

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 873 946 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

04.07.2001 Bulletin 2001/27

(51) Int Cl.7: **B65D 83/38**

(21) Application number: **98107302.6**

(22) Date of filing: **22.04.1998**

(54) **Aerosol container**

Aerosolbehälter

Réceptient aérosol

(84) Designated Contracting States:
CH DE FR GB IT LI

(30) Priority: **24.04.1997 JP 12179797**

(43) Date of publication of application:
28.10.1998 Bulletin 1998/44

(73) Proprietors:

- **TOYO CHEMICAL CO., LTD.**
Kamakura-shi, Kanagawa 247 (JP)
- **Toyo Aerosol Industry Co., Ltd.**
Tokyo 100 (JP)

(72) Inventors:

- **Mitsui, Toshiyuki**
Kawagoe-shi, Saitama (JP)
- **Hachinohe, Yukio**
Kawagoe-shi, Saitama (JP)
- **Habu, Yoshitaka**
Kawagoe-shi, Saitama (JP)
- **Tsunoda, Shinichi**
Kawagoe-shi, Saitama (JP)

- **Hirata, Mitsuto**
Kamakura-shi, Kanagawa (JP)
- **Sato, Tetsuya**
Kamakura-shi, Kanagawa (JP)
- **Yamamoto, Katsuhiko**
Kamakura-shi, Kanagawa (JP)
- **Kishida, Koji**
Kamakura-shi, Kanagawa (JP)

(74) Representative: **Gervasi, Gemma, Dr.**
NOTARBARTOLO & GERVASI Srl,
Corso di Porta Vittoria, 9
20122 Milano (IT)

(56) References cited:
EP-A- 0 784 024

- **PATENT ABSTRACTS OF JAPAN vol. 012, no.**
302 (M-732), 17 August 1988 & JP 63 076993 A
(TOYO SEIKAN KAISHA LTD), 7 April 1988,
- **PATENT ABSTRACTS OF JAPAN vol. 013, no.**
526 (M-897), 22 November 1989 & JP 01 214433
A (HOKKAI CAN CO LTD), 28 August 1989,

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 873 946 B1

Description**BACKGROUND OF THE INVENTION**

Field of the Invention:

[0001] The present invention relates to an aerosol container in which a valve cap is fitted into an opening at the neck and particularly, to a raw material which is used for producing the aerosol container.

Prior Art:

[0002] Conventionally, an aerosol container in which a valve cap is fitted into an opening at the neck, the one having such a structure as shown in a cross-sectional view of Figure 2 is disclosed in, for example, Japanese Patent KOKAI (Laid-Open) No.76993/88. This structure is the one in which ring recess (3) is formed on the neck of the container body (1); and valve cap (7) is fitted into the above-mentioned neck region (2) and the lower end (8) of the valve cap (7) is narrowed down into the above-mentioned recess (3), wherein valve housing (5) for valve (4) extending into the inside of the container, is airtightly supported with sealing member (6). Regarding such an aerosol container, a high pressure-resistant property is requested for the container in itself, so that a resin such as polyethylene terephthalate is commonly used in the form of a single substance for a raw material of the container.

[0003] However, since such an aerosol container is produced taking into consideration only the pressure-resistant property of the container in itself, the pressure-resistant effect of the container in itself is elevated rather than the engagement force of the valve cap. There has been the disadvantage that when the aerosol container was left as it is, for example, in a car as parked under the blazing sun, the container in itself is not bursted, but the engagement region is broken, so that the contents are jetted out from the container body while the valve cap is explosively scattered out.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide an aerosol container, out of which a valve cap and contents therein are not explosively scattered even if an internal pressure of the aerosol container is elevated, while a high pressure-resistant property of the container in itself is maintained.

[0005] According to the present invention, there is provided an aerosol container in which a valve cap is fitted into an opening at the neck of the aerosol container, characterized in that the raw material forming the aerosol container is a high molecular compound having a glass-transition temperature of 74°C -100°C.

[0006] In the aerosol container of the present invention, when the internal pressure thereof has come up to such a degree as the contents would be exploded, the aerosol container is expanded in itself to lower the internal pressure, so that a burst of the container can be avoided. In order to provide such a function, the glass-transition temperature of a raw material for the aerosol container is set in the range of 74 °C to 100°C, preferably 75°C to 85°C. When this glasstransition temperature is less than 74°C, the container is easily expanded in itself, while when the temperature is more than 100°C, the container is not expanded since the container is hard in itself. In this respect, when the container is produced, the bottom region thereof is little drawn, so that the bottom region is provided with a lower strength as compared with other regions, and thus, it causes the result that the bottom region having a lower pressure-resistant property is exploded.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Figure 1 is a schematic elevation view of an aerosol container which is used for working examples and comparative examples of the present invention; and

Figure 2 is a longitudinal section view in which elements in and around the opening of a conventional aerosol container are shown on an enlarged scale.

DETAILED DESCRIPTION OF THE INVENTION

[0008] As a raw material forming the aerosol container of the present invention, a high molecular compound having the above-mentioned glass-transition temperature can be properly selected and employed. For example, polycarbonate, poly(ethylene naphthalate), polysulfone, polyethersulfone, a mixture of polyethyleneterephthalate (PET) and

polyarylate (PAr) and the like can be exemplified. Preferably, it is the mixture of PET and PAr, wherein a mixture ratio of PET to PAr by weight % is preferably 60:40 to 95:5, more preferably 80: 20 to 95:5 by weight %. If the compounded content of PAr is too little, the ability to engage between the aerosol container and the valve cap thereof is decreased, while if the compounded content of PAr is too much, the container comes to be difficult to expand in itself, so that the bottom region having a low pressure-resistant property is bursted out.

[0009] Then, as a method of forming the aerosol container of the present invention, a biaxial stretching blow-molding hot-parison method is commonly used. This method comprises feeding a parison obtained through an injection molding while its hot state, to a reheating process without staying, followed by forming and thereafter, mechanically drawing the parison in a longitudinal direction while the parison is maintained at a constant temperature in a blow-die; and at the same time or in succession, blowing a pressed air into the blow-die so as to expand the parison in a circular direction (or in a transverse direction). Furthermore, there is a method of forming an aerosol container which comprises forming the engaged region of the valve cap on the periphery of the opening according to a non-stretching injection molding; and forming a body of the container which is filled with contents, according to a stretch blow-molding. According to such a stretch blow-molding, the longitudinal drawing of the body and the transverse drawing thereof are controlled to a low stretch ratio of 1.00 to 1.15 times and 1.90 to 2.20 times, respectively, and thereby, the container can be deformed and expanded under a high pressure following a temperature elevation of the contents and thus, the thickness thereof can be thinned so as to lower the internal pressure.

[0010] With respect to the contents which an aerosol container of the present invention can be filled with, conventionally known ones can be employed. As the contents, for example, human-body articles, domestic articles, industrial articles can be exemplified. As for human-body articles, there are hair articles, cosmetics, odor-removing/sweat-repressing agents and other human-body articles; as for domestic articles, there are insecticides, coating agents, cleaners, foods and other domestic articles; and as for industrial articles, there are automobile articles and other industrial articles. As for the above-mentioned hair articles, there are hairsetting sprays, hairdressing conditioners, hair shampoos, rinses, acid wool-dyeing agents, oxidizing two-agent type permanent wool-dyeing agents, color sprays, decoloring agents, permanent-wave agents, hair-growing agents and the like. As cosmetics, there are shaving creams, after-shave lotions, perfumes, eau de Cologne, face-cleansing agents, anti-suntan agents, foundations, dehairing/decoloring agents, bath agents, dentifrice agents and the like. As the odor-removing/sweat-repressing agents, there are odor-removing agents, sweat-repressing agents, body shampoos and the like. As other human-body articles, there are muscle-antiflash agents, skin-trouble agents, medicines for a dermatophytosis, other medicines, injurious-insect repellents, cooling agents, cleaning-wiping agents, agents for oral-cavity and the like. As insecticides, there are space insecticides, insecticides for a cockroach, gardening insecticides, insecticides for a tick, insecticides for an uncomfortable insect and the like. As coating agents, there are domestic paints, automobile paints, undercoating agents and the like. As cleaners, there are domestic cleaners for glass, lens cleaners, carpet cleaners, bath cleaners, lustering cleaners for a floor/furniture, shoe/leather cleaners, wax lustering agents and the like. As other domestic articles, there are indoor odor-removing agents, toilet odor-removing agents, waterproofing agents, washing starches, herbicides, clothing insecticides, flameproofing agents and the like. As automobile articles, there are defogging agents, thawing agents, engine-starting agents, puncture-repairing agents, engine cleaners and the like. As other industrial articles, there are lubricating/anti corrosive agents, adhesive agents, metal deep-cut agents, mold releasing agents and the like.

[0011] As the forms of the above-mentioned contents, a liquid, a fluid state, a semi-solid state, a foam state, a gaseous state, as well as a mixture of each of the above-mentioned states and a little solid in a powder state or a particle state, and the like can be properly selected and employed.

[0012] The above-mentioned contents can include a material which has been conventionally employed as an additive agent. As such an additive agent, alcohol; a synthetic resin; a propellant (a simple substance selected from the group consisting of LPG (liquefied petroleum gas), DME (dimethyl ether), N_2 , CO_2 and the like, or a mixture thereof); cellulose; ammonium; water; perfumes; dyes; surface active agents; pigments are properly selected and added thereto. For example, some of the above-mentioned hair sprays include a denatured alcohol and LPG for the propellant as main components, to which an acrylic resin alkanolamine liquid, polyoxyethyleneoleyl ether, a perfume and the like are added, while some of the above-mentioned hair treatments include the denatured alcohol and LPG for the propellant as main components, to which a liquid paraffin, propylene glycol, methylphenyl polysiloxane and a perfume are added.

[Working Examples]

[0013] Hereinafter, Working Examples of the present invention will be in detail explained referring to the Drawings and Tables.

Working Examples 1-5 and Comparative Examples 1-2:

[0014] An aerosol container shown in Figure 1 has a content volume of 97ml and a weight of 30g, wherein reference

numeral (10) is an opening of the aerosol container, which is an engagement region for engaging a valve cap (which is not shown in Figure 1), and reference numeral (11) is a body for retaining contents therein. The aerosol containers were formed according to a biaxial stretching blow-molding hot-parison method, after mixing PET and PAr in mixing ratios as shown in Table 1. As the stretching conditions in the parison, a preheating temperature of 140 °C to 165°C and a heating time of 20 seconds were employed at a heating position, while a blow-die temperature of 20°C, a blow-pressure of 20 to 35kgf/cm² and a blow-time of 10 to 15 seconds were employed at a stretching position. The stretch ratio of the body of each of bottles were 1.1 times in the longitudinal direction and 2.0 times in the transverse direction.

[0015] With respect to the item "Evaluation at Temperature Elevated to 80°C " in Table 1, each of the aerosol containers was filled with contents and an aqueous solution containing LPG (liquefied petroleum gas) under the conditions of an ordinary temperature (about 25°C) and an internal pressure of 6kg/cm² and then, a valve cap as shown in Figure 2 was fitted into the opening. Supposing the inside of an automobile car as parked under the blazing sun, an environmental temperature was elevated from an ordinary temperature (about 25 °C), and after the temperature reached 80°C, the temperature of 80°C was maintained for a period of eight hours, and then it was visually evaluated whether an engagement region which is positioned on the periphery of the opening of each of the aerosol containers had been broken or not.

[0016] The composition of contents used here are as follows:

<Hair Spray>		Weight%
Acrylic Resin Alkanolamine Liquid (3%)		4.00
Polyoxyethyleneoleyl Ether		0.01
Triethanolamine		0.50
Perfume		0.17
Denatured Ethyl Alcohol of 99%		55.32
LPG		40.00
		<u>100.00</u>

Table 1

		PET wt. %	PAr wt. %	Glass Transition Temperature	Evaluation at Temperature Elevated to 80°C
Comparative Examples 1		100	0	73	Engagement Region was Broken at 75°C in Middle of Elevation
Working Examples	1	95	5	75	Not Broken
	2	88	12	78	Not Broken
	3	80	20	81	Not Broken
	4	68	32	88	Not Broken
	5	60	40	95	Not Broken
Comparative Examples 2		50	50	102	Occurrence of Burst at Container Bottom

[0017] As shown in Table 1, when the ratio of PET:PAr by weight % is in the range of 60:40 to 95:5, the above-mentioned engagement region was not broken, and the containers were not burst as well, while when the ratio of a polyarylate is 50% (Comparative Example 2), the container's bottom having a low pressure-resistance was bursted.

Working Example 6 and Comparative Example 3:

[0018] Aerosol containers which were produced in the same mixing ratios as the ones in the Comparative Example 1 and Working Example 1 were filled with the same contents under an internal pressure of 6 kg/cm², respectively, and the environmental temperature was elevated. At this time, the temperature of vapor phase in the aerosol containers, the temperature of liquid-phase in the aerosol containers, the internal pressure in the aerosol containers, and the visual evaluation as to whether the engagement regions were broken are shown in Table 2.

Table 2

PET/PAr Mixing Ratio	Temperature- Elevating Time (min.)	Environmental Temperature (°C)	Vapor-Phase Temperature (°C)	Liquid-Phase Temperature (°C)	Internal Pressure (kg/cm ²)	Evaluation of Engagement Region
Comparative Example 3	0	33	29	25	6.2	All Right
	70	75	69	57	13.3	All Right
	75	76	71	59	12.3	Engagement Region was Broken
Working Example 6	0	36	35	33	6.9	All Right
	70	72	65	57	12.8	All Right
	80	76	71	61	13.6	All Right
	90	80	75	66	10.8	All Right
	120	80	76	73	5.5	All Right

[0019] As shown in Table 2, the engagement region was not broken by using a aerosol container-forming raw material composed of a mixture of polyarylate with polyethylene terephthalate, even if a vapor-phase temperature is 71°C, and an internal pressure is in the range of 12 to 13kg/cm². This is, because the container was expanded in itself, and its thickness was thinned, and thereby, the internal pressure was decreased.

[Effect of the Invention]

[0020] According to the present invention, an aerosol container in which a valve cap is fitted into an opening of the container, is produced to have a glass transition temperature of a raw material of the aerosol container in the range of 74 °C to 100°C, and thereby, such an effect that the aerosol container in itself maintains a high pressure resistance, while even if the internal pressure of the aerosol container is increased, the valve cap or the contents there of are not explosively scattered out of the container can be provided.

Claims

1. An aerosol container in which a valve cap (7) is fitted into an opening (10) at the neck of the container, characterised in that the raw material for forming said aerosol container is a high molecular compound having a glass-transition temperature of 74° C to 100° C.
2. The aerosol container according to claim 1, wherein said high molecular compound is selected from the group consisting of polycarbonate, poly(ethylene naphthalate), polysulfone, polyethersulfone, and a mixture of polyethylene terephthalate and polyarylate.
3. The aerosol container according to claim 1, wherein said high molecular compound is a mixture of polyethylene terephthalate and polyarylate.
4. The aerosol container according to claim 3, wherein a mixing ratio of a mixture of polyethylene terephthalate and polyarylate by weight % is in the range of 60:40 to 95:5.
5. An aerosol container according to claim 1, wherein the body (11) of said aerosol container is formed under the conditions of a longitudinal drawing of 1.00 to 1.15 times, and a transverse drawing of 1.90 to 2.20 times according to a stretch blow-molding.

Patentansprüche

1. Aerosolbehälter, bei dem eine Ventilkappe (7) in eine Öffnung (10) am Hals des Behälters eingepaßt ist,

dadurch **gekennzeichnet**, daß

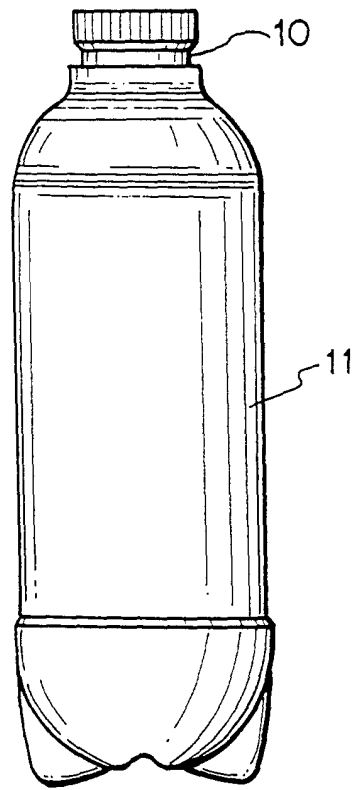
das Rohmaterial zur Formung des Aerosolbehälters eine Verbindung mit hohem Molekulargewicht ist, die eine Glasübergangstemperatur von 74°C bis 100°C hat.

- 5 **2.** Aerosolbehälter nach Anspruch 1,
dadurch **gekennzeichnet**, daß
die Verbindung mit hohem Molekulargewicht aus der Gruppe bestehend aus Polycarbonat, Poly(ethylenaphthalat), Polysulfon, Polyethersulfon und einem Gemisch aus Polyethylenterephthalat und Polyarylat ausgewählt ist.
- 10 **3.** Aerosolbehälter nach Anspruch 1,
dadurch **gekennzeichnet**, daß
die Verbindung mit hohem Molekulargewicht ein Gemisch aus Polyethylenterephthalat und Polyarylat ist.
- 15 **4.** Aerosolbehälter nach Anspruch 3,
dadurch **gekennzeichnet**, daß
das Mischungsverhältnis eines Gemisches aus Polyethylenterephthalat und Polyarylat, ausgedrückt als Gew.-%, im Bereich von 60:40 bis 95:5 liegt.
- 20 **5.** Aerosolbehälter nach Anspruch 1,
dadurch **gekennzeichnet**, daß
der Körper (11) des Aerosolbehälters nach einem Streckblasformen unter den Bedingungen eines 1,00- bis 1,15-fachen Streckens in Längsrichtung und eines 1,90- bis 2,20-fachen Streckens in Querrichtung geformt wird.

25 **Revendications**

- 30 **1.** Bombe aérosol dans laquelle un capuchon de valve (7) est ajusté dans une ouverture (10) au niveau du col du conditionnement, caractérisée en ce que la matière première utilisée pour former ladite bombe aérosol est un composé de masse moléculaire élevée ayant une température de transition vitreuse de 74°C à 100°C.
- 2.** Bombe aérosol selon la revendication 1, dans laquelle ledit composé de masse moléculaire élevée est choisi dans le groupe composé de polycarbonate, de poly(éthylène naphtalate), de polysulfone, de polyéthersulfone et d'un mélange de polyéthylène téréphtalate et polyarylate.
- 35 **3.** Bombe aérosol selon la revendication 1, dans laquelle ledit composé de masse moléculaire élevée est un mélange de polyéthylène téréphtalate et polyarylate.
- 4.** Bombe aérosol selon la revendication 3, dans laquelle un rapport de mélange du mélange de polyéthylène téréphtalate et polyarylate en % de poids est dans la plage de 60:40 à 95:5.
- 40 **5.** Bombe aérosol selon la revendication 1, dans laquelle le corps (11) de ladite bombe aérosol est formé dans les conditions suivantes, à savoir un étirage longitudinal de 1,00 à 1,15 fois, et un étirage transversal de 1,90 à 2,20 fois selon un procédé de moulage par étirage-gonflage.

F I G . 1



F I G . 2

