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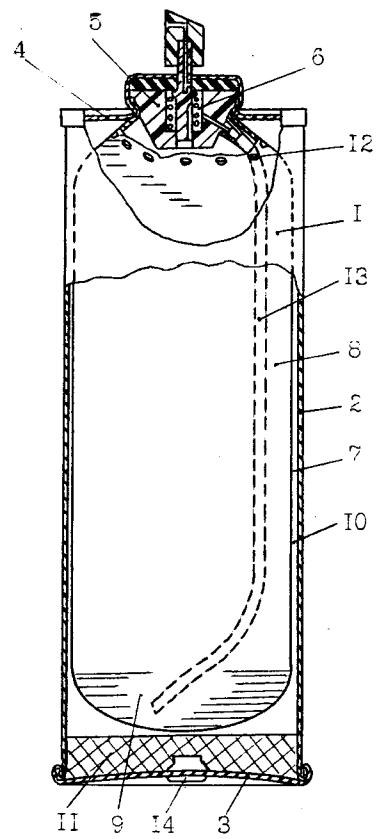
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I-10121 Torino (IT)(54) **METHOD FOR CREATION OF POSITIVE PRESSURE OF SORBED GAS IN WORKING CAVITY OF
AEROSOL PACKAGE.**

(57) The invention relates to packaging techniques, namely to methods of creation of positive pressure for discharging the content of a package and is directed to providing for uniform flow rate of the atomized substance, increasing the efficiency, as well as decreasing the adverse effect on the environment of the use of the aerosol packages. An aerosol package, in the working cavity of which a positive pressure of a sorbed gas is created when it is used, comprises a sealed receptacle (1) filled with a substance (liquid) (9) to be atomized and provided with a gas cushion containing a sorbed gas, for instance CO₂. The receptacle is connected to the atomizing

nozzle (5) through a tube (13) whose input is located below the level of the substance (9) to be atomized. The package also comprises a sorbent (11) contained in a cavity (10) isolated from the outside atmosphere outside the receptacle (1) and from the substance (9) to be atomized, whereas the cavity (10) is connected hydraulically to the gas cushion. As sorbent is used a substance which has a higher absorption capacity for the sorbed gas than the substance (9) to be atomized, for instance the activated carbon or zeolite. The method allows to decrease the adverse effect of the human activity on the environment.

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Field of the Invention

The present invention relates to the package technics and can be used, for example, in aerosol package, used varnishdye covering, in medicine mainly for prophylaxis and breast disease treatment and local anaesthesia, as well as in perfumery industry and also in housekeeping for household chemistry substances spraying and so on.

Background of the Invention

One of the global world problems is an increasing influence of the man activity upon the environment and in particular - upon the destruction of stratospheric ozone under the influence of freons (compounds of the chlorine-fluorine derivatives of hydrocarbons), on the limitation of usage of which there was adopted the Monreal Protocol. That's why for the excess pressure inside the package they offer alternative technical decisions in the result of the usage of which the damage influence upon the environment is decreased or eliminated.

It's known the method of making an excess pressure of gaseous carbon dioxide (CO₂) inside the package working volume for liquid spraying (the demand of F.R.G. No 093625561, Int.Cl. B65D 83/14, 1988), the method consists of the desorption of CO₂, dissolved in sorbent - spraying liquid. This way is based on making sufficient storage of working gas under the liquid level for its spraying, that's way for the increasing of the package filling with spraying liquid it's necessary to enlarge the volume and as a result of which -- the thickness of the package case, that is -- its material capacity. To increase the level of package filling and to decrease unevenness of the spraying substance expense according to this method the working gas is dissolved in the spraying substance that must have some sorbent characteristics in reference to the working gas, that however limits the range of substances that can be dispersed (sprayed) this way.

Objective of the Invention

In the essence of this invention there is a task to provide evenness of spraying substance expenses to increase economy as well as to decrease damage influence upon the environment while using aerosol packages.

This task is solved in such a way that in the method of making an excess pressure of sorbent gas in the working volume of the aerosol package the essence of which (method) is desorption of the sorbent gas, dissolved in a sorbent, the sorbent gas is put into the working volume and it can be,

for example, carbon dioxide CO₂, desorpted from sorbent having larger absorbing quality in reference to sorbent gas in a package in comparison with a spraying substance and keeping its quantity invariable while being sprayed.

The desorpted sorbent gas is transmitted to the working volume while getting necessary differential pressure between the isolated spraying substance and the sorbent.

Besides, the desorption of the sorbent gas is fulfilled in a separate capacity and/or at the periphery of the working volume of the package.

It's necessary to point out that as sorbent they use sorbent in a solid and/or liquid phase.

An activated charcoal and/or zeolite is used as sorbent in a solid phase.

A solid or liquid phase of the sorbent gas is used as a sorbent gas while it's being dissolved in sorbent.

This method of creating an excess pressure in the volume of the aerosol package decreases damage influence upon the environment while using aerosol packages.

Besides, excess pressure changes of the desorpted gas in the gas capacity of the working volume in spraying are relatively not large because of the high sorption capability of the working gas absorption in the unchangable quantity of sorbent, that makes it possible to provide expense evenness of the spraying substance, that is expecially important in varnish-dye covering.

Low values of the initial excess pressure of the sorbent gas and its excess pressure reduction in the gas capacity of the working volume make it possible the increase package filling degree of the spraying substance as well as package production economy because of the material capacity reduction, for example, by means of the thin-walled package usage.

The usage of sorption of the residual substances (working gas, spraying substances) in sorbent decreases corrosion and other processes taking place in waste package, i.e. makes it possible to decrease harmful waste into the atmosphere and waste package influence upon the environment.

Package loading with sorbent gas, for example, with CO₂ just in a solid phase makes package loading operation easier.

Elimination of the interaction between spraying substance and sorbent while turning over (shaking, etc) the package enlarges the quantity of the used sorbents.

It's also necessary to point out that this method enlarges the range of climate zones of the usage and/or storage working range and aerosol package exploitation because of the possibility of the sorbent usage with demanded characteristics.

In this method while operating this unit it is possible to have the dispersed liquid temperature different from the sorbent and environment temperature that is obtained by means of the dispersion of sorbent and spraying liquid as well as by means of heat isolation and/or heat absorption characteristics of sorbent .

Brief Description of the Drawings

On the drawings:

- Figure 1 is an illustration of a sorbent positioning at the periphery of the working volume of the aerosol package.
- Figure 2 is an illustration of a sorbent positioning in the inner case of the the aerosol package, isolating sorbent from dispersed substance, as well as of the sorbent positioning in the top part of the working volume above the dispersed liquid level.

Detailed Description

The given method can be realised in package for different substance dispersion (spraying). The construction of the aerosol unit is a sealed capacity 1, made as a cylindrical case 2 (referring Fig. 1 and Fig. 2) with a bottom 3 and a cover 4, which is hermetically connected with a dispersion head 5 and a valve 6. As it is shown in Figure 1 inside of the out case 2 there is an inner casing 7 with a working volume 8, filled with dispersed substance 9 (liquid).

In the cavity 10 between the outer case 2 and the inner casing 7 there is a sorbent 11, for example, an activated charcoal (it can be zeolite). At the top part of the inner casing 7 there made some holes 12 (windows, etc.) by the help of which the working volume 8 is communicated with the cavity 10. In the working volume 8 from its bottom up to the top there is a tube 13 for delivery of the dispersed liquid 9 to the inlet of the dispersion head 5. At the bottom 3 there is a charging valve 14 for the sorbent and sorbent gas. As sorbent gas there can be used carbon dioxide (CO₂) highly used in aerosol packages that answers ecological demands, put to sorbent gases of package, as well as - hydrocarbons, ethers and etc. In Figure 2 there shown another possible positioning of the sorbent 11 inside the inner casing 7 of the package and/or at the top part of the working volume 8 above the dispersed (spraying) liquid level 9. It is also possible to position the sorbent 11 out of the outer case 2 of the package, but in this case it must be put in a separate sealed cavity, communicating by means of a supply main of the desorption gas with a gas cavity of the working volume (it

is not shown in the drawing). In the top part of the case 2 there set a charging valve 15 for a dispersed substance. Charging valves 14 and 15 can be set at any convenient place on the outer case 2. The movement schemes of the desorption gas and dispersed substance are shown by arrows in the drawing.

As the dispersed substance 9 there can be used different liquids, emulsions, suspensions and fine- dispersed powders. In the latter case dispersed substance supply 9 is provided by means of creating a pseudo-liquated layer by bringing desorption gas, desorpted from the sorbent 11, at the moment of pressure laving in the working volume 8 when opening the valve 6 of the dispersion head 5.

The desorption gas can be brought to the working volume 8 as from the communicated with the working volume cavity 10 where there is a sorbent 11, by the way, this cavity can be got by a ring space between the inner casing 7, containing the dispersed substance 9, and the outer case 2 of the package (see Fig. 1), and - from the sorbent 11, situated just in the working volume 8 (see Fig. 2). As energy supply, necessary for gas desorption from the package environment it carried out is important to provide a thermal contact between the outer case 2 of the package and the substance of sorbent 11, which is enough for gas exhaust with a sufficient speed, creating dynamics of recovery of demanded pressure in the working volume 8 at the moment after the package action that is to say immediately after the termination of a regular rate of spraying.

Package filling is carried out by the dispersed substance 9 and sorbent 11 and then, for example, by CO₂, brought inside the cavity 10 with the sorbent either as a gas state (at a lower temperature and heat exhaust from the package) or as liquid (also at a low temperature, for example, about -73 C), or as a solid phase - in a state of "dry ice".

In two latter variants (see Fig. 2) it is not practically necessary to fulfill heat exhaust from the package (about 1.5 kJ/g CO₂), because heat absorption takes place in phase conversion of CO₂ from a liquid or solid state to a sorption state.

Package filling is made taking into account, for example such quantity of CO₂ supply into the sorbent cavity which is possible to be absorbed in sorbent in given loading conditions .

Sorbent volume in CO₂ is determined in this case as by a sorbent type and by a demanded pressure (P) of CO₂ in the working volume at a given operation temperature (for example, 17 C). For a typical value of the demanded pressure at a level of 0.15 MPa the volume (a) of such sorbent as activated charcoal (type AГ) is about 33 g of

CO₂ for 100 g of coal at a temperature (t) of 17 C. But taking into account possible increasing of initial pressure in the package up to, for example, 0.2 MPa and/or operating characteristics keeping while changing operating temperature in the given limits, the initial rate of sorbent filling by CO₂ is larger, i.e. it consists of 50 g of CO₂ for 100 g of sorbent.

Corelation of a and P at a constant temperature t is described by the sorption isotherm equation by Freundlich (see Timofeev D.P. "Sorption Kinetics", M. Publishing House of the Academy of Sciences of the USSR, 1962, p.95-98).

ln

$$a = \ln K + 1/N * \ln P ,$$

where a - sorbent volume by the dissolved working gas in it. P - working gas pressure, K and N - Freundlich constants, determined by the sorbent type.

Because of the fact that at the lower value of P of the working range and at the residual value a the quantity of CO₂ supplied during the operation time of the package, must be sufficient for practically full displacement of the dispersed substance, it means that when having CO₂ density equal to 300 1/kg (at the pressure of 0.15 MPa and at t = 17 C), it is nessary to desorpt about 3 g of CO₂ in order to displace 1 l of the dispered liquid. Having difference of the initial and final volume of a of CO₂ equal to 50-35 = 15 g per 100 g sorbent, it means that the quantity of sorbent must be not less than 30 g. Having filling density of sorbent at the level of 600 g/l, the volume, filled with sorbent, must not be less than 0.05 l.

Everything described above refers to the offered technical decision when the whole initial volume of sorbent is used for its supplement to the working volume. It means that there must be provided stable conditions of conservation of the sorbent quantity during operation time and, of course, - necessary heat supply to the whole volume of it (sorbent).

It stands to reason, that when spraying fine-dispersed powders, as it was described above, some quantity of CO₂ will escape from the package at the time of powder moving to the spraying zone and to the package environment and this fact will demand usage of more specific quantities of sorbent than these given above.

In order to prevent corelations (for example, when the package is turned over) of the dispersed substance 9 and sorbent 11, when such a combination of them is used that the said corelation can provide an undesirable change of their characteristics, working gas supply from the cavity 10 with the sorbent 11 to the working volume 8 (see

Fig. 1) is fulfilled only when some given differential pressure between these spaces is obtained, that can be fulfilled by means of the work of the spring valve (as the work of the valve 6 of the dispersion head 5), which opens the inlet of the working gas from volume 8 only at a lower pressure in the working volume (for example, on the state of sraying) and/or at an increased pressure in the cavity 10 of sorbent (for example, at temperature increasing in this cavity).

An important quality of the usage of sorbent with an absorption capability higher in comparison with that of the dispersed substance, is an opportunity to prevent a package working gas (after the operation usage of this package) escapement into the environment, for example, when the case is damaged (because, in particular, of corrosion). This opportunity is obtained by means of the environment temperature decreasing, for example, when transporting utilised package into cold climate zones. When necessary it is even possible to organize a processing treatment of utilised package in such a way that when package opening takes place, the temperature decreases up to the value, when the considerable part (up to 80-90 %) of the working gas is again sorpted in sorbent and that's why can be used again as well as sorbent itself.

The demanded decreasing of the temperature is determined by the following dependence (see: Stolarevkii A.Y. "Secondary Energy Accumulation" in the Collection "Atomic - Hydrogen Energetics and Technology", edition 4, M. Energy - Edition, 1982, p. 95);

ln

$$P = - A * (t + 273) ** (- 1) + B$$

where A and B - are parameters of the given sorbent, P - residual pressure of the unsorpted gas.

As given above in the example of this method operation as sorbent there can be used activated charcoal, characterised by a rather high absorption capability as for as CO₂ is concerned and relatively low price, as well as zeolite, the characteristics of which can provide higher pressure P at a given working temperature.

Finding of grade and/or combination of different sorbent types (for example, charcoal + zeolite) permits to optimise operation condition.

For convenient loading of the package there can be used liquid sorbents as well as in combination with solid ones in the state of which there can be used some organic combinations, in particular, dimethylethertetraethylenealcohol or halogenides.

Claims

1. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package consisting in desorption of the sorbent gas dissolved in sorbent said method comprising: in said working volume they transmit said sorbent gas, for example , CO₂, being desorpted from said sorbent, possessing an absorption capability in reference to said sorbent gas in a package higher than this capability of the dispersed substance and keeping its quantity constant when being sprayed. 5 10
2. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1 where by they transmit the desorpted gas into the working volume after obtaining a given differential pressure between the isolated dispersed substance and sorbent. 15 20
3. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1 where by desorption of said sorbent gas is fulfilled in a separate capacity. 25
4. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1 whereby desorption of the sorbent gas is fulfilled at the periphery of said package working volume. 30
5. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1 whereby desorption of the sorbent gas is fulfilled in a separate capacity and at the periphery of the package working volume. 35 40
6. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1,2,3,4 and 5 whereby they use said sorbent in a solid phase as sorbent. 45
7. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1,2,3,4 and 5 whereby they use said sorbent in a liquid phase. 50
8. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1,2,3,4 and 5 whereby they use said sorbent in a solid and liquid phase. 55
9. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1,2,3,4,5 and 6 whereby in a solid phase of said sorbent they use activated charcoal.
10. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1,2,3,4,5 and 6 whereby in a solid phase of said sorbent they use zeolite.
11. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1,2,3,4,5 and 6 whereby in a solid phase of said sorbent they use activated charcoal seolite.
12. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1 whereby in a state of of said sorbent gas in its dissolving in sorbent they use a solid phase of said sorbent gas.
13. The method of creating an excess pressure of the sorbent gas in the working volume of the aerosol package as defined in claim 1 whereby in a state of said sorbent gas in its dissolving in sorbent they use a liquid phase of said sorbent gas.

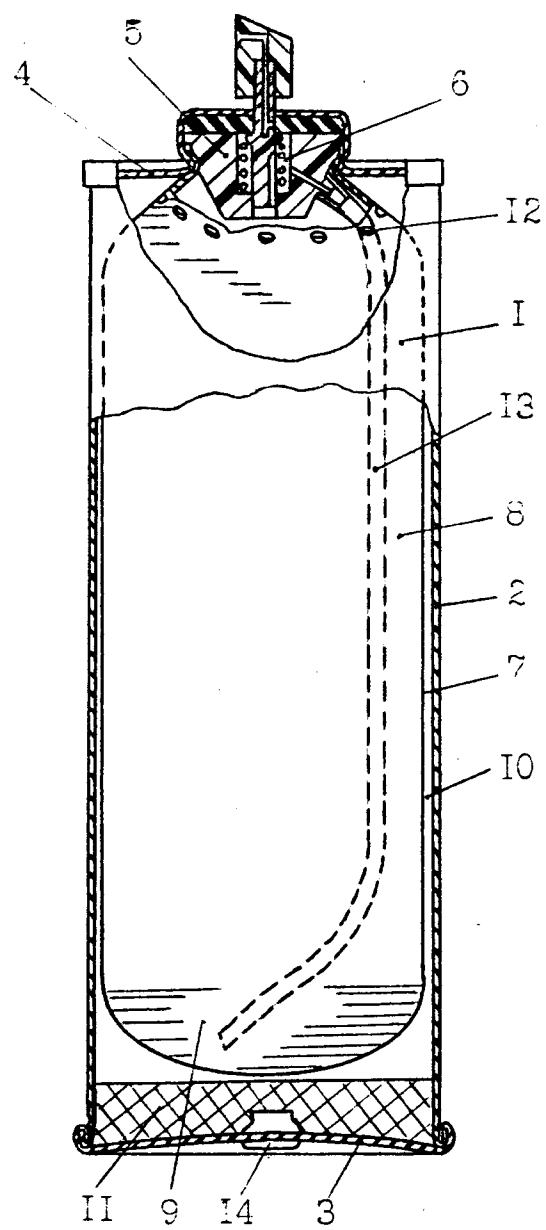


Fig.1.

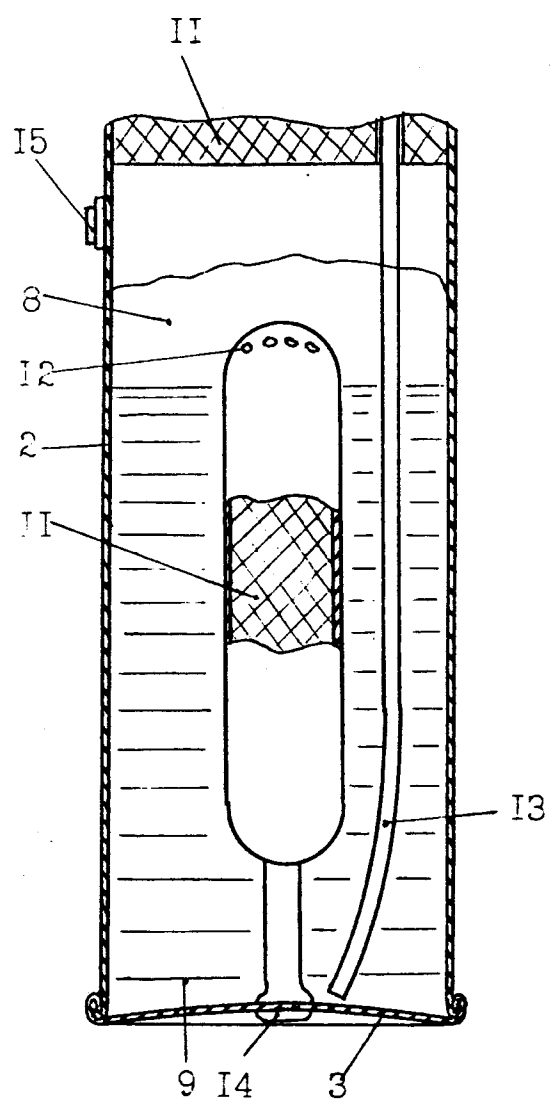


Fig.2.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/RU 92/00129

A. CLASSIFICATION OF SUBJECT MATTER		
IPC ⁵ B65D 83/14		
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)		
IPC ⁵ B65D 83/14		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A1, 3625561 (TECHNICA ENTWICKLUNGSSGESELLSCHAFT MBH & CO KG), 4 February 1988 (04.02.88), (cited in the description)	1-12
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A	DE, A1, 3708396 (WEIGL, ROBERT), 8 October 1987, (08.10.87), the abstract	1-12
	--	
A	US, A, 4646946 (ELLIS M. REYNER), 3 March 1987, (03.03.87), the abstract	1-12
	--	
A	US, A, 4679706 (ENVIRO-SPRAY SYSTEMS, INC.), 14 July 1987, (14.07.87), the abstract	1-12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
10 August 1992 (10.08.92)		30 September 1992 (30.09.92)
Name and mailing address of the ISA/		Authorized officer
ISA/RU		
Facsimile No.		Telephone No.