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Section 29

AUSTRALIA

Patents Act 1990

632264

PATENT REQUEST: PETTY PATENT

I being the person identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying Petty complete specification.

Full application details follow.

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[54] Invention Title: DRY POWDER COMPRESSED GAS AEROSOL

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Drawing number recommended to accompany the abstract .....

ASSOCIATED PROVISIONAL APPLICATION(S) DETAILS

[60] Application Numbers and Dates

PL 4566 FILED 7TH SEPTEMBER 1992

PL 5017 FILED 30TH SEPTEMBER 1992

By my Patent Attorneys,
WATERMARK PATENT & TRADEMARK ATTORNEYS

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DATED this 5th day of October 1992.

Ian A. Scott.

Registered Patent Attorney

(12) PATENT ABRIDGMENT (11) Document No. AU-B-26200/92
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 632264

(Australian Petty Patent)

(54) Title
DRY POWDER COMPRESSED GAS AEROSOL

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(56) Prior Art Documents
US 3055435
US 2065848
US 2819763

(57) The present invention in one form therefore provides a dry powder aerosol product which comprises:

an aerosol can including a valve and a dispensing mechanism including a dip tube, as desired;

an amount of dry hydrophobic powder in the aerosol can; and

an inert gas at a pressure of at least 620 kPag at 20°C.

The present invention also provides a method of manufacturing a dry powder aerosol product which comprises:

introducing a desired amount of dry hydrophobic powder into an aerosol can;

fitting a valve and dispensing mechanism including a dip tube, as desired, to the can such that the valve and dispensing mechanism does not contact the powder and the dip tube of the dispenser mechanism, where present, does not protrude into the powder;

inverting the can to ensure that the open end of the dip tube, where present, is clear of the powder; and

pressurizing the can at a gassing station with an inert gas to a pressure of at least 620 kPag at 20°C.

CLAIM

1. A dry powder aerosol product which comprises:

an aerosol can including a valve and a dispensing mechanism

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including a dip tube, as desired;

an amount of dry hydrophobic powder in the aerosol can; and

an inert gas at a pressure of at least 620 kPag at 20°C.

AUSTRALIA 632264

Patents Act 1990

ORIGINAL
COMPLETE SPECIFICATION
PETTY PATENT

Invention Title: DRY POWDER COMPRESSED GAS AEROSOL

The following statement is a full description of this invention, including the best method of performing it known to me:-

DRY POWDER COMPRESSED GAS AEROSOL

This invention relates to dry powder compressed gas aerosol products and to methods and apparatus for the manufacture thereof and particularly but not exclusively to fire extinguishing aerosol products.

For many years there has been an as yet unfulfilled need for dry powder aerosol products which do not use organic propellants which are non toxic to humans and which do not damage the environment. Despite suggestions that dry powder aerosol products propelled by compressed inert gases are the ideal products, no such products with acceptable dispensing characteristics, product stability, shelf life, fineness of spray, etc., have been produced to date and no method and apparatus for making such products devised.

US Patent Nos. 3055435 (Warnock), 2065848 (Carter) and 2819763 (Boal) relate to dry powder fire extinguishers (as distinct from aerosol can products) using compressed gases such as nitrogen, carbon dioxide or air and somewhat surprisingly ethane to propel dry chemicals from the extinguisher. The patents are particularly concerned with valve mechanisms and the use of adsorbents to facilitate the expulsion of the fire extinguishing chemical. None address the problems of producing an aerosol can dry powder fire extinguishing product. US Patent No. 2785838 (Mayer) proposes a dry powder aerosol can fire extinguisher and addresses one problem associated with such devices by providing a valve plug at the end of the dip tube which is operated to open the dip tube to egress of powder when the can valve mechanism is operated to permit expulsion of the contents. The patent is particularly concerned with liquefied gas products using e.g. dichlorodifluoro-methane rather than a compressed gas such as nitrogen and with overcoming the problems associated with the powder becoming wetted by the liquefied gas propellant and forming lumps which may well block the valve mechanism and orifice of the aerosol can thus preventing useful operation.

In "Principles of Aerosol Technology", Paul A. Sanders, 1990, Van Nostrand Reinhold Company pp 28-33, 60-62, 88-90 & 161-163: "The Science and Technology of Aerosol Packaging", John S. Sciarra and Leonard Stoller, 1974, John Wiley & Sons, pp 136-141, and "Kirk Othmer Encyclopaedia of Chemical Technology", Vol. 1, pp 670-685; all relate how, in the 1950's and 1960's, the possible use of nitrogen as a compressed gas propellant for aerosol cans was greeted with considerable enthusiasm as nitrogen was cheap, low in toxicity, inert and stable. However the use of nitrogen was substantially rejected primarily due to the difficulties in expulsion of all the product when only utilizing compressed gas filling pressures of up to 690 kPag at 20°C. In

cases of accidental discharge on inversion of the can, compressed gas only may be expelled to the extent that insufficient gas remains to expel all of the product. The use of compressed gases was substantially abandoned for all uses.

Despite the more recent and urgent need to drastically reduce global emissions of greenhouse gases and ozone-damaging gases, such as or including hydrocarbon, halocarbon or halo-hydrocarbon liquefied gases there is still no acceptable dry powder compressed gas aerosol product known or available which can be used for a wide variety of applications which desirably project the product a long distance in an acceptable spray pattern.

It is an object of the present invention therefore to provide a compressed gas dry powder aerosol product which can be used for a wide variety of applications including fire extinguishing applications and to provide a method and apparatus for the manufacture of such products.

The present invention in one form therefore provides a dry powder aerosol product which comprises:

an aerosol can including a valve and a dispensing mechanism including a dip tube, as desired;

an amount of dry hydrophobic powder in the aerosol can; and

an inert gas at a pressure of at least 620 kPag at 20°C.

The present invention also provides a method of manufacturing a dry powder aerosol product which comprises:

introducing a desired amount of dry hydrophobic powder into an aerosol can;

fitting a valve and dispensing mechanism including a dip tube, as desired, to the can such that the valve and dispensing mechanism does not contact the powder and the dip tube of the dispenser mechanism, where present, does not protrude into the powder;

inverting the can to ensure that the open end of the dip tube, where present, is clear of the powder; and

pressurizing the can at a gassing station with an inert gas to a pressure of at least 620 kPag at 20°C.

Preferably the powder is a fire-retardant powder which is a finely-divided, hydrophobic, and free-flowing powder and which includes a fire retardant compound such as ammonium hydrogen phosphate and the gas is nitrogen.

Preferably the pressure is at least 690 kPag and most preferably from 840 to 1000 kPag at 20°C.

Preferably the can is a nominal 670 ml can and the amount of powder in the can is 370-420, preferably 400 gm. Preferably the weight of gas introduced is approximately 5.0 to 5.6, preferably 5.3 gm for a 670 ml nominal volume can.

Preferably the can is disconnected from the gassing station prior to shutting off the gas flow to ensure that the valve mechanism of the can is closed before the pressure is reduced by cessation of the gas flow to substantially prevent any powder from entering the dip tube of the valve mechanism and possibly causing blockage with subsequent disruption of gas and product flow on discharge.

The Standards Association of Australia, Australian Standard AS 2278-1986 for Metal Aerosol containers are required to conform to the following minimum distortion pressure standards;

1. Low pressure containers (seamed tin plate containers) must withstand a pressure of 970 kPag at 55°C.

2. Intermediate pressure containers (monobloc aluminium containers) must withstand a pressure of 1100 kPag at 55°C.

3. High pressure containers must withstand a pressure of 1265 kPag at 55°C, for containers of internal diameter less than or equal to 75 mm and nominal (brimful) capacity of less than or equal to 820 ml.

The above preferred method is based on aerosol cans complying with the minimum Australian Standards for low and intermediate pressure cans. It will be appreciated that with cans which exceed the minimum standards as to minimum distortion pressure then the pressure of nitrogen can be accordingly increased. For example if a low pressure can can withstand 1150 kPag without distortion, the nitrogen pressure can be increased to 1000 kPag at 20°C which is a far greater pressure than suggested by the prior art.

The above filling pressures are based on the following pressure/temperature table for compressed gases including nitrogen.

Temp (°C)	Pressure (kPag) approx.	
10	500	960
20	521	1000
30	542	1040
40	564	1080
50	585	1120
55	596	1140

It will be readily apparent that the method and apparatus of the invention may be used to provide a wide range of powder compressed gas aerosol products by the inclusion of appropriate powder based carrier for a particular active ingredient desired.

Preferred embodiments of the invention will now be described in relation to the accompanying drawing which shows an apparatus in plan view for following the method of the invention.

Aerosol cans are unscrambled at unscrambler 10 and transferred to product filling station 11 where product FUREX 710, which includes as a major component, ammonium hydrogen phosphate in finely divided form is introduced into the can in an amount of about 400 gm from product storage 12. The cans are transferred to valve and dispenser station 13 where the valves and dispensers are inserted with the can on an angle such that the dip tube of the valve and dispenser combination remains clear of the product whilst the combination is inserted and crimped onto the can. The filled can is then transferred to the gassing station 14 where the can is gassed with nitrogen to a pressure of at least 840 kPag with the can inverted on an angle of at least 45°C. The can then passes to valve button station 15 thence to capping station 16 and on to packaging station 17.

The cans are check weighed prior to and following gassing at stations 18 and 19 to check that the desired amount of gas is introduced.

It is also possible to install other check weighing stations to check the weight of the powder added. The table following gives figures for a run of 24 cans filled with fire retardant material and nitrogen gas.

TABLE

No.	A	B	C	D	E
1	101.2	480.8	489.6	495.0	505.8
2	101.2	485.4	494.2	499.6	510.2
3	101.6	485.8	494.4	499.8	510.6
4	101.2	485.0	493.6	499.0	509.6
5	101.0	485.6	494.4	499.6	510.4
6	101.0	483.4	492.2	497.4	508.2
7	102.0	484.8	493.6	498.8	509.6
8	101.6	483.2	492.0	497.2	508.0
9	101.8	483.8	492.6	498.0	508.6
10	102.0	483.6	492.4	497.8	508.4

No.	A	B	C	D	E
11	102.2	484.8	493.4	498.8	509.4
12	102.2	483.3	492.2	497.4	508.2
13	100.8	485.4	494.4	499.6	510.2
14	101.2	482.6	491.4	496.6	507.2
15	101.0	486.2	495.0	500.2	511.0
16	100.8	482.6	491.4	496.6	507.2
17	101.6	484.4	493.2	498.4	509.2
18	100.8	484.0	492.8	498.0	508.8
19	101.2	484.8	493.6	499.0	509.8
20	102.0	483.0	491.6	407.0	507.6
21	100.6	483.4	492.0	497.2	507.8
22	100.6	483.0	491.8	497.0	507.6
23	100.6	486.2	495.0	500.2	511.0
24	101.2	484.6	493.4	498.8	509.4

A Empty can wt. (gm)

B Can and product wt. (gm)

C Closed can wt. (gm)

D Gassed can wt. (gm)

E Final can wt. (gm) (actuator and lid fitted)

Empty can variation range: 100.8 - 102.2 = 1.4 grams

Gas wt. difference range (D-C) 5.2 - 5.4 grams

wt. powder variation (B-A) 379.6 - 385.6 grams average range 6 grams

Plus actuator and lid average wt. 10.6 - 10.8 grams

A particularly preferred fire retardant material is FUREX 710, a fire extinguishing powder based on ammonium hydrogen phosphate with additives such as stabilizers, hydrophobic enhancement and anti-caking agents manufactured by Chemische Produkte Weinstock & Siebert, of Dusseldorf, Germany.

It will be readily appreciated that the method and apparatus may be used for a variety of hydrophobic powder aerosol products and that the invention is not restricted to dry powder fire extinguishing aerosol products. It will be readily apparent that a dry powder aerosol product of the invention may be made with any finely divided, hydrophobic, free flowing powder.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A dry powder aerosol product which comprises:

an aerosol can including a valve and a dispensing mechanism including a dip tube, as desired;

an amount of dry hydrophobic powder in the aerosol can; and

an inert gas at a pressure of at least 620 kPag at 20°C.

2. A dry powder aerosol product as claimed in claim 1 in which the pressure is at least 690 kPag and most preferably from 840 to 1000 kPag at 20°C.

3. A dry powder aerosol product as claimed in claim 1 or 2 in which the can is a nominal 670 ml can and the amount of powder in the can is 370-420, preferably 400 gm.

DATED this 23rd day of September, 1992.

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IAS/ML

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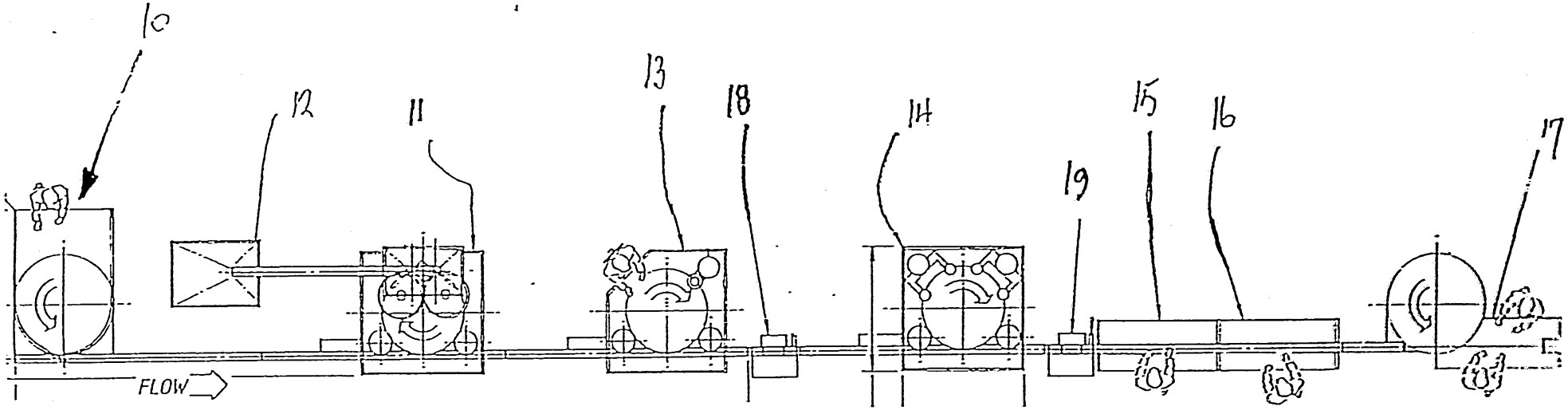
ABSTRACT

A dry powder aerosol product which comprises:

an aerosol can including a valve and a dispensing mechanism including a dip tube, as desired;

an amount of dry hydrophobic powder in the aerosol can; and

an inert gas at a pressure of at least 620 kPag at 20°C.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