(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 915 029 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.05.1999 Bulletin 1999/19

(51) Int. Cl.[6]: **B65D 83/38**, B21D 51/24, B21D 51/26

(21) Application number: **97203397.1**

(22) Date of filing: **31.10.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(71) Applicant:
THE PROCTER & GAMBLE COMPANY
Cincinnati, Ohio 45202 (US)

(72) Inventor:
Lauwers, Hilde Antoinette Elza
2500 Lier (BE)

(74) Representative:
Mather, Peter Geoffrey et al
BVBA Procter & Gamble Europe SPRL,
Temselaan 100
1853 Strombeek-Bever (BE)

(54) High pressure resistant aerosol container

(57) The present invention relates to a cylindrical can for an aerosol container, the can comprising a curled portion, whereby the curled portion has been ground to obtain a flat surface 10, the flat surface being in a plane normal to the axis of the can, thus defining a substantially flat ring, so that this surface provides an improved sealing between the can and a mounting cup, in particular in the case of high pressure aerosol containers.

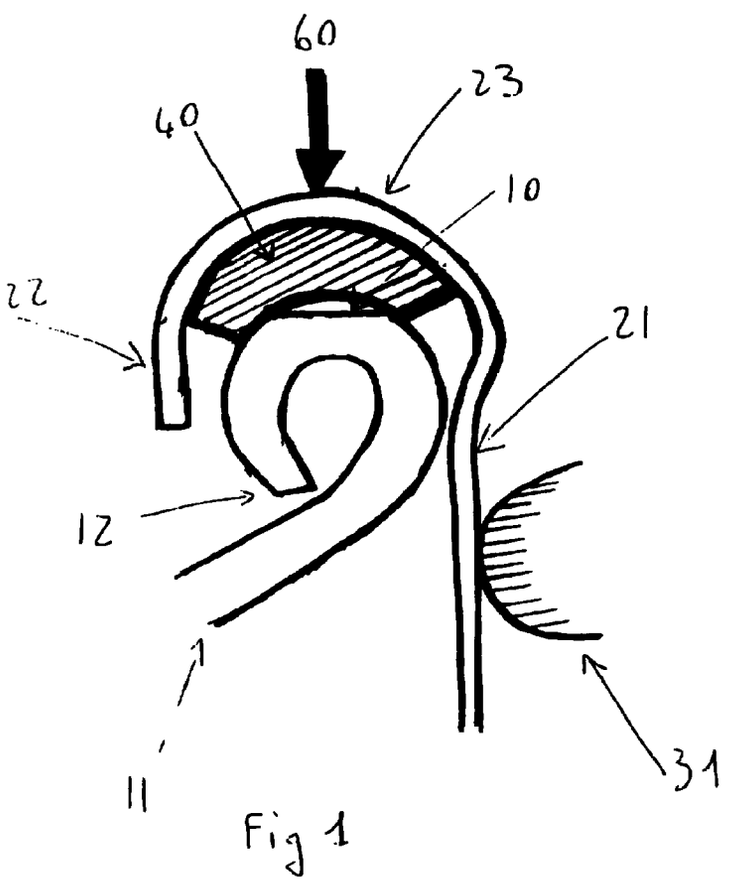

Fig 1

EP 0 915 029 A1

Description

Technical field

[0001] The invention relates to an aerosol container, and more particularly to such a container which can withstand high internal pressure.

Background of the invention

[0002] Pressurised containers are usually comprising three basic elements being a can, a mounting cup and sealing means. Aluminum cans are widely used in pressurised containers. Such cans have a basic shape, dimensions and method of manufacture which have become relatively standardised. These cans are usually formed by extrusion or cold drawing processes as described for example in US-A-4 441 354, processes during which a cylindrical unitary hollow aluminium body is formed together with a circular neck which is defined by a curled portion of the can. The circular neck is designed for co-operating with the mounting cup which will be usually crimped onto the neck, thus joining these two elements together, the junction being made by means of the third element of the container, the sealing means. Various improvements of these three elements taken separately or in combination have been proposed. Numerous sealing or crimping methods have been proposed for improving the junction between the circular neck and the mounting cup. Usually, these improvements imply a modification of the sealing means between the circular neck of the can and the mounting valve. The sealing means may be a grommet, a polymeric layer as described in WO-A-81/01695, or a gasket in a sleeve form as described in EP-A-0 033 626. Other improvements are related to modifications of the shape of the mounting cup as in US-A-4 813 576 or in US-A-5 052 577. In US-A-5 052 577 in particular, the modification of the shape of the mounting cup can be combined with a modification of the shape of the circular neck of the can, whereby the circular neck of the can comprises a flat conical surface. The aim of such modifications is to improve sealing at the junction between the mounting cup and the circular neck of the can.

[0003] The present invention concerns an essentially cylindrical can for aerosols, the can comprising a substantially circular neck, whereby the neck is defined by a curled portion, the curled portion having a flat surface. Such a can is known from US-A-5 052 577.

[0004] In another aspect of the present invention, a process for producing an aerosol container is presented, the aerosol container comprising a can, a mounting cup and sealing means, whereby the can is an essentially cylindrical can, the can comprising a substantially circular neck, the neck being defined by a curled portion, the process comprising a can forming step for forming the can and the neck and a grinding step for grinding a flat surface on the curled portion.

[0005] Among the advantages of having a flat surface around the curled portion is that irregularities or wrinkles on the outside of the curled portion of the neck which may cause leakage are removed. Indeed, most of the aluminum cans exceeding 50mm in neck diameter are ground at an angle on the outside of the curled portion of the neck to produce a substantially conical flat surface on which sealing means can be compressed during the crimping of the mounting cup.

[0006] While having this advantage, conical flat surfaces have disadvantages. Indeed, the sealing means will tend to be squeezed down following the slope of the cone when subject to a high crimping force, as is the case for high pressure containers, thus involving an insufficient compression of the sealing means for resisting to high pressure. Furthermore, the conical flat reduces substantially the resistance of the neck to forces applied along the axis of the container, as is the case during crimping. This involves deformations of the curled portion of the neck which induce leakage.

[0007] The invention seeks to provide a container of the above mentioned kind which can withstand high crimping force and which will minimise leakage at high pressure.

Summary of the invention

[0008] In accordance with the invention, this object is accomplished in a can of the above mentioned kind in that the flat surface defines a substantially planar ring in a plane normal to the main axis of the can.

[0009] In another aspect of the invention, the object is accomplished by a process of the above mentioned kind in that the grinding is made in a plane normal to the main axis of the cylindrical can, so that the flat surface is a substantially planar ring in a plane normal to the main axis of the cylindrical can.

[0010] A can according to the invention has a number of advantages. Since the flat surface is in a plane normal to the main axis of the can, the flat surface is providing an improved resistance to forces along this axis, which correspond to the forces applied during crimping. Indeed such a force can be equally distributed onto the entire flat surface, so that uniform compression of sealing means could be achieved, thus producing a better crimp quality. This is not the case when using a conical flat surface as the flat surface is not normal to the main axis of the can. Furthermore, the sealing means do not tend to squeeze one way or another because there is no slope on the flat surface, so that the sealing means are kept well centred and in the right position. While having these advantages, the can according to the invention still has the benefit of the flat surface which prevents leakage due to wrinkles or irregularities of the surface of the curled part of the neck. Therefore the can according to the invention has an improved resistance to high pressure and risks of leakage are consequently minimised.

Detailed description of the invention

[0011]

Figure 1 is a partial cross section of the region of a can curled portion while being pre-compressed and prior to crimping, the section being made along a radial plane containing the main axis of the container.

Figure 2 is a partial cross section of the region of a can curled portion while being crimped, the section being made along a radial plane containing the main axis of the container.

Figure 3 is a partial cross section of the region of a can curled portion after crimping, the section being made along a radial plane containing the main axis of the container.

[0012] The invention relates to an essentially cylindrical can for aerosols, the can comprising a substantially circular neck defined by a curled portion. Such cans comprising a curled portion are usually metal cans. Two main types of such metal cans exist, cans made out of steel or cans made out of aluminum.

[0013] Cans made out of steel, preferably tin plated steel, may be made out of two parts, such as the "cone less can" of Carnaudmetalbox for example, but are normally comprising three parts: a bottom base, a top dome and a side cylinder. These three components are co-operating in such a manner that the base and the dome are positioned onto the extremities of the side cylinder. The side cylinder is generally made from a thin steel sheet which is welded to form the desired cylinder. The base has normally no opening, apart from safety high pressure release mechanisms. However, the dome is the part which usually comprises the curled portion. The curled portion is obtained by machining the sheet of steel from which the dome is made. The whole curled portion has substantially a torus shape defined by the revolution of an essentially circular shape about the axis of the cylindrical can. The essentially circular shape, which corresponds to a section of the curled portion along a plane comprising the axis of the cylindrical can, is in this case comparable to the extremity of a question mark sign, the bottom part 11 of the question mark being part of the rest of the dome, and the other part 12, which is at the extremity of the semi-circle, being turned away from the central axis which is the axis of the cylindrical container.

[0014] Cans made out of aluminum have a structure which is different in that they are normally composed of a unitary mono-block part which is machined using processes such as extrusion or cold drawing whereby a flat piece of metal is formed into a hollow cylindrical body. This means that there is no need for assembling a base, a dome and sides. However, such aluminium cans are normally also provided with a curled portion. The curled portion is having the same characteristics as the curled portion of steel cans as described above.

[0015] Machining such a curled portion requires special procedures, but it is providing a smooth and relatively solid structure which can be used for connecting the can with a mounting cup. In a normal process for producing an aerosol container, the can will be provided with a mounting cup. The mounting cup is a separate part which usually comprises a valve, and which co-operates with the curled portion of the can to seal it. By a valve it is meant a device for controlling a flow of product, whereby the control may consist of letting product through or not. Usually, valves are comprising a stem. Indeed, the aim is to obtain a sealed container of which the only output is the valve situated onto the mounting cup. In order to seal efficiently the container, the mounting cup normally comprises a double skirt. The double skirt normally co-operates with the curled portion of the can in the following manner. The curled portion of the can is inserted between the inner skirt 21 and the outer skirt 22 forming the double skirt. Once this is done, the mounting cap is hold tight against the can, so that the top part of the curled portion which is tangential to a plane normal to the axis of the can is pressing against a portion of the mounting cup which is linking the inner and the outer skirt and which is also tangential to a plane normal to the axis of the can. The inner skirt, the linking portion 23 and the outer skirt have a section which can be compared with an inverted "U", in which the curled portion is positioned. Once positioned, the mounting cup is fixed by crimping. Crimping consists in using a crimping head 31 to press against the inner skirt in a radial direction from the centre of the cylindrical can to the side of the cylindrical can. In this manner, the inner skirt is bent so as to come in contact with the inner side of the can, thus forming a metal-metal contact region 32 and consequently sealing the mounting cup onto the can.

[0016] In order to obtain a good seal most of the containers also comprise sealing means 40. These sealing means are provided between the curled portion of the can and the linking portion of the double skirt of the mounting cup. Various sealing means are known from the art. For example, a polymeric layer may be provided onto the inner side of the mounting cup. In most of the cases, the sealing means comprises a grommet which is placed between the curled portion of the can and the linking portion of the double skirt of the mounting cup. The sealing means is normally pre-compressed when the mounting cup is being held tight against the can. Pre-compression is preferably obtained by applying a force onto the mounting cup in the direction of the axis of the container. Crimping occurs as described above.

[0017] In order to obtain a reliable seal, the presence of wrinkles should be avoided on the surface of the curled portion. Indeed, such wrinkles would facilitate egress of the content of the container. In order to avoid

this, some cans are provided with a flat surface on the curled portion. Such a flat surface is typically to be found on bigger sizes of aluminium cans. It is provided by grinding the curled portion of the can at an angle, preferably on the outer side of the curled portion. Such flat surfaces are defining a conical surface which makes an angle of about 45 degrees with the axis of the can. The aim of this flat surface is to improve the contact of the sealing means in the seal region.

[0018] The can according to the invention comprises a flat surface 10 on its curled portion. However, the flat surface defines a substantially planar ring in a plane normal to the main axis of the container. Indeed, the flat surface according to the invention is not a conical surface as it is substantially planar. By substantially planar it is meant that it may be slightly bent, so that the flat surface has a direction in a cross section in a plane comprising the main axis which makes an angle with the direction normal to the main axis comprised between 5 degrees and -5 degrees. It was found that such a structure was allowing to improve very significantly the quality of the seal. Indeed, such a structure is combining two sealing principles from the liquid capping technology, i.e. the plug seal, corresponding to a surface to surface contact, and the cone seal, corresponding to the contact of a sharp edge with a surface. The flat surface of the invention is providing a plug seal 51 as it is pressed against the linking portion of the mounting cup, both the linking portion and the flat surface being tangential to a plane normal to the direction of the cylindrical can in the seal area. The plug seal is also efficient in the presence of sealing means, whereby a plug seal is established between the flat surface and the sealing means, and between the sealing means and the linking portion of the mounting cup. The cone seal is produced by both sides of the planar ring intersecting the rest of the curled portion, sides which are defined by two circular edges centred on the axis of the can and inscribed in a plane normal to this axis. Indeed, these circular structures act as edges for producing a cone seal against the outer skirt 52 and against the inner skirt 53 of the mounting cup, preferably against the sealing means placed in between the mounting cup and the flat surface. In order to fulfil their function both as a cone seal and as a plug seal, the sealing means should cover the flat surface and go beyond both circular edges at the sides of the flat surface, in order to form a plug seal structure and a double cone seal structure. This preferably applies when using a grommet, the grommet being placed between the inner and the outer skirt of the mounting cup, and being compressed between the linking part of the mounting cup and the flat surface, going beyond the edges of the flat surface. It is also preferred that grinding is such that the flat surface is machined with a precision of at least 0.3 mm, preferably 0.2 mm, so that surface defaults are kept to a minimum, thus preventing leaking.

[0019] The fact that the flat surface is in a plane normal to the axis of the container is fundamental for different reasons.

[0020] Firstly, the flat surface is normal to the direction along which the pre-compression force is applied during production. Consequently, the force is applied uniformly on the surface, thus reducing risks of deformations of the various parts forming the seal such as the inner skirt, outer skirt or linking portion of the mounting cup, or the curled portion of the can.

Furthermore, such an increased resistance to the pre-compression force 60 allows application of higher forces, preferably of more than 1000 N, more preferably of more than 1200 N, even more preferably of more than 1400 N and most preferably of more than 1600 N. In order to withstand such levels of force, the thickness 61 of the can in the curled portion should be of at least 0.75 mm. Normally this lower limit for the thickness is found just under the ground flat surface. In order to achieve this preferred thickness, the can may be thicker in the region of the curled portion than in the rest of the can.

The flat grinding also allows uniform distribution of the pre-compression force, so that the crimp dimensions can be achieved uniformly over the total crimp circle (over all individual crimp fingers composing the crimping head) hence improving uniformity of the metal/metal contact over the total crimp circle as well. Indeed, crimp dimensions for high pressure cans should be set tighter than traditional crimp dimensions and any high variation in tightness should be reduced. The dimensions relevant to crimping are the crimp diameter and the crimp height, the crimp height 33 being the distance between the level of the top of the linking portion of the mounting cup and the level of application of the crimping force 34 in the radial direction in a plane normal to the direction of the cylindrical can, and the crimp diameter corresponding to the diameter of the crimp head, which is equal to the diameter of the inner skirt at the level of crimping when crimping occurred. Indeed, crimping consists in pressing the inner skirt against the curled portion to form the metal to metal contact.

[0021] Crimping dimensions are tighter when the crimping diameter is increased and when the crimping height is diminished. It should be noted that crimping occurs when the seal is being pre-compressed so that the sealing elements should be kept compressed once the seal region has been crimped and once the pre-compression force has been removed. Indeed, the pre-compression is pressing the elements forming the seal against each other, while the crimping is maintaining them in this position. This means that the combination of an increased pre-compression force and of tight crimping will produce a higher quality seal.

Due to both more uniform distribution of the pre-compression force and the more uniform metal/metal contact giving a more uniform distribution of the pulling force onto the sealing means after the crimping step, with flat grinding according to the invention it was found that in case of use of compressible sealing means such as a grommet, it is possible to compress the sealing

means after the crimping step down to less than 85% of its original thickness, preferably down to less than 80%, more preferably down to less than 75%, the compressed thickness being measured along a line 41 having the direction of the main axis of the can, the line crossing the mounting cup in the area of the linking portion at the point where it is normal to the mounting cup. Such a compression is most preferred when the content of the can is reaching high pressures, i.e. pressures of more than 10 bar at 50 °C, preferably of more than 10.5 bar at 50 °C, more preferably of more than 11 bar at 50 °C, even more preferably of more than 11.5 bar at 50 °C, most preferably of more than 12 bar at 50 °C. Such a compression is also particularly useful in the case of a container containing a product comprising surfactants. Indeed, surfactants have the ability to co-operate with a surface in such a manner that they will tend to pass around the seal. This can be avoided when using good compression of the seal by applying the teachings of the invention. This particularly applies to a can which is at least partly filled with a liquid composition comprising surfactants, preferably 18 to 90 % by weight of surfactants, more preferably 30 to 50 %. Furthermore, such products will usually not induce swelling of a grommet, so that any dead points in crimping would not be blocked by swelling of the grommet in contact with the product, so that the grommet should be compressed sufficiently to allow blocking of any dead points. By a dead point it is meant a point in the sealing region at which the crimping force was not applied.

Another reason for using a flat surface 10 according to the invention is that sealing means would not tend to squeeze on one side or on the other of the sealing region by following the slope of a conical flat surface, as in the case of the invention the flat surface is substantially planar.

[0022] As explained above, the invention particularly applies to containers reaching high pressures at 50°C. Such pressures are equilibrium pressures at the temperature considered. The equilibrium pressure is for example composed of a partial pressure due to the propellant gas and to the partial pressure due to the product contained which is in the gaseous form. The partial pressures are adding up to create the equilibrium pressure. By equilibrium it is meant that the pressure and the temperature are not evolving in time once the equilibrium is reached. It is a thermodynamic equilibrium. In particular high pressures are reached when using a gaseous propellant which can be dissolved in the product to be dispensed, examples of such gaseous propellants including CO_2 and N_2O. These propellants are particularly used in combination with a product which is a foaming composition contained in the container.

[0023] In a particular embodiment of the invention, the invention is applied to a unitary aluminium can with a 1 inch opening, i.e. a curled portion providing an opening of about 2.54 cm. The can and the curled portion are formed using backward extrusion or deep drawing and stretching. Forming of such a can is described for example in US-A-4 441 354. Once formed, the curled portion of the can is ground. Grinding is done by removing a part of the curled portion of the can so as to form the flat surface of the invention. In the example, grinding is along a plane normal to the axis of the can, with a precision of less than 5 degrees in angle of deviation between the flat surface formed and the plane normal to the axis of the container, preferably with a precision of less than 4 degrees, more preferably with a precision of less than 3 degrees, even more preferably with a precision of less than 2 degrees and most preferably with a precision of less than 1 degree. The grinding preferably provides a substantially flat ring having a width comprised between 1 and 2 mm. Grinding is such that the flat surface has a height difference of not more than 0.2 mm in the preferred embodiment. Furthermore, the height between the level of application of the crimping force and any point of the flat surface should preferably not have a variation of more than 0.3 mm per can, including both the height difference of the flat surface and the shape of the curled part of the can. This is an improvement when comparing to standard contact height differences for such cans, which are the corresponding normalised value, and which are of the order of 0.5 mm according to FEA standard 203. The curled portion of the can is such that the residual thickness after grinding is of more than 0.75 mm. However, the curled portion should not be too thick in order to keep a good quality metal to metal contact when crimping. Once the can is formed and ground, pre-compression can take place.

[0024] Pre-compression in the preferred embodiment is made by applying a force 60 in the direction of the axis of the can. The force is applied on a mounting cup. The mounting cup comprises a valve and a double skirt, composed of an inner and outer skirt linked by a linking portion. The double skirt is co-operating with the curled portion of the can in such a manner that the inner skirt is inserted within the 1 inch opening along the inner side of the curled portion whereas the outer skirt is inserted along the outer side of the curled portion. In the example, a circular grommet having a substantially rectangular cross-section is inserted between the mounting cup and the can between the skirts and to be compressed between the linking portion and the flat surface, both being substantially tangential to a plane normal to the axis of the can. Consequently, the pre-compression force will compress the grommet, so that a plug seal and a double cone seal as described above will be formed, the grommet having a thickness of less than 85% of its original thickness when compressed during and after pre-compression and crimping, the thickness being measured along the main axis of the can at the level of the top of the linking part. The pre-compression force, the crimping force and the pulling force due to the metal/metal contact, all contributing to compression, are in this example homogeneously distributed over the

whole flat surface, as being applied in a direction normal to the flat surface, so that compression is more homogeneous and therefore of better quality. Furthermore, the flat surface of the invention allows the can structure to sustain forces 150 N greater than forces sustained by normal cans prior to being distorted, the force being applied onto the can along the direction of the axis of the can. The compression is maintained by crimping the mounting cup onto the can. Crimping is made with a crimping diameter of 27.2 ± 0.1 mm and a crimping height of 5.2 ± 0.1 mm for an aluminium valve. For a steel valve, the crimping diameter is of 27.4 ± 0.1 mm and the crimping height is of 5.0 ± 0.1 mm. Tests indicated that the larger the crimp diameter and the smaller the crimping height the more compression is achieved. The container is filled with a composition containing surfactants in a proportion comprised between 18 and 90 % by weight of the composition, preferably comprised between 30 and 50 % by weight of the composition, as well as with a compressed gas propellant, in this case CO_2, air, N_2, N_2O or a mixture of them. This container will show no product seepage after two weeks storage at 45°C, and a weight loss of less than 0.5 grams after one year storage at 35°C when filled so as to have an equilibrium pressure of 12 bar at 50 °C. It should be noted that current containers with a can having a conical flat surface ground at an angle of more than 45 degrees with the plane normal to the direction of the can are leaking after one week at 45°C, whereas the containers according to the invention will not leak after three month at 45°C. This is avoiding for the user to have a container out of which the propellant is partially or completely gone, thus making the can non-appropriate for use. It should be noted that micro-leakage is solved by the invention. Micro-leakage cannot be observed in the hot water bath which is taking place during the manufacturing process of the container for leak testing.

Claims

1. An essentially cylindrical can for aerosols, the can comprising a substantially circular neck, whereby the neck is defined by a curled portion, the curled portion having a flat surface (10), characterised in that the flat surface (10) defines a substantially planar ring in a plane normal to the main axis of the cylindrical can.

2. The can according to claim 1, whereby the can is a unitary aluminum can.

3. A process for producing an aerosol container, the aerosol container comprising a can, a mounting cup and sealing means, whereby the can is an essentially cylindrical can, the can comprising a substantially circular neck, the neck being defined by a curled portion, the process comprising a can forming step for forming the can and the neck and a grinding step for grinding a flat surface (10) on the curled portion, characterised in that the grinding is made in a plane normal to the main axis of the cylindrical can, so that the flat surface is a substantially planar ring in a plane normal to the main axis of the cylindrical can.

4. A process as in claim 3 for producing an aerosol container, the aerosol container comprising a can, a mounting cup and sealing means (40), whereby the process further comprises a pre-compression step, whereby the sealing means are pre-compressed between the flat surface (10) and the mounting cup by applying a pre-compression force (60) in the direction of the axis of the cylindrical can, and a crimping step, whereby the mounting cup is crimped around the curled portion during pre-compression using a crimping head (34).

5. A process according to claim 4, whereby the sealing means (40) comprises a grommet, whereby the grommet is compressed after the crimping step down to less than 85% of its original thickness, the compressed thickness being measured along a line (41) having the direction of the main axis of the can, the line crossing the mounting cup at the point where it is normal to the mounting cup.

6. A process according to claim 4, whereby the pre-compression force (60) is of at least 1000 N.

7. A process according to claim 3, whereby the flat surface (10) is ground with a height difference of less than 0.3 mm.

8. A process according to claim 3, whereby the can is partly filled with a liquid composition comprising surfactants.

9. A process according to claim 3, whereby the aerosol container is filled with a liquid composition and with a propellant, the equilibrium pressure inside of the filled container being of at least 11 bar at 50°C.

10. A process according to claim 3, whereby the can has a residual thickness (61) after grinding in the curled portion of at least 0.75 mm.

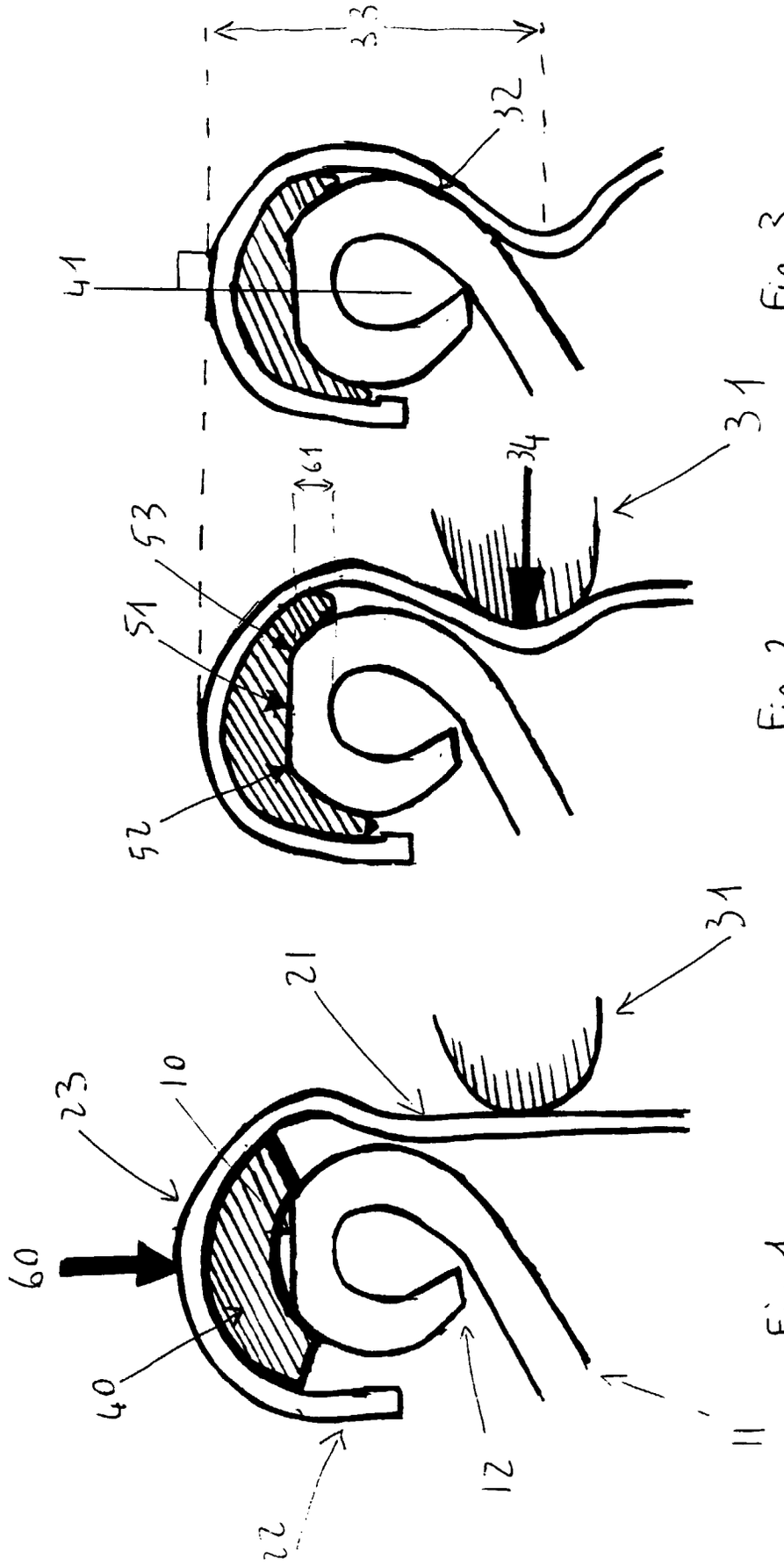

Fig. 3

Fig. 2

Fig. 1

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 20 3397

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 Y	DE 29 32 826 A (LECHNER GMBH) * the whole document * ---	1-3 4	B65D83/38 B21D51/24 B21D51/26
D,Y	US 5 052 577 A (ARMSTRONG LABORATORIES INC.)	4	
A	* column 1, line 10 - line 29 * * column 4, line 31 - line 49 * * figure 4 * -----	1-3,5,6	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65D
B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	1 April 1998	MARTIN A.G.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims

☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,

namely claims:

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

See sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid,

namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims,

namely claims: 4-6

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 97 20 3397

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 4-6

   mounting of the cup

2. Claim : 7 10

   dimensions of the curled portion

3. Claim : 8 9

   contents

The application does not meet the requirements of unity of invention.

REASONS :

Claim 1 : not new (see DE-A-2932826, fig.3)

Claim 2 : trivial

Claim 3 : not inventive (see DE-A-2932826; page 4, lines 18-25)

Starting from this prior art three problems to be solved corresponding to the three groups of claims as indicated above have been identified.

A partial search report has been drawn up for claims 1 to 3, as well as for group 1. Groups 2 and 3 are considered to constitute inventions different from the subject matter of group 1.

The search will be completed as far as further search fees are being paid.