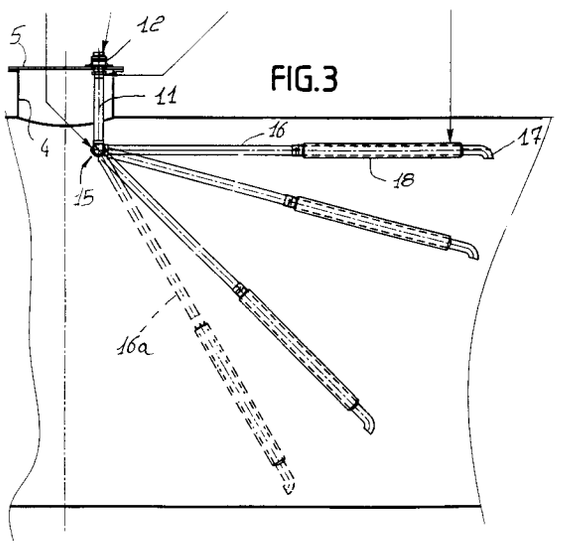

FIG.3

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The present invention relates to a saturation device for tanks for liquid fuels such as gasoline, petrol and the like.

It is known that liquid fuel storage tanks, besides being buried to avoid flammability, must comply with safety rules to avoid the risk of explosion. So-called saturation systems are used for this purpose; in these systems, safety is achieved by forming a non-explosive mixture inside the tank above the liquid fuel.

In particular, in the above mentioned safety systems the air that lies above the liquid is mixed with such a percentage of fuel vapors as to be outside the explosive range (which is defined as being 1.1 to 5.4% of fuel). Indeed, this percentage can be so high as to take the mixture outside the flammability range as well.

As shown schematically in figure 1, known saturation devices have a saturation tray 1 which is located on the bottom of the tank 2 and contains fuel; the saturation tray 1 is connected to the outside by means of a ventilation pipe 3. The air drawn in by negative pressure enters the tank after bubbling through the fuel contained in the tray so that the air becomes saturates.

This saturation system entails a negative pressure that must be overcome to draw the fuel; this negative pressure is proportional to the extent to which the tank is filled. Accordingly, the pump connected to the tank must withstand a stress that increases in proportion to the increase in the level difference H to be overcome.

The aim of the present invention is to solve the above problem by providing a saturation device for liquid fuel storage tanks that allows to minimize the negative pressure to be overcome in order to draw fuel, making said negative pressure independent of the extent to which said tank is filled. In particular, said device facilitates the operation of the pump, which runs with a minimum effort, thus increasing its life and improving all its operating conditions (e.g. noise, cavitation, negative pressure, etc.).

Within the scope of this aim, an object of the present invention is to provide a saturation device which is simple in concept, safe and reliable in operation and versatile in use.

With the foregoing and other objects in view, the invention provides a saturation device for liquid fuel storage tanks, which comprises: a ventilation pipe rigidly coupled to the top of the tank and connectable to the outside; a saturation pipe which is articulated, at one end, to said ventilation pipe so that it floats and has, at its opposite end, a curved tip portion which is suitable to ensure its immersion in the liquid fuel contained in said tank; and floating means rigidly coupled to said floating saturation pipe for keeping the free end of said saturation pipe floating on the surface of said liquid fuel.

Further characteristics of the invention will become apparent from the following detailed description of a preferred embodiment of the saturation device for liquid fuel tanks, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a schematic view of a conventional saturation device;

figure 2 is a corresponding schematic view of the saturation device according to the invention;

figure 3 is a vertical sectional view of a tank equipped with the saturation device according to the invention;

figures 4, 5, 6, and 7 are enlarged-scale views of some details of figure 3;

figures 8 and 9 are detail views of means for the articulation of said saturation pipe, shown respectively in exploded condition and in assembled configuration;

figures 10 and 11 are transverse sectional views of said articulation means in their extreme angular positions.

With particular reference to the above figures, the reference numeral 10 generally designates the saturation device, which is installed in a liquid fuel tank 2. The buried tank 2 is provided with a conventional manhole 4.

The saturation device 10 has a ventilation pipe 11 which is arranged vertically at the top of the tank 2, at the manhole 4, and is rigidly coupled to a fire-stopping saturation element 12 by means of which it can be connected to the outside.

The fire-stopping saturation element 12 has a flange 13 by means of which it is fixed to the lid 5 of the manhole 4 (see figure 4). The fire-stopping saturation element 12 is internally provided with a disk having a preset weight and allowing, in a known manner, the partial discharge of the gas in case of thermal expansion of the liquid fuel contained in the tank 2.

The ventilation pipe 11 is threaded in an upward region in order to fix it to the fire-stopping saturation element 12 and can be locked by means of a lock nut 14 that allows to set its angular position and height (figure 5).

A saturation pipe 16 is articulated to the lower end of the ventilation pipe 11 by means of a joint 15 which is practically of the elbow type (figure 6); said saturation pipe 16 is meant to float inside the tank 2. The saturation pipe 16 has, at its free end, a curved tip portion 17 suitable to ensure its immersion in the liquid fuel contained in the tank 2.

The saturation pipe 16 is externally provided with a coaxial floating pipe 18 (figure 7) suitable to keep the free end of said saturation pipe floating on the surface of the liquid fuel, with the tip portion 17 immersed in said fuel. The floating pipe 18, which is sealed at its ends, in practice forms an air-filled

chamber on the saturation pipe 16.

The joint 15, which is shown in detail in figures 8 and 9, is constituted by two angular connectors or couplings 19 and 20 which are similarly provided with a threaded inlet for screw-thread coupling with a male element 21 and a female element 22 respectively. The male element 21 is suitable to be rotatably inserted in the female element 22 so as to form a seal by means of a pair of annular gaskets 23; the male element 21 is axially retained by an elastic washer 24 which is suitable to abut against an internal shoulder 25 of the female element 22.

The angular rotation allowed to the couplings 19 and 20 is limited by the engagement of an external ridge 26 of the male element 21, which is shaped like a circular arc, within a slot 27 which is formed by the female element 22 along a circular arc that is appropriately longer. In practice, a mutual angular rotation through 60° is allowed between the extreme positions shown in figures 10 and 11.

The operation of the saturation device can be easily understood from the above description.

The saturation pipe 16, which floats by means of the joint 15, floats at all times on the surface of the liquid contained in the tank, varying its inclination as the level of the liquid varies, as shown by the dashed line 16a. The curved tip portion 17 ensures that the pipe is immersed in the liquid.

In practice, the articulation 15 allow the saturation pipe 16 to rotate between a substantially horizontal position when the tank is filled to its maximum level and a position which is inclined downwards by 60° when the tank is filled to its minimum level. This limitation of course prevents the saturation pipe 16 from striking the bottom of the tank.

This minimizes the level difference to be overcome to draw fuel, which is determined essentially by the curved part of the tip portion 17 (see figure 2, where this level difference is designated by H). This level difference is practically constant as the angular position of the saturation pipe 16 varies, and therefore the negative pressure to be overcome to draw fuel is equally constant, regardless of how full the tank is.

The described saturation device therefore allows to minimize the negative pressure to be overcome to draw fuel, making it independent of how full the tank is.

The fact should also be noted that the saturation device is provided in such a manner that it can be inserted in the tank without disassembling the lid of the existing manhole, and therefore it is possible to install it in existing systems.

Furthermore, adjustment of the angular position and height of the ventilation pipe 11 allows to arrange the saturation pipe 16 so that it floats in an optimum manner, particularly avoiding interference with any pipes present inside the tank.

In the practical execution of the invention, the materials employed, as well as the shapes and dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Saturation device for liquid fuel storage tanks, characterized in that it comprises: a ventilation pipe rigidly coupled to the top of the tank and connectable to the outside; a saturation pipe which is articulated, at one end, to said ventilation pipe so that it floats and has, at its opposite end, a curved tip portion which is suitable to ensure its immersion in the liquid fuel contained in said tank; and floating means rigidly coupled to said floating saturation pipe for keeping the free end of said saturation pipe floating on the surface of said liquid fuel.

2. Device according to claim 1, characterized in that said floating means include a pipe coaxially mounted on the outside of said floating saturation pipe and sealingly closed at its ends, so as to form an air-filled chamber on said saturation pipe.

3. Device according to claim 1, characterized in that said ventilation pipe is arranged vertically at the top of said tank, at a manhole, and is rigidly coupled to a fire-stopping saturation element having a flange by means of which it is fixed to the lid of said manhole of the tank.

4. Device according to claims 3, characterized in that said ventilation pipe is rigidly coupled to said fire-stopping saturation element by screw means, said screw means allowing to adjust angular position and height of said ventilation pipe.

5. Device according to claim 1, characterized in that said floating saturation pipe is articulated to said ventilation pipe by means of an elbow joint constituted by two angular connectors to which a male element and a female element are screwed, said male and female elements being mutually rotatably connected and having

means for limiting mutual rotation between said angular connectors.

6. Device according to claim 5, characterized in that said joint allows said floating saturation pipe to rotate between a substantially horizontal position when the tank is filled to its maximum level and a position which is inclined downwards by 60° when the tank is filled to its minimum level.

7. Device according to claim 1, characterized in that said curved tip portion of said floating saturation pipe is suitable to set the level difference to be overcome in order to draw fuel from said tank.

8. Floating saturation device for liquid fuel tanks, comprising one or more of the technical features described herein and/or illustrated in the accompanying drawings.

FIG.2

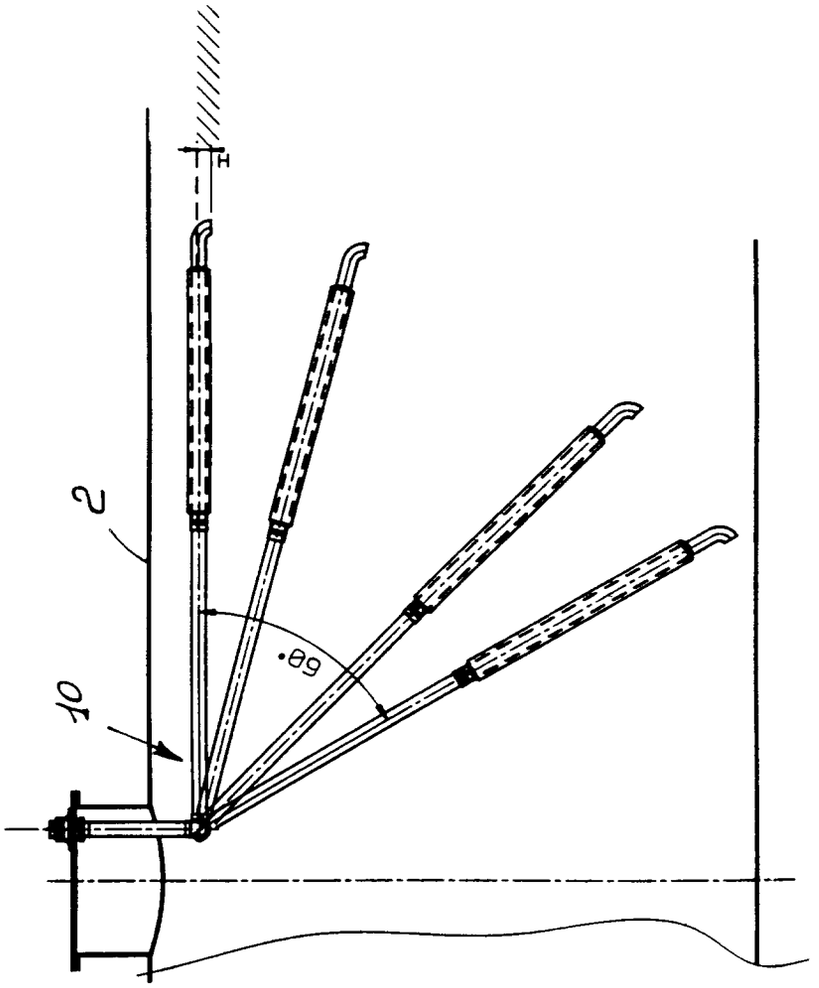


FIG.1

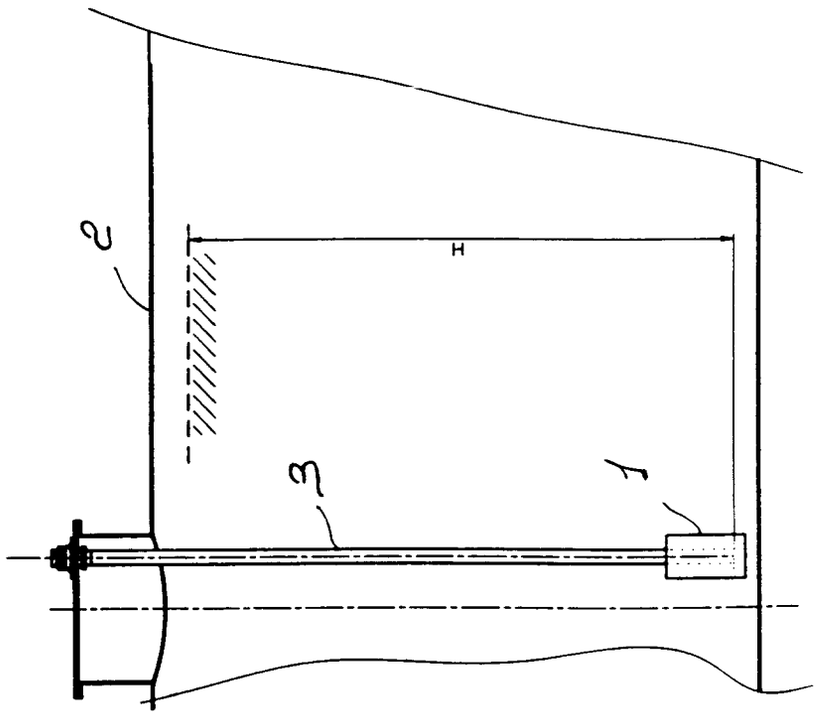


FIG.4

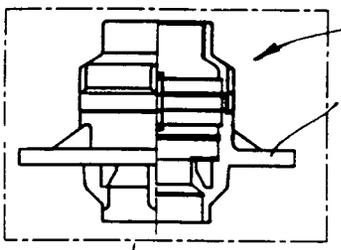


FIG.7

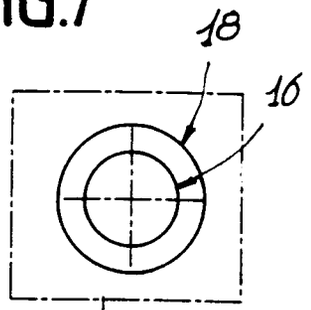


FIG.6

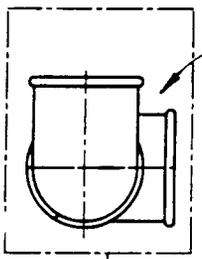


FIG.5

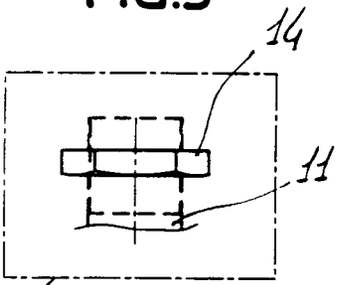


FIG.3

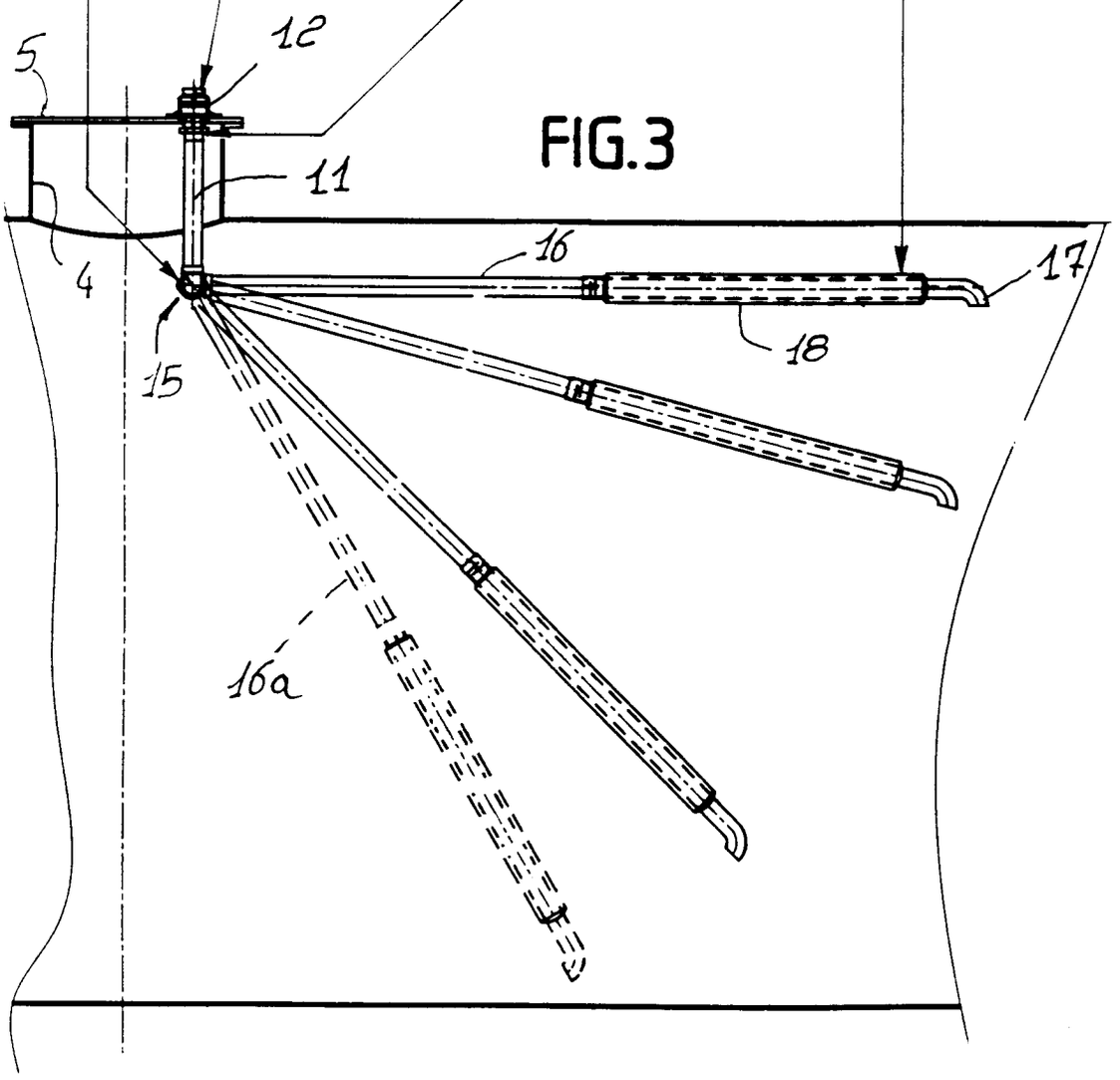


FIG.11

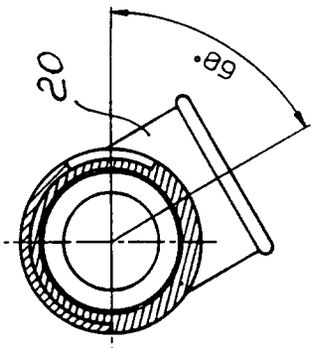


FIG.10

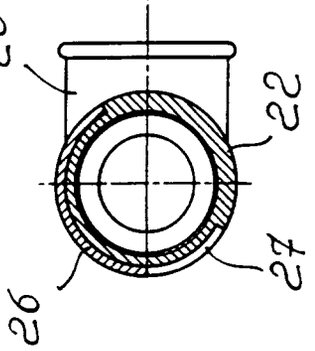


FIG.9

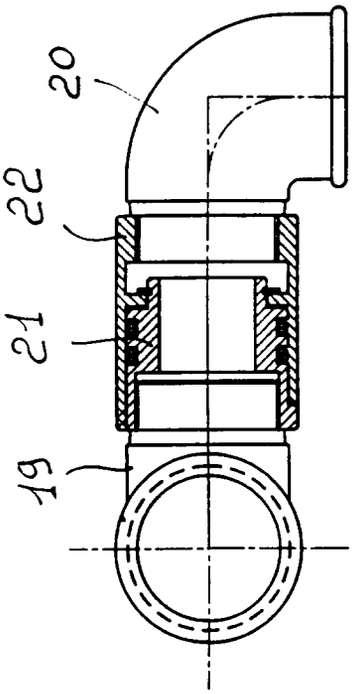
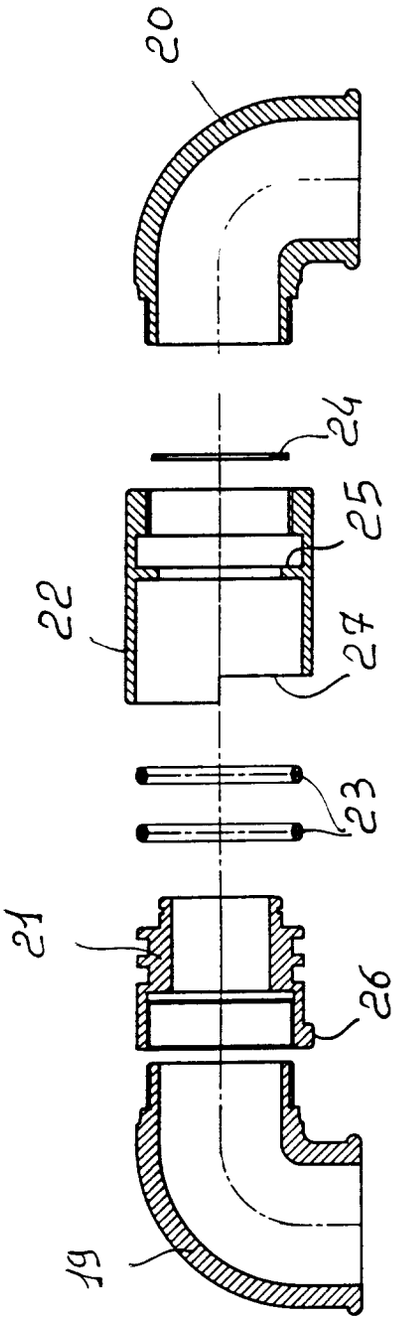


FIG.8



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PARTIAL EUROPEAN SEARCH REPORT

which under Rule 45 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number EP 94 11 3892

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.6)
X	US-A-3 172 581 (M. NANNI) * figure 1 *	1,2	B67D5/06
X	FR-A-2 213 904 (J. MULLER) * figure 1 *	1,2	
X	FR-A-1 358 254 (MEGATOR PUMPS & COMPRESSORS LIMITED) * figures 1,2 *	1	
X	BE-A-1 000 346 (J. VANDER ELST) * figures 1,2 *	1	
A	FR-A-1 457 558 (ESSO STANDARD) * figure 1 *	1	
A	US-A-1 668 793 (J. WIGGINS) * figure 1 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B67D

INCOMPLETE SEARCH

The Search Division considers that the present European patent application does not comply with the provisions of the European Patent Convention to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of some of the claims

Claims searched completely :

Claims searched incompletely :

Claims not searched : 8

Reason for the limitation of the search:

Rule 29(6) EPC.

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 December 1994	Smolders, R

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